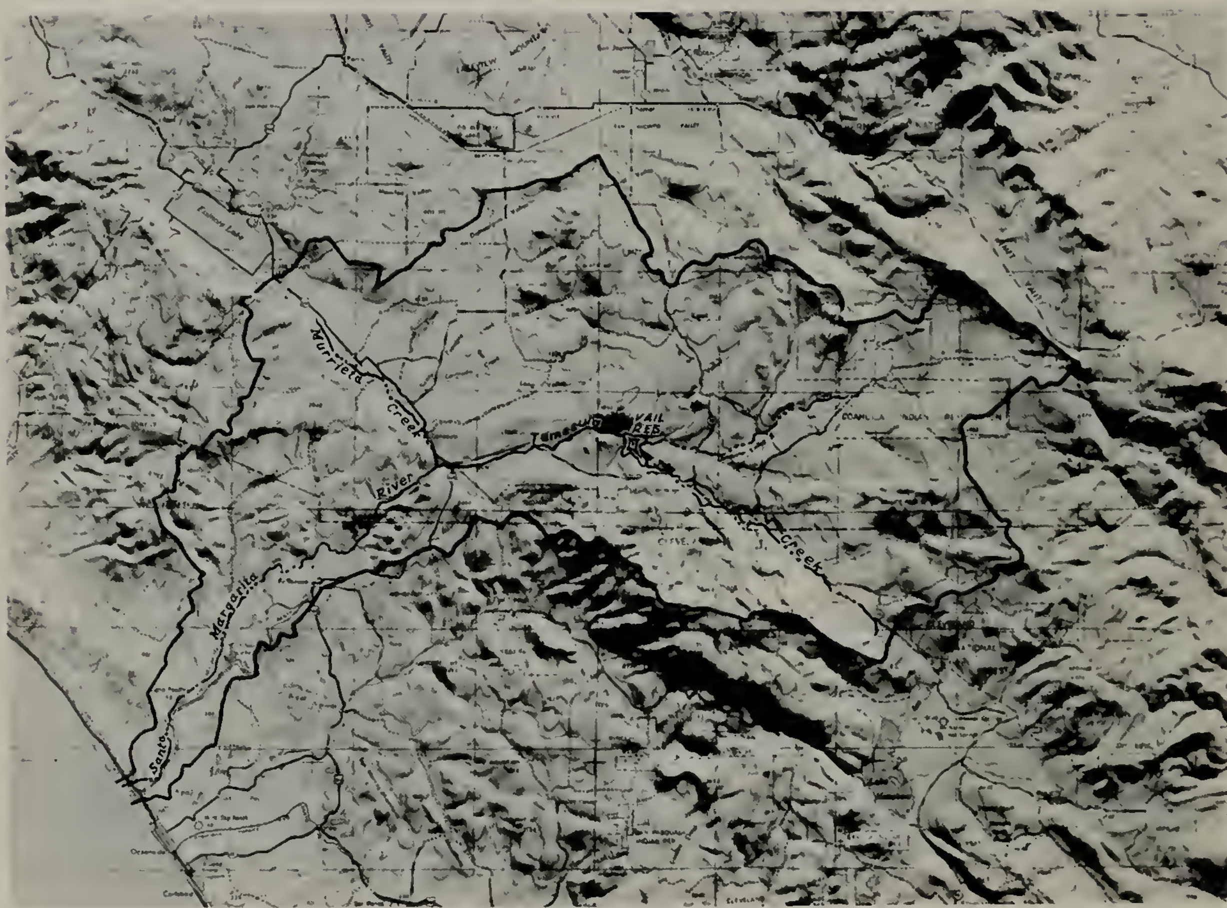

Santa Margarita River Watershed and Vicinity

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

GOODWIN J. KNIGHT, Governor
FRANK B. DURKEE, Director of Public Works
HARVEY O. BANKS, State Engineer

Bulletin No. 57

SANTA MARGARITA RIVER INVESTIGATION

Volume I

TEXT AND PLATES

June, 1956

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June 29, 1956

Mr. Frank B. Durkee
Director of Public Works
Public Works Building
Sacramento, California

Dear Mr. Durkee:

There is transmitted herewith Bulletin No. 57 of the Division of Water Resources, Department of Public Works, entitled "Santa Margarita River Investigation".

Item 262.5 of Chapter 3, Statutes of 1952 (Budget Act of 1952), appropriated to the Division of Water Resources, Department of Public Works, the sum of $150,000

> "For surveys and investigations of the water resources of the Santa Margarita Watershed including but not limited to hydrography, hydroeconomics, the use and distribution of water for agricultural and other beneficial purposes, including consideration of both surface and underground water conditions, and the availability of natural situations for reservoirs or reservoir systems for gathering and distributing flood or other waters ..."

Item 2055 of Chapter 777, Statutes of 1955, appropriated an additional $25,000 for this investigation.

Bulletin No. 57 consists of Volume I, which presents results of a comprehensive analysis of water supply, water utilization and requirements, legal considerations, and preliminary plans for water supply development within Santa Margarita River watershed, and Volume II, which contains basic hydrologic data.

Very truly yours,

Harvey O. Banks
State Engineer

ACKNOWLEDGMENT

Valuable assistance and data used in this investigation and report were contributed by agencies of the federal, state, and county governments, and by private companies and individuals. This cooperation is gratefully acknowledged.

Special mention is made of the helpful cooperation of the Agricultural Research Service of the United States Department of Agriculture, California Electric Power Company, Fallbrook Public Utility District, San Diego Gas and Electric Company, United States Army Corps of Engineers, United States Navy, and the Vail Company.

ORGANIZATION
STATE DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

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ORGANIZATION
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ORGANIZATIONAL CHANGES

At the time this investigation commenced, A. D. Edmonston was State Engineer. On November 1, 1955, Mr. Edmonston retired from state service and was succeeded by Harvey O. Banks.

The function under which this investigation was conducted was directed successively by Gordon Zander, Harrison Smitherum, Harvey O. Banks, and L. C. Jopson until January 3, 1956, when technical supervision of all investigations under specific legislature requests was assigned to W. L. Berry.

CHAPTER I. INTRODUCTION

The Santa Margarita River watershed, located in the South Coastal Area of California and including portions of San Diego and Riverside Counties, has a semiarid climate and potential water requirements which far exceed the natural supply. The need for water has resulted in much litigation over water rights in the area in spite of the relatively small water use. The general shortage of readily available water has so limited agricultural endeavor that only about six per cent of the total irrigable land in the watershed is presently irrigated. Only three-tenths of one per cent of the watershed is urbanized.

Additional water can be developed locally, but ultimate needs for water can only be satisfied by importation of large supplemental supplies.

Authorization for Investigation

Because of the limited amount of hydrologic and geologic information available concerning the Santa Margarita River watershed, and the need for more complete data for planning purposes and for use in active water rights litigation, the California State Legislature in the Budget Act of 1952, made an appropriation of $150,000 to the Division of Water Resources for a complete investigation of water resources, requirements, and use in Santa Margarita River watershed. A supplemental appropriation of $25,000 was made in 1955.

In accordance with the original legislation, the full text of which is reproduced in Appendix A, the Santa Margarita River investigation was started in July, 1952. Objectives of the investigation were: the determination of present cultural development, water requirements, and water use; determination of ultimate cultural development and water requirements;

exploration of further use of local resources; and the development of plans to obtain supplemental supplies.

Related Investigations and Reports

Prior investigations and reports reviewed in connection with this investigation include the following:

American Geophysical Union. "Symposium on Phreatophytes". Transactions, America Geophysical Union, Volume 33, Number 1, pp. 57-80. February, 1952.

Blaney, Harry F. and Muckel, Dean C. "Utilization of the Waters of Lower San Luis Rey Valley, San Diego County, California". United States Department of Agriculture, Soil Conservation Service, Division of Irrigation. April, 1945.

California State Department of Public Works, Referee. "Report of Referee", Temecula Creek Reference. July, 1956.

California State Department of Public Works, Division of Engineering and Irrigation. "Flow in California Streams". Bulletin No. 5. 1923.

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California State Engineer. "Irrigation in California, Southern California". Part II of Irrigation Report of the State Engineer of California. 1888.

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California State Water Resources Board. "Report on Feasibility of Feather River Project and Sacramento-San Joaquin Delta Diversion Projects Proposed as Features of The California Water Plan". May, 1951.

Carpenter, E. J. and Storie, R. Earl. "Soil Survey of the Capistrano Area, California". United States Department of Agriculture, Bureau of Chemistry and Soils, in cooperation with the University of California, College of Agriculture, Agricultural Experiment Station. Series 1929.

Dunn, J. E., Holmes, L. C., and Strahorn, A. T., Guernsey, J. E. "Reconnaissance Soil Survey of the Central Southern Area, California". United States Department of Agriculture, Bureau of Soils in Cooperation with the University of California, College of Agriculture, Agricultural Experiment Station. 1921.

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Lippincott, J. B. "Available Supply of Santa Margarita River for Fallbrook Irrigation District, San Diego, California". February, 1926.

Mead, Roy G. "Suggested Distribution of Water to Irrigable Areas Within Santa Margarita Watershed". December, 1927.

Rancho Santa Margarita vs. Vail. Miscellaneous exhibits and information made available by H. M. Hall.

Sonderegger, A. L. "Report on Santa Margarita Ranch, The Ground Water Basins and Evaporation and Transpiration Losses and Storage Capacity". 1926.

Storie, R. Earl and Weir, Walter W. "A Rating of California Soils". University of California, College of Agriculture, Agricultural Experiment Station. Bulletin 599. January, 1936.

Storie, R. Earl. "An Index for Rating the Agricultural Value of Soils". University of California, College of Agriculture, Agricultural Experiment Station. Bulletin 556. September, 1933.

Storie, R. Earl. "The Classification and Evaluation of the Soils of Western San Diego County". University of California, College of Agriculture, Agricultural Experiment Station. Bulletin 552. June, 1933.

Troxell, Harold C. "Hydrology of Western Riverside County, California". Riverside County Flood Control and Water Conservation District in Cooperation with United States Department of the Interior, Geological Survey. October, 1948.

United States Department of Commerce, Weather Bureau. Climatological Data, published monthly.

United States Department of the Interior, Geological Survey. "Southern California Floods of January, 1916". Water Supply Paper 426. 1918.

United States Department of the Interior, Geological Survey. "Floods of March, 1938, in Southern California". Water Supply Paper 844, 1942.

United States Department of the Interior, Geological Survey, Surface Water Branch. "Surface Water Supply of the United States, Part II, Pacific Slope Basins in California". Water Supply Papers published annually.

Waring, Gerald A. "Ground Water in the San Jacinto and Temecula Basins, California". United States Department of the Interior, Geological Survey. Water Supply Paper 429. 1919.

The Division of Water Resources, under direction of the State Water Resources Board, has for the past several years conducted surveys in connection with the State-wide Water Resources Investigation authorized by Chapter 1541, Statutes of 1947. This investigation has resulted in the formulation of The California Water Plan, a comprehensive plan for full conservation, control, and utilization of the State's water resources to meet present and future water needs for all beneficial uses and purposes in all parts of the State, insofar as practicable. Published in 1951 as the first step in the formulation of the plan is State Water Resources Board Bulletin No. 1, "Water Resources of California". Bulletin No. 2, "Water Utilization and Requirements of California", was published in June, 1955, and Bulletin No. 3, a presentation of The California Water Plan, was released in preliminary form for comment by interested local agencies in May, 1956. This bulletin will be published in final form in fiscal year 1956-57.

In May, 1951, the State Water Resources Board published "Report on Feasibility of Feather River Project and Sacramento-San Joaquin Delta Diversion Projects Proposed as Features of The California Water Plan". Construction of the Feather River Project was authorized by the Legislature in Chapter 1441, Statutes of 1951. The act authorized and directed the Department of

Public Works to conduct necessary investigations and prepare plans for construction. A total of $2,227,056 was subsequently appropriated for this work. As a result of studies conducted after 1951, the Division of Water Resources published, in February, 1955, the report entitled "Program for Financing and Constructing the Feather River Project as the Initial Unit of The California Water Plan". The aqueduct which is proposed in these reports, would follow a high-line route which crosses the eastern portion of the Santa Margarita River watershed at an elevation of about 3,000 feet, and would deliver supplemental water to the watershed.

The Legislature in the Budget Act of 1956, Chapter 1, Statutes of 1956, appropriated an amount of $9,350,000 for surveys, explorations, investigations, preparation of construction plans and specifications; and surveys of, negotiations for, and acquisition of rights of way, easements, and property, including other expenses in connection therewith, for the Feather River Project. Authorized specifically was an item of $200,000 for studies of alternative aqueduct routes to San Diego County.

Studies of The California Water Plan, presented in the aforementioned Bulletin No. 3, included analyses of preliminary locations of three aqueducts to San Diego County, namely, the San Diego High Line, Barona, and Second San Diego aqueducts, all of which traverse the Santa Margarita River watershed on the approximate alignments shown on Plate 25, "Existing and Potential Water Supply Developments". It was found that these aqueducts would provide for ultimate needs of the area to be served. The studies contemplated for fiscal year 1956-57, under the specific authorization mentioned above, consist essentially of analyses of alternative locations for the Second San Diego aqueduct, which is presently needed.

A survey of the water resources of the Santa Ana River was conducted by the Division of Water Resources for the State Water Resources Board, and in April, 1956, Bulletin No. 15, "Santa Ana River Investigation", was released in preliminary form for comment by interested local agencies. The Bulletin will soon be published in final form. Basic data relative to the Elsinore area, collected for that survey, were useful in the present investigation. Much data from the Southern California Area Investigation, a continuing investigation of the water resources of southern California by the Division of Water Resources, are used in this report. These data consist primarily of records of precipitation and of depths to ground water. Water analyses obtained in the periodic stream sampling and ground water monitoring programs of the Division of Water Resources are also utilized. The Department of Public Works, Division of Water Resources, is the referee in the Temecula Creek Court Reference, and as referee has made investigations in the Temecula Creek portion of the Santa Margarita River watershed. The "Report of Referee" is to be published in July, 1956. Basic data developed for that investigation are used herein.

Hydrologic and geologic data concerning the Santa Margarita River system, generally for the period 1920 through 1927, were obtained and presented in evidence in Rancho Santa Margarita vs. Vail, et al. Much of the information presented therein, pertinent to the present investigation, was made available by the Vail Company and is included in this report either in the analyses presented or in the basic data. Pertinent portions of the data presented in evidence in United States vs. Fallbrook Public Utility District, et al., have also been utilized in this report either in the text or appendixes. These data were largely collected and compiled by the Camp Pendleton Office of Ground Water Resources and concern water facilities and use on Camp Pendleton. Similar data for the period after the close of the trial were supplied to the Division of Water Resources through 1953, after which further information was withheld.

The United States Army Corps of Engineers completed a comprehensive flood control investigation of the Santa Margarita River in 1949. Data from that investigation have been utilized in this report principally in the sections on water conservation and flood control.

Scope of Investigation and Report

The Santa Margarita River field investigation was conducted during the period from July, 1952, through May, 1954, primarily from a field office at Murrieta. The need for hydrologic data suitable for use in water right litigation required the collection and study of data in more detail than is ordinarily required for water resources investigations. A large amount of basic data is tabulated in the appendixes of this report, and much historical and current information gathered by local groups and agencies has been included.

Available precipitation and stream runoff records were collected and the following stations and equipment were installed to obtain supplemental data: seven continuously operated stream gaging stations and other temporary stations; three Class A evaporation stations; and three recording rain gages. Many stream flow measurements were made, particularly during the summer months when the surface water supply is critical. Areas of rising water were located, and diversions from the streams were measured or estimated.

In 1952 and 1953, lands in the watershed were classified both as to present use and ultimate use capability, and a survey was made of irrigation practices. To determine the rate of consumptive use of water for various irrigated crops and for native vegetation on the watershed, a study which included measurements of soil moisture depletion at representative test plots throughout the watershed, was made in cooperation with the United States Department of Agriculture.

Available water quality data were collected and additional mineral analyses of surface and ground waters were made to determine the native quality and to study the nature, cause, and extent of possible degradation thereof.

Geologic features of the watershed were investigated to ascertain the water-bearing characteristics of various rock types found therein; to determine the hydrologic significance of the permanent structural features of the area; to determine the mode of occurrence, movement, and ultimate destination of ground water; and to locate and evaluate the characteristics of water-bearing deposits forming the several ground water basins identified in the watershed for purpose of preparing estimates of the storage capacity thereof.

Water-bearing rocks and pertinent structural details were mapped, water wells were located, and their logs obtained. Depths to ground water were measured periodically and 40 key wells were measured monthly.

Detailed hydrologic studies were made for each of the principal drainage areas of the Santa Margarita River watershed. These studies included estimates of the presently developed surface and ground water supplies, and present and probable future supplemental water requirements. Also estimated was the present waste to the ocean, and the portion of this waste susceptible to conservation through operation of both surface and underground reservoirs.

The development of possible plans for additional conservation of local water and regulation of imported water supplies included field examination of feasible dam sites, together with a geologic investigation thereof. Preliminary designs and cost estimates were prepared for dams of several heights at a number of sites and for conveyance and distribution systems and pertinent works. Preliminary plans were also prepared for possible works to furnish supplemental water from the aqueducts proposed as part of The California Water Plan, and from the Colorado River supply of The Metropolitan Water District of Southern California.

Results of the Santa Margarita River Investigation are presented in this report in the four ensuing chapters. Chapter II, "Water Supply", contains data on and analyses of precipitation, runoff, and imports and exports of water. It also includes results of investigation and study of the ground water basins, and contains data regarding the mineral quality of surface and ground waters. Chapter III, "Water Utilization and Requirements", includes data and estimates of the nature and areal extent of present and probable ultimate patterns of land use and of water requirements therefor, and contains estimates of present and probable ultimate supplemental water requirements. It also includes data on demands for water with respect to rates, times, and places of delivery. Chapter IV, "Legal Considerations", is a summary of litigation and review of California water law pertinent to the Santa Margarita River watershed. Chapter V, "Plans for Water Development", describes preliminary plans for conservation and utilization of local water supply, including estimates of yield and of cost for the construction of works. Possible plans for the development of imported water supplies are also considered. Chapter VI, "Summary, Conclusions, and Recommendations", includes a brief summary of the preceding chapters and conclusions and recommendations resulting from the investigation and study.

Area Under Investigation

The area under investigation comprises all lands within the drainage of the Santa Margarita River, located in the South Coastal Area of California in northern San Diego and western Riverside Counties. The general location of the investigational area is shown on Plate 1, "Location of Santa Margarita River Watershed." The watershed lies east of Lake Elsinore between the San Jacinto Mountains and mountains of the Palomar block and extends to the Pacific Ocean near the City of Oceanside. Nearly four-fifths of the area is inland from the coastal divide which meanders in a generally east-west direction across Santa Rosa plateau. This region is termed herein the "Inland Area", and the portion of the watershed seaward from the coastal divide is called the "Coastal Area".

The Coastal Area is triangular, about 20 miles in length with a maximum width of about 10 miles; the Inland area is roughly rectangular, about 18 miles wide and 40 miles long. These areas are delineated on Plates 2A and 2B, depicting physiography of the Coastal and Inland areas, respectively.

The watershed has an area of 742 square miles, the largest for any stream in the South Coastal Area south of Santa Ana River. It is bounded on the south by the drainage area of the San Luis Rey River, on the north by that of the San Jacinto River, and on the east by the area draining to the Colorado River Basin. On the west the watershed adjoins the drainage areas of San Mateo, San Onofre, and Las Pulgas Creeks which flow directly to the ocean.

Topography

The two main tributaries of the Santa Margarita River are Temecula and Murrieta Creeks, the drainage areas of which together constitute the Inland Area. The two creeks join to form the Santa Margarita River at the head of Temecula Canyon, a narrow, precipitous, five-mile long gorge.

Temecula Creek drains the relatively high lands north of Palomar Mountain, which comprise 85 per cent mountains and foothills and 15 per cent valley and mesa lands lying largely more than 1,500 feet above sea level. In the Murrieta Creek drainage area a large proportion of the total comprises valley and mesa lands, which for the most part lie at elevations between 1,000 and 1,500 feet above sea level.

Highest terrain is in the eastern portion of the investigational area, where Thomas Mountain and Palomar Mountain rise to elevations above sea level of 6,812 feet and 6,138 feet, respectively. Four relatively flat divides along the northwestern boundary lie at elevations ranging from 1,300 to 1,600 feet, and stream bed elevation at the head of Temecula Canyon is 960 feet. About one-fourth of the total watershed of the Santa Margarita River lies above 3,000 feet elevation.

Topography of the portion of the Coastal Area which lies north of Fallbrook, at elevations ranging for the most part up to about 2,500 feet above sea level, is generally rough. Valley and gently rolling hill lands occupy most of the Coastal Area between Fallbrook and the ocean.

Climate

The climate of the Santa Margarita River watershed is typically Mediterranean, being characterized by warm dry summers and cool rainy winters. About 75 per cent of the precipitation occurs during the four-month period from December through March. Precipitation occurs generally in the form of rainfall, but snow is common on the mountain ridges and as much as three feet of snow has reportedly fallen in a single season at Anza. Mean seasonal depth of precipitation ranges from less than 10 inches near Vail Reservoir to over 40 inches west of Palomar Observatory, varying with elevation and topographic influences.

The coastal mountains block a considerable portion of the prevailing moist sea breeze and there results a marked difference in climate between the Coastal and Inland areas. Landward from the coastal mountains, the moderating influence of the ocean is less and temperatures are more extreme. A definite rain shadow effect of the mountains is also evident, as stations inland from Palomar Mountain have about 10 inches less precipitation than those at similar elevations on the coastal slopes.

No long-record weather stations are located in the watershed, but temperature data at the Escondido, Elsinore, and Warner Springs stations, adjacent thereto, are considered representative as regards the frost-free periods and mean annual temperatures in the Coastal, lower Inland, and upper Inland areas of the Santa Margarita River watershed, respectively. Records at the respective stations are shown in the following tabulation:

Area	Long-record Station Considered Representative of Area	Average Frost Free Period, in days	Mean Annual Temperature, in degrees F.
Coastal	Escondido	257	61.0
Lower Inland	Elsinore	249	63.4
Upper Inland	Warner Springs	181	58.5

Temperature extremes at Elsinore vary from a record low of 17° to a high of 118°. During the investigational period, the lowest and highest temperatures recorded at any of the currently operated weather stations were 12° and 110°, both recorded at the Murrieta station. Extremes for the same period at O'Neill Lake, which may be considered representative of coastal conditions, were 21° and 106°, and at Anza, representative of the upper Inland area, temperatures ranged from 13° to 99°.

Geology

The most obvious geologic feature of the Santa Margarita River watershed is the predominant northwest-southeast trending fault pattern which is manifested by the orientation of Murrieta Valley, Palomar and Agua Tibia Mountains, upper Temecula Creek, and the mountain ridge between Thomas and Lookout Mountains. These features are illustrated in the Frontispiece photograph of a relief map of the watershed.

Geologically it is considered that the Inland area was originally a part of the Santa Ana River drainage system with the ancestral Temecula-Murrieta Creek flowing westward through Lake Elsinore, and that later the Santa Margarita River eroded the coastal mountain ridge headward sufficiently to "capture" the ancestral stream and eventually reverse the direction of flow in Murrieta Creek.

Geologic formations of the Santa Margarita River watershed include Cretaceous and Pre-Cretaceous metamorphic and igneous rocks and overlying sedimentary deposits ranging in age from early Tertiary to Recent. Small remnants of volcanic Tertiary and Quaternary rocks are also evident. The sediments are largely of continental origin, but scattered outcrops of rocks deposited under marine conditions are exposed near the coast.

Only the sedimentary formations can be considered to be water bearing to any appreciable degree. These have been deposited within bedrock depressions, forming basins capable of storing water. Recent sediments contain thick strata of sands and gravels of high permeability, and deposits of this type yield large supplies of ground water. Some deposits of older alluvial fill yield moderate supplies. The igneous and metamorphic basement rocks are nonwater-bearing, with the exception of joints, fractures, or deeply weathered zones from which the yield is generally small. In some localities, however, they are important in that they provide the only presently available water supply.

Soils

Soils of the Santa Margarita watershed have been mapped by the United States Department of Agriculture, Bureau of Soils, as reported in the San Diego Reconnaissance, 1915; Central Southern Area Reconnaissance, 1921; Riverside Area, 1917; Capistrano Area, 1929; and Oceanside Area, 1929. An index rating of the soils, covered in the above reports, was made in 1936 by R. Earl Storie of the Agricultural Experiment Station of the University of California. At the present time, parts of this watershed are being surveyed in detail by the Soil Conservation Service of the United States Department of Agriculture. In 1951 and 1952 the United States Marine Corps conducted a soil and land classification survey of the Camp Pendleton Reservation and some adjacent areas, utilizing Soil Conservation Service methods and procedures. In the present investigation a land classification survey was made to determine the suitability of lands for irrigation development, utilizing the data from the previous surveys when possible. In the classification survey soil depth and texture were considered, but no attempt was made to classify the soils in detail except with regard to their irrigability.

The soils within the watershed vary in their physical and chemical properties according to differences in parent material, mode of formation, and age and degree of development if alluviated. Broadly, the agricultural soils can be grouped into three classifications: (1) Recent alluvial soils; (2) old valley terrace soils and coastal plain soils; and (3) residual soils.

The Recent alluvial soils are those lying adjacent to the streamways and have undergone little or no change in physical or chemical composition since their deposition. These soils are in general deep, fertile, easily irrigated, and suited for production of a wide variety of crops.

Old terrace soils and coastal plain soils are those that have developed on old valley fillings or old alluvial fans and terraces. These soils have moderate to strongly developed claypans, but normally exhibit good drainage characteristics. They are generally highly productive and have a wide crop adaptability and are fairly extensive within the area.

Residual soils are those that have developed in place by the action of soil forming processes upon the underlying parent material. Their physical and chemical characteristics are closely related to the nature of the parent material. In general, these soils are productive and are suited to a wide variety of crops, particularly citrus and avocados.

Historical and Present Development

The decision of the Spanish government in 1768 to colonize "Upper" California and the arrival of a colonization expedition the following year, marks the beginning of development in Santa Margarita River watershed. The expedition established Franciscan missions all along the coast, and for nearly sixty years the Franciscans maintained almost complete control of Upper California. Thousands of Indians were baptized and worked in mission fields and orchards and tended vast herds of mission cattle. At this time the Santa Margarita Valley was a part of the lands of San Luis Rey Mission. In the early 1800's the gradual secularization of mission lands, brought about the transfer of land control to private owners largely by grant from the Mexican Government. After numerous transfers and consolidations of lands and the conquest of California by the United States in 1848, the new government issued patents for the various ranchos. Throughout this entire period the missions and ranchos represented practically the only settlements except for scattered groups of Indians, and lands were almost exclusively used for cattle raising. A small group of Temecula Indians, whose tribe once occupied the low lands of Murrieta Valley now form a scattered settlement in the Pechanga Indian Reservation in upper Pechanga Valley. A group of Coahuila Indians is presently located at the Coahuila Indian Reservation near Anza.

Modern development in the area may be said to date from the construction, in 1883, of the California Southern Railroad from San Bernardino, across Perris Valley and through Murrieta Valley, Temecula Canyon, and Santa Margarita Valley to San Diego. This opened Murrieta Valley to more extensive development and towns were established at Wildomar, Murrieta, and Temecula. The section of the railroad line through Temecula Canyon was washed out in 1884 and again in 1891, after which it was abandoned. Since that time the line from Perris into Murrieta Valley has also been abandoned, with the closest shipping points now being Elsinore and Winchester, both on branch lines of the Atcheson, Topeka and Santa Fe Railway Company and lying just beyond the watershed boundary. Between Fallbrook and Fallbrook Junction, near Oceanside, portions of the original line are still in use. Two modern State highways, U. S. Routes 101 and 395, between the Los Angeles metropolitan area and San Diego, together with an adequate system of secondary paved highways, serve the area.

Between Wildomar and Murrieta the arable slopes have for many years been used for grain raising by dry farming methods. Attempts have been made to raise fruit, but fruit production has not become a major enterprise and only a few groves of deciduous trees and olives now exist. Between Murrieta and Temecula considerable areas of natural pasture have long been used for

Fallbrook and Naval Ammunition Depot

Courtesy Pacific Air Industries

Santa Margarita Rancho
Home of Pio Pico, Now
Residence of Commanding
General of Camp Pendleton

Courtesy Title Insurance and Trust Company, Los Angeles

cattle raising, but acreage devoted to alfalfa, irrigated by deep well pumps, has increased rather rapidly in the past few years. Alfalfa has been grown on lands bordering Santa Gertrudis Creek since prior to 1915. Valley and rolling lands in the vicinity of Diamond, Domenigoni, French, Los Alamos and Long Valleys north of Temecula and Murrieta have been dry farmed for many years, but of late some of these valley lands have been planted to alfalfa and truck crops, irrigated from local wells.

The Vail Ranch, one of the largest agricultural operations in the United States, comprises some 90,000 acres in the Pauba and Santa Rosa Ranchos and portions of Temecula and Little Temecula Ranchos, which were patented about 1870. Of these lands, about 41,000 acres are within the watershed of the Santa Margarita River. The Vail Company has developed the lands into a modern stock ranch. The higher lands are used for grazing and growing of dry farmed grain, and part of the valley lands have, since about 1890, been used for growing alfalfa. Irrigation water was first obtained by direct diversion from Temecula Creek, this being later supplemented by flow from artesian and other wells drilled in the valley. For a time following 1930 the entire supply was derived from the wells, but since 1953 considerable additional acreage has been planted to miscellaneous farm crops supplied by water released from Vail Reservoir.

The higher lands in several small valleys in the eastern part of the watershed have, since the 1880's been occupied by ranches producing principally hay and grain, irrigation water being obtained for the most part by diversions from Temecula Creek. Agricultural practice has changed little in recent years, except in limited areas where ground water has been developed for irrigation. Homesteads were taken up in Anza Valley starting about 1913. Most of the land there is devoted to grain raising, but in 1949 irrigation wells were drilled and some alfalfa is now grown.

Earliest agricultural development in the Fallbrook area dates back to the construction of wells around 1890. Variable yields were obtained, but production from some wells is said to have been adequate to irrigate 25 acres of land. Development of irrigated land continued on the basis of supply from underground sources until 1925 when the Fallbrook Irrigation District, predecessor of the present Fallbrook Public Utility District, was organized. Water was supplied by local wells and diversion from the Santa Margarita River. Diversions increased gradually to about 100 acre-feet in 1939. In that year diversions were augmented by pumping from the Bonsall ground water basin on San Luis Rey River, and, starting in 1948, by importation of Colorado River water. Lands of the District lie in the Santa Margarita River and San Luis Rey River drainage basins. In 1926, two-thirds of the irrigated land in the entire District was devoted to citrus culture. Irrigated agriculture increased greatly from about 1947, and at the present time avocados are grown on about 90 per cent of the irrigated lands in the Santa Margarita River portion of the District.

Development on Camp Joseph H. Pendleton, a large permanent Marine Corps training base, consisting principally of the former Rancho Santa Margarita y Las Flores, relates back to the beginnings of the Rancho. Adjacent to Camp Pendleton and often referred to as part of it is the Fallbrook Naval Ammunition Depot. Also located at Camp Pendleton is the United States Naval Hospital, Oceanside, California. The military reservation as a whole has an area of about 135,000 acres, of which about 38,000 are within the watershed of the Santa Margarita River.

The ranch originally was granted to Andres and Pio Pico in 1841 and was called Rancho San Onofre y Santa Margarita. It was one of six belonging to San Luis Rey Mission. Other lands were added to the original grant and a patent to all the lands was issued in 1879. Among other noteworthy activities, Pio Pico was the last territorial governor of California under Mexico, and Andres Pico was State senator in 1860-61. The rancho prospered under the Picos, and at the time of the change in government Santa Margarita had 10,000 cattle, 2,000 horses, and 15,000 sheep.

Title to the Rancho passed to Richard O'Neill and James Flood in 1882, and Richard O'Neill maintained his residence at, and conducted the affairs of the stock ranch until his death. He was succeeded by his son, Jerome O'Neill. The following quotation from the report by Wm. Ham. Hall, the first California State Engineer, entitled "Irrigation in Southern California" and dated 1888, describes early development of O'Neill Lake and O'Neill Ditch on the Rancho, and provides a picture of other water development in San Diego County, which at that time included all of the Santa Margarita River watershed.

"Santa Margarita River Farm Ditches

"Near the mouth of the canon, and about eight miles from the coast, a ditch is taken out of the river for irrigation on the Santa Margarita ranch, and about three hundred acres of alfalfa and twelve acres of orchard and vineyard are thus irrigated. The main ditch is three quarters of a mile in length, and terminates in a reservoir, covering one hundred and sixty acres, built in 1883 by throwing up an embankment of earth across a flat side valley. This dam is about twelve feet high, one thousand three hundred and forty feet long, and is provided with an outlet near the south end, consisting of a wooden opening four feet four inches wide, reaching from top to bottom, with loose plank four inches thick set one above the other (not inclined) to retain the water and enable it to be drawn off from the top by removing one plank after the other. A part of the diverting ditch is in flume, five feet six inches wide in the clear, and twenty-two inches deep. If the extent of the appropriation is to be judged by the capacity of the flumes, its volume must exceed one thousand inches. August 27, 1886, the flume was carrying nearly all the water of the stream, and its flow measures one hundred and forty miner's inches.

"From the reservoir to the rancho house, one and one half miles, the ditch is about six feet wide on the bottom, two feet deep, with a grade of four feet to the mile. It is carried one and one half miles farther, and has a number of laterals from which water is distributed in checks in the alfalfa field. This is probably the only old irrigation ditch in the county irrigating any considerable area, which has any pretense of a systematic utilization of water, and in this case its use is rather more required for exterminating gophers than as an absolute necessity for plant growth, because the bottom lands on which it is used are naturally moist and sub-irrigated. Besides this ditch there are several exceedingly small works, irrigating in all from seventy-five to one hundred acres in small patches in the water-shed of this river."

From 1883 to 1942, when nearly 132,000 acres of the rancho were sold to the United States for Camp Pendleton, water was diverted from the Santa Margarita River into O'Neill Lake and later used for irrigation. Additional limited quantities of water were pumped from wells primarily for stock watering purposes. In 1938 an irrigation system was built to serve Stuart Mesa, adjacent to the coast and largely outside the Santa Margarita River watershed. Since 1942 the Stuart Mesa lands have been leased to agriculturists, but use of O'Neill Lake was discontinued for irrigation use at that time. Many new wells were drilled on the reservation starting in 1942, and use for military purposes has since exceeded agricultural use. Mesa lands are still used, however, for growing citrus, truck crops, and flowers, and much of the other land in Camp Pendleton is utilized for grazing, subject to its primary use for military training.

Native vegetation on the Santa Margarita River watershed varies from grass and weeds on the low valley and hill lands to forests of evergreens on the ridges of Agua Tibia, Palomar, Thomas, and other high mountains. Numerous groves of oak trees are also found scattered throughout the watershed.

Large areas of land within the watershed are in single ownership or control. Indian Reservations constitute 32 square miles, the Naval Reservations of Camp Pendleton and the Fallbrook Naval Ammunition Depot occupy 59 square miles, the Vail Company owns 122 square miles, and 85 square miles are within the San Bernardino and Cleveland National Forests.

Industrial activity consists of limited developments in fruit packing and light manufacturing, and operation of the repair shops and storage depots of the United States Navy, which constitute a major industrial establishment.

Present centers of population in the watershed are Murrieta, Temecula, Fallbrook, Camp Pendleton Marine Barracks, and a few small community centers. The population of the entire Santa Margarita River watershed was about 1,800 in 1910 and about 4,000 in 1950. The largest town, Fallbrook, which lies mostly within Santa Margarita River watershed had a population of 1,735 in 1950. The average annual military population of Camp Pendleton varied from a war time peak of about 50,000 in 1944 to 11,000 in 1946, increasing again to about 50,000 in 1952. In Table I are presented United States Census figures for Murrieta Township, which constitutes about one-third of the Inland Area and is representative thereof, and for Fallbrook.

TABLE I

CENSUS DATA

Year	Area: Murrieta Township	Area: Fallbrook
1900	764	--
1910	765	--
1920	886	--
1930	969	--
1940	1,041	--
1950	1,265	1,735

Hydrographic Units

To aid in evaluation of water resources and requirements of the Santa Margarita River watershed and to facilitate analysis of water supply problems, the watershed was divided into six hydrographic units, the boundaries of which are shown on Plate 3, and others where appropriate. The boundaries of the units are definite topographic divides which were selected after giving consideration to factors affecting water supply and utilization, topography, geology, climate, and availability of data, in order to include within each unit lands having similar problems. In Table 2, the units are listed and the area of each is shown.

TABLE 2

AREAS OF HYDROGRAPHIC UNITS

Hydrographic Unit	Description of Unit	Area of Unit: Square miles	Area of Unit: Acres
1	Murrieta Creek drainage area above gage at Temecula	221	141,546
2	Temecula Creek drainage area above Vail Reservoir	157	100,766
3	Lancaster-Coahuila Creek drainage area above Vail Reservoir	163	103,981
4	Remainder of Temecula Creek below Vail Reservoir	45	29,045
5	Santa Margarita River from gage at Temecula Canyon to De Luz dam site	114	73,098
6	Santa Margarita River from De Luz dam site to coast	42	26,679
	TOTAL	742	475,115

Numbering System

Well reference numbers used herein indicate approximate well locations. The wells are numbered by the system now utilized by the Division of Water Resources, according to the township, range, and section subdivision of the Federal land survey. Under this system, each section is subdivided into 40-acre plots, which are lettered according to the "Key to Numbering System" shown on Plate 3 and others where appropriate. Wells are numbered within each of these 40-acre plots according to the order in which they are located. For example, referring to Plate 9A, "Location of Wells", well 9S/3W-6A1 is the first well located in the NE 1/4 of the NE 1/4 of Section 6 in Township 9 South, Range 3 West, San Bernardino Base and Meridian. On the map, which depicts township, range, and section boundaries, the location of this well is designated by the letter and number A1 only. A similar numbering system was used for identifying springs, diversion points, and precipitation stations.

CHAPTER II. WATER SUPPLY

The principal source of water supply of Santa Margarita River watershed is direct precipitation and stream flow originating within the watershed, both of which vary cyclically over a wide range. Ground water is utilized extensively and lesser amounts are diverted from the surface flow. Relatively small quantities are imported from the Colorado River and from wells outside the watershed. The water supply of the watershed is discussed in this chapter under the headings "Precipitation", "Runoff", "Imports and Exports", "Underground Hydrology", and "Quality of Water".

The terms used in connection with the discussion of water supply in this report are defined as follows:

Annual - This refers to the 12-month period from January 1 of a given year through December 31 of the same year.

Seasonal - This refers to a 12-month period other than the calendar year.

Precipitation Season - This refers to the 12-month period from July 1 of a given year through June 30 of the following year.

Runoff Season - This refers to the 12-month period from October 1 of a given year through September 30 of the following year. This period is also referred to as the "water year".

Average - This is used in reference to arithmetical averages relating to periods other than mean periods.

Mean - This is used in reference to arithmetical averages relating to mean periods.

Mean Period - This is used in reference to periods chosen to represent conditions of water supply and climate over a long period of years. The 50-year period 1897-98 through 1946-47, as used in State Water Resources Board Bulletin No. 1, was selected as the period for estimating mean seasonal precipitation. The 48-year period from 1895-96 through 1942-43 was selected for estimating mean seasonal runoff.

Precipitation

The Santa Margarita River watershed lies in the path of marine air masses which move generally easterly over the coastal mountains into the inland portion of the watershed. A marked rain shadow effect of the mountains results from this movement. Precipitation on the watershed, most of which falls in the form of rainfall, is the primary source of all local water available for use in the area.

Precipitation Stations and Records

Existing records at 93 precipitation stations in or near the Santa Margarita River watershed were collected from published reports, public and private agencies, and individuals. Temporary stations were established by the Division of Water Resources at Murrieta, Los Alamos Valley, Wilson Valley, and Anza Fire Station. Locations of the precipitation stations are shown on the isohyetal map, Plate 3, "Lines of Equal Mean Seasonal Precipitation". The stations, with their map reference numbers, elevations, source and period of record, estimated mean seasonal depth of precipitation, and maximum and minimum recorded seasonal depths of precipitation are listed alphabetically by Hydrographic Units in Table 3, "Mean, Maximum, and Minimum Seasonal Precipitation at Stations Within and Adjacent to the Santa Margarita River Watershed". Tabulated in Appendix D are monthly precipitation records at stations established by the Division of Water Resources and at other stations in the watershed whose records are 10 years or greater in length and previously unpublished. Annual values are presented for other stations at which records are available.

TABLE 3

MEAN, MAXIMUM, AND MINIMUM SEASONAL PRECIPITATION AT STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED

Station	Map reference number	Elevation, in feet	Period of record	Source of record	Estimated mean seasonal precipitation, in inches*	Recorded maximum and minimum seasonal precipitation: Season	Inches
			Hydrographic Unit 1				
Greenwood (Los Alamos Valley)	7S/2W-15C	1,400	1912-1914, 1917-1926	Private	12.88	1921-22 1912-13	24.28 6.64
Los Alamos Valley	7S/2W-12A	1,500	1953-54	D.W.R.	15.19	1953-54 1953-54	12.76 12.76
Murrieta	7S/3W-16N	1,090	1952-1954	D.W.R.	15.58	1953-54 1952-53	13.70 10.61
Murrieta Hot Springs	7S/3W-13N	1,100	1946-1950	R.C.F.C.W.C.D.	10.89	1948-49 1946-47	9.91 6.12
Pauba Ranch (Station A)	7S/2W-26A	1,450	1919-1921	Vail Co.	14.62	1919-20 1920-21	13.94 11.06
Sage	7S/1W-12A	2,283	1938-1953	U. S. Corps of Engrs.	15.88	1940-41 1950-51	28.13 7.27
Santa Rosa Ranch (Cienega)	7S/4W-28P	2,000	1924-1941	Vail Co.	22.94	1940-41 1924-25	40.57 9.20
Santa Rosa Ranch (Gate)	7S/3W-19C	1,200	1923-1941	Vail Co.	17.16	1940-41 1923-24	30.54 8.50
Santa Rosa Ranch (E)	7S/3W-32P	1,450	1942-1946, 1947-1951, 1952-1953	U.C.L.A.	19.49	1942-43 1950-51	28.92 7.80
Temecula	8S/3W-12M	1,019	1901-1920	Private	15.62	1915-16 1903-04	25.54 5.87
Wildomar	6S/4W-34J	1,242	1914-1952	Private	13.78	1921-22 1950-51	28.79 4.44
Wildomar (Near)	6S/4W-35C	1,290	1929-1954	U. S. Corps of Engrs.	13.99	1940-41 1950-51	27.52 4.44

MEAN, MAXIMUM, AND MINIMUM SEASONAL PRECIPITATION AT STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED (continued)

Station	Map reference number	Elevation, in feet	Period of record	Source of record	Estimated mean seasonal precipitation, in inches*	Recorded maximum and minimum seasonal precipitation: Season	Inches
			Hydrographic Unit 2				
Aguanga (Upper)(See also Aguanga No. 1, in Hyd. Unit 3)	8S/2E- 7D	3,100	1928-1948	U.S.W.B.	12.94	1940-41 1933-34	24.20 4.62
Anza	7S/3E-21B	3,900	1949-1951 1953-54	U.S.W.B. D.W.R. (1953-54)	14.33	1952-53 1950-51	11.73 7.29
Anza (Cartier)	7S/3E- 4K	4,650	1949-1954	Private	22.04	1951-52 1949-50	33.77 10.50
Coahuila	7S/3E-31M	3,800	1911-1918	U.S.W.B.	16.14	1914-15 1912-13	27.95 4.43
Rancho Ramona	8S/1E- 7P	1,600	1950-51	Private	8.02	1950-51 1950-51	4.25 4.25
Wilson Creek	7S/1E-24G	3,000	Feb. 1953-Jan. 1954	D.W.R.	14.24	--- ---	--- ---
			Hydrographic Unit 3				
Aguanga No. 1 (Lower) (See also Aguanga in Hyd. Unit 2)	8S/1E-34G	1,986	1908-1928	U.S.W.B.	13.73	1921-22 1924-25	24.17 7.18
Oakgrove	9S/2E-17R	2,751	1910-1921, 1938-1942, 1947-1949, 1953-54	U. S. Forest Service D.W.R. (1953-'54)	17.63	1940-41 1947-48	29.61 9.99
Pauba Ranch (Station E)	8S/1W-14D	1,450	1920-1954	Vail Co.	12.09	1940-41 1933-34	24.58 3.73
Pauba Ranch (Station K)	8S/1W-10R	1,410	1923-1927	Vail Co.	13.21	1925-26 1924-25	17.48 6.64
Radec	8S/1E-19Q	1,700	1951-1954	Private	14.66	1951-52 1952-53	19.40 11.65

MEAN, MAXIMUM, AND MINIMUM SEASONAL PRECIPITATION AT STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED (continued)

Station	Map reference number	Elevation, in feet	Period of record	Source of record	Estimated mean seasonal precipitation, in inches*	Recorded maximum and minimum seasonal precipitation: Season	Inches
			Hydrographic Unit 3 (continued)				
Vail Lake	8S/1W-10M	1,400	1952-1954	U.S.M.C.	13.45	1953-54 1952-53	11.55 9.43
			Hydrographic Unit 4				
Pauba Ranch (Station C)	8S/2W-16M	1,080	1920-1954	Vail Co.	15.36	1936-37 1950-51	30.37 7.10
			Hydrographic Unit 5				
De Luz	8S/4W-29H	450	1902-1940, 1945-1947, 1953-54	Private	19.58	1921-22 1903-04	40.57 8.37
Rainbow (Honor Camp No. 2)	9S/2W- 5D	1,550	1949-1954	State Division of Forestry	21.91	1951-52 1949-50	31.05 11.66
Rainbow (Steinberg)	9S/3W- 1Q	1,150	1951-1954	Private	22.45	1951-52 1952-53	32.52 14.13
Santa Rosa Ranch (Ranch House)	7S/4W-35Q	1,720	1922-1941, 1948-1954	Vail Co.	24.27	1936-37 1950-51	43.10 8.25
Santa Rose Ranch (B)	8S/3W- 7M1	1,250	1942-1944, 1946-1948, 1949-1952	U.C.L.A.	19.89	1951-52 1950-51	29.52 7.67
Santa Rosa Ranch (B1)	8S/3W- 7M2	1,250	1943-1953	U.C.L.A.	18.64	1951-52 1950-51	29.78 7.85
Santa Rosa Ranch (C)	8S/4W-12P1	900	1942-1945, 1948-1951, 1952-53	U.C.L.A.	19.65	1942-43 1950-51	27.87 7.75
Santa Rosa Ranch (D)	8S/4W-12P2	950	1943-1945, 1947-48, 1950-51, 1952-53	U.C.L.A.	18.13	1943-44 1950-51	19.58 7.98

MEAN, MAXIMUM, AND MINIMUM SEASONAL PRECIPITATION AT STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED (continued)

Station	Map reference number	Elevation, in feet	Period of record	Source of record	Estimated mean seasonal precipitation, in inches*	Recorded maximum and minimum seasonal precipitation: Season	Inches
			Hydrographic Unit 5 (continued)				
Santa Rosa Ranch (DR)	8S/4W-12L	1,200	1943-44, 1947-48, 1949-50, 1951-52	U.C.L.A.	18.95	1951-52 1947-48	31.22 9.01
Santa Rosa Ranch (Saxman)	8S/3W- 7A	1,600	1945-1951	U.C.L.A.	20.98	1945-46 1950-51	18.81 9.74
Sky Ranch	8S/5W-23R	2,314	1949-1954	Private	27.27	1951-52 1950-51	43.72 11.43
			Hydrographic Unit 6				
Fallbrook (No. 3)	9S/4W-24K	695	1936-1943	Private	17.56	1936-37 1941-42	32.24 16.11
Fallbrook (No. 6)	9S/4W-24B	700	1911-1926	Private	17.24	1921-22 1912-13	28.63 9.31
O'Neill Lake	10S/4W- 5Q	110	1953-54	U.S.M.C.	12.74	1953-54 1953-54	10.70 10.70
Santa Margarita Ranch	10S/4W-18F	90	1913-1942	Private, U. S. Corps of Engrs.	14.13	1940-41 1924-25	27.88 7.84
			Adjacent to Watershed				
Agua Tibia (No. 1)	9S/1W-30Q	1,025	1931-1943	Private	17.26	1936-37 1933-34	33.63 9.40
Agua Tibia (No. 2)	9S/1W-30H	1,225	1940-1943	Private	24.61	1940-41 1941-42	42.32 23.98
Bonsall Basin	10S/3W-10J	215	1939-1943	Private	15.57	1940-41 1942-43	27.10 15.90
Chihuahua Mountain	9S/3E-35A	4,200	1911-1915	San Diego County Water Co.	20.00	1914-15 1912-13	26.84 13.53

MEAN, MAXIMUM, AND MINIMUM SEASONAL PRECIPITATION AT STATIONS
WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED
(continued)

Station	Map reference number	Elevation, in feet	Period of record	Source of record	Estimated mean seasonal precipitation, in inches*	Recorded maximum and minimum seasonal precipitation: Season	Inches
			Adjacent to Watershed (continued)				
Chihuahua Valley	9S/3E-23E	4,450	1952-1954	Private	18.94	1953-54 1952-53	15.23 14.31
Cuyamaca (Key Station)	(Not on map)	4,677	1887-1954	U.S.W.P.	38.96	1926-27 1893-94	66.55 15.05
Deadmen's Hole	10S/2E- 1F	3,200	1911-1924	San Diego County Water Co.	21.75	1921-22 1912-13	38.93 12.19
Elsinore (Sta. 13802)	5S/5W-34R	1,340	1914-1943, 1944-45, 1946-47, 1948-1952	Private	16.96	1940-41 1950-51	36.02 8.18
Elsinore (Key Station)	6S/5W- 8K	1,272	1887-88, 1897-1912, 1915-1947, 1948-1954	U.S.W.P.	13.29	1936-37 1950-51	26.35 4.46
Elsinore (Railroad Canyon Dam)	6S/4W- 2M	1,390	1927-1952	Temescal Water Co.	11.15	1940-41 1927-28	23.84 3.39
Escondido No. 1 (Key Station)	(Not on map)	750	1894-95, 1897-1954	U.S.W.B.	17.01	1936-37 1903-04	32.84 8.15
Fallbrook (H. E. White)	9S/3W-20H	750	1909-1948	Private	18.89	1921-22 1947-48	34.66 7.86
Fallbrook (No. 1)	9S/3W-21E	750	1876-1903, 1948-1951	U.S.W.B.	17.14	1883-84 1878-79	40.77 7.70
Fallbrook (No. 4)	9S/3W-20E	850	1932-1943	Private	17.70	1936-37 1933-34	32.35 11.00
Fallbrook (No. 5)	9S/4W-25R	670	1938-1943	Private	17.60	1940-41 1938-39	30.65 16.82
Fallbrook (Steele)	9S/3W-31M	540	1950-1954	Private	16.40	1951-52 1950-51	24.36 7.80

MEAN, MAXIMUM, AND MINIMUM SEASONAL PRECIPITATION AT STATIONS
WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED
(continued)

Station	Map reference number	Elevation, in feet	Period of record	Source of record	Estimated mean seasonal precipitation, in inches *	Recorded maximum and minimum seasonal precipitation: Season	Inches
			Adjacent to Watershed (continued)				
Hemet Lake	6S/3E- 7K1	4,350	1896-1940	Lake Hemet Water Co. U. S. Corps of Engrs.	19.90	1921-22 1933-34	34.21 6.12
Hemet Reservoir	6S/3E- 7K2	4,400	1940-1951	U.S.W.B.	18.88	1940-41 1947-48	30.82 10.50
Meagher	10S/1W- 3M	1,217	1937-1943	Private	17.54	1940-41 1938-39	31.25 16.05
Mendenhall Valley	10S/1E- 2R	4,500	1911-1916	San Diego County Water Co.	34.42	1914-15 1912-13	53.72 24.69
Mount Palomar (See also Palomar Mtn. Obs.)	9S/1E-27Q	5,550	1938-1946	Palomar Observatory	25.97	1940-41 1941-42	42.01 20.59
Nellie	10S/1E- 9H	5,350	1901-02, 1904-1907, 1909-1923	U.S.W.B.	45.44	1905-06 1918-19	77.40 28.83
Oceanside, C. A. A.	11S/5W-13Q	20	1945-1951	U.S.W.B.	11.56	1945-46 1950-51	10.40 5.82
Oceanside (No. 1)	11S/5W-26E	30	1892-1909	Private	11.31	1904-05 1903-04	16.29 4.52
Oceanside (No. 2)	11S/5W-26C	67	1909-1926	Private	12.06	1914-15 1923-24	22.12 6.06
Oceanside (No. 3)	11S/5W-26D	60	1926-1943	San Diego Gas and Electric Co.	12.90	1940-41 1928-29	24.95 7.54
Oceanside (No. 4)	11S/4W-19E	280	1926-1943	City of Oceanside	13.44	1940-41 1928-29	26.80 8.62
Oceanside (No. 4A)	11S/5W-24C	224	1924-1929	City of Oceanside	11.96	1926-27 1924-25	16.05 6.13

MEAN, MAXIMUM, AND MINIMUM SEASONAL PRECIPITATION AT STATIONS
WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED
(continued)

Station	Map reference number	Elevation, in feet	Period of record	Source of record	Estimated mean seasonal precipitation, in inches	Recorded maximum and minimum seasonal precipitation: Season	Inches
			Adjacent to Watershed (continued)				
Oceanside (Crouch)	11S/4W-19P	75	1873-1916	Private	9.82	1883-84 1876-77	25.66 3.41
Pala	9S/2W-27L	450	1939-1943	Private	16.82	1940-41 1939-40	30.28 16.30
Paloma Valley	6S/3W-22G	1,520	1939-1952	Private	13.41	1940-41 1950-51	26.09 4.28
Palomar Mountain Observatory (See also Mt. Palomar)	9S/1E-34B	5,598	1942-1954	U.S.W.B.	29.72	1951-52 1949-50	50.63 15.89
Puerta La Cruz	10S/3E-17K	2,772	1911-1917	San Diego County Water Co.	18.18	1915-16 1912-13	30.51 11.53
Red Mountain Ranch	9S/3W-16R	940	1925-1943	Private	17.75	1936-37 1932-33	34.52 11.75
Rincon of Warner Ranch	10S/2E-16K	2,975	1913-1916	San Diego County Water Co.	28.35	1915-16 1913-14	45.18 27.20
San Jacinto (Key Station)	(Not on map)	1,550	1887-87, 1892-1954	U.S.W.B.	13.54	1921-22 1933-34	25.23 6.36
San Luis Rey	11S/4W- 5K	60	1901-1921	Private	13.53	1905-06 1903-04	23.26 6.51
Tripp Flats	7S/2E- 3F	3,900	1948-1952	R.C.F.C.W.C.D., D.W.R.	18.37	1951-52 1948-49	26.23 9.77

MEAN, MAXIMUM, AND MINIMUM SEASONAL PRECIPITATION AT STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED (continued)

Station	Map reference number	Elevation, in feet	Period of record	Source of record	Estimated mean seasonal precipitation, in inches*	Recorded maximum and minimum seasonal precipitation	
						Season	Inches
			Adjacent to Watershed (continued)				
Wight	9S/2W-31P	300	1929-1943	Private	14.68	1936-37 1933-34	27.50 7.35
Winchester (U.S.W.B.)	5S/2W-27E	1,470	1940-1951	U.S.W.B.	11.42	1940-41 1950-51	20.17 4.44

* Mean period 1897-98 through 1946-47.

Abbreviations:

- D.W.R.: Division of Water Resources.
- U.C.L.A.: University of California at Los Angeles, Dr. Pillsbury.
- U.S.W.B.: United States Weather Bureau.
- R.C.F.C.W.C.D.: Riverside County Flood Control and Water Conservation District.
- U.S.M.C.: United States Marine Corps.

Mean Seasonal Precipitation

Mean seasonal precipitation over the entire watershed was estimated. Composite indices of wetness, used in estimating the mean seasonal precipitation at shorter record stations, were calculated by combining the indices of wetness for four long record United States Weather Bureau Stations. These key stations, Cuyamaca, Elsinore, San Jacinto, and Escondido are outside the watershed, but their indices were found to be representative of the Santa Margarita River watershed. Table 4, "Seasonal Precipitation and Indices of Wetness at Key Stations", is a tabulation of the precipitation, indices of wetness, and the resulting composite indices for the four base stations. From the composite indices, departures from the mean were accumulated and a residual mass diagram was plotted as shown on Plate 4, "Composite Accumulated Departure from Mean Seasonal Precipitation at Key Stations".

TABLE 4

SEASONAL PRECIPITATION AND INDICES OF WETNESS AT KEY STATIONS

(Mean Period 1897-98 through 1946-47)

Season	Cuyamaca Inches	Cuyamaca Index	Elsinore Inches	Elsinore Index	Escondido No. 1 Inches	Escondido No. 1 Index	San Jacinto Inches	San Jacinto Index	Average index
1886-87							11.68[a]	86	86
88	21.51[a]	55	19.17	144					100
89	52.83	136							136
1889-90	61.51	158							158
91	63.84	164							164
92	39.61	102							102
93	39.21	101					13.73[a]	101	101
94	15.05	39					8.93	66	52
1894-95	54.78	141			16.55[a]	97	16.67	123	120
96	23.38	60					9.20	68	64
97	38.96	100					15.51[a]	115	108
98	27.69	71	6.62	50	8.68	51	9.46[a]	70	61
99	23.35	60	6.47	49	9.47	56	8.40[a]	62	57
1899-1900	27.70	71	5.98	45	13.89	82	9.58[a]	71	67
01	42.81	110	14.29	108	14.46	85	13.40	99	100
02	36.00	92	9.65	73	11.66	69	8.24	61	74
03	37.60	96	16.08	121	17.69	104	15.75	116	109
04	23.37	60	6.65[a]	50	8.15	48	7.90[a]	58	54
1904-05	57.89	149	21.47	162	23.49[a]	138	18.59	137	147
06	56.24	144	25.96	195	25.43	150	14.79	109	150
07	44.91	115	18.02	136	17.89	105	18.02	133	122
08	30.35	78	11.90	90	13.52	79	12.67	94	85
09	45.65	117	15.03	113	18.21	107	13.76	102	110
1909-10	33.44	86	14.14	106	18.83	111	12.52	92	99
11	32.15	82	11.63	88	15.44	91	15.44	114	94
12	31.90	82	10.47	79	14.70	86	12.64	93	85
13	31.02	80	---	68[b]	10.31	61	8.62	64	68
14	34.82	89	---	113[b]	19.11	112	18.87	139	113
1914-15	55.79	143	---	142[b]	25.37	149	18.09	134	142
16	56.87	146	22.71	171	27.94	164	16.60	123	151
17	39.82	102	11.49	86	17.04	100	11.45	85	93
18	29.53	76	11.97	90	13.87	82	12.27	91	85
19	29.93	77	7.44	56	12.28	72	10.25	76	70
1919-20	40.15	103	12.66	95	15.17	89	14.61	108	99
21	27.18	70	9.64	73	11.40	67	10.82	80	72
22	59.58[a]	153	26.22	197	29.89	176	25.23	186	178
23	38.11	98	7.38	56	11.56	68	10.68	79	75
24	29.89	77	7.66	58	10.61	62	9.74	72	67
1924-25	36.10	93	6.73	51	11.32	67	7.28	54	66
26	36.82	94	14.10	106	21.44	126	16.69	123	112
27	66.55	171	16.45	124	24.68	145	19.37	143	146
28	21.43	55	8.02	60	14.46	85	9.44	70	68
29	35.55	91	7.22	54	12.87	76	9.19	68	72
1929-30	41.62	107	17.07	128	17.00	100	15.10	111	112
31	26.78	69	11.34	85	14.49	85	8.87	65	76
32	53.58	138	19.67	148	24.58	145	19.54	144	144
33	40.14	103	9.33	70	17.05	100	9.94	73	86
34	18.28	47	8.01	60	9.08	53	6.36	47	52

SEASONAL PRECIPITATION AND INDICES OF WETNESS AT KEY STATIONS (continued)

(Mean Period 1897-98 through 1946-47)

Season	Cuyamaca Inches	Cuyamaca Index	Elsinore Inches	Elsinore Index	Escondido No. 1 Inches	Escondido No. 1 Index	San Jacinto Inches	San Jacinto Index	Average index
1934-35	38.07[a]	98	17.28	130	21.08	124	15.91	117	117
36	39.71	102	9.33	70	12.76	75	10.07	74	80
37	66.42	170	26.35	198	32.84	193	24.62	182	186
38	49.04	126	18.91	142	19.39	114	14.84	110	123
39	35.71	92	12.63	95	15.14	89	12.88	95	93
1939-40	38.47	99	13.35	101	19.57	115	16.23	120	109
41	64.06	164	25.96	195	31.36	184	24.63	182	181
42	32.88	84	11.20	84	18.99	112	12.26	91	93
43	38.18	98	14.71	111	16.17	95	15.46	114	104
44	40.39	104	16.56	125	17.46	103	13.49	100	108
1944-45	36.99	95	10.09	76	14.42	85	12.49	92	87
46	35.77	92	7.73	58	14.94	88	12.39	91	82
47	31.73	81	7.89	59	13.11	77	11.62[a]	86	76
48	27.46	70	---	59[b]	8.69	51	7.55	56	59
49	38.26	98	7.87[a]	59	14.20[a]	83	9.45	70	78
1949-50	30.53	78	6.17	46	10.74[a]	63	7.13	53	60
51	27.14	70	4.46	34	9.26[a]	54	7.27	54	53
52	55.02	141	17.85	134	24.57[a]	144	18.22	135	138
53	27.90	72	8.25	62	11.93	70	11.59	86	72
54	35.40	91	10.38	78	14.71	86	10.84	80	84
Mean seasonal precipitation, 1897-1947	38.96		13.29		17.01		13.54		

a. Partially estimated from surrounding stations.
b. Indices are average indices for Cuyamaca, Escondido, and San Jacinto.

Using the mean precipitation values presented in Table 3, the isohyetal map, Plate 3, was constructed in accordance with the procedure used by H. C. Troxell in the report "Hydrology of Western Riverside County, California", published by the Riverside County Flood Control and Water Conservation District in cooperation with the United States Department of the Interior, Geological Survey. This map shows graphically the increase in precipitation with increase in elevation to the summit of the Coastal range, the marked decrease throughout the lower portions of the Inland Area due to the shading effect of the Coastal range, and finally another increase as distance from the shading range increases and higher ground is encountered in the northeasterly portion of the area. The map serves primarily, however, to provide a basis for the evaluation of the volume of mean seasonal precipitation on the various portions of the watershed as set forth in Table 5.

TABLE 5

ESTIMATED MEAN SEASONAL
DEPTH AND TOTAL QUANTITY OF PRECIPITATION
IN SANTA MARGARITA RIVER WATERSHED

Hydrographic Unit	Mean seasonal depth in inches	Precipitation quantity in acre-feet
1	15.5	182,800
2	16.1	135,200
3	20.3	175,900
4	17.7	42,800
5	21.2	129,100
6	14.7	32,700
Average	17.6	
TOTAL		698,500

Regimen of Precipitation

Precipitation varies widely from year to year and from one period of several years to another as demonstrated by the graph on Plate 4 showing the composite accumulated departure from mean seasonal precipitation at Cuyamaca, Elsinore, San Jacinto, and Escondido. The variations at three stations within the watershed, namely Aguanga, Pauba Ranch-Station C, and De Luz, and at Elsinore and Oceanside which are closely adjacent to the boundary, are shown by the bar graphs on Plate 5, "Recorded and Estimated Seasonal Precipitation at Selected Stations". On this plate the graph for Aguanga represents a composite of records at two stations, and that for Oceanside combines records at four stations.

The records at Pauba Ranch-Station C are current and nearly continuous since 1920-21; and, since this station is centrally located within the watershed the seasonal and monthly variations in precipitation are fairly representative of the entire watershed. Records at this station, therefore, are presented in Table 6, "Recorded Seasonal Precipitation and Indices of Wetness at Pauba Ranch-Station C". The indices show that precipitation at the station has ranged, during the period of record, from 46 to 197 per cent of the mean. During the same period the range at Elsinore was from 34 to 198 per cent, and that at Oceanside from 50 to 194 per cent.

TABLE 6

RECORDED SEASONAL PRECIPITATION AND INDICES OF WETNESS
AT PAUBA RANCH-STATION C

Season	Recorded seasonal precipitation (inches)	Indices of wetness, per cent	Season	Recorded seasonal precipitation (inches)	Indices of wetness, per cent
1920-21	11.99	78	1939-40	16.96	110
22	25.71	167	41	28.18	183
23	10.75	70	42	15.43	100
24	11.51	75	43	17.90	116
			44	14.88	97
1924-25	8.60	56			
26	19.65	128	1944-45	12.62[a]	82
27	23.70	154	46	11.92[b]	78
28	9.54	62	47	10.12[a]	66
29	11.33	74	48	7.31	48
			49	11.82	77
1929-30	18.46	120			
31	13.16	86	1949-50	8.05	52
32	22.58	147	51	7.10	46
33	12.30	80	52	21.82	142
34	7.17	47	53	9.58	62
			54	12.12	79
1934-35	17.93	117	Average for period of record	14.96	
36	12.05	78			
37	30.37	197			
38	21.59	140			
39	14.19	92	Mean seasonal precipitation	15.36	

a. Partially estimated.
b. Wholly estimated.

The extremes during periods of record at other stations are set forth in Table 3. In the watershed, the maximum recorded seasonal precipitation of 43.7 inches occurred in 1951-52 at Sky Ranch Station. At Palomar Mountain Observatory, located less than one-quarter mile outside the watershed boundary, 50.63 inches was recorded in 1951-52. The recorded minimum seasonal depth of precipitation within the watershed, 3.73 inches, occurred in 1933-34 at Pauba Ranch-Station E. The foregoing values are 160, 186, and 31 per cent of mean seasonal precipitation at the respective stations.

Maximum recorded precipitation in individual storms occurred at Santa Rosa Ranch House during the storm of February 10-17, 1927, and amounted to 22.57 inches with a daily high of 11.30 inches on February 16, 1927. The maximum recorded daily precipitation was 12.38 inches, which occurred on January 23, 1943, at Santa Rosa Ranch Gate station. This maximum occurred during the storm of January 21-25, 1943, during which precipitation totaled 13.11 inches.

As has been stated, the regimen of precipitation at Pauba Ranch Station C is considered to be representative of that throughout the watershed. The average distribution of precipitation by months at that station during the period of record is presented in Table 7. The values indicate that, on the average, 74.4 per cent of the seasonal total fell during the four-month period, December through March, and that the occasional summer storms during June, July and August produced only one and four-tenths per cent of the seasonal total.

TABLE 7

MEAN MONTHLY DISTRIBUTION OF PRECIPITATION
AT PAUBA RANCH-STATION C

Month	Precipitation	
	In inches	In per cent of seasonal total
July	0.02	0.1
August	0.14	0.9
September	0.21	1.4
October	0.74	4.9
November	1.07	7.2
December	3.02	20.2
January	2.50	16.7
February	3.15	21.1
March	2.45	16.4
April	1.27	8.5
May	0.33	2.2
June	0.06	0.4
TOTALS	14.96	100.0

Runoff

The Santa Margarita River extends from the confluence of Temecula and Murrieta Creeks just upstream from Temecula Canyon to the Pacific Ocean, a distance of about 30 miles. Temecula Creek, also some 30 miles long, drains about 586 square miles of valley, hill and mountain lands lying easterly from the junction. Murrieta Creek, about 13 miles long, drains 221 square miles lying to the west and north. Pechanga, Arroyo Seco, Smith, Lancaster, and Chihuahua Creeks, together with numerous smaller streams, are tributary to Temecula Creek; and Warm Springs and Santa Gertrudis Creeks are the principal contributors to the flow in Murrieta Creek. Sandia and De Luz Creeks flow directly into Santa Margarita River. The drainage area of the entire system is 742 square miles.

Streams in this watershed are of three types: intermittent, ephemeral, and perennial interrupted. Intermittent streams are those which flow during protracted periods, but not continuously, and in this watershed are typified by Cole Canyon Creek which flows generally from the advent of the first winter rains until late spring. An ephemeral stream is defined as one which flows only in direct response to precipitation, and a perennial stream is one which flows continuously. Perennial interrupted streams are those which have perennial reaches with intervening intermittent or ephemeral reaches.

The main streams of the Santa Margarita River system, of which Temecula Creek may be cited as an example, are of the perennial interrupted type. This stream contains reaches in which the flow is continuous. These reaches are typically in canyons through nonwater-bearing formations and are interrupted by ground water basins, at the upstream ends of which ordinary stream flow disappears by seepage into the sands and gravels, and at the downstream ends of which cienegas are formed. Cienegas, or points of rising water, along Temecula Creek are located at Dodge, Oakgrove, lower Culp, Aguanga, Radec, Nigger, and Pauba Valleys. The "Hydrographic Map", Plate 6, depicts stream types within the watershed, and by width of line indicates the relative magnitudes of their typical summer flows.

Regulation of stream flow, other than the relatively minor natural regulation in the several ground water basins traversed by the streams, is effected by Vail Dam and Reservoir on Temecula Creek at Nigger Canyon, which reservoir impounds runoff from the 320 square miles of drainage area comprising Hydrographic Units 2 and 3.

Stream Gaging Stations and Records

The earliest runoff records available in the Santa Margarita River watershed were obtained in April, 1894, on Temecula Creek and Santa Margarita River. A few miscellaneous measurements were made through the following years until 1918, and an increasing number were made in the period 1918 through 1922 by the Vail Company. Excerpts from these records are reproduced in Appendix E. In January and February, 1923, three permanent gaging stations were established, another was added in 1924, and a fifth in 1930. Also established in 1930 was a water-stage recorder on O'Neill Ditch, in Rancho Santa Margarita. The five permanent stream gaging stations constitute the long record stations in the Santa Margarita River watershed. Their establishment was accelerated by need for runoff data in the water rights litigation, Rancho Santa Margarita vs. Vail, et al. All of the above stations are presently operated jointly by the Vail Company, the United States Navy, and the United States Geological Survey. Other stations, including eight stations installed during the investigational period by the Division of Water Resources, have been operated for short periods.

Stream gaging stations in the watershed are listed in Table 8 "Stream Gaging Stations in Santa Margarita River Watershed", together with their map reference number, location, period of record, and source of data. The map reference number is the stream mile designation for the particular gaging station, which indicates the stream, or tributary, and location of the station. The first number indicates the major stream system and the last represents the number of miles upstream on an individual tributary. Intermediate numbers are mileages to successive stream confluences. For example, number 93-30.1-0.4 refers to a station on a tributary of Santa Margarita River which has its confluence located 30.1 miles upstream from the ocean, i.e. Murrieta Creek. The station is 0.4 mile up Murrieta Creek from its confluence with Santa Margarita River.

TABLE 8

STREAM GAGING STATIONS IN SANTA MARGARITA RIVER WATERSHED

Stream mile reference number	Stream	Location	Drainage area, in square miles	Period of record	Source of record
93-2.6	Santa Margarita River	At Ysidora	740	1923-1955	USGS
93-11.6	Santa Margarita River	Near De Luz Station	704	June, 1925-March, 1926[a]	USGS
93-12.2-0.7	De Luz Creek	Near Fallbrook	45	1951-1955	USGS
93-20.5	Santa Margarita River	Near Fallbrook	645	1924-1955	USGS
93-30.0	Santa Margarita River[b]	Near Temecula	586	1923-1955	USGS
93-30.1-0.4	Murrieta Creek	At Temecula	221	1930-1955	USGS
93-30.1-3.9-0.6	Santa Gertrudis Creek	Near Temecula	88	1952-1954[a]	DWR
93-30.1-4.8-0.5	Warm Springs Creek	Near Murrieta	58	1952-1954[a]	DWR
93-30.1-9.0-0.1	Cole Canyon Creek	Near Murrieta	8.8	1952-1954[a]	DWR
93-41.0	Temecula Creek (Santa Margarita-Temecula)	At Nigger Canyon	320	1923-1955	USGS
93-41.6-5.5	Lancaster Creek	Near Radec	115	1950-1951[a]	DWR
93-41.6-11.3	Coahuila Creek (Lancaster-Coahuila)	Near Anza	80	1950-1954[a]	DWR
93-45.3	Temecula Creek (Santa Margarita-Temecula)	Near Radec	133	1950-1954[a]	DWR
93-48.1	Temecula Creek (Santa Margarita-Temecula)	Below Aguanga Valley	-	1954[a,c]	DWR
93-51.1	Temecula Creek (Santa Margarita-Temecula)	Above Aguanga Valley	-	1953[a,c]	DWR
93-52.4	Temecula Creek (Santa Margarita-Temecula)	Near Aguanga	71	1950-1954[a,d]	DWR
93-54.0	Temecula Creek (Santa Margarita-Temecula)	Near Oakgrove Valley	61	1950-1954[a,d]	DWR

a. Use of station discontinued.
b. Prior to October 1, 1952, United States Geological Survey referred to this station as Temecula Creek at Railroad Canyon.
c. Less than one year of record. Station location not shown on Plate 6.
d. Station not rated for storm flows.

Locations of gaging stations are shown on Plate 6, "Hydrographic Map". Records of flow at the United States Geological Survey stations are published annually by the Geological Survey in its water supply papers entitled "Surface Water Supply of the United States, Part II, Pacific Slope Basins in California". Records of flow at the Division of Water Resources stations and miscellaneous unpublished stream flow measurements are included in Appendix E to this report.

Runoff Characteristics

Runoff in streams in the watershed is derived primarily from rainfall, and as a result, stream flows exhibit monthly and seasonal variations similar to those shown by the precipitation records. Absence of snow pack in the tributary watershed results in a rapid decrease in flow of streams at the conclusion of the winter precipitation season. Following severe storms, discharge in the larger streams often increases in a few hours time from practically no flow to a rate of thousands of cubic feet per second. Stream flows vary greatly from month to month and from season to season. The erratic nature of flow in the Santa Margarita River has long been recognized, as the following quotation from an 1888 report by the California State Engineer will indicate:

> "This river is no exception to the rule of light summer flow and winter torrents which is applicable to all southern California streams. In July or August, one unfamiliar with these watercourses could not suspect it of the extreme violence displayed in such winters as 1884-85, when it destroyed the California Southern Railroad for nearly twenty miles. Several thousand cubic feet per second (possibly five thousand) must have been the volume of its flow at that time, sustained for several weeks."

Seasonal natural runoff in the principal streams of the watershed has varied from a maximum of about 700 per cent of the mean to a minimum of

Santa Margarita River
at Ysidro Gaging Station

April, 1954

Flood of February, 1927

Courtesy H. M. Hall

about 15 per cent of the mean. Seasonal variations in runoff of the area are represented by the bar graph of seasonal natural runoff of the Santa Margarita River at Ysidora presented on Plate 8. The cyclic nature of the occurrence of runoff at this station is shown on Plate 7 by the graph of accumulated departure from mean seasonal natural runoff. On this graph a downward trending line indicates a drought period with less than mean runoff, and a rising line indicates a wet period with greater than mean runoff. The maximum recorded seasonal flow at Ysidora, which occurred in the year 1937-38, was 122,000 acre-feet, but it is estimated that in 1915-16 about 280,000 acre-feet passed this point. No water passed the station in either 1949-50 or 1950-51. The monthly variation in recorded seasonal runoff for the Fallbrook station, at which summer flow is less affected by ground water pumping is shown in Table 9.

TABLE 9

AVERAGE MONTHLY DISTRIBUTION OF RECORDED RUNOFF OF SANTA MARGARITA RIVER NEAR FALLBROOK*

Month	Runoff in acre-feet	Per cent of seasonal total
October	410	1.7
November	640	2.7
December	1,460	6.1
January	2,950	12.2
February	7,120	29.5
March	7,390	30.7
April	2,160	9.0
May	750	3.1
June	410	1.7
July	270	1.1
August	230	1.0
September	290	1.2
TOTALS	24,080	100.0

* For period 1925-26 through 1952-53.

Flood Flows and Frequencies

Major floods have caused destruction and havoc in the watershed of the Santa Margarita River since the days of earliest development. Probably the greatest known flood in the area occurred in January, 1862. Following this the next great flood, which severely damaged the railroad in Temecula Canyon, occurred in February, 1884. In February, 1891, another great flood occurred which again destroyed the railroad and caused its abandonment. Other floods occurred in this region in the years 1906, 1909, 1910, 1916, 1927, 1938, and 1943. Of these the largest was that of January, 1916, which destroyed nearly all the Atchison-Topeka and Santa Fe branch railroad line from Oceanside to Fallbrook along the Santa Margarita River. The peak flow of this stream at Ysidora was estimated by the United States Corps of Engineers to be 66,500 cubic feet per second. The greatest flood during the period of record at the stream gaging stations occurred in February, 1927, when every highway and railroad bridge along the course of the river was destroyed or made unsafe. Peak flow at Ysidora for this storm occurred on February 16, 1927, and was estimated to be 33,600 cubic feet per second. Maximum discharges of various streams in the watershed during the periods of record are summarized in Table 10.

Santa Margarita River
at Highway 101, Flood
of February, 1927

Courtesy H. M. Hall

Temecula Creek at
Highway 395
February 18, 1927

Courtesy H. M. Hall

TABLE 10

MAXIMUM RECORDED DISCHARGES FOR STREAMS
IN THE SANTA MARGARITA RIVER WATERSHED

Stream	Maximum discharge, in second-feet	Date
Temecula Creek at Nigger Canyon	17,100[a]	Feb. 16, 1927
Murrieta Creek at Temecula	17,500	Jan. 23, 1943[b]
Santa Margarita River near Temecula	25,000[a]	Feb. 16, 1927
Santa Margarita River near Fallbrook	33,100[a]	Feb. 16, 1927
Santa Margarita River at Ysidora	33,600[a]	Feb. 16, 1927

a. By slope-area method.
b. Record began October 1, 1930.

In State Water Resources Board Bulletin No. 1, the probable frequencies with which floods of different magnitude will occur or be exceeded in periods of up to 250 years were estimated by the "California method" for the stream gaging stations on Temecula Creek at Nigger Canyon, Santa Margarita River near Temecula (formerly called Temecula Creek at Railroad Canyon), Santa Margarita River near Fallbrook, and Santa Margarita River at Ysidora. Graphs setting forth these estimates are presented on Plates 32 and 33 of Bulletin No. 1. The values on the graphs are presented in terms of mean daily flow in second-feet per square mile, and separate curves are drawn for one-, two-, three-, and five-day floods. Expression of flood quantities in terms of units of discharge per square mile permits direct comparison of adjacent drainage basins.

In the present investigation, hydrographs were developed for one in one thousand year floods for purposes of spillway design at the Fallbrook, Lippincott and De Luz dam sites. The instantaneous peak flows determined from the hydrographs are 142,000 and 164,000 cubic feet per second at the respective sites.

Quantity of Runoff

Stream flow records at the Geological Survey stations--seasonal values for which are set forth in Appendix I, Table I-2, "Seasonal Runoff from Streams Within the Santa Margarita River Watershed, and Semiseasonal Inflow to Existing and Proposed Reservoirs"--used in conjunction with longer records of flow in streams outside the watershed, provide the basis for estimating the natural runoff by seasons since 1894-95 at six gaging stations, and the semiseasonal inflow under present conditions to three reservoir sites. The adopted values of natural runoff in Temecula Creek at Nigger Canyon, Murrieta Creek at Temecula, Santa Margarita River near Temecula, and Santa Margarita River near Fallbrook, during the period 1894-95 through 1946-47, are those presented in State Water Resources Board Bulletin No. 1. The method of estimating natural flow at the four stations in later years, natural flow at De Luz dam site and at Ysidora since 1894-95, and semi-seasonal inflow since 1894-95 to Vail, Fallbrook, and De Luz reservoirs under present conditions of development, is discussed in detail in Appendix I, following Table I-2.

Runoff in Murrieta Creek at Temecula is a direct measure of runoff from Hydrographic Unit 1. Runoff in Temecula Creek at Nigger Canyon measures the combined outflow from Hydrographic Units 2 and 3, consideration of elevation, precipitation, and natural water losses providing the basis for allocation of the flow between the two units. Runoff from Hydrographic Unit 4 is the difference between the runoff in Santa Margarita River near Temecula and the runoff from Hydrographic Units 1, 2, and 3. Runoff from Hydrographic Unit 5 was determined by adding to the flow at the gaging station on Santa Margarita River near Fallbrook the estimated runoff from the remaining area in the unit below that station. In this area, by far the greater portion of runoff occurs in the watershed of De Luz Creek, and the estimate involved a detailed study of monthly records at the Fallbrook and Ysidora gaging stations, taking into account losses to native vegetation, depletion by diversion of surface flow and extraction of ground water, and recharge of underground basins by reservoir releases and spreading of sewage treatment plant effluent. Runoff from Hydrographic Unit 6 is the difference between the flow at the Ysidora gaging station and the previously calculated outflow from Unit 5.

Estimated values of mean seasonal natural runoff from each hydrographic unit for the period 1895-96 through 1942-43, together with the maximum and minimum seasonal runoffs, are presented in Table 11. The total mean seasonal runoff from the Santa Margarita River watershed under natural conditions was thus estimated to be 36,300 acre-feet. Utilizing methods similar to those described in Appendix I, the total mean seasonal runoff from the watershed under present (1953) conditions of development, i.e., assuming all present depletions to have been operative throughout the mean period, was estimated to be 25,200 acre-feet. This represents the total present waste to the ocean, and is the quantity of Santa Margarita River water which is presently available for salvage.

TABLE 11

MAXIMUM, MINIMUM, AND MEAN SEASONAL NATURAL RUNOFF BY HYDROGRAPHIC UNITS WITHIN THE SANTA MARGARITA RIVER WATERSHED

Hydrographic unit	Seasonal natural runoff				
	Maximum		Minimum		Mean,
	Acre-feet	Season	Acre-feet	Season	in acre-feet
1	60,300	1915-16	440	1950-51	8,600
2	23,600	1915-16	430	1950-51	3,400
3	57,000	1915-16	1,040	1950-51	8,200
4	20,100	1915-16	0	1931-32	2,600
5	117,000	1915-16	320	1950-51	14,200
6	--	--	--	--	- 700*
TOTAL					36,300

* Net depletion.

The hydrographic units of the watershed vary considerably in slope, shape, exposure, surface mantle, and type of cover. The cumulative effects of these variable characteristics on runoff are indicated in Table 12, "Mean Seasonal Precipitation and Runoff in Santa Margarita River Watershed", in which the average depth and quantity of precipitation in each hydrographic unit and the corresponding depth and quantity of runoff are compared. Estimated mean seasonal natural runoff from the coastal slopes of Hydrographic Unit 5 represents 11.0 per cent of the mean seasonal precipitation, whereas, in the inland country of Hydrographic Unit 2 the corresponding value is only 2.5 per cent. The smallest relative runoff occurs, however, in Unit 6, adjacent to the coast, where runoff at Ysidora averages less than the estimated flow leaving Hydrographic Unit 5. Thus in Unit 6, there is a net depletion averaging 700 acre-feet per year. This depletion is believed to result from the small total precipitation and large loss to phreatophytes on the valley floor.

TABLE 12

MEAN SEASONAL PRECIPITATION AND RUNOFF
IN SANTA MARGARITA RIVER WATERSHED

Hydrographic Unit No.	Mean seasonal precipitation		Mean seasonal natural runoff		Runoff in per cent of precipitation
	Depth, inches	Acre-feet	Depth, inches	Acre-feet	
1	15.5	182,800	0.73	8,600	4.7
2	16.1	135,200	0.40	3,400	2.5
3	20.3	175,900	0.95	8,200	4.7
4	17.7	42,800	1.08	2,600	6.1
5	21.2	129,100	2.33	14,200	11.0
6	14.7	32,700	--	- 700*	-2.1

* Net depletion.

Because of the nature of terrain, with ground water basins and areas of present and potential use widely distributed over the watershed, and the lack of recorded data suitable for the purpose, no estimate of total local water supply available for use in the watershed has been attempted. Instead, water supply values essential to the purposes of this report are developed and discussed in the later sections in which they are utilized.

Imports and Exports

Imports

The Fallbrook Public Utility District lies partly within Santa Margarita River watershed and partly within the watershed of San Luis Rey River. The District has obtained supplies of water by pumping from Bonsall Basin on San Luis Rey River, by direct diversion from Santa Margarita River, and by importation from Colorado River. Pumping from Bonsall Basin was discontinued in March, 1954, by court injunction.

Officials of the District indicate that in the past few years all of Santa Margarita River water has been used in Santa Margarita River watershed and all water from Bonsall Basin has been used in San Luis Rey River watershed. It is, therefore, assumed that on the average, as regards Fallbrook Public Utility District, there has been no net export or import between the two watersheds during the period for which data are presented herein.

Colorado River water has been imported by the District since 1947 and distributed in both watersheds. Water is conveyed to the District from San Diego County Water Authority aqueduct at Rainbow, about seven miles northeast of Fallbrook, by two roughly parallel pipe lines of 16-inch and 24-inch diameter along the route shown on Plate 25, the 16-inch line extending to Oceanside. Import from the Colorado River was estimated by deducting the supply obtained from the Santa Margarita River from the total water deliveries to the part of the District within Santa Margarita River watershed. Water deliveries to this area were estimated to be 23.8 per cent of total water deliveries to the District on the basis of a study by the District of water sales within and outside the watershed in 1952. Import under present conditions is considered to be the average of estimated import for the period 1951-52 through 1953-54.

Other imports to the watershed are generally of small amount and for the most part were assumed to be offset by similar minor exports; however, in Diamond Valley in the northern portion of Hydrographic Unit 1, a shallow divide separates the Santa Margarita River watershed from the San Jacinto watershed, and a portion of the water used on lands within the Santa Margarita River watershed, estimated to have totaled 100 acre-feet in the 1953 irrigation season, is obtained from wells outside.

Estimated historical imports during the period 1942-43 through 1952-53, together with values which represent estimated average imports under present (1953) conditions of development in the watershed, are presented in Table 13.

TABLE 13

ESTIMATED IMPORTS AND EXPORTS
SANTA MARGARITA RIVER WATERSHED

IN ACRE-FEET

Season	Imports: Colorado River Water to Fallbrook Public Utility District	Imports: Ground Water to Diamond Basin*	Imports: Total	Exports: Military Use Outside Watershed: Gross	Exports: Military Use Outside Watershed: Sewage Return to Santa Margarita Coastal Basin	Exports: Military Use Outside Watershed: Net	Exports: Agricultural Use Outside Watershed	Exports: Sewage Export from within the Watershed	Exports: Total
1942-43	0		0	530	0	530	1,030	0	1,560
-44	0		0	1,990	0	1,990	1,180	210	3,380
1944-45	0		0	2,170	0	2,170	1,140	330	3,640
-46	0		0	1,930	0	1,930	1,750	370	4,050
-47	0		0	1,790	0	1,790	1,520	370	3,680
-48	580		580	2,120	0	2,120	1,750	420	4,290
-49	980		980	2,350	0	2,350	1,370	430	4,150
1949-50	880		880	2,210	140	2,070	1,370	410	3,850
-51	980		980	2,140	680	1,460	940	280	2,680
-52	230		230	2,460	810	1,650	1,080	290	3,020
-53	540	100	640	2,830	1,250	1,580	1,320	350	3,250
-54	760	-	-	-	-	-	-	-	-
"PRESENT"	500	100	600	2,200	1,000	1,200	1,300	300	2,800

* ESTIMATED FOR 1952-53 ONLY.

Exports

Export of water from Santa Margarita River watershed is limited to Camp Pendleton, where water has been exported since 1938. For the period 1938 until 1942, when the United States Navy acquired Rancho Santa Margarita y Las Flores, exports were for agricultural use along the coast on portions of Stuart and South Mesas, the locations of which are indicated on Plate 2-A, "Physiography". After 1942, exports for agricultural use along the coast were continued, and in addition, water was also exported for military use in various areas of the reservation. The quantities estimated to have been exported are presented in Table 13.

Portions of the water exported from the Santa Margarita River watershed for military purposes are returned to the watershed as effluent from sewage treatment plants, which is allowed to percolate in Santa Margarita Coastal Basin. On the other hand, some sewage effluent originating within the watershed is discharged directly to the ocean and some has, in the past, been exported to the San Luis Rey River watershed. Estimated historical exports of water and sewage during the period 1942-43 through 1952-53, together with values considered to be representative of present conditions are presented in Table 13.

Of the seven plants on the naval reservations, the Naval Ammunition Depot plant--serving the Depot and portions of Fallbrook--and plants 3 and 5 serve areas within the watershed; service areas of plants 2, 4, and 6 are outside; and plant 1 serves an area which was estimated to be about 25 per cent inside and 75 per cent outside the watershed.

Effluent from the Ammunition Depot plant and plant 3 has always been discharged within the watershed. Effluent from plants 1 and 2 was formerly discharged to Pilgrim Creek in the San Luis Rey River watershed, but effluent from plant 1 has been returned to the Santa Margarita River watershed since August, 1950 and that from plant 2 since July, 1952. Plants 4, 5, and 6 discharge to the ocean through a common outfall. Since completion of the treatment plant of the Fallbrook Sanitary District late in 1954, sewage from the Fallbrook area has not been treated at the Naval Ammunition Depot plant, but the effluent is still discharged into Fallbrook Creek, a tributary of O'Neill Lake. In Table 14 are shown the amounts of effluent discharge from each of the plants since their establishment and the disposition of discharges from service areas within and outside the watershed.

TABLE 14

SEWAGE TREATMENT PLANT DISCHARGES AND THEIR DISPOSITION

In Acre-Feet

Season (Oct. 1 through Sept. 30)	Camp Pendleton Plants: 1	2	3	4	5	6	Naval ammunition depot plant	Total discharge	Disposition of discharges from service areas: Within watershed: Spread in basin	To San Luis Rey watershed	To ocean	Outside watershed: Returned to basin	Spread in San Luis Rey watershed	To ocean
1943-44	630	343[a]	456	6[b]	55[b]	---	---[c]	1,490	456	158	55	---	815	6
-45	449[a]	383[a]	362[a]	37[b]	220[b]	12	---[c]	1,463	362	112	220	---	720	49
-46	738[a]	180[b]	338[a]	15[b]	180[b]	110[b]	---[c]	1,561	338	186	180	---	732	125
-47	575	259	345	8[b]	223[a]	234[b]	100[b]	1,744	445	144	223	---	690	242
-48	617	414	478	38[b]	267[a]	235[a]	100[b]	2,149	578	155	267	---	876	273
-49	687	436	475	53[b]	261	249	100[b]	2,261	575	172	261	---	951	302
-50	784	495	471	31[b]	259	261	100[b]	2,401	618	149	259	141	942	292
-51	901	571	537	40[a]	277	297	100[b]	2,723	862	---	277	676	571	337
-52	959[a]	572[a]	619[a]	53[b]	289	323	100[b]	2,915	959	---	289	811	480	376
-53	930[b]	550[b]	630[b]	65[b]	351[a]	357[a]	100[b]	2,983	963	---	351	1,247	---	422
TOTALS	7,270	4,203	4,711	346	2,382	2,078	700	21,690	6,156	1,076	2,382	2,875	6,777	2,424

a. Partially estimated.
b. Wholly estimated.
o. Not estimated.

Underground Hydrology

Valley and mesa lands, as previously indicated, comprise less than one-fourth of the area of the Santa Margarita River watershed. However, numerous bodies of ground water exist in such areas and water supplies of the Santa Margarita River watershed are regulated in some degree by storage in these ground water reservoirs.

Usable ground water supplies are found principally in the Recent alluvium of valley areas, but water is also extracted from older sedimentary formations on hill and mesa lands and to a lesser extent from fractured rock. The sources of replenishment of these ground water reservoirs are deep percolation originating in stream flow, precipitation, irrigation water, and sewage; and subsurface transfer of water from one ground water body to another. Removal of water from the reservoirs is effected by pumped extractions, by consumptive use by vegetation in areas of high ground water, by effluent discharge as rising water, and by subsurface outflow.

Terms used in the discussion of underground hydrology in this report are defined as follows:

Ground Water Basin - A pervious formation with sides and bottom of relatively impervious material in which ground water is stored. In this report, valleys filled with Recent alluvium are generally considered to constitute the basins although it is recognized that such bodies of Recent alluvium when surrounded by less pervious but still water-bearing older formations, could be termed sub-basins of a larger basin comprising both materials. The bodies of older, less permeable formations are not generally treated as ground water basins herein, because of the relatively small development of water from such material and the consequent lack of physical and hydrologic data. Many small bodies of Recent alluvium in the watershed, although they are basins under the above definition, have not been separately considered because of their present relative unimportance.

Free Ground Water - This generally refers to a body of ground water not overlain and confined by impervious materials, and moving under the influence of the water table slope. In areas of free ground water, the ground water basin provides storage to regulate varying amounts of replenishment with changes in ground water levels indicating changes in ground water storage.

Confined Ground Water - A body of ground water immediately overlain by materials sufficiently impervious to sever free hydrologic connection with overlying water, and moving under pressure caused by the difference in head between intake and discharge areas of the confined water body. Changes in the elevation of water in wells indicate changes in pressure rather than change in ground water storage.

Rising Water - Surface flow originating in ground water. The water surface of such an effluent stream stands at a lower level than the water table or piezometric surface of the ground water body in which it originates.

Percolation - The movement or trickling of water downward or laterally through the interstices or pores of a porous medium. Deep percolation refers to moisture which penetrates below the depths from which it can be used by plants.

Specific Yield - This term, when used in connection with ground water, refers to the ratio of the volume of water a saturated material will yield by gravity to its own volume, and is commonly expressed as a percentage. Ground water storage capacity is estimated as the product of the specific yield and the volume of material in the depth interval considered.

Specific Capacity - The number of gallons per minute produced by a pumping well, per foot of drawdown.

Drawdown - The difference between static and pumping water levels in a well, measured in feet.

Drillers' logs, water level measurements, and pumping tests at water wells and test wells throughout the area constitute a major source of basic data for the study of underground hydrology. The locations of wells and test holes or exploratory wells, where data were obtained for purposes of the investigation herein reported upon, are shown on Plates 9A and 9B, "Location of Wells". On the same plates the following materials underlying the surface of the watershed are classified on the basis of their water-bearing characteristics: materials of high permeability, composed of Recent alluvium which constitutes the principal source of ground water; materials of low permeability, composed of older alluvium, which yields limited quantities of ground water generally restricted to domestic or stock use; and generally impermeable materials composed of igneous, metamorphic, and cemented sediments which are practically nonwater-bearing, but which yield limited and very occasionally large quantities of water from joints, fractures, and highly weathered zones.

The majority of wells in the Santa Margarita River watershed are used for domestic and stockwatering purposes only, because in many areas wells of sufficient capacity for commercial irrigation cannot be developed. Elsewhere in the watershed, however, the ground water basins are the source of water supply for many individual irrigation enterprises, and in some cases support very substantial irrigation developments and extensive military operations. The 23 ground water basins which are designated as such in this report, are delineated on Plates 10 and 11, "Lines of Equal Elevation of Ground Water".

Starting in the fall of 1950, when the Division of Water Resources was appointed Referee in the case of Barbey, et al. vs. Oviatt, et al., water levels were measured in the Temecula Creek watershed which comprises

Hydrographic Units 2, 3, and 4. Measurements at most of the wells were made during the fall seasons of 1950 and 1951, and a number of wells were measured monthly. When the Santa Margarita River Investigation commenced in the summer of 1952, the well measuring program was expanded throughout the watershed. Fall and spring measurements were obtained at about 400 wells from the fall of 1952 through the spring of 1954, and the monthly program was expanded to include 40 representative wells.

Few long record water level measurements are available, but one well in Pauba Basin has been measured continuously since 1918. Also available, are measurements obtained at five wells in the Anza Basin in August, 1916, and considerable data relative to water levels in Pauba, Murrieta, and Santa Margarita Coastal basins during the period 1920 through 1927. More recent water level data relative to wells in the Santa Margarita Coastal Basin were obtained from the United States Geological Survey, and the Office of Ground Water Resources at Camp Pendleton. Recent data were also obtained from the Vail Company, and from the files of the Division of Water Resources.

Maps showing lines of equal elevation of ground water in the Spring of 1927, and in the Fall of 1953, at which times data were relatively complete, are presented herein as Plates 10A and 10B, and Plates 11A and 11B. It is believed that levels in the Spring of 1927 represent, as nearly as possible, all time high water level conditions, and that those in the Fall of 1953 were near the historic low. While levels were probably somewhat lower in the fall of 1951, records providing good coverage over the watershed at that time are not available, and hydrographs of representative wells shown on Plate 12, "Fluctuation of Water Levels at Selected Wells", indicate that the differences in water levels between Fall 1951 and Fall 1953 were not great.

Available records of depths to ground water are tabulated in Appendix G.

Geologic Investigation

The geologic investigation of the watershed included collection and analysis of previous geologic reports and maps; field mapping of the watershed with particular reference to those characteristics which affect the occurrence, storage, and movement of ground water; and collection and analysis of 405 water well or test hole drillers logs and 2 oil well drillers logs. These data were utilized in preparing Plates 13A and 13B, "Areal Geology", and Plates 14, 15, 16, and 17, "Geologic Sections", and provide the basis for Plates 2A and 2B, "Physiography".

Rocks exposed in the Santa Margarita River watershed range in age from Pre-Cretaceous metamorphic and igneous rocks, to Recent alluvium which is being deposited at the present time. The rocks are divided into two general categories: (1) a basement complex comprising Cretaceous igneous rocks of the southern California batholith, and associated Pre-Cretaceous, igneous and metamorphic rocks; and (2) the superjacent rocks, a sedimentary blanket largely composed of continental deposits transported from the neighboring highlands and deposited in the basins lying within the watershed.

The superjacent rocks range in age from early Tertiary to Recent. They are largely of continental origin, with some Marine deposits of Quaternary and Tertiary age located in the Coastal area near the mouth of the Santa Margarita River. No known wells penetrate the Marine sediments within the watershed and they, as well as Tertiary rocks of continental origin, are considered to be largely nonwater-bearing.

The principal water-bearing deposits are Quaternary sediments which range in age from Pleistocene to Recent, the Recent alluvial deposits including the principal water-bearing aquifers in the region.

Recent alluvium, defined as those materials undergoing deposition, falls into three general categories: (1) Alluvial fans, (2) basin deposits, and (3) stream channel deposits. Most of the alluvial fan deposits are poorly sorted and ground water yields therefrom are comparatively low. Basin deposits consist largely of fine grained sediments of low permeability which have been laid down by overflow waters from the streams in the watershed, and these deposits, too, generally do not produce large amounts of water. Stream channel deposits contain well sorted sands and gravels and wells penetrating these coarse deposits are highly productive.

The Pleistocene sediments are composed of terraces, fanglomerates, and other alluvial deposits which have been subjected to weathering. They are of less permeable nature than the Recent alluvial deposits but there may be local phases of unweathered sands and gravels of high permeability from which locally important supplies of water can be obtained.

Table B-1 of Appendix B, in which the geology is discussed in greater detail, presents the stratigraphy of the Santa Margarita River watershed, and shows the general character of the rocks and their water-bearing characteristics.

Structure of the region is complex and consists chiefly of high angle normal faults. Faulting has been continuous from at least Pleistocene time to the present. The most prominent faults are the San Jacinto fault zone, the scarp of which makes up a portion of the northeastern watershed boundary, the Aguanga and Aqua Caliente faults, whose scarps form the northeasterly boundary of the upthrust Palomar block, and the Murrieta graben, a downdrop block lying between the Willard fault zone and the Wildomar fault. The Wildomar fault effectively stops the movement of water and produces a ground water cascade. A line of springs, shown on Plate 6 along the northeast edge of Murrieta

Valley, is the result of this barrier. The fault is also believed responsible for the formation of zones of confined ground water in Pauba Valley, Santa Gertrudis Valley, and Warm Springs Valley upstream from the fault. The approximate boundaries of these areas are shown on Plates 10B and 11B. Ground water contours on the plates depict the hydraulic discontinuity at the fault.

Well Drilling Methods

The majority of water wells in the Santa Margarita River watershed are drilled by the standard portable cable tool or hydraulic rotary methods, the cable tool method being somewhat more common. Many of the older wells, however, are hand-dug wells of large diameter and shallow depth, the yield being usually adequate for domestic purposes only.

Most of the drilled wells are cased with steel casing, which is perforated opposite the coarser materials. Many wells have been gravel packed to provide a large percolating surface in fine water-bearing materials and to prevent such materials from entering the perforations and clogging the wells.

In areas where ground water is extracted from residuum, which is usually of shallow depth and does not readily yield water, wells of large diameter are often used. These are usually drilled with a power auger, or "cess-pool rig", are about three feet in diameter, and are encased with sections of concrete pipe for the top few feet only. Lateral auger holes are often drilled radially outward near the bottom of such wells. These laterals conduct water into the well and materially increase the yield. Wells of this type within the watershed are largely located in the vicinity of Fallbrook.

Ground Water Basins

As mentioned previously, 23 ground water basins have been delineated on the ground water contour maps, Plates 10 and 11. To a degree depending upon the extent of present development and consequent availability of information, the following items were obtained for each basin: location and description; geologic characteristics; storage capacity; water level records; source of replenishment and direction of movement of ground water; and characteristics of water wells. Methods and procedures utilized in preparing estimates of specific yield of water-bearing formations and storage capacity of ground water basins are described in Appendix B. Ground water basin information and data are summarized in Table 15, "Ground Water Basin Data". Anza, Murrieta, Pauba, and Santa Margarita Coastal basins are more fully discussed in the following paragraphs.

TABLE 15

GROUND WATER BASIN DATA

Basin	Area, in acres	Elevation, in feet	Approximate number of active wells: 5 H.P. or over	Approximate number of active wells: Others	Maximum well yield reported, in GPM	Estimated usable storage capacity, in acre-feet	Main tributary streams	Water-bearing formations	Other data
							Hydrographic Unit 1		
Diamond	2,600	1,530-1,820	10	6	1,130	26,800	Warm Springs Creek	Recent alluvium	
Domenigoni	3,000	1,440-1,530	5	9	900	16,700	Warm Springs Creek	Recent alluvium	Geologic Section B-B'
French	3,000	1,320-1,460	4	8	190	6,860	Tributary of Warm Springs Creek	Recent alluvium and slightly dissected older alluvium	
Los Alamos	1,700	1,320-1,480	2	5	240	7,520	Tucalota Creek	Recent alluvium and slightly dissected older alluvium	Hydrograph of well 7S/2W-8A1 just outside basin
Murrieta	4,400	980-1,160	23	82	700	136,000	Cole Canyon, Warm Springs, Santa Gertrudis, and Murrieta Creeks	Recent alluvium underlain by older alluvium	Geologic Sections A-A' and K-K' Hydrograph of well 7S/3W-16N5
Santa Gertrudis	580	1,040-1,100	4	5	1,310	6,460	Santa Gertrudis Creek	Recent alluvium underlain by older alluvium	Geologic Section J-J'
Tucalota	260	2,220-2,440	3	5	260	585	Tucalota Creek	Recent alluvium	
Wildomar	590	1,160-1,260	5	21	360	13,500	Murrieta Creek	Recent alluvium underlain by older alluvium	
							Hydrographic Unit 2		
Anza	5,700	3,800-4,400	6	31	550	34,100	Coahuila and Hamilton Creeks	Recent alluvium	Geologic Section C-C' Hydrograph of well 7S/3E-21J1
Lower Coahuila	1,300	3,350-3,550	0	5	25	2,600	Coahuila Creek	Recent alluvium	

GROUND WATER BASIN DATA
(CONTINUED)

Basin	Area, in Acres	Elevation, in Feet	Approximate Number of Active Wells: 5 H.P. or Over	Approximate Number of Active Wells: Others	Maximum Well Yield Reported, in GPM	Estimated Usable Storage Capacity, in Acre-Feet	Main Tributary Streams	Water-Bearing Formations	Other Data
							Hydrographic Unit 2 (continued)		
Lower Lancaster	480	1,480-1,600	3	1	370	5,840	Lancaster Creek	Recent alluvium underlain by undifferentiated upper Pleistocene sediments	Hydrograph of well 8S/1E-7N1
Upper Coahuila	710	3,550-3,800	0	4	--	190	Coahuila Creek	Recent alluvium	
Upper Lancaster	460	1,640-1,880	1	3	90	3,060	Lancaster Creek	Recent alluvium underlain by older alluvium	Geologic Section F-F' Hydrograph of well 8S/1W-13Q1
							Hydrographic Unit 3		
Aguanga	1,200	1,800-2,200	2	5	180	35,200	Cottonwood and Temecula Creeks	Recent alluvium underlain by undifferentiated upper Pleistocene sediments	Geologic Section E-E'
Dodge	1,000	2,880-3,300	2	5	70	3,220	Kohler Canyon and Temecula Creeks	Recent alluvium	
Lower Culp	610	2,320-2,800	0	3	25-30 (estimated)	630	Temecula Creek	Recent alluvium	
Nigger	310	1,480-1,560	2	0	--	8,100	Temecula Creek	Recent alluvium underlain by undifferentiated upper Pleistocene sediments	Geologic Section F-F'
Oakgrove	2,000	2,720-3,200	1	13	90	11,200	Chihuahua and Temecula Creeks	Recent alluvium	Geologic Section D-D' Hydrograph of well 9S/2E-16F1

GROUND WATER BASIN DATA
(CONTINUED)

Basin	Area, in acres	Elevation, in feet	Approximate number of active wells: 5 H.P. or over	Approximate number of active wells: Others	Maximum well yield reported, in GPM	Estimated usable storage capacity, in acre-feet	Main tributary streams	Water-bearing formations	Other data
Hydrographic Unit 3 (continued)									
Radec	130	1,600-1,720	1	3	55	555	Temecula Creek	Recent alluvium underlain by undifferentiated upper Pleistocene sediments	
Hydrographic Unit 4									
Pauba	3,000	1,020-1,300	10	4	1,750	28,600 (unconfined zone)	Temecula Creek	Recent alluvium underlain by older alluvium	Geologic Sections G-G' and H-H' Hydrograph of well 8S/2W-12H1
Pechanga	2,200	960-1,320	1	3	340	28,200	Pechanga and Temecula Creeks	Recent alluvium underlain by older alluvium	Hydrograph of well 8S/2W-28C1
Hydrographic Unit 5									
Rainbow	450	1,020-1,160	1	26	75	335	Rainbow Creek	Recent alluvium	Hydrograph of well 9S/3W-1Q1
Hydrographic Unit 6									
Santa Margarita Coastal:									
Sub-basins:									
Upper	860	80-140	3	0	1,980	9,200			Hydrograph of well 10S/4W-7J1
Chappo	2,240	40-80	5	0	1,800	13,600			Hydrographs of wells 10S/5W-13J1 and 10S/5W-23L1
Ysidora	1,100	10-40	6	0	1,900	1,200			Hydrograph of well 11S/5W-2E and stilling well at Ysidora gage
	4,200	10-140	14	0	1,980	24,000	Santa Margarita River	Recent Alluvium	Geologic Section L-L'

Anza Basin. Ground water conditions in this basin were reported by Gerald Waring in United States Geological Survey Water Supply Paper 429 entitled "Ground Water in the San Jacinto and Temecula Basins, California", published in 1919. At that time the area was known as Babtiste Valley. The hydrograph for one of the wells reported in the water supply paper, 7S/3E-21J1, is presented on Plate 12. The reported measurement of August, 1916, plotted on the hydrograph, indicates that ground water levels have changed but slightly since that time, recent August measurements of depths to water in the same well being only three to seven feet greater than in August, 1916. Comparison of records from other wells in the basin indicates that, on the average, water level elevations in 1953 were slightly, but not appreciably, lower than in 1916.

Ground water contours indicate that movement of water is generally toward Coahuila Creek; however, the slope of the water table in the narrow southeast extension of the basin is very flat, thus indicating little, if any, movement in that area. Water levels in the northwest portion of the basin exhibit a discontinuity of as much as 140 feet. This effect, which is depicted on Plate 11B showing ground water contours for fall 1953, is apparently the result of a northeast trending fault through the Basin.

Alluvial materials filling Anza Basin are relatively fine, and water well yield is generally small. Of the 37 active wells in the Basin, a number have been tested at rates up to 100 gallons per minute, but many have yields of less than 25 gallons per minute. The four best wells, located in the central portion of the basin, are used for irrigation and have yields of 100 to 500 gallons per minute. The best of these has a specific capacity of 13.7. Other wells tested have specific capacities ranging between 0.2 and 6.7. At least one well in the basin has exhibited pressure characteristics.

Murrieta Basin. This basin is located in the central portion of Murrieta graben which also includes Wildomar and Pechanga Basins. The basin area is limited by the extent of Recent alluvium, which is bounded on the northeast and southwest by older alluvium and is generally 100 to 125 feet in depth. This formation is underlain by older alluvium, in which there are numerous permeable lenses as indicated by geologic section K-K' through Murrieta Valley shown on Plate 17. The variable character of valley fill is further indicated by the fact that some wells in the central portion of the valley have exhibited pressure characteristics. These effects are believed to be the result of local confining lenses of limited extent. In the portions of Murrieta Basin which lie northeast of Wildomar fault, and in Santa Gertrudis Basin, which is separated from Murrieta Basin by the fault, the barrier effect of the fault results in well defined pressure characteristics in more extensive confined aquifers.

Logs of wells drilled in Murrieta Basin bear no notation that bedrock was encountered. However, the log of the Vernard No. 1 oil test well 7S/3W-21H1, outside the basin, indicates that bedrock was reached at a depth of 2,450 feet. Because this well is not located in the Murrieta graben, but in a higher block northeast of Wildomar fault, the depth of older alluvium in the graben southwest of the oil test well is believed to be in excess of 2,500 feet. The difference in elevation of bedrock across Wildomar fault is depicted on geologic section A-A' on Plate 14.

Well measurements in Murrieta Basin are available for the period 1925 through 1927 and for the period of this investigation. Ground water contour maps for spring 1927 and fall 1953 show little change in water surface elevation. The hydrograph of well 7S/3W-16N5 on Plate 12 depicts the fluctuation during the period of investigation.

Streams supplying Murrieta Basin include those draining the north slope of Santa Rosa Plateau, and Warm Springs, Santa Gertrudis, and Murrieta Creeks. Ground water moving down the valley causes rising water of about one-half cubic foot per second in Murrieta Creek at Temecula.

Of the 105 active wells located in Murrieta Basin, 23 are equipped with pumps of five horsepower or greater. Of the better wells tested 13 yielded 100 to 300 gallons per minute. Drawdowns averaged about 60 feet and specific capacities ranged from two to ten and averaged about five gallons per minute per foot of drawdown.

Pauba Basin. Pauba Basin is located in Pauba Valley which was eroded into a large body of older alluvium by Temecula Creek. The Basin, as considered herein, is limited in areal extent to the valley floor and is separated from Pechanga Basin by the Wildomar fault.

Basin fill is composed of Recent alluvium underlain by older alluvium. Depth to basement rock is known at only one location in the Basin, namely, at well 8S/2W-12H1 which is known locally as the "windmill" well. At this well bedrock was reached at a depth of 510 feet. However, well 8S/2W-17M1, closely adjacent to the Basin near its downstream boundary, was drilled to a depth of 2,471 feet without reaching basement complex. Probable depth to bedrock in the basin at its downstream boundary is, therefore, in excess of 2,500 feet.

The Recent alluvium constitutes a free ground water zone tapped by relatively shallow wells ranging in depth up to 250 feet. In the downstream three-fourths of the Basin, ground water in the deeper older alluvium is confined by a bed composed largely of clay and sandy clay, with small lenses of sand and gravel. As discussed later in the section on water quality, characteristics of water from the zones above and below the confining bed are distinctly different. Separate sets of ground water contours for the free ground water zone and for the confined zone are shown on Plates 10B and 11B. Because measurements at pressure wells during spring 1927 and fall 1953 were insufficient for the purpose, the lines of equal elevation of pressure levels shown are those for March, 1926, and January, 1954, at which times conditions were not far different from those of spring 1927 and fall 1953.

Storage capacity of the free ground water zone is estimated to be 52,000 acre-feet, and of this, 28,600 acre-feet is considered to be usable. The older alluvium which underlies the Recent alluvium in the basin as herein delimited, is apparently contiguous with similar formations on both sides of the valley. Since a major part of the underlying formation appears to be under pressure, and available data are insufficient to determine the extent and capacity of the entire body, an evaluation of these factors for the portion underlying the Recent alluvium would be meaningless. The limited available data indicate, however, that the older alluvium is deep and contains interfingering lenses of sediments, some of which are moderately permeable. In effect these lenses constitute conduits through which ground water either may escape from or enter the Basin, as herein delimited, depending upon the ground water gradient at any particular time. Because of the irregular shape of the lenses, their heterogeneous composition, and unknown areal extent, the evaluation of leakage through them becomes a complex problem and no evaluation was attempted in this investigation.

Water levels at the windmill well have been recorded during the period 1918 through 1955. The well has flowed at times following periods of heavy runoff in Temecula Creek, but its level fluctuates directly with that at a shallow well nearby, 8S/2W-12H2. Fluctuations at well 8S/2W-11J1, about one mile downstream, are similar to those at the windmill well, although the decline from 1945 to 1952 was only 18 feet as compared with 46 feet at the windmill well. At well 8S/2W-20E1, which represents conditions in lower Pauba Basin as well as in Pechanga Basin, water levels changed but seven feet in the same period. The hydrograph of the windmill well (8S/2W-12H1) shown on Plate 12, "Fluctuation of Water Levels at Selected Wells", represents generally the regimen of water table fluctuation in Pauba Basin, even though it exhibits pressure characteristics at times. The magnitude of the fluctuations, as indicated above, decreases generally with distance downstream. The lack of response to the floods of early 1952, and the sharp rise in 1953--about five feet at the windmill well-- are believed to be due to the holding back of flood water in Vail Reservoir and its later release for irrigation.

Well yields of up to 1,750 gallons per minute with specific capacities up to 70 have been obtained from shallow wells in the Basin. At present there are four flowing wells in the Basin, 8S/2W-15C1, 16A1, 16G1, and 17G1. Well 8S/2W-17M1, the deep exploratory well previously mentioned as being just outside the Basin, is also artesian. Natural flow in 17M1 was measured at 400 gallons per minute before it was test pumped, and with a test pump installed it produced 2,326 gallons per minute with a specific capacity of 20.3. All of the artesian wells except 17M1 were drilled in 1903-04 and were reported to have flowed at a rate of about 200 gallons per minute in 1915. Well 15C1 was flowing at a rate of 210 gallons per minute in January, 1951.

Santa Margarita Coastal Basin. Santa Margarita Coastal Basin is located in the valley of the lower Santa Margarita River on Camp Pendleton. The valley is an irregularly shaped flood plain bounded by hills of largely nonwater-bearing rocks, the same material extending under the Recent alluvium of the valley to form the sides and bottom of the ground water basin. The downstream boundary of the Basin is defined by the location of the Ysidora stream gaging station in Ysidora Narrows. Two other constrictions divide the Basin into three sub-basins, herein called, in downstream order: Upper, Chappo, and Ysidora Sub-basins.

The three Sub-basins are filled with alluvium varying in maximum depth from about 170 feet in Upper Sub-basin to about 200 feet in Chappo and Ysidora Sub-basins. Ground water in Upper and Chappo Sub-basins is essentially unconfined, although some wells in each have exhibited pressure characteristics. This is believed to be the result of lenses of relatively impermeable sediments interspersed among the permeable materials. The pressure characteristics are more pronounced, however, in Ysidora Sub-basin, and ground water therein may be described as semi-confined. Well logs shown graphically on Plate 17 indicate the manner in which the proportion of fine sediments increase in the downstream direction. In Ysidora Sub-basin the "upper member", delineated on the geologic section, contains a large proportion of the tighter materials, and consequently the "lower member" is the main source of water in that area.

Total storage capacity of Santa Margarita Coastal Basin is estimated to be 61,600 acre-feet of which 24,000 acre-feet is usable. The latter amount is predicated on the assumption that the upper 10 feet of storage throughout the basin cannot be considered as available under full development, and that storage below 100 feet depth or below sea level is unusable. The estimated usable capacities of Upper, Chappo, and Ysidora Sub-basins are 9,200, 13,600, and 1,200 acre-feet, respectively.

Utilizing values derived by the procedure described in Appendix B, graphs relating storage capacity to depth, as shown on Plate 18, were prepared. From these graphs, the amount of ground water storage capacity which could be developed by drawing the ground water levels down to any particular depth, can be estimated. Thus, if the ground water level in Upper Sub-basin were drawn to an average depth of 100 feet below ground surface, about 12,000 acre-feet of storage capacity would be developed below ground surface. If the capacity in the top 10 feet, or about 2,800 acre-feet were ignored, a net storage capacity of 9,200 acre-feet would result.

Recharge of Santa Margarita Coastal Basin is primarily by deep percolation of precipitation falling directly on the Basin surface and by deep percolation of runoff in the Santa Margarita River. Most of the time in the past there has been relatively little space available in the ground water Basin to receive percolation. Because of the low water table conditions in December, 1951, opportunity for percolation was probably greater than it has been at any other time. Daily stream flow records indicate that 7,800 acre-feet of stream runoff in the Santa Margarita River percolated into and recharged the Basin during the period December 30, 1951, through January 18, 1952. From January 19 through January 30, 1952, the outflow from the Basin at Ysidora gaging station exceeded the inflow, and the accumulated excess outflow during this latter period amounted to 1,500 acre-feet. Replenishment to the Basin from the stream flow between December 30, 1951, and January 30, 1952, was thus approximately 6,300 acre-feet. The daily discharge records for this period were used to construct the percolation diagram of Plate 19, "Relationship Between Discharge of Santa Margarita River and Percolation in Santa Margarita Coastal Basin".

The percolation diagram of Plate 19 is based on the assumption that flow in the stream is in accordance with the Manning formula, and that the rate of percolation is directly proportional to the wetted area. With the slope of the line thus established as three on eight on log-log paper, the daily discharge records obtained during the above period were utilized to estimate the position of the line which is believed to best represent the average percolation rate which would probably result from a given rate of flow.

Depths to water in wells in the Santa Margarita Coastal Basin were measured extensively during the period 1920 through 1927 and since 1950. A few other measurements are available for the period 1943 through 1949. Ground water conditions in the basin are depicted on the ground water contour maps, Plates 10A and 11A, and by hydrographs of five wells on Plate 12, "Fluctuation of Water Levels at Selected Wells". Profiles of historical ground water levels along a section roughly paralleling the river are shown on Plate 20.

It is believed that water levels in August, 1951, (Plate 12) were at the all time low. In Upper and Chappo Sub-basins the lowest static water level elevations during that month were 18 feet below ground surface, and in Ysidora Sub-basin the minimum elevation was 29 feet below ground surface. These minima in Upper and Chappo Sub-basins are approximately 10 feet lower than those of December, 1925, and the corresponding difference in Ysidora Sub-basin is about 23 feet. At the all time high in the spring of 1927, ground water levels throughout the Basin were within a few feet of ground surface. These comparisons indicate the relatively small magnitude of fluctuation of the water table and the correspondingly small use that has been made of available storage capacity in Chappo and Upper Sub-basins.

Results of available pumping tests made in Santa Margarita Coastal Basin are summarized in Table 16.

TABLE 16

SANTA MARGARITA COASTAL BASIN WATER WELL YIELDS

Sub-basin	Number of wells tested	Average yield of wells, in gpm	Specific capacity
Upper	2	200-350	3.8-7
Upper	1	1,980	220
Chappo	4	600-900	19-50
Chappo	2	1,600	97-121
Chappo	1	1,800	31
Ysidora	7	1,800	100

Quality of Water

The principal objectives of the water quality investigation of the Santa Margarita River watershed were determination of quality of the surface and ground waters with respect to their suitability for the various beneficial uses and determination of the presence and source of degradation thereof if any.

Data utilized in the determination of quality of water included 150 complete and 33 partial mineral analyses of surface waters, 280 complete and 759 partial mineral analyses of ground waters, and 47 complete mineral analyses of spring waters. Most of the complete mineral analyses were of samples collected during the course of this investigation. Most of the partial analyses were made by the United States Navy to monitor sea-water intrusion in Santa Margarita Coastal Basin.

Complete mineral analyses include determinations of concentration of four cations, namely, calcium, magnesium, sodium, and potassium; five anions, namely, carbonate, bicarbonate, chloride, sulfate, and nitrate; total dissolved solids; boron; and computations of per cent sodium and total hardness. The more recent analyses generally also include the determination of fluoride ion concentration. For the most part the partial analyses include determinations of chloride ion concentration and total dissolved solids only.

All available mineral analyses are reported in four tables in Appendix H. In Tables H-1 and H-2, respectively, analyses of spring waters and surface waters are presented, both by hydrographic units. In Tables H-3 and H-4, respectively, complete and partial analyses of ground waters are shown by hydrographic units and basins.

The locations of springs are shown on Plate 6, and well locations appear on Plates 9A and 9B. Locations of stream sampling points may be determined by interpolation between stream mile readings shown on Plate 6.

The terms used in connection with the discussion of quality of water in this report are defined as follows:

Quality of Water--Those mineral characteristics of water affecting its suitability for beneficial uses.

Degradation--Any impairment of the quality of water due to causes other than disposal of sewage and industrial wastes.

Pollution--Impairment of the quality of water by sewage and industrial waste to a degree which does not create a hazard to public health but which adversely and unreasonably affects such water for beneficial uses.

Contamination--Impairment of the quality of water by sewage or industrial wastes to a degree which creates a hazard to public health through poisoning or spread of disease.

Hardness--A characteristic of water which causes coagulation of soap, increased consumption of soap, deposition of scale on boilers, injurious effects in some industrial processes, and sometimes objectionable taste; and which is due in large part to the presence of salts of calcium, magnesium, and iron.

Character of Water--The predominant cation and anion identify the character of water. For example, a water with a sodium-bicarbonate (Na-HCO_3) character contains sodium and bicarbonate ions in excess of 50 per cent of the total cations and anions, respectively.

Water Quality Criteria

Investigation and study of the quality of surface and ground waters of the Santa Margarita River watershed, as reported herein, is limited to the consideration of the mineral constituents of the waters, with particular reference to their suitability for irrigation use. It is noted, however, that, within the limits of the mineral analyses herein reported, a water which is suitable for irrigation may also be considered as either being generally suitable for municipal and domestic uses, or susceptible to such treatment as will render it suitable for those purposes.

The factors which were used as a guide in determining suitability of water for irrigation use comprise the following: (1) chloride concentration; (2) total dissolved solids, as measured by electrical conductance; (3) boron concentration; and (4) per cent sodium.

The significance of these factors is as follows:

1. The chloride ion is usually the most troublesome element in irrigation water. It is not considered essential to plant growth, and excessive concentrations will inhibit growth.

2. The amount of total dissolved solids, as indicated by electrical conductance ($EC \times 10^6$ at 25°C), furnishes an approximate indication of the over-all mineral quality of the water. The presence of excessive amounts of total dissolved salts in irrigation water will reduce crop yields. Total dissolved solids in parts per million approximate seven-tenths of the electrical conductance.

3. Crops are sensitive to boron concentration, but require a small amount (less than 0.1 part per million) for growth. Most plants will not tolerate more than 0.5 to 2 parts per million of this constituent.

4. Per cent sodium reported in the analyses is the ratio of the sodium cation to the sum of all cations and is obtained by dividing sodium by the sum of calcium, magnesium, potassium, and sodium, all expressed in equivalents per million, and multiplying by 100. Water containing high per cent sodium has an adverse effect upon the physical structure of the soil by dispersing the soil colloids and making the soil "tight", thus retarding movement

of water through the soil, retarding the leaching of salts, and making the soil difficult to work.

Various criteria have been developed to classify waters with respect to their suitability for irrigation. The following excerpts from a paper by Dr. L. D. Doneen of the University of California at Davis include a classification utilized herein for irrigation waters.

> "Because of diverse climatoligical conditions, crops, and soils in California, it has not been possible to establish rigid limits for all conditions involved. Instead, irrigation waters are divided into three broad classes based upon work done at the University of California, and at the Rubidoux, and Regional Salinity laboratories of the U. S. Department of Agriculture.
>
> "Class 1. Excellent to Good--Regarded as safe and suitable for most plants under any condition of soil or climate.
>
> "Class 2. Good to Injurious--Regarded as possibly harmful for certain crops under certain conditions of soil or climate, particularly in the higher ranges of this class.
>
> "Class 3. Injurious to Unsatisfactory--Regarded as probably harmful to most crops and unsatisfactory for all but the most tolerant.
>
> "Tentative standards for irrigation waters have taken into account four factors or constituents, as listed below:

Factor	Class 1 Excellent to good	Class 2 Good to injurious	Class 3 Injurious to unsatisfactory
Conductance (E.C.x10^6 at 25°C)	Less than 1000	1000-3000	More than 3000
Boron, ppm	Less than 0.5	0.5-2.0	More than 2.0
Per cent sodium . . .	Less than 60	60-75	More than 75
Chloride, epm	Less than 5	5-10	More than 10

(End of quotation)

As a result of recent research by Dr. Doneen, he has suggested the use of a factor which he terms effective salinity, in lieu of total dissolved solids as measured by "conductance" in the foregoing standards. The suggested procedure takes cognizance of the fact that as the soil solution becomes concentrated due to the removal by plants of only a small percentage of the total salts occurring in the irrigation water, certain of the salts will precipitate out, leaving only the more soluble salts in the soil solution. These soluble salts constitute the effective salinity.

Insofar as this factor is concerned, he tentatively classifies irrigation water as follows, the effective salinity being expressed in parts per million:

Soil Conditions	Effective Salinity for Class I	II	III
Little or no leaching can be expected	165	165-275	275
Some leaching, but restricted	275	275-550	550
Open soils with easy deep percolation	385	385-825	825

The effective salinity of each of the waters for which analyses are presented in this report has not been determined, but review of the records indicates that generally the classification of irrigation waters as determined by the original Doneen standards would not materially change if the same waters were subjected to classification utilizing effective salinity.

Probably the most widely used criteria for determining the suitability of water for domestic and municipal use are the "United States Public Health Service Drinking Water Standards, 1946", which have been adopted by the California State Department of Public Health. These Standards establish mandatory limits for certain mineral constituents, and non-mandatory but recommended limits for others. The mandatory limits, in parts per million, are as follows:

Lead	0.1
Fluoride	1.5
Arsenic	0.05
Selenium	0.05
Hexavalent chromium	0.05

Non-mandatory, but recommended limits are as follows:

Copper	3.0
Iron and manganese together	0.3
Magnesium	125
Zinc	15
Chloride	250
Sulfate	250
Phenolic compounds in terms of phenol	0.001
Total solids, desirable	500
permitted	1000

Total hardness is a significant factor in the determination of the suitability of a water for domestic and municipal use. Waters containing 100 ppm or less of hardness (as $CaCO_3$) are considered as "soft"; those containing 101 to 200 ppm are considered as "moderately hard"; and those with more than 200 ppm are considered "very hard".

The relationship of infant methemoglobinemia to nitrates in water supply has led to recommendations that limitations be set for nitrates in drinking water. The California State Department of Public Health has recommended a tentative limit of 10 parts per million nitrate nitrogen as N (44 parts per million nitrate as NO_3) for domestic waters. Any water containing higher nitrate concentrations may be considered to be of questionable quality for domestic and municipal use.

It should be noted that no bacterial analyses have been made, and discussion herein of suitability of waters for domestic and municipal purposes is limited to considerations of mineral quality.

Quality of Surface Waters

Surface waters in the Santa Margarita River watershed are generally of good mineral quality and suitable for prevailing beneficial uses. The 150 complete and 33 partial mineral analyses of surface waters are presented in

Appendix H, Table H-2. Typical mineral analyses, selected from Table H-2, are presented in Table 17. Variations in quality occur both areally and with rate of stream flow. Ranges in the mineral constituents, variations in character, and the irrigation classification of samples are presented in Table 20 "Summary of Mineral Analyses of Surface Waters".

TABLE 17

TYPICAL MINERAL ANALYSES OF SURFACE WATERS[a]

Stream	Stream mile	Date / Time[b]	Discharge, second-feet	ECx10⁶ at 25°C	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
									Hydrographic Unit 1										
Cole Canyon Creek	93-30.1-9.0-0.1	1-25-54	23	149	7.6	10 / 0.5	6 / 0.50	10 / 0.5	2 / 0.06	--	43 / 0.7	15 / 0.32	14 / 0.4	7 / 0.12	0.3	0.01	132	50	30
Murrieta Creek	93-30.1-0.4	6-4-54	1[c]	1,266	7.6	44 / 2.2	15 / 1.22	196 / 8.53	15 / 0.38	--	256 / 4.2	76 / 1.58	223 / 6.3	4 / 0.06	0.6	0.4	743	171	69
Santa Gertrudis Creek	93-30.1-3.9-0.6	1-25-54	55	96	7.0	8 / 0.4	3 / 0.25	5 / 0.23	2 / 0.06	--	31 / 0.5	10 / 0.20	7 / 0.2	6 / 0.09	0.0	0.01	103	32	24
Warm Springs Creek	93-30.1-4.8-0.5	2-27-53	0.12	1,040	7.9	38 / 1.9	11 / 0.89	169 / 7.35	--	--	140 / 2.3	80 / 1.67	216 / 6.1	2 / 0.03	--	1.05	586[d]	140	73
		3-22-54	110	417	7.6	28 / 1.4	8 / 0.67	40 / 1.73	4 / 0.09	--	79 / 1.3	50 / 1.05	50 / 1.4	5 / 0.07	0.1	0.03	306	104	45
									Hydrographic Unit 2										
Coahuila Creek	93-41.6-11.3	12-9-53 / 1515	0.17	600	8.0	40 / 2.0	13 / 1.10	73 / 3.19	4 / 0.11	--	165 / 2.7	83 / 1.72	67 / 1.9	4 / 0.07	0.4	0.1	419	155	50
Lancaster Creek	93-41.6-5.5	11-21-50 / 1615	0.28	1,410	8.6	60 / 3.0	33 / 2.7	250 / 10.90	--	--	244 / 4.0	247 / 5.14	220 / 6.2	4 / 0.06	--	0.0	936[d]	285	67
Wilson Creek	93-41.6-7.2-1.8	5-14-54 / 0855	0.19	1,321	8.3	126 / 6.3	39 / 3.25	125 / 5.43	7 / 0.17	--	396 / 6.5	257 / 5.35	119 / 3.35	3 / 0.04	0.6	0.1	957	478	36
									Hydrographic Unit 3										
Arroyo Seco Creek	93-41.1-1.7	4-8-54	5[c]	357	8.1	35 / 1.75	11 / 0.90	34 / 1.49	3 / 0.07	--	149 / 2.45	41 / 0.86	32 / 0.9	4 / 0.06	0.4	0.1	282	132	35
Chihuahua Creek	93-55.1-4.0	1-10-51 / 1730	0.02	2,130	8.1	234 / 11.7	92 / 7.50	230 / 10.0	--	--	390 / 6.4	802 / 16.7	195 / 5.5	3 / 0.05	--	0.1	1,751[d]	960	34
Temecula Creek	93-45.0	3-22-54	350	135	7.3	16 / 0.8	2 / 0.2	9 / 0.39	3 / 0.08	0 / 0	49 / 0.8	15 / 0.31	2 / 0.05	1 / 0.02	0.1	0.01	116	50	27
	93-45.2	11-30-51	0.5[c]	1,920	8.3	250 / 12.5	2 / 0.2	210 / 9.12	--	--	486 / 7.8	470 / 9.80	160 / 4.5	2 / 0.03	--	0.2	1,337[d]	635	42

TYPICAL MINERAL ANALYSES OF SURFACE WATERS[a]
(continued)

Stream	Stream mile	Date / Time[b]	Discharge, second-feet	ECx10⁶ at 25°C	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
Hydrographic Unit 3 (continued)																			
Temeoula Creek	93-55.6	11-19-51 / 1630	0.5	710	8.5	71 / 3.55	21 / 1.70	69 / 3.01	--	--	269 / 4.4	115 / 2.39	43 / 1.2	4 / 0.06	--	0.1	457[d]	262	37
Hydrographic Unit 4																			
Temecula Creek	93-30.9	4-12-54 / 1200	12[c]	1,058	7.9	87 / 4.34	21 / 1.73	120 / 5.22	3 / 0.07	0 / 0	307 / 5.04	144 / 3.0	108 / 3.05	0 / 0	--	0.1	620	304	46
	93-35.6	4-19-54	0.12	870	7.9	70 / 3.5	20 / 1.62	106 / 4.60	2 / 0.04	--	244 / 4.0	131 / 2.72	99 / 2.8	2 / 0.04	0.6	0.1	596	256	47
Hydrographic Unit 5																			
De Luz Creek	93-12.2-6.5	12-22-53	0.14	490	7.8	38 / 1.9	18 / 1.47	48 / 2.09	1 / 0.03	--	208 / 3.4	16 / 0.34	60 / 1.7	4 / 0.07	0.2	0.0	333	168	38
Santa Margarita River	93-20.0	5-12-52[e] / 1100	6	1,010	7.9	67 / 3.34	25 / 2.06	106 / 4.61	43 / 0.11	10 / 0.33	264 / 4.33	110 / 2.29	118 / 3.33	1 / 0.01	0.4	0.3	607[d]	270	46
Hydrographic Unit 6																			
Fallbrook Creek	93-8.8-7.9	4- 2-54 / 1130	--	1,710	8.3	107 / 5.35	50 / 4.15	173 / 7.54	1 / 0.02	--	275 / 4.5	264 / 5.51	238 / 6.7	27 / 0.44	0.7	0.3	1,138	475	44

a. All Analyses by Division of Water Resources unless otherwise noted.
b. Pacific Standard Time indicated by 24-hour time system.
c. Estimated.
d. Total dissolved solids determined by summation.
e. Analyzed by United States Geological Survey, Water Quality Branch, unpublished records subject to revision.

Quality of Ground Waters

Ground water quality varies both in composition and concentration throughout the Santa Margarita River watershed. Most of the ground water basins contain waters which are generally of good mineral quality and suitable for prevailing beneficial uses.

The 280 complete and 759 partial mineral analyses of ground waters, including 106 complete and 13 partial analyses from wells outside the ground water basins are presented in Tables H-3 and H-4 of Appendix H. Typical mineral analyses of ground waters, selected from Appendix H, are presented in Table 18. Table 21 presents a summary of the 174 complete and 746 partial mineral analyses of ground water basin waters, including ranges in mineral constituents, variations in character, and irrigation classifications. As previously mentioned, the majority of the partials are from wells in the Santa Margarita Coastal Basin.

TABLE 18

TYPICAL MINERAL ANALYSES OF GROUND WATERS[a]

Well number	Date sampled	$EC \times 10^6$ at $25^\circ C$	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$ ppm	Per cent Na
								Hydrographic Unit 1									
Diamond Basin 6S/2W-1A1	11- 5-52	810	8.2	77/3.85	22/1.81	75/3.26	--	--	207/3.4	132/2.76	92/2.6	11/0.18	--	0.2	512[b]	283	37
French Basin 6S/2W-28G2	5-15-53	1,090	7.6	93/4.65	27/2.20	103/4.46	--	--	165/2.7	222/4.61	135/3.8	7/0.11	--	0.1	669[b]	342	39
Los Alamos Basin 7S/2W-4K1	4- 7-53	1,090	7.5	95/4.75	25/2.10	96/4.15	--	--	374/4.5	111/2.31	149/4.2	10/0.16	--	0.1	673[b]	342	38
Murrieta Basin 7S/3W-7R2	11- 3-52	650	7.8	28/1.4	8/0.66	109/4.75	--	--	183/3.0	40/0.83	96/2.7	2/0.04	--	0.2	349[b]	103	70
Wildomar Basin 6S/4W-35M2	10-29-52	540	8.3	44/2.2	25/2.08	58/2.52	--	--	238/3.9	34/0.70	53/1.5	18/0.29	--	0.1	351[b]	214	38
								Hydrographic Unit 2									
Anza Basin 7S/3E-20J2	9- 2-54	748	7.1	80/4.0	14/1.20	48/2.12	6/0.15	--	159/2.6	131/2.74	67/1.9	15/0.24	0.1	0.2	504	260	28
Lower Lancaster Basin 8S/1E-7Q4	3-12-52	1,270	7.9	77/3.85	29/2.41	256/11.14	--	--	354/5.8	235/4.89	234/6.6	1/0.01	--	0.3	1,008[b]	313	64

TYPICAL MINERAL ANALYSES OF GROUND WATERS[a]
(continued)

Well number	Date sampled	$ECx10^6$ at 25°C	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
								Hydrographic Unit 3									
Aguanga Basin 8S/1E-33G1	7-18-52	1,020	7.5	113/5.65	24/2.00	66/2.85	--	--	220/3.6	254/5.49	44/1.25	4/0.06	--	0.1	618[b]	382	27
Radec Basin 8S/1E-19G1	11-19-51	1,440	8.3	133/6.65	34/2.79	175/7.57	--	--	403/6.6	269/5.60	160/4.5	2/0.04	--	0.3	975[b]	480	45
								Hydrographic Unit 4									
Pauba Basin 8S/2W-11L1	5-26-54	1,053	7.9	92/4.6	12/1.0	115/4.99	5/0.14	--	272/4.45	161/3.36	117/3.3	5/0.09	0.4	0.3	702	280	47
16G1	5-26-54	652	8.3	15/0.75	1/0.1	112/4.88	2/0.06	--	134/2.2	31/0.64	103/2.9	16/0.25	0.6	0.2	378	43	84
								Hydrographic Unit 5									
Rainbow Basin 9S/3W-1P3	11-10-53	952	7.7	58/2.9	35/2.9	80/3.48	4/0.10	--	104/1.7	35/0.73	199/5.6	35/0.57	0.6	0.0	647	290	38

TYPICAL MINERAL ANALYSES OF GROUND WATERS[a]
(continued)

Well number	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$ ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
Hydrographic Unit 6																	
Santa Margarita Coastal Basin																	
Upper Sub-basin																	
10S-4W-5D1	1-25-52[c]	990	7.8	62/3.1	22/1.8	120/5.2	--	0/0	263/4.3	93/1.9	110/3.1	0.05/--	0.4	0.95	694	--	52
Chappo Sub-basin																	
10S/4W-18M2	1-25-52[c]	1,150	7.8	62/3.1	19/1.6	161/7.0	--	0/0	286/4.7	130/2.7	124/3.5	0.07/--	0.5	0.4	806	--	60
Ysidora Sub-basin																	
10S/5W-35K1	1-11-52[c]	1,300	7.5	73/3.64	25/2.04	177/7.72	--	0/0	323/5.3	112/2.3	176/5.0	0.02/--	0.5	0.2	749[b]	--	58
11S/5W-2E1	11-29-51[c]	--	8.2	58/--	100/--	--	--	--	--	55/--	184/--	--	--	--	550	--	--
2E1	11-18-52[c]	1,940	7.7	191/9.53	50/4.11	163/7.09	4/0.09	--	424/6.95	510/10.62	168/4.74	1/0.02	--	0.2	1,299[b]	682	--

a. All analyses by Division of Water Resources unless otherwise noted.
b. Total dissolved solids determined by summation.
c. Analysis obtained from United States Navy.

Quality of Spring Waters

Discharge from springs in the Santa Margarita River watershed is small and limited generally to domestic use, therefore the following discussion of spring water quality is restricted to the criteria established by the United States Public Health Service and adopted by the California State Department of Public Health.

Complete analyses of 47 samples collected from 45 springs located in Hydrographic Units 1 through 5 are presented in Table H-1 of Appendix H. It is believed that few if any springs exist in Hydrographic Unit 6. Typical analyses are presented in Table 19.

TABLE 19

TYPICAL MINERAL ANALYSES OF SPRINGS[a]

Spring number	Spring name	Date sampled	ECx10^6 at 25°C	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
								Hydrographic Unit 1										
7S/3W-35K2		8-19-53	1,280	7.8	24 / 1.2	16 / 1.29	228 / 9.92	--	--	250 / 4.1	37 / 0.77	266 / 7.5	3 / 0.05	0.9	1.0	744	124	80
								Hydrographic Unit 2										
7S/1E-24G		9-23-52	480	8.4	31 / 1.55	5 / 0.40	55 / 2.41	--	--	171 / 2.8	19 / 0.40	46 / 1.3	2 / 0.02	--	0.2	243[b]	92	55
7S/2E-26C	Coahuila Spring	8-18-53	330	8.8	2 / 0.1	0 / 0	67 / 2.89	--	--	101 / 1.65	24 / 0.51	28 / 0.8	1 / 0.02	1.2	0.4	242	5	97
								Hydrographic Unit 3										
8S/2E-22G1	Twin Oaks Spring	11- 2-53	627	8.0	72 / 3.6	15 / 1.25	51 / 2.21	7 / 0.18	--	122 / 2.0	174 / 3.63	43 / 1.2	2 / 0.04	0.3	0.1	510	242	31
8S/1W-21C	Dripping Spring	2- 9-51	470	7.8	48 / 2.4	15 / 1.21	36 / 1.57	--	--	225 / 3.7	23 / 0.49	35 / 1.0	4 / 0.07	--	0.0	273[b]	180	30
								Hydrographic Unit 4										
8S/2W-36F	Collier Spring	2-11-52	350	7.8	17 / 0.85	4 / 0.31	66 / 2.87	--	--	134 / 2.2	29 / 0.61	46 / 1.3	1 / 0.01	--	0.1	229[b]	58	71
								Hydrographic Unit 5										
9S/4W- 5P		8-25-54	373	7.5	48 / 2.4	6 / 0.47	41 / 1.77	3 / 0.08	--	171 / 2.8	17 / 0.35	50 / 1.4	6 / 0.10	0.2	0.1	288	144	37

a. All analyses by Division of Water Resources.
b. Total dissolved solids determined by summation.

TABLE 20

SUMMARY OF MINERAL ANALYSES OF SURFACE WATERS

Stream	Number of analyses: Completes	Number of analyses: Partials	Number of sampling points	Predominant character	Irrigation classification	Range: TDS, ppm	Range: Cl, ppm	Range: B, ppm	Range: Na, per cent
				Hydrographic Unit 1					
Cole Canyon Creek	4	-	1	Ca-Mg, HCO_3-Cl[a] Ca-Na, HCO_3[b]	1	132-195	14-28	0-0.03	30-36
Murrieta Creek	5	-	3	Na, Cl	2	463-1,215	121-372	0.2-0.4	63-69
Santa Gertrudis Creek	2	-	1	Ca-Mg, HCO_3[a] Na-Ca, SO_4-HCO_3[b]	1	103-267	7-11	0.01-0.05	24-42
Warm Springs Creek	7	-	1	Na-Ca, Cl-HCO_3[a] Na, Cl[b]	1,2	306-1,074	25-344	0.03-1.05	45-73
				Hydrographic Unit 2					
Coahuila Creek: Upstream	2	-	1	Na-Ca, HCO_3-Cl	1	331-419	57-67	0-0.1	50
Downstream	2	-	1	No predominant character	2	962-1,096	188-206	0.2-0.4	58-60
Lancaster Creek	10	-	4	Na, variable	2	278-430	160-305	0-0.4	51-67
Wilson Creek	11	-	5	No predominant character	1,2	434-1,146	46-160	0-0.2	34-42
				Hydrographic Unit 3					
Arroyo Seco Creek	4	-	2	Ca-Na, HCO_3	1	191-562	25-69	0-0.1	35-44
Chihuahua Creek	3	-	2	Ca-Na, SO_4	2,3	867-2,454	82-298	0-0.2	34
Kohler Canyon	4	-	1	Ca-Na, HCO_3	1	249-274	25-32	0-0.1	26-33
Rattlesnake Creek	1	-	1	Ca-Na, HCO_3-SO_4	1	585	39	0.1	26
Temecula Creek	34	-	21	Ca-Na, HCO_3-SO_4	1,2	116-1,337	2-160	0-0.2	23-44
				Hydrographic Unit 4					
Pechanga Creek	2	-	1	Na-HCO_3, Cl	2,3	254-360	46-96	0-0.03	66-91
Temecula Creek	31	-	10	Na-Ca, HCO_3-Cl to Na-Ca, HCO_3-SO_4	1,2	519-1,307	57-223	0.1-0.45	40-59
				Hydrographic Unit 5					
Coleman Creek (Tributary to De Luz Creek)	2	-	1	Ca-Na, HCO_3	1	233-253	28-35	0.01	35-36

SUMMARY OF MINERAL ANALYSES OF SURFACE WATERS
(continued)

Stream	Number of analyses: Completes	Number of analyses: Partials	Number of sampling points	Predominant character	Irrigation classification	Range: TDS, ppm	Range: Cl, ppm	Range: B, ppm	Range: Na, per cent
				Hydrographic Unit 5 (continued)					
De Luz Creek:									
Upstream	1	-	1	Na-Ca, HCO_3[b]	1	333	60	0	38
Downstream	1	-	1	Na, HCO_3[a]	2	--	34	0	70
Fern Creek	1	-	1	Na-Ca, HCO_3	1	185	27	0.05	48
Rainbow Creek	2	-	2	No predominant character	1	227-521	53-124	0.02-0.05	31-54
Sandia Creek	1	-	1	Na-Ca, HCO_3-Cl	1	354	64	0.1	36
Santa Margarita River	11	33	4	Na-Ca, HCO_3-Cl	1,2[c]	606-754	65-298	0.1-0.3	46-54
				Hydrographic Unit 6					
Fallbrook Creek	1	-	1	Na-Ca, Cl-SO_4	2	1,138	238	0.34	44
O'Neill Lake	2	-	2	Na, Cl-HCO_3	1,2	592	140-230	0.12	57-60
Santa Margarita River at lagoon at Hwy. 101: 6 second-feet flow	1	-	1	Na, Cl-HCO_3	1	546	146	0.1	57
No flow	2	-	1	Na, Cl	3	17,558-23,621	9,900-11,880	2.06-3.00	78

a. Predominant character for high flows.
b. Predominant character for low flows.
c. Partial analyses of samples taken during high flows indicate classification 1 for irrigation use.

TABLE 21

SUMMARY OF MINERAL ANALYSES OF GROUND WATERS

BASIN	NUMBER OF ANALYSES: COMPLETES	NUMBER OF ANALYSES: PARTIALS	NUMBER OF SAMPLING POINTS	PREDOMINANT CHARACTER	IRRIGATION CLASSIFICATION	RANGE: TDS, PPM	RANGE: CL, PPM	RANGE: B, PPM	RANGE: NA, PER CENT
				HYDROGRAPHIC UNIT 1					
DIAMOND	5	-	4	NO PREDOMINANT CHARACTER	1, 2	349-709	46-146	0.1-0.2	34-42
DOMENIGONI	3	1	3	CA-NA, SO_4-CL	1, 3	470-2,014	96-387	0.1	36-83
FRENCH	9	-	8	NO PREDOMINANT CHARACTER	1, 2	269-804	53-163	0-0.13	30-52
LOS ALAMOS	4	-	4	NO PREDOMINANT CHARACTER	1, 2	362-962	71-227	0.1	32-42
MURRIETA	33	3	32	CA, NA-HCO_3	1, 2, 3	220-984	11-369	0-2.5	28-76
SANTA GERTRUDIS	1	1	2	NA, CL	3	250-369	71-128	0.2	77-87
WILDOMAR	12	-	12	NA, CA-HCO_3	1, 2	221-977	25-263	0.01-0.1	25-54
				HYDROGRAPHIC UNIT 2					
ANZA	16	-	11	NO PREDOMINANT CHARACTER	1, 2	304-969	39-135	0-0.2	12-53
LOWER COAHUILA	3	-	3	NA, CL-HCO_3	1, 2	227-783	53-160	0.3-0.5	49-75
LOWER LANCASTER	4	-	4	NA, CL-HCO_3	2	996 1,205	234-277	0.2-0.3	59-64
UPPER COAHUILA	1	-	1	CA-NA, HCO_3	1	135	77	0	35
UPPER LANCASTER	3	-	3	NO PREDOMINANT CHARACTER	2, 3	447-1,899	92-613	0.2-0.6	62-71
				HYDROGRAPHIC UNIT 3					
AGUANGA	5	-	3	NO PREDOMINANT CHARACTER	1, 2	164-618	21-75	0.01-0.3	27-64
DODGE	2	-	1	CA-NA, HCO_3	1	232-295	18	0.1	30-39
LOWER CULP	2	-	2	NA-CA, HCO_3	1	722-755	64-85	0.1-0.2	44-48
NIGGER	1	-	1	NA, CL-HCO_3	3	436	121	2.9	93
RADEC	4	-	3	NO PREDOMINANT CHARACTER	2, 3	953-1,439	103-560	0.1-0.3	30-49

SUMMARY OF MINERAL ANALYSES OF GROUND WATERS
(CONTINUED)

BASIN	NUMBER OF ANALYSES: COMPLETES	NUMBER OF ANALYSES: PARTIALS	NUMBER OF SAMPLING POINTS	PREDOMINANT CHARACTER	IRRIGATION CLASSIFICATION	RANGE: TDS, PPM	RANGE: CL, PPM	RANGE: B, PPM	RANGE: NA, PER CENT
				HYDROGRAPHIC UNIT 4					
PAUBA:									
CONFINED	15	-	4	NA-HCO_3 TO NA, CL-HCO_3	2, 3	287-424	67-106	0.01-0.07	61-97
UNCONFINED	10	-	7	NA-CA, HCO_3-SO_4	1, 2, 3	354-763	50-117	0-0.8	36-98
PECHANGA	3	-	3	NO PREDOMINANT CHARACTER	1	352-369	17-50	-	38-52
				HYDROGRAPHIC UNIT 5					
RAINBOW	3	-	3	NO PREDOMINANT CHARACTER	1, 2	332-897	71-330	0-0.1	38-51
				HYDROGRAPHIC UNIT 6					
SANTA MARGARITA COASTAL									
SUB-BASINS:									
UPPER	5	10	8	NA, HCO_3-CL	1, 2	450-776	106-186	0.05-0.2	49-63
CHAPPO	10	36	25	NA, HCO_3-CL	1, 2, 3	390-1,334	110-745	0.1-0.4	51-90
YSIDORA	20	695	23	NA, HCO_3-CL TO NA, CL	1, 2, 3	337-9,030	60-4,910	0-0.4	48-69

The analyses show that in the samples collected from a majority of the springs in Hydrographic Unit 1, the chloride concentration exceeded the recommended limit of 250 ppm, and that total dissolved solids exceeded the desirable limit of 500 ppm but were less than the permitted limit of 1,000 ppm. In the six samples collected in the Unit, hardness ranged from soft to moderately hard. One analysis of Murrieta Hot Springs water indicates a fluoride content of 4.4 ppm, materially exceeding the limit of 1.5 ppm.

The analyses of sixteen samples collected in Hydrographic Unit 2 indicate hardness ranging from soft to very hard, with the majority classed as soft. The limit for fluorides was exceeded in one sample and the desirable limit for total dissolved solids was slightly exceeded in two.

In six of sixteen samples from springs in Hydrographic Unit 3, total dissolved solids exceeded the desirable limit, but in only three was 1,000 ppm exceeded. Indicated hardness ranged from soft to very hard with 10 of the 16 samples classed as very hard.

Waters from sampled springs in Hydrographic Units 4 and 5 were found to be suitable for domestic use in all respects. Those in Unit 4 are classed as soft and in Unit 5 the range is from soft to moderately hard.

Water Quality Problems

There are few known problems of pollution or contamination within Santa Margarita River watershed. There is, however, a threat of salt-water intrusion in Santa Margarita Coastal Basin, a contamination by an industrial waste discharge exists in the Murrieta area, and high concentrations of nitrates are found in a few limited areas. Irrigation application of waters of high per cent sodium found in certain localities in the watershed also presents a problem.

Salt-Water Intrusion - Santa Margarita Coastal Basin. Ground water in Santa Margarita Coastal Basin is of fair quality, being generally Class 2 irrigation water. However, samples from a few wells have been of poor quality.

U.S.G.S. test well 6, 10S/5W-23Q1, yielded samples with chloride concentrations of 440 and 600 ppm in 1951 and 1952, respectively. This well is at the edge of the Recent alluvium and it is probable that the poor quality water is connate in the La Jolla formation, Telj, which is adjacent to and underlies the Recent alluvium at this location. On January 10, 1952, samples from well 11S/5W-2K1 reached a maximum of about 525 ppm chloride ion concentration after test pumping for 20 minutes, and remained stable thereafter throughout two and one-half hours of pumping. A composite thief sample obtained at a depth of 185 feet during pumping contained 875 ppm chlorides, which indicates that poor quality water is obtained from the lower levels in this well. A series of water analyses, mostly partials, taken from this well throughout the period November, 1947, through November, 1952, indicates that water quality deteriorated from 243 ppm chlorides to 450 ppm between November, 1947, and December, 1948. The concentration remained fairly constant for a time thereafter but reached a maximum of 610 ppm in November, 1950. On the date of the last sample reported, November, 1952, there were 532 ppm chlorides in the water. The use of the well is said to have been discontinued in 1950 because of the high chloride content. This well is located near the boundary of the San Onofre Breccia, Tmso, and La Jolla formation and the latter formation probably underlies Recent alluvium at the well. The poor quality water very likely is derived from the La Jolla formation. In support of this belief, it is noted that samples from windmill wells in the San Luis Rey River watershed to the southeast which were drilled in this formation show chloride concentration of 800 to 1,000 ppm.

On January 3 and 4, 1952, when water levels were near the all time low, a series of samples was obtained from test wells in and downstream from Ysidora Narrows. These wells are 11S/5W-2N4 midway in the Narrows, 10B1 at the lower end of the Narrows, and 9J1 on the tidal flat at Highway 101. A representative pumped sample at test well 2N4 contained 650 ppm of chlorides, but a composite of thief samples taken at the 195 foot depth during pumping contained 4,910 ppm chlorides. Analysis of similar samples taken at the other two wells showed that chlorides at test well 10B1 were 650 ppm in the pumped sample and 1,290 ppm in the composite sample at a depth of 194 feet; at test well 9J1 chlorides were 2,190 ppm in the pumped sample and 20,300 ppm in the composite at a depth of 292 feet. Pumped samples obtained in June and July, 1951, at the three wells had the following chloride content; well 2N4, 460 ppm; well 10B1, 390 ppm; and well 9J1, 1,900 ppm. Thus the pumped samples at these wells indicate increases in chloride content of 190, 260, and 290 ppm, respectively, during the latter half of 1951. On January 9, 1952, water samples were also obtained from the Pacific Ocean and from the lagoon on Santa Margarita River at Highway 101. Comparison of the relationship between all constituents of these waters with the samples obtained at depth in the three test wells mentioned above indicates marked similarity between them.

Prior to and at the time the above samples were taken, a landward gradient in the ground water profile existed from the vicinity of Highway 101 near the ocean to Ysidora Sub-basin in the vicinity of well 11S/5W-2E1, as shown by water level profile of August, 1951, presented on Plate 20. Considering this adverse gradient and the results of the analyses discussed in the previous paragraphs, it appears likely that the degradation noted in Ysidora Narrows was the result of intrusion of sea water through the avenue of approach afforded by Recent alluvial deposits which extend from Ysidora Sub-basin to the ocean.

The extent of degradation from this source is believed to have been adequately monitored by the collection of a large number of samples from irrigation well 11S/5W-2E1 over the period November, 1947, through November, 1952. Partial analyses only were made on most of these samples, but there were a few more complete analyses. Chloride content in the samples increased gradually from 168 ppm in November, 1947 to 308 ppm in April, 1951, at which time pumping of the well was discontinued. By November, 1951, chlorides had reduced to 184 ppm which value is comparable to chlorides in other wells throughout the Sub-basin. In June, 1952, and November, 1952, the chlorides were reported to be 148 and 168 ppm, respectively. Thus, it is likely that the degradation extended to well 2E1, but because that well was pumped through April, 1951, and ground water contours indicate it was at or near the center of the ground water depression in the summer of 1951, it is believed highly improbable that sea water could have penetrated inland from the well.

From a study of ground water levels in Ysidora Sub-basin in conjunction with the water analyses considered herein, it is apparent that degradation in the Sub-basin, whether from connate waters or from sea water, is the result of lowered ground water levels. Marked improvement in the quality of water in Ysidora Sub-basin occurred after the flood runoff from the storms of December 30, 1951, through January, 1952, reached the area. No discharge occurred at the Ysidora gaging station until January 13, 1952, because of percolation which took place upstream in Santa Margarita Coastal Basin and because of the effect of sand dams which detained runoff in Ysidora Sub-basin until they were washed out.

Murrieta Chrome Waste Discharge. One incident of contamination by a waste discharge was discovered and brought to the attention of the Division of

Water Resources in March, 1956, when it became known that chromium plating company in Murrieta had been discharging hexavalent chromium wastes to the ground surface and to a cesspool. Four wells in the immediate vicinity of the waste disposal site were polluted with hexavalent chromium in concentrations up to three ppm. Eighteen other wells in Murrieta and vicinity contained traces of hexavalent chromium.

After the ground discharge had been halted, additional samples of ground water were obtained, but at the time of publication of this report the results were inconclusive.

High Nitrate Concentrations. As reported previously in the quoted domestic water quality standards, waters containing nitrate concentrations in excess of 44 ppm may be considered to be of questionable quality for use by infants, and therefore are generally unsuitable for domestic or municipal use.

Water samples from only 11 wells throughout the watershed, most of them in Murrieta Valley or in the Fallbrook area, were found to contain nitrates in excess of the stated limit. In all but one of these samples the concentration was less than 67 ppm. No evidence was found which indicated that the excessive nitrates resulted from conditions other than those peculiar to the individual wells concerned. It is believed, therefore, that the quality of water near each of the wells in question has been degraded in some degree.

Sodium Type Waters. As previously pointed out in the discussion of water quality standards, waters containing high percentages of sodium are not well suited for agricultural use in most instances, although such waters may be used on some highly permeable sandy soils without detrimental effect. There are several areas within the Santa Margarita River watershed where ground waters contain high percentages of sodium ion. One such area extends along the northeast side of Wildomar fault, and includes Santa Gertrudis Basin, the deep artesian aquifers of Pauba Basin, and portions of Murrieta Basin northeast of the fault. Ground waters in this area and springs along the fault contain sodium in percentages ranging from 65 to 98 per cent. A number of the wells are used for irrigation. Ground waters in portions of the Radec and Lancaster Valley areas are also high in per cent sodium. The quality of these waters appears to be associated with the undifferentiated Upper Pleistocene sediments, Qps, which are adjacent to and underlie portions of Radec and Lancaster Valleys.

The artesian wells of Pauba Basin provide about 10 per cent of the ground water used for irrigation in Pauba Valley by the Vail Company. The artesian waters are applied therein with caution, and are mixed with other waters to reduce the per cent sodium.

CHAPTER III. WATER UTILIZATION AND REQUIREMENTS

The nature and magnitude of water utilization and requirements in the Santa Margarita River watershed, both at the present time and under probable ultimate conditions of development, are considered and evaluated in this chapter under the general headings: "Present Water Supply Development", "Land Use", "Unit Use of Water", "Factors of Water Demand", "Water Requirements", and "Supplemental Water Requirement". In connection with the discussion, the following terms are used as defined:

Water Utilization - This term is used in a broad sense to include all employments of water by nature or man, whether consumptive or nonconsumptive, as well as irrecoverable losses of water incidental to such employment, and is synonymous with the term "water use".

Consumptive Use of Water - This refers to water consumed by vegetative growth in transpiration and building of plant tissue, and to water evaporated from adjacent soils, from water surfaces, and from foliage. It also refers to water similarly consumed and evaporated by urban and nonvegetative types of land use.

Water Requirement - The amount of water needed to provide for all beneficial uses and for irrecoverable losses incidental to such uses. As used in this report, the term refers only to consumptive uses of applied water and attendant irrecoverable losses.

Applied Water - The water delivered to a farmer's headgate in the case of irrigation use, or to an individual's meter in the case of urban use, or its equivalent. It does not include direct precipitation.

Irrigation Efficiency - This refers to the ratio of consumptive use of applied water to the total amount of applied water, and is commonly expressed as a percentage.

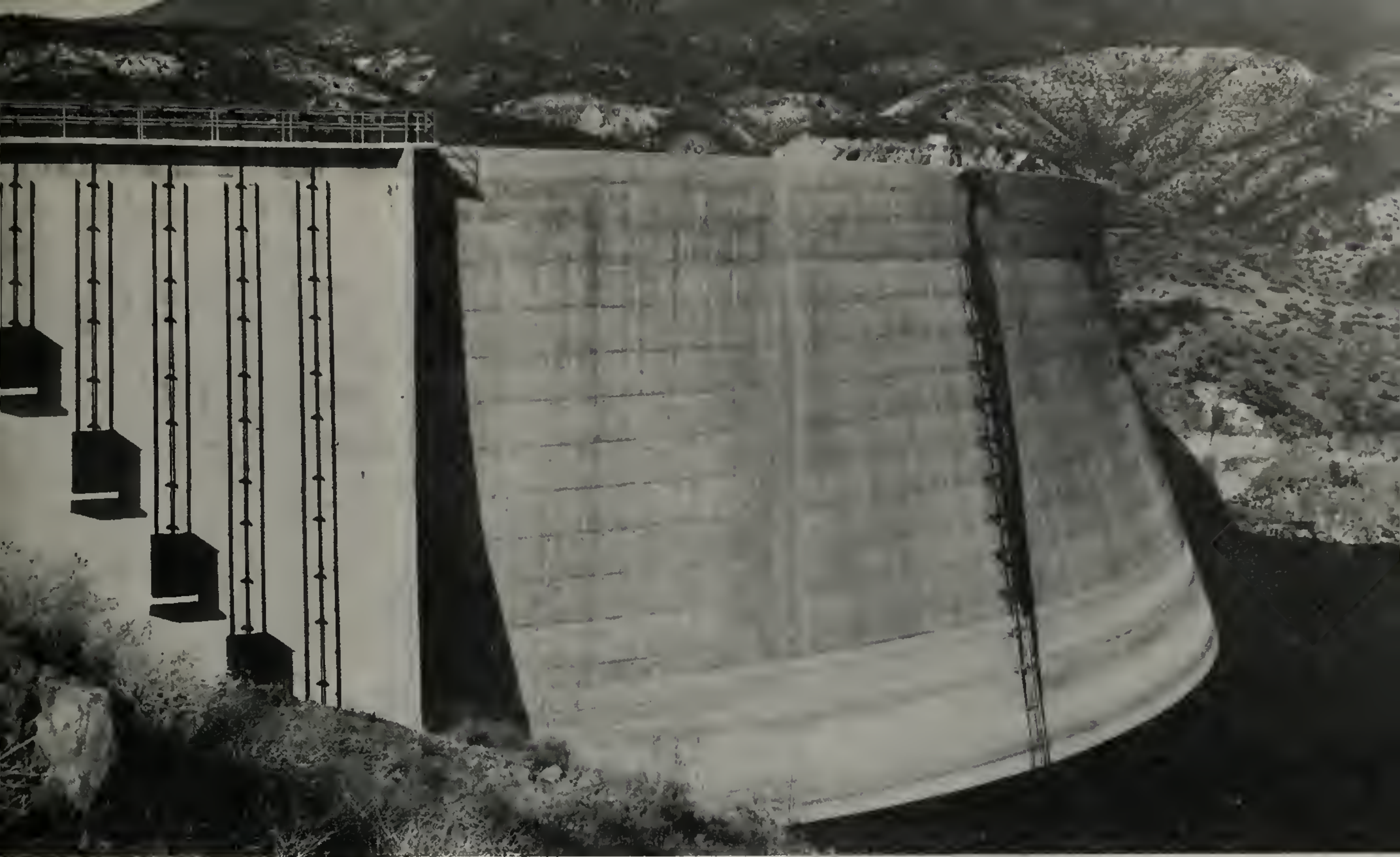
Ultimate - This refers to conditions after an unspecified but long period of years in the future when land use and water supply development will be at a maximum and essentially stabilized. It is recognized that any present forecasts of the nature and the extent of such ultimate development, and resultant water utilization, are inherently subject to possible large errors in detail and appreciable error in the aggregate. However, such forecasts, when based upon best available data and present judgment, are believed to be of value in establishing long-range objectives for development of water resources. They are so used herein, with the full knowledge that their re-evaluation after the experience of a period of years may result in considerable revision.

Present Water Supply Development

The major portion of the water presently used in the Santa Margarita River watershed is pumped from the underground, with a lesser but significant quantity being diverted directly from surface streams and springs. Regulation in Vail Reservoir on Temecula Creek, which was completed in 1949 and is the only major surface storage development in the watershed, serves to augment both surface and underground supplies.

Water Service Agencies

Major active water service entities in the watershed are: Fallbrook Public Utility District, which serves domestic and agricultural water to an area which lies partly within and partly outside the Santa Margarita River watershed; Rainbow Municipal Water District, formed recently to supply Colorado River water to an area lying partly within and partly outside the watershed; United States Naval Reservation, comprising the three military



Vail Dam

Courtesy State Division of Highways

Santa Margarita River at De Luz Road Ford

commands--United States Naval Ammunition Depot at Fallbrook, United States Naval Hospital, and the Marine Corps' Camp Joseph H. Pendleton--which derive water for military and agricultural uses from Santa Margarita Coastal Basin and from Santa Margarita River by direct diversion; Vail Company, which derives water for its agricultural uses from Pauba Basin and from Temecula Creek, which as stated is controlled by Vail Reservoir; and South Elsinore Mutual Water Company, the service area of which extends into the Santa Margarita River watershed, but which at present serves domestic and irrigation water to areas outside the watershed only. Rainbow Municipal Water District was annexed to the San Diego County Water Authority and to the Metropolitan Water District of Southern California on April 10, 1954. Water deliveries to the District started in 1954, but it is believed that no water has yet been served within the Santa Margarita River watershed. Service areas of the foregoing entities are delineated on Plate 6, "Hydrographic Map". It will be noted that all lands of the Vail Company and of the Naval Reservation are included in the service areas of those entities, although legal restrictions relating to riparian lands and to appropriative water rights as discussed in Chapter IV, "Legal Considerations", may operate to limit the use of water from Santa Margarita River to supply a portion of such lands.

Ground Water Extractions

In the Santa Margarita River watershed there are about 145 wells of relatively heavy draft, equipped with pumps having motors of 5 horsepower or greater. Of these, 135 wells supply water to meet irrigation requirements and 10 are used for military purposes. In addition there are about 250 other active wells in the watershed. Ground water extractions by the Vail Company and the Navy have been measured for a period of years, and for these entities the monthly totals of extractions are listed in Tables 22 and 23. It will be noted that for the Vail Company the values shown for the period October, 1922, through April, 1930, include surface diversions. Measurements were made by water meter and in some cases by measured pumping rates and recorded time of operation. Pumpage by other water users in the watershed was calculated for the year 1953 by utilizing kilowatt hours of electric power consumption and values for pumping plant efficiency, as determined by pump tests, or by applying appropriate values of applied water to areas of irrigated land. Total ground water extractions for 1953 are summarized by hydrographic units in Table 29.

TABLE 22

GROUND WATER EXTRACTIONS BY VAIL COMPANY[a]

In Acre-Feet

Season	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
1919-20		No record prior to May 1920						137	129	215	224	190	Inc.
20-21	89	---	---	27	2	77	101	156	191	332	291	214	Inc.
21-22	95	---	---	---	---	---	---	205	223	219	256	280	Inc.
22-23	282	224	126	74	83	234	388	628	445	550	488	485	4,007
23-24	636	237	126	89	473	278	209	604	730	737	744	692	5,555
1924-25	746	287	257	19	458	686	504	895	754	731	726	685	6,748
25-26	448	241	170	278	145	486	170	435	579	733	737	683	5,105
26-27	513	150	36	46	46	74	107	399	479	709	739	618	3,916
27-28	455	68	71	206	315	327	561	639	596	630	657	517	5,042
28-29	225	71	38	74	11	164	374	529	502	684	853	576	4,101
1929-30	409	382	284	92	61	62	245	96	150	112	95	103	2,091
30-31[a]	108	19	186	207	38	217	204	104	89	50	51	55	1,328
31-32	139	61	85	20	18	31	174	139	116	160	80	91	1,114
32-33	40	75	85	129	196	232	159	65	113	176	104	102	1,476
33-34	93	290	117	54	144	251	246	85	79	78	56	64	1,557
1934-35	100	146	89	8	0	0	33	145	88	76	69	73	827
35-36	193	206	233	187	1	33	31	92	74	65	63	61	1,239
36-37	39	44	39	0	0	0	67	63	219	157	67	102	797
37-38	104	211	40	29	6	0	139	194	189	225	97	169	1,403
38-39	207	3	73	0	0	12	201	329	355	437	370	209	2,196
1939-40	146	21	94	9	0	46	190	223	403	551	375	329	2,387
40-41	252	44	66	0	0	0	0	90	318	551	329	351	2,001
41-42	223	39	51	177	119	145	106	553	382	568	428	357	3,148
42-43	265	182	241	95	45	23	85	434	540	561	405	220	3,096
43-44	203	126	23	0	0	55	120	284	509	558	390	370	2,638

GROUND WATER EXTRACTIONS BY VAIL COMPANY[a]
(continued)
In Acre-Feet

Season	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
1944-45	385	111	0	66	17	40	213	442	431	489	144	356	2,694
45-46	282	183	185	33	111	362	98	415	461	411	330	464	3,335
46-47	453	80	22	22	86	69	197	360	370	485	438	513	3,095
47-48	365	296	118	251	78	120	112	250	242	245	325	315	2,717
48-49	241	340	30	10	0	89	234	206	142	195	187	200	1,874
1949-50	182	134	116	13	98	167	214	183	220	225	256	344	2,152
50-51	338	196	207	133	152	223	327	182	244	278	287	272	2,839
51-52	185	118	15	0	30	8	146	257	317	460	483	550	2,569
52-53	531	175	16	26	280	267	303	533	589	603	315	299	3,937
53-54	154	273	533	191	78	300	314	548	480	782	468	407	4,528
1954-55	266	147	119	12	219	451	559	518	718	901	950	736	5,596

a. Prior to May 1930, tabulation includes surface diversions

TABLE 23

GROUND WATER EXTRACTIONS BY UNITED STATES NAVY, CAMP PENDLETON

In Acre-Feet

Season	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
Agricultural Use (Stuart and South Mesa Pumps)													
1942-43	243	163	128	126	86	66	153	278	287	309	243	277	2,359
43-44	293	253	44	81	63	121	166	136	193	190	176	162	1,878
1944-45	175	37	51	76	63	19	86	184	185	240	183	260	1,559
45-46	267	207	137	168	111	116	86	247	258	304	215	241	2,357
46-47	224	105	80	161	110	132	160	219	259	270	209	215	2,144
47-48	267	257	176	271	193	133	150	255	317	319	294	175	2,807
48-49	157	285	101	133	105	116	166	193	248	255	232	253	2,244
1949-50	251	225	164	136	67	126	120	154	253	298	218	257	2,269
50-51	240	150	138	118	62	109	123	100	124	178	152	126	1,620
51-52	144	92	65	26	95	50	66	139	154	229	173	193	1,426
52-53	166	61	41	65	129	119	129	136	178	273	219	235	1,751
53-54	207	100	135	36	66	58	78	161	195	261	307	286	1,890
1954-55	201	96	85	58	76	127	163	138	208	282	251	261	1,946
Military Use (Excluding Stuart and South Mesa Pumps)													
1942-43	250	250	250	250	250	250	250	250	250	250	250	250	3,000
43-44	281	258	248	215	250	304	297	339	335	300	352	314	3,493
1944-45	309	361	333	281	245	297	276	310	279	347	358	407	3,803
45-46	406	372	331	274	255	298	250	257	264	244	234	204	3,389
46-47	190	210	212	223	188	214	230	274	303	389	371	334	3,138
47-48	291	290	261	281	230	266	273	338	356	397	386	353	3,722
48-49	285	300	247	239	243	312	366	382	438	456	436	414	4,118

GROUND WATER EXTRACTIONS BY UNITED STATES NAVY, CAMP PENDLETON
(continued)
In Acre-Feet

Season	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
				Military Use (Excluding Stuart and South Mesa Pumps) (continued)									
1949-50	345	338	288	271	249	306	304	341	383	361	380	313	3,879
50-51	294	262	241	233	232	297	316	366	385	417	375	336	3,754
51-52	369	284	269	293	285	293	320	441	397	457	449	454	4,311
52-53	418	363	329	353	352	387	403	438	474	516	489	443	4,965
53-54	425	350	358	315	263	273	276	325	359	380	426	398	4,148
1954-55	352	302	301	278	269	321	397	404	442	501	535	525	4,627
						Total Extractions							
1942-43	493	413	378	376	336	316	403	528	537	559	493	527	5,359
43-44	574	511	292	296	313	425	463	475	528	490	528	476	5,371
1944-45	484	398	384	357	308	316	362	494	464	587	541	667	5,362
45-46	673	579	468	442	366	414	336	504	522	548	449	445	5,746
46-47	414	315	292	384	298	346	390	493	562	659	580	549	5,282
47-48	558	547	437	552	423	399	423	593	673	716	680	528	6,529
48-49	442	585	348	372	348	428	532	575	686	711	668	667	6,362
1949-50	596	563	452	407	316	432	424	495	636	659	598	570	6,148
50-51	534	412	379	351	294	406	439	466	509	595	527	462	5,374
51-52	513	376	334	319	380	343	386	580	551	686	622	647	5,737
52-53	584	425	370	418	481	506	532	574	652	789	708	678	6,717
53-54	632	450	493	351	329	331	354	486	554	641	733	684	6,038
1954-55	553	398	386	336	345	448	560	542	650	783	786	786	6,573

Surface Diversions and Storage

Early agricultural development in the watershed, as previously indicated, was based on direct diversion of surface stream flow. The number of diversions has been increasing as demands for water increase, although some of the diversions have been replaced by pumping from the underground. During the course of the investigation a total of 64 diversion systems were located in the Santa Margarita River watershed, of which 51 were active in 1953. The locations of these diversions are shown on Plates 21A and B, "Location of Diversions and Irrigated and Irrigable Lands". A summary of pertinent information and history of the diversions is presented in Table 24.

Included in Table 24, are six diversions from springs for which applications for appropriation of water have been filed with the Division of Water Resources in accordance with provisions of Division 2, Part 2, of the Water Code. Many other spring diversions have been developed and are in active use, usually for domestic and stock purposes. Among these are the Murrieta Hot Springs (7S/3W-14J1,2) at which a modern resort has been developed, and Collier Spring (8S/2W-36F) on Pechanga Creek, from which a domestic distribution system has been installed to deliver water a distance of about three miles downstream to users on the Pechanga Indian Reservation. The locations of all springs known to the Division of Water Resources are shown on Plate 6. Presented in Table 25 "Estimated Annual Surface Diversions", are the surface diversions for the years 1951, 1952, and 1953.

TABLE 24

DESCRIPTIONS OF SURFACE DIVERSIONS

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
Irene Barton	8S/1E-29Q	None	Temecula Creek	Unknown	Irrigation, domestic and stock	2	Earth dam 30 feet long, 5 hp centrifugal pump.	Power consumption and pump test	None	Ernest Fisk, Tenant.
Annie E. Bergman	8S/1E-35M	None	Temecula Creek	1887	Irrigation, and domestic	31	Small earth dam, steel and masonry pipe lines, and 2 terminal reservoirs.	Weir	March, 1951 through June, 1954	Diversion formerly known as Seeley-Thompson, also formerly owned by Madeleine E. and Packard Thurber.
Paul Bradshaw	8S/3W-31L	Application No. 14561	Brians Creek (tributary of Sandia Creek)	1948	Irrigation	37	Earth dam 270 feet long. Diversion from reservoir by 15 hp Peerless turbine and 3/4 mile of pipe line.	None	None	Pipe line is connected with conduit from diversion 9S/3W-7D2.
L. W. Butler	8S/4W-31K	None	Fern Creek	About 1860	Irrigation, domestic, stock, and recreation	15	Masonry dam 25 feet long, steel and concrete pipe lines, 2 small reservoirs, and a domestic storage tank. Water may also be diverted to a large lake used for recreation.	None	None	Formerly owned by Mr. Brode.

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
Elmer B. Denio	9S/1E-12L	License No. 3268	Unnamed spring tributary to Temecula Creek	1938	Domestic use occasionally on week ends. Formerly used for domestic and stock watering.	None	Concrete dam 4 feet long, $\frac{1}{2}$ mile of pipe terminating at a 2200 gallon tank.	None	None	
Elmer B. Denio	9S/1E-12R	None	Unnamed spring tributary to Temecula Creek	Prior to 1951	Domestic use occasionally on week ends.	None	Water diverted through pipe to smaller storage tank.	None	None	
Duncan Industries	7S/1W-12H	None	Tucalota Creek	Prior to 1944	Irrigation, flood control and recreation.	3	Earth dam 150 feet long, 150 feet of pipe line.	None	None	Property leased from E. Thorelson in December, 1951.
Cyril M. Ewing	8S/5W-23Q	License No. 2596	Unnamed Spring tributary to DeLuz Creek	1938	Inactive since summer of 1951.	None	Masonry dam 35 feet long (washed out), steel pipe line, and a 2,000 gallon reservoir near house.	None	None	
Fallbrook Public Utility District	9S/3W-7D1	Permit No. 7033	Santa Margarita River	1925	Municipal, irrigation	1800, (see remarks)	200 hp motors and Peerless turbines, pipe line to service area connection.	Flow meter	1925 through May, 1955	1,800 acres is the total area of F.P.U.D. within Santa Margarita River watershed.

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
R. L. Freeman	9S/3W-4G	None	Santa Margarita River	Unknown	Irrigation, and domestic	1	5 hp pump and pipe line.	None	None	
Felix R. and Theodora L. Garnsey	8S/4W-30B	Permit No. 5505	Cottonwood Creek	1926	Inactive	None	Small rock dam, and gravity pipe line.	None	None	
Felix R. and Theodora L. Garnsey	8S/4W-30H	Permit No. 8166	Cottonwood Creek	1931	Irrigation	58	Earth dam 160 feet long, diversion from reservoir by 3 hp pump to small concrete sump from which a concrete pipe carries water by gravity to a small earth reservoir.	None	None	Present diversion system installed in 1949-50.
Katharine C. Gibbon and William C. Cottle	8S/1E-29L	None	Temecula Creek	1885	Irrigation	86	Earth and rock dam, steel pipe line, and earth ditch terminating at the Cottle Reservoir	Weirs	January, 1951 through September, 1954	Diversion used alternately for three and one-half days per week on the Gibbon and Cottle ranches to irrigate 55 and 31 acres respectively in 1953.

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
Martin Grammer	9S/2E-34L	Permit No. 6279	Unnamed Spring tributary to Temecula Creek	1943	Irrigation, domestic and stock	1/3	Intake structure at spring, and pipe line terminating at a 3,000 gallon masonry reservoir at the Grammer house and a 4,000 gallon irrigation reservoir.	None	None	
Sydney Grossman	$8\frac{1}{2}$S/3E-31R	Permit No. 5179	Cooper Canyon Creek	1938	Inactive	None	Concrete arch dam 50 feet long, and pipe line to Pawnee Mine.	None	None	
Sydney Grossman and Oscar L. Paris	8S/3E-31G	None	Unnamed Springs tributary to Chihuahua Creek	Unknown	Domestic (except drinking) stock and intermittent mine operation	None	Pipe lines terminating at four large storage tanks at the Pawnee Mine.	None	None	Formerly owned by E. L. and Billie Carr. System replaced 31 K in Oct. 1953. System also serves Oviatt's cattle troughs.
Sydney Grossman and Oscar L. Paris	8S/3E-31K	None	Tributary of Chihuahua Creek	Unknown	Inactive	None	Pipe lines from creek to two large storage tanks at the mine.	None	None	System replaced by parallel system 31G in October, 1953, but is intact for stand-by use.
W. F. Hanes	9S/3W-8B	None	Santa Margarita River	Unknown	Irrigation, and domestic	27	30 hp pump, and pipe lines to a reservoir. Domestic pipe line branches off conduit to reservoir.	Power consumption	None	

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
Estate of Alexander F. Hanson	8S/4W-36D	Permit No. 4603	Sandia Creek	1938	Inactive	None	Concrete dam about 100 feet long, and diversion pump.	None	None	Diversion formerly used for domestic purposes and irrigation of a citrus nursery.
Edward G. Helm and Pankonian	9S/3W-5R	None	Santa Margarita River	Unknown	Irrigation	10	15 hp deep well turbine, and pipe lines.	Power consumption and pump test	None	
M. M. Henderson	8S/3W-33Q	None	Santa Margarita River	1941	Irrigation	12	10 hp centrifugal pump, and pipe line.	None	None	
Jennings	9S/3W-4P	None	Santa Margarita River	Unknown	Irrigation	2	15 hp centrifugal pump, and pipe line.	None	None	
B. M. Jurkovich	8S/1W-25B	License No. 2400	Unnamed Spring tributary to Temecula Creek	1935	Domestic	None	Pipe lines, and two storage tanks.	None	None	
Georgia E. Kerr	7S/1E-35E	License No. 404	Wilson Creek	1920	Inactive	None	Earth dam, and pipe line. (Dam washed out early in 1953)	None	None	

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
Garner L. and Walter G. Knox	8S/1E-19M1	None	Temecula Creek	Prior to 1943	Irrigation	70	Small earth and rock dam, earth ditch, and pipe line, terminating at two earth reservoirs.	Weir	January, 1951 through September, 1954, except June through September, 1951, no record.	Diversion formerly known as Tripp-Jones. Irrigation supplemented by ground water.
George A. Lange	9S/3W-4N1	None	Santa Margarita River	1939	Irrigation, and domestic	Few fruit trees only	A one cylinder belt driven piston pump and two hp motor, pipe line to a 1,000 gallon reservoir.	Power consumption and pump test	None	
Frederick W. Linke	7S/1E-26F	None	Wilson Creek	About 1929	Domestic, and recreation	None	Centrifugal pump at small pond, and pipe line to small reservoir.	None	None	
Milton M. and Evelyn M. Lloyd	9S/2E-20C	License No. 2843	Two unnamed springs tributary to Temecula Creek	1923	Domestic, and stock	None	Pipe line and two small storage tanks near the Lloyd house.	None	None	System is connected with Diversion 9S/2E-20E.
Milton M. and Evelyn M. Lloyd	9S/2E-20E	License No. 2844	Unnamed Spring tributary to Temecula Creek	1933	Domestic, and stock	None	Pipe line connected to diversion 20C system.	None	None	

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
Edgar S. Lohman	8S/1W-29R	License No. 2741	Cienega tributary to Temecula Creek	1941	Domestic	None	Pipe line, and a 25,000 gallon concrete reservoir.	None	None	
L. T. Lundgate	9S/3W-8A	None	Santa Margarita River	Unknown	Domestic	None	½ hp pump, pressure tank, and pipe line.	None	None	
Dr. Mangan and Mary Reyac	8S/4W-31M	None	Fern Creek	About 1942	Irrigation and domestic	2	Dam 20 feet long, and pipe line.	None	None	
R. F. Matthews	8S/4W-21E	None	Tributary of DeLuz Creek	About 1950	Irrigation	6	Earth dam, 5 hp pump, and pipe line to a hill-top reservoir.	None	None	
A. R. Meriokle	9S/3W-7F	None	Santa Margarita River	Unknown	Domestic	None	Gasoline engine and centrifugal pump, and pipe line to reservoir.	None	None	
Paul Mortz	9S/3W-4H	None	Santa Margarita River	Unknown	Domestic	None	One hp pump and pipe line.	None	None	
Adelbert S. Nelson	8S/5W-23J	Permit No. 5201	Coleman Creek	1938	Domestic	None	Masonry dam 50 feet long, and pipe line.	None	None	

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
James Oviatt	8S/1E=7R	None	Lancaster Creek	1881	Irrigation	81	Masonry intake structure 4 feet high and 60 feet long set parallel to the stream channel, concrete block open channel, a subsurface collection gallery, concrete pipes, and two reservoirs, one of which was inactive in 1952.	Weir	February, 1951 through May, 1954	
James Oviatt	9S/2E-28R	None	Kohler Canyon, a tributary of Temecula Creek	Unknown	Irrigation	5	Small earth dam	Weir	February, 1951 through May, 1954	
James Oviatt and Harold K. Brinkerhoff	9S/2E-17F	None	Temecula Creek	Unknown	Irrigation, and domestic	10	Earth dam 20 feet long, and earth ditch terminating at an earthen reservoir.	Weir	July, 1951 through September, 1954	Nine of the ten irrigated acres in 1953 belong to James Oviatt. During 1951 and 1952, water was diverted for approximately 3½ days per week. During the remainder of week, Temecula Creek was allowed to flow downstream to Diversion 9S/1E-12H. During 1953, water was diverted a greater portion of the time since no diversions were made at 9S/1E-12H.

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
James Oviatt, Meta L. Cummings, and Edith S. Harmer	9S/2E-21L	None	Temecula Creek	Unknown	Domestic	None	Stone and concrete diversion box in creek, and pipe line to cabins.	None	None	Formerly known as Mapes diversion.
J. E. Patten	8S/1E-19N	None	Temecula Creek	1939	Irrigation, and domestic	$\frac{1}{2}$	1/3 hp pump, and pipe line to small storage tank.	None	None	Paul Poore, Tenant.
G. G. Fepple	9S/3W-9E	None	Rainbow Creek	About 1924	Irrigation, and domestic	7	5 hp pump, and 3 pipe lines.	None	None	
Ray Peters	9S/3W-4F1	None	Santa Margarita River	1892	Irrigation	8	5 hp centrifugal pump, and pipe line.	None	None	
John H. and Marie L. Richie	8S/1E-19M2	None	Temecula Creek	Unknown	Inactive since August, 1952. Formerly domestic.	None	Earth and rock dam, a one cylinder gasoline engine powered pump, pipe line, and a 1,400 gallon masonry reservoir.	None	None	Dam also serves diversion 8S/1E-19M1.
Russell	9S/3W-4F2	None	Santa Margarita River	Prior to 1947	Domestic	None	One hp pump, and pipe line to pressure tank.	None	None	
Charles Sawday	9S/3W-7D2	None	Santa Margarita River	Unknown	Irrigation	39	50 hp pump, and pipe line.	None	None	Pipe line is connected with conduit from diversion 8S/3W-31L.
Mike Seery	8S/5W-13Q	Application No. 15031	Cotton-wood Creek	1952	Domestic	None	Masonry intake structure in stream bed, and 450 feet of hose to storage tank.	None	None	

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
Roy E. Shipley	7S/1E-24C	None	Wilson Creek	Unknown	Domestic	None	Earth dam, and a pipe line terminating at an earth reservoir.	None	None	
Martin Smith	9S/3W-4N3	None	Santa Margarita River	Unknown	Inactive	None	See remarks	None	None	Jet pump constituted diversion equipment. Former use was for domestic purposes.
Estate of Adelbert V. Studer	9S/2E-28C	Permit No. 6499	Rattlesnake Creek	1934	Inactive	None	Series of pipe lines from stream bed.	None	None	
Rex J. Toner	8S/2E-22H	None	Tule Creek	About 1922	Inactive	None	Concrete dam 20 feet long, and pipe lines.	None	None	20 acres of alfalfa irrigated in 1954 and prior to 1951.
Donald B. Trunnell	8S/1E-29R	None	Temecula Creek	Unknown	Irrigation (Inactive in 1952 and 1953)	None	Earth dam, centrifugal pump, and pipe line.	None	None	
Turnbull	9S/4W-12H	None	Santa Margarita River	1926	Domestic	None	$1\frac{1}{2}$ hp pump, and pipe line to 500 gallon tank.	None	None	
John C. Tyler	8S/1E-9Q	None	Lancaster Creek	Unknown	Irrigation	246	Concrete dam 20 feet long, and pipe line to earth reservoir	Weir	February, 1951 through January, 1952, and September, 1952 through May, 1954.	

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
United States Naval Ammunition Depot	9S/4W-14N	None	Santa Margarita River	About 1942	Domestic	None	5 hp pump, and pipe line.	Flow meter	January, 1945 through November, 1951	
United States Navy, O'Neill Ditch	10S/4W-5D	None	Santa Margarita River and Fallbrook Creek	1883	Recreation	None	Earth ditch from Santa Margarita River to O'Neill Ditch, which is located on Fallbrook Creek.	Water stage recorder	Since October, 1930 (U.S.G.S. Water Supply Papers)	See text of Chapter I for early history of this diversion.
Vail Company	8S/1W-10D	Permit No. 7032	Temecula Creek	1948 (see remarks)	Irrigation, and recreation	1,588	Concrete, variable radius arch dam 130 feet high, with a 49,500 acre-foot capacity reservoir, and 6.7 miles of 24 inch concrete pipe line.	Flow meter	Vail Reservoir releases since August, 1949	See text of Chapter I for history of early surface diversions.
Israel Wannatick and Jaime Portney	9S/3W-4N2	None	Santa Margarita River	Unknown	Inactive	None	Equipment removed.	None	None	
Alvis A. Ward	9S/1E-12H	None	Temecula Creek	1886	Irrigation (Inactive November, 1952 through March, 1954)	None	Sand dam, concrete pipe line, and an earth ditch to a reservoir.	Power consumption and pump test	January, 1951 through October, 1952	Formerly owned by Ernest L. and Essie B. Barbey.

DESCRIPTIONS OF SURFACE DIVERSIONS
(continued)

Owner	Diversion number	Appropriations on file with State	Water supply source	Year started	Use in 1953	Irrigated area served in 1953, acres	Description of diversion system	Measuring device	Available records	Remarks
R. L. Warren	9S/3W-4L	None	Santa Margarita River	Unknown	Irrigation	5	$7\frac{1}{2}$ hp pump, and pipe line.	None	None	
Gustav Weber and Eugene Lawler, Jr.	9S/1E-29C	Permit No. 3883	Cutca Creek, a tributary of Smith Creek	Unknown	Irrigation, domestic, and stock.	3	Masonry dam 15 feet long, a gasoline powered pump, pipe line, and two storage tanks totaling 4,000 gallons capacity	None	None	
Dr. Samuel M. Wilson	8S/4W-32E	None	DeLuz Creek	About 1937	Irrigation	12	Concrete dam, gasoline engine powered centrifugal pump, and pipe line.	None	None	
Doris I. Worcester	7S/2E-12N	Permit No. 9038	Unnamed spring tributary to Coahuila Creek	Prior to 1946	Stock	None	Undeveloped spring.	None	None.	
Doris I. Worcester	7S/2E-13C	None	Tributary of Coahuila Creek	Unknown	Domestic (Washing only)	None	Earth dam four feet long, a one cylinder gasoline engine and centrifugal pump, and pipe line.	None	None	

TABLE 25

ESTIMATED ANNUAL SURFACE DIVERSIONS

In Acre-Feet

Diversion number	Owner	Diversion 1951	Diversion 1952	Diversion 1953
7S/1E-24C	Shipley	a	a	a
-26F	Linke	1	1	1
-35E	Kerr	4	a	b
7S/2E-12N	Worcester	a	a	a
-13C	Worcester	c	c	c
7S/1W-12H	Duncan Industries	a	a	a
8S/1E- 7R	Oviatt	140	160	165
- 9Q	Tyler	115	a	250
-19M1	Knox	a	185	260
-19M2	Richie	c	c	b
-19N	Patten	2	2	2
-29L	Gibbon-Cottle	730	455	665
-29Q	Barton	a	13	21
-29R	Trunnell	8	b	b
-35M	Bergman	370	390	400
8S/2E-22H	Toner	a	b	b
8S/3E-31G	Grossman and Paris	a	a	a
-31K	Grossman and Paris	a	a	b
8½S/3E-31R	Grossman	b	b	b
8S/1W-10D	Vail Company	235*	1,585*	6,880*
-25B	Jurkovich	c	c	c
-29R	Lohman	c	1	c
8S/3W-31L	Bradshaw	a	a	a
-33Q	Henderson	a	a	22
8S/4W-21E	Matthews	a	a	12
-30B	Garnsey	b	b	b
-30H	Garnsey	a	a	155
-31K	Butler	a	a	13
-31M	Dr. Mangan	a	a	5
-32E	Dr. Wilson	a	a	24
-36D	Hansen Estate	b	b	b
8S/5W-13Q	Seery	c	c	c
-23J	Nelson	c	c	c
-23Q	Ewing	b	b	b
9S/1E-12H	Ward	50	80	b
-12L	Denio	c	c	c
-12R	Denio	c	c	c
-29C	Weber and Lawler	3	2	2
9S/2E-17F	Oviatt-Brinkerhoff	80 (July-Dec.)	115	235
-20C,E	Lloyd	1	1	1
-21L	Oviatt, Cummings, and Harmer	1	1	1

ESTIMATED ANNUAL SURFACE DIVERSIONS
(continued)
In Acre-Feet

Diversion number	Owner	1951	1952	1953
9S/2E-28C	Studer Estate	b	b	b
-28R	Oviatt	115	120	80
-34L	Grammer	1	1	1
9S/3W-4F1	Peters	a	a	15
-4F2	Russell	c	c	c
-4G	Freeman	a	a	2
-4H	Mortz	c	c	c
-4L	Warren	a	a	8
-4N1	Lange	a	1	2
-4N2	Wannatick and Portney	b	b	b
-4N3	Smith	b	b	b
-4P	Jennings	a	a	4
-5R	Helm and Pankonian	3	2	4
-7D1	Fallbrook Public Utility District	860	860	1,750
-7D2	Sawday	a	a	70
-7F	Merickle	c	c	c
-8A	Ludgate	c	c	c
-8B	Hanes	a	a	120
-9E	Pepple	a	a	15
9S/4W-12H	Turnbull	c	c	c
-14N	U. S. Naval Ammunition Depot	70	100	100
10S/4W- 5D	U. S. Navy, O'Neill Ditch	1,400	44	6

* Releases from Vail Reservoir.
a. No estimate made.
b. No apparent use.
c. Less than one acre-foot.

There are two surface reservoirs of significance in the watershed, Vail Reservoir, previously mentioned, and O'Neill Lake in the lower reaches of the watershed. Other reservoirs exist but they are small and provide little if any carry-over storage from one year to the next. Releases from such reservoirs are included with the direct surface diversions.

O'Neill Lake on Camp Pendleton has a storage capacity of about 1,300 acre-feet. It is supplied by runoff in Fallbrook Creek and other tributary streams, by sewage treatment plant effluent, by direct precipitation, and by diversion from Santa Margarita River through O'Neill Ditch. At the present time the reservoir is used primarily for recreational and esthetic purposes at its location adjacent to the United States Naval Hospital, within the reservation of Camp Pendleton. Under the present mode of operation the lake level is maintained at or near full capacity, allowing sewage effluent from plant 1 and the Naval Ammunition Depot plant and tributary runoff to enter the reservoir and, except during periods of high runoff, allowing Santa Margarita River water to enter the lake through O'Neill Ditch. This ditch, through an arrangement of gates and by-pass channels, "floats" on the lake, and as a result water diverted from Santa Margarita River enters the lake only when the other inflow quantities are insufficient to satisfy consumptive use due to evaporation from the water surface, and incidental use by phreatophytes at lake's edge. The quantity of this consumptive use is estimated to total 390 acre-feet per year, based on the actual fluctuations in surface area which occurred in the period April, 1945, through September, 1951. Any inflow in excess of the above consumptive use overflows to Santa Margarita Coastal Basin below.

In past years, since purchase of the former Rancho Santa Margarita Y Las Flores by the United States of America, occasional releases have been made from the lake to the ground water basin. Such releases serve to recharge the basin by percolation to the ground water body just as the basin is recharged by (1) Santa Margarita River water not diverted in O'Neill Ditch, (2) flow in O'Neill Ditch which by-passes the lake, and (3) overflow from the lake. Thus Santa Margarita River water, which percolates and is subsequently extracted from the ground by pumping for beneficial purposes, is beneficially used whether it passes through O'Neill Lake or not. Releases from the lake, therefore, neither add to nor detract from the beneficial use of the water so extracted.

Prior to sale of Rancho Santa Margarita, O'Neill Lake was used to store Santa Margarita River water generally at all times except during periods of excessive runoff, and releases were made by gravity to irrigate lands overlying Santa Margarita Coastal Basin. Under the present method of operation of the lake and the ground water basin, extractions from which supply all water used on Camp Pendleton in the vicinity of Santa Margarita River, the yield of O'Neill Lake is considered to be zero.

Vail Reservoir on Temecula Creek was built by the Vail Company and completed in June, 1949. The dam forming this reservoir is a variable radius arch concrete structure, 130 feet in height from stream bed to crest. The reservoir capacity is about 49,500 acre-feet. The spillway of the dam was designed to pass a flood of 72,000 cubic feet per second. Application for the right to store water at the site was first made on August 2, 1919, under appropriation Application No. 1423, but the project was actually constructed under Application No. 11518, dated August 16, 1946. Gates at the dam were first closed in November, 1948, and to date the reservoir has not filled. Relatively small releases to Temecula Creek (i.e. to ground water in Pauba Basin) were made in each of the years 1949 through 1952, and in 1953 a distribution system was completed and water was released for irrigation of lands overlying Pauba Basin, downstream from the dam.

The calculated safe yield of Vail Reservoir for the critical period 1895-96 through 1903-04 is 6,800 acre-feet per season, based on the semiseasonal inflows to the reservoir presented in Appendix I, Table 1-2. Allowance was made for reduction in effective reservoir storage capacity due to sedimentation in the amount of 4,640 acre-feet. This amount represents the loss after 50 years of operation, estimated to be 0.8 per cent by volume of the reservoir inflow for that period. Semiseasonal distribution of demand was made in accordance with historical use by the Vail Company as presented in Table 37, the October-March demand being 32 per cent and the April-September demand 68 per cent of the total. Estimated mean seasonal precipitation of 1.00 foot at the site was distributed in accordance with the average indices of wetness at key stations as presented in Table 4, and further divided semiseasonally according to percentages of actual precipitation which occurred at the key stations. Semiseasonal gross depth of evaporation from the reservoir water surface was estimated to be 1.42 and 3.27 feet for the periods October-March and April-September, respectively. These values were adopted from long time records of evaporation at Lake Elsinore. In calculating net evaporation, allowance was made for the quantities of water that would have been salvaged from the former swamp in the reservoir area. Considered as salvage was the portion of consumptive use of the swamp which was derived from runoff. This allowance was based on data, presented in the following table, which were taken from the report "Vail Reservoir Report on Salvage of Evapo-Transpiration Losses", by A. L. Sonderegger, dated July, 1948.

TABLE 26

CONSUMPTIVE USE BY FORMER SWAMP LANDS
AT VAIL RESERVOIR

Net seasonal consumptive use		Monthly distribution of consumptive use	
Contour interval	Use in acre-feet	Month	Per cent of annual
1350-1360	38	January	2.6
1350-1370	137	February	3.2
1350-1380	187	March	5.5
1350-1390	351	April	8.6
1350-1400	502	May	11.7
1350-1410	666	June	13.1
1350-1420	836	July	15.7
1350-1430	1,135	August	14.2
1350-1440	1,272	September	11.6
1350-1450	1,371	October	7.0
1350-1460	1,438	November	4.2
1350-1470	1,487	December	2.6

Areas and capacities of Vail Reservoir for various depths of water at dam, as prepared by the Water Resources Division of the United States Geological Survey, are presented in Table 27.

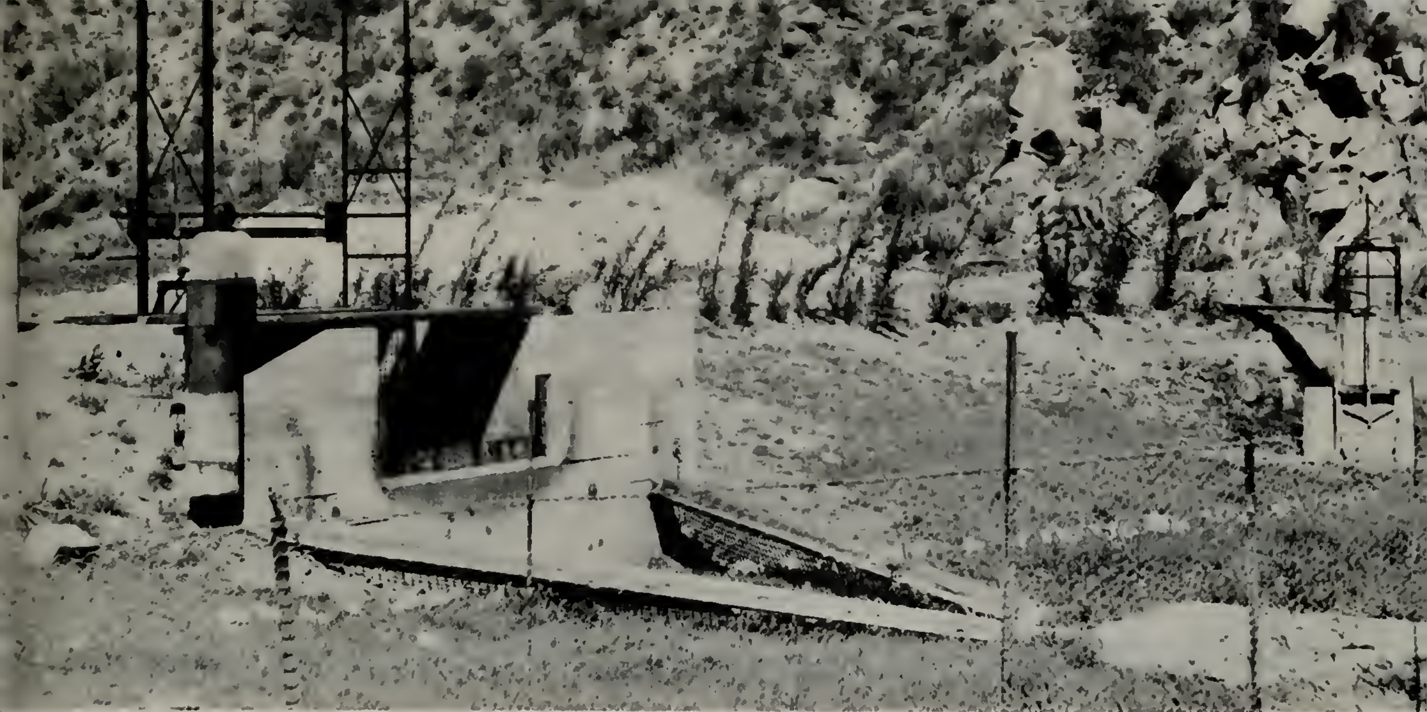
TABLE 27

AREAS AND CAPACITIES OF
VAIL RESERVOIR

Depth of water at dam, in feet	Water surface area, in acres	Storage capacity, in acre-feet
0	0	0
10	9	39
20	54	327
30	101	1,093
40	162	2,395
50	269	4,526
60	340	7,565
70	428	11,396
80	575	16,392
90	705	22,780
100	826	30,420
110	945	39,280
120	1,078	49,370
120.1	1,080	49,520

Applications to appropriate water have been made for many of the diversions tabulated herein in accordance with provisions of Division 2, Part 2, of the Water Code of the State of California. Applications and pertinent data relating to them are tabulated in Appendix K.

Seasonal quantities of water directly diverted, or released from surface storage units, by the Vail Company, Camp Pendleton, Fallbrook Naval Ammunition Depot, and Fallbrook Public Utility District are shown in Table 28. Summaried by hydrographic units in Table 29, "Developed Water Supply of Santa Margarita River Watershed in 1953", are the amounts of water extracted from ground water and diverted from surface streams and springs in the watershed in 1953.



Vail Company
Diversion
T8S/R1W-10D

Fallbrook Public Utility
District Diversion
T9S/R3W-7D1

TABLE 28

SEASONAL SURFACE DIVERSIONS BY WATER SERVICE ORGANIZATIONS

In Acre-Feet

Season (Oct. 1 - Sept. 30)	Fallbrook Public Utility District from Santa Margarita River (Diversion 9S/3W-7D1)	Camp Pendleton O'Neill Ditch Diversion from Santa Margarita River[a] (Diversion 10S/4W-5D)	U. S. Naval Ammunition Depot from Santa Margarita River (Diversion 9S/4W-14N)	Vail Co. from Temecula Creek[c] (Diversion 8S/1W-10D)
1924-25	3			
25-26	13			
26-27	15			
27-28	17			
28-29	25			
1929-30	24			
30-31	25	2,540		
31-32	28	3,050		
32-33	52	2,200		
33-34	81	2,490		
1934-35	68	1,270		
35-36	97	2,340		
36-37	81	2,470		
37-38	91	3,340		
38-39	104	2,100		
1939-40	131	1,080		
40-41	130	1,800		
41-42	170	1,640		
42-43	203	1,160[b]		
43-44	155	4,940[b]		
1944-45	152	2,280[b]		
45-46	86	3,020[b]	68	
46-47	86	2,100[b]	42	
47-48	40	4,940[b]	81	
48-49	113	4,340[b]	90	136

SEASONAL SURFACE DIVERSIONS BY
WATER SERVICE ORGANIZATIONS
(continued)
In Acre-Feet

Season (Oct. 1 - Sept. 30)	Fallbrook Public Utility District from Santa Margarita River (Diversion 9S/3W-7D1)	Camp Pendleton O'Neill Ditch Diversion from Santa Margarita River[a] (Diversion 10S/4W-5D)	U. S. Naval Ammunition Depot from Santa Margarita River (Diversion 9S/4W-14N)	Vail Co. from Temecula Creek[c] (Diversion 8S/1W-10D)
1949-50	382	1,910[b]	62	274
50-51	595	1,470[b]	68	235
51-52	1,150	196[b]		1,585
52-53	1,215	0		6,076
53-54	1,233			4,408
1954-55				

a. Diversion in O'Neill Ditch started in 1883; measurements of flow available from 1930-31.

b. Diversions have, since October, 1942, largely by-passed O'Neill Lake in O'Neill Ditch and returned to river.

c. Surface diversions by Vail Co. prior to November, 1931, are included in table of "Ground Water Extractions by Vail Company". Data recorded are releases from Vail Reservoir.

TABLE 29

DEVELOPED WATER SUPPLY OF
SANTA MARGARITA RIVER WATERSHED IN 1953

In Acre-Feet

Hydrographic Unit	Ground water	Springs	Surface water	Sub-total	Import	Total
1	8,650	200	0	8,850	100	8,950
2	1,590	70	420	2,080	0	2,080
3	530	50	1,670	2,250	0	2,250
4	3,660	30	6,880	10,570	0	10,570
5	520	60	2,320	2,900	0	2,900
6	7,070	0	0	7,070	250	7,320
	22,020	410	11,290	33,720	350	34,070

Land Use

As a first step in estimating the water requirement of the Santa Margarita River watershed, survey determinations were made of the nature and extent of present land use as related to water utilization. Similarly, the probable nature and extent of ultimate land use were forecast on the basis of land classification survey data, which segregated lands of the watershed in accordance with their suitability for irrigated agriculture.

Past and Present Patterns of Land Use

The first land use survey in the watershed was made in 1904, when a survey of irrigated lands was made in the area comprising Hydrographic Units 1 through 4. The results of that survey and another covering the same area made in 1915, are shown on a map included in United States Geological Survey Water Supply Paper No. 429. A survey, which was conducted in portions of Hydrographic Units 5 and 6 in San Diego County in 1934, was reported in California Division of Water Resources Bulletin No. 48, "San Diego County Investigation".

A detailed land use survey was conducted throughout the Santa Margarita River watershed during the season 1951-52, and during the summer of 1953 the irrigated lands were re-surveyed. Acreages of each land use type were determined by measuring the respective areas, exclusive of highways and county roads. Farmsteads and urban areas were separately determined, and for irrigated lands, an additional one per cent of the area was deducted for access roads to obtain the net irrigated area. The resultant patterns of land use in 1952 and 1953 are shown in Table 30. The classification "Roads", in the table, includes highways, county roads, and estimated areas of farm roads. Areas classified as "Urban" were restricted to Fallbrook, Temecula, Murrieta, Wildomar, and Camp Pendleton on which paved airport, warehouse areas, housing, hospital, and barracks areas were classified to be urban. Total irrigated land in the watershed increased 750 acres or 13 per cent, between 1952 and 1953, nearly 600 acres of new land being placed under irrigation on Pauba Ranch upon completion of a system for distribution of Vail Reservoir water. For comparative purposes the results of these and the earlier surveys are summarized in Table 31.

Avocados in
Fallbrook Area

Fallbrook Area

Courtesy Fallbrook Public Utility District

TABLE 30

1952 AND 1953 LAND USE IN HYDROGRAPHIC UNITS OF
SANTA MARGARITA RIVER WATERSHED

In Acres

Class and type of land use	Hydrographic Unit No. 1		Hydrographic Unit No. 2		Hydrographic Unit No. 3		Hydrographic Unit No. 4		Hydrographic Unit No. 5		Hydrographic Unit No. 6		Totals	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953
IRRIGATED LANDS														
Alfalfa	880	930	510	160	70	70	580	720	15	0	0	0	2,055	1,880
Alfalfa seed	220	230	320	370	0	0	0	0	0	0	0	0	540	600
Permanent pasture	710	630	60	70	105	230	50	260	35	20	0	0	960	1,210
Truck	100	210	0	40	0	25	0	575	40	60	15	25	155	935
Deciduous	110	130	20	20	5	5	15	15	30	30	0	0	180	200
Citrus	20	20	0	0	0	0	0	0	190	110	190	160	400	290
Avocados	0	0	0	0	0	0	0	0	410	410	390	390	800	800
Grain	25	170	220	230	50	40	295	0	0	10	0	0	590	450
Corn	25	20	0	0	0	0	0	20	0	0	0	0	25	30
Vineyard	0	0	0	0	0	0	0	0	30	30	5	5	35	35
Subtotals	2,090	2,340	1,130	890	230	370	940	1,590	750	670	600	580	5,740	6,440
NONIRRIGATED LANDS														
Dry farmed and fallow	49,470	49,220	7,610	7,850	2,850	2,785	2,900	2,470	670	670	390	390	63,890	63,385
Olives	260	260	0	0	0	0	0	0	30	30	20	20	310	310
Roads	1,000	1,000	350	350	250	250	200	200	250	250	300	300	2,350	2,350
Farmsteads	440	440	70	70	30	30	50	50	20	20	0	0	610	610
Urban	130	130	0	0	0	0	0	0	10	10	1,310	1,310	1,450	1,450
Water surface	30	30	200	200	220	220	10	10	20	20	280	280	760	760
Subirrigated pasture	620	620	2,140	2,140	210	135	370	370	70	70	20	20	3,430	3,355
Phreatophytes	640	640	110	110	630	630	80	80	1,180	1,180	1,970	1,970	4,610	4,610
Dry river bottom	640	640	180	180	230	230	860	860	90	90	450	450	2,450	2,450
Native vegetation	85,850	85,850	88,980	88,980	99,320	99,320	23,590	23,370	70,000	70,000	21,340	21,340	389,080	388,860
Miscellaneous	370	370	0	0	10	10	40	40	10	90	0	20	430	530
Subtotals	139,450	139,200	99,640	99,880	103,750	103,610	28,100	27,450	72,350	72,430	26,080	26,100	469,370	468,670
TOTALS	141,540	141,540	100,770	100,770	103,980	103,980	29,040	29,040	73,100	73,100	26,680	26,680	475,110	475,110

TABLE 31

PAST AND PRESENT AREAS OF IRRIGATED LAND IN HYDROGRAPHIC UNITS OF SANTA MARGARITA RIVER WATERSHED

In Acres

Hydrographic Unit No.	Year				
	1904	1915	1934	1952	1953
1	0	100	--	2,090	2,340
2	0	0	--	1,130	890
3	0	0	210[a]	190	380
4	90	290	--	930	1,570
5	--	--	110	750	680
6	--	--	1,030[b]	600	580
TOTALS	90	390	1,350	5,690	6,440

a. San Diego County only.
b. Includes 368 acres in Fallbrook Irrigation District, a small but undetermined portion of which is in Hydrographic Unit 5.

Probable Ultimate Pattern of Land Use

Land Classification. During 1953 and 1954, a reconnaissance land classification survey was made of the entire watershed area to delimit the lands suitable for ultimate irrigation development. This land classification survey determined the amount and location of the irrigable lands, and subdivided them into various crop adaptability classes. The purpose of such a classification was to provide a direct approach for forecasting a probable crop pattern that would result from the full development of the irrigable lands, in order to provide a basis for estimating probable ultimate water requirements in the watershed.

The classification survey of irrigable lands gave consideration to such physical characteristics of the land as topography, soil depth, soil texture, saline or alkaline conditions, high water table conditions, and presence of rock. The present agricultural practices, climatic conditions, and ease of irrigation were also considered insofar as they influenced the crop adaptability of the various land classes. No consideration was given to those economic factors relating to production and marketing, which are variable among given areas and subject to considerable fluctation over a period of years. Neither the position of the land, as related to a possible water supply, nor availability of a water supply were influencing factors in the land classification.

Previously obtained soil and land classification data were available for lands in the Santa Margarita River watershed, but no single comprehensive survey of the entire area had been made. As mentioned in Chapter I, four separate soil surveys of the area have been made. Together these surveys covered the entire area of the Santa Margarita River watershed, but they were conducted at different times, by different personnel, and to various standards. The resulting data for much of the area were not generally suitable for purposes of establishing water requirements. The United States Department of Agriculture's Soil Conservation Service is presently making detailed surveys in portions of the watershed. Data obtained in these surveys are ordinarily suitable for land classification purposes, but such surveys are usually made upon the request of individual owners and the total amount of land thus surveyed is relatively small and scattered throughout the watershed. The Marine Corps, however, utilizing Soil Conservation Service methods and procedures, conducted a soil and land classification survey of all lands within Camp Pendleton in 1951 and 1952. Results of the survey were made available and were very useful in this investigation. Although methods differed somewhat from those used in the survey for this investigation, it was possible to adapt the data to the system used throughout the remainder of the area, and a consistent land classification survey of the entire watershed was thus obtained.

Table 32 comprises a description of each crop adaptability class and the standards utilized in the survey.

Northeast of Murrieta

Courtesy State Division of Highways

Northern Watershed Boundary at Highway 395

Courtesy State Division of Highways

TABLE 32

IRRIGABLE LAND CLASSIFICATION STANDARDS

Class	Characteristics
V -	Smooth lying valley lands with slopes up to 6 per cent in general gradient in reasonably large sized bodies sloping in the same plane; or slightly undulating lands which are less than 4 per cent in general gradient. The soils have medium to deep effective root zones, are permeable throughout, and free of salinity, alkalinity, rock, or other conditions which would limit the crop adaptability of the land. These lands would be suitable for all climatically adapted crops.
Vl -	Similar in all respects to Class V except for having fairly coarse textures and low moisture holding capacities, which in general make these lands unsuited for the production of shallow-rooted crops because of the frequency of irrigations to supply the water needs of such crops.
Vw -	Similar in all respects to Class V, except for the present existing condition of a high water table which in effect limits the crop adaptability of those lands to pasture crops. Project drainage and a change in irrigation practices would be required to affect the crop adaptability of these lands. For the purpose of this investigation, it is assumed that there will be no change in the use of these lands.
Vs -	Similar in all respects to Class V, except for the presence of saline and alkali salts which limit the present adaptability of these lands to crops tolerant to those conditions. The presence of salts within the soil indicates poor drainage and a medium to high water table. The reclamation of these lands will require drainage and the application of additional water over and above crop requirements in order to leach out the harmful salts.
Vm -	This class covers marsh lands which under present conditions are nonirrigable, being under water a large part of the year. The present vegetation is mostly tules and water-loving types of plants. These lands would require extensive drainage before they could be utilized for agricultural crops. It is assumed that there will be no change and that their water use will continue to be the same as the present. If this type of land were developed, the probable result would be a decrease in its water requirement.

IRRIGABLE LAND CLASSIFICATION STANDARDS
(continued)

Class	Characteristics
Va -	Land at present considered nonirrigable due to the presence of saline and alkali salts in excess of agricultural crop tolerance. The feasibility of reclamation of this type of land is presently unknown. It is therefore assumed for this report that the ultimate land use of these lands will remain unchanged.
H -	Undulating and rolling lands up to 20 per cent maximum slope for large-sized bodies sloping in the same plane, grading down to less than 12 per cent for undulating lands. The soils are permeable, with medium to deep effective root zones, and are suitable for the production of all climatically adapted crops. The only limitation is that imposed by topographic conditions which affect the ease of irrigation and the amount of land that might ultimately be developed.
Hp -	Similar in all respects to Class H, except for the depth of the effective root zone which limits the use of this land to shallow-rooted crops.
Hr -	Similar in all respects to Class H, except for the presence of rock on the surface or within the plow zone in sufficient quantity to restrict the use of the land to non-cultivated crops.
Ht -	Similar in all respects to Class H, except for topographic limitations. Smooth slopes up to 30 per cent in general gradient for large-sized bodies sloping in the same plane, and up to 12 per cent slopes for rougher and more undulating topography. This class of land will not be as highly developed as other "H" classes of land.
Htp -	Similar in all respects to Class Ht, except for the depth of the effective root zone which limits the use of this land to shallow-rooted crops.
Htr -	Similar in all respects to Class Ht, except for the presence of rock on the surface or within the plow zone in sufficient quantity to restrict the use of the land to non-cultivated crops.
N -	Includes all lands which fail to meet the minimum requirements of the above classes.

Results of the survey indicate that 109,850 acres of land in the watershed, out of a total of 475,100 acres, are susceptible of intensive agricultural development by irrigation.

Approximately 33,000 acres or nearly 1/3 of the gross irrigable acreage are valley floor lands, of which the vast majority are Class V. The topography is smooth and level or gently sloping, and is suitable for most types of irrigation practice. Soil textures vary from fine to coarse, but are predominantly of medium texture and in general have good water-holding capacities, and the soil structure permits easy penetration of roots, air, and water. These lands generally are suited for continuous production of all climatically adapted irrigated crops.

Irrigable hill lands meet the requirements of irrigable valley lands in all respects, except for topography, which limits their suitability to certain climatically adapted crops under special irrigation practices. Since these lands vary in topographic relief from gently sloping or rolling to steeply sloping or rolling, care must be exercised in the type of irrigation practice; and terracing, and/or permanent cover crops may be required. Some of these lands are to be found on recent alluvial soils, but for the most part they comprise residual soils or old valley terrace soils. The best of the hill lands, which have adequate soil depth and are suitable for most climatically adapted crops, comprise about 61,000 acres or around 60 per cent of the total of the gross irrigable lands. These lands are highly valued in Hydrographic Units 5 and 6 for the production of avocados and citrus. In the higher mountainous areas, these lands have limited crop adaptabilities, but are potentially irrigable. The remainder of the hill lands, totaling some 15,000 acres or about 7 per cent of the total gross irrigable acreage, are limited somewhat in their crop adaptabilities by soil depth or presence of rock. These lands, however, are suitable for certain climatically adapted crops.

Results of the classification of irrigable lands in the Santa Margarita River watershed by hydrographic units and counties are presented in Table 33.

TABLE 33

CLASSIFICATION OF LANDS BY HYDROGRAPHIC UNITS AND COUNTIES OF
SANTA MARGARITA RIVER WATERSHED

In Acres

Hydrographic unit and county	Land class: Irrigable lands											Nonirrigable lands				Totals
	V	Vl	Vw	Vs	H	Hp	Hr	Ht	Htp	Htr	Total	Vm	Va	N	Total	
Hydrographic Unit 1																
Riverside	11,299	165	13	2,307	15,935	2,982	0	5,802	8,604	0	47,107	0	175	94,256	94,431	141,540
Hydrographic Unit 2																
Riverside	5,861	1,425	53	0	13,035	543	0	55	1,116	0	22,088	0	636	78,042	78,678	100,770
Hydrographic Unit 3																
Riverside	262	1,022	0	0	3,101	0	0	79	237	0	4,701	0	0	43,083	43,083	47,780
San Diego	1,997	843	0	0	1,996	121	78	84	1	113	5,233	0	0	50,964	50,964	56,200
totals	2,259	1,865	0	0	5,097	121	78	163	238	113	9,934	0	0	94,047	94,047	103,980
Hydrographic Unit 4																
Riverside	3,187	769	0	54	4,106	13	0	849	361	0	9,339	0	1	18,517	18,518	27,860
San Diego	0	0	0	0	0	0	0	0	9	0	9	0	0	1,177	1,177	1,180
totals	3,187	769	0	54	4,106	13	0	849	370	0	9,348	0	1	19,694	19,695	29,040
Hydrographic Unit 5																
Riverside	182	0	0	0	1,004	0	0	538	0	0	1,724	0	0	29,540	29,540	31,260
San Diego	541	86	0	0	1,083	25	154	2,756	205	0	4,850	0	0	36,984	36,984	41,840
totals	723	86	0	0	2,087	25	154	3,294	205	0	6,574	0	0	66,524	66,524	73,100
Hydrographic Unit 6																
San Diego	2,155	896	0	14	4,920	0	0	5,452	1,365	0	14,802	14	17	11,846	11,877	26,680
Riverside County	20,791	3,381	66	2,361	37,181	3,538	0	7,323	10,318	0	84,959	0	812	263,438	264,250	349,210
San Diego County	4,693	1,825	0	14	7,999	146	232	8,292	1,580	113	24,894	14	17	100,971	101,002	125,900
TOTALS	25,484	5,206	66	2,375	45,180	3,684	232	15,615	11,898	113	109,853	14	829	364,409	365,252	475,110

Land Use. Utilizing the results of the land classification, and giving consideration to present and probable future trend of development, a pattern for probable ultimate land use was forecast for the Santa Margarita River watershed for the purpose of estimating water requirements. It has been estimated in State Water Resources Bulletin No. 2, that future extensive urban development in this portion of the South Coastal Area will be confined to a narrow coastal strip, a few miles in width. The area of the coastal strip within Santa Margarita River watershed is small, and much of the land therein is either river bottom or tidal marsh. Since it is believed that communities elsewhere within the watershed will remain essentially farm community centers, and that they too will occupy a relatively small percentage of the total area, all lands within the watershed are, for purposes of predicting the probable ultimate water requirement, considered according to their suitability for agricultural, rather than urban use. Consumptive use of applied water for urban areas is generally somewhat less than similar use by the average irrigated crops forecast for the watershed, and therefore it is believed that the foregoing assumption is conservative in that the estimated total water requirement is somewhat larger than would otherwise result.

As regards the lands within the Camp Pendleton Military reservation, it is recognized that the selection of an agricultural pattern of land use may result in an estimated ultimate water requirement greater than that which will probably occur so long as the reservation remains a part of the Marine Corps establishment. Considering the uncertainty as to what the situation may be after the unspecified long period of years which will elapse before attainment of the "ultimate", it is believed that this higher estimate is desirable.

Results of the land classification were in terms of gross irrigable acreages; therefore, appropriate percentage factors were applied to reduce these areas to average net acreages that might ultimately be irrigated in any one season. The factors account for the effect of size and shape of the parcels of irrigable lands, inclusions of small areas of non-irrigable lands among the irrigable classes, production capacity of the lands and probable crop rotation, ease of irrigation development, and inclusion of roads, highways, and other non-agricultural land uses. The factors were largely based upon experience and judgment of the classifiers, and knowledge of the characteristics of the lands under consideration.

The ultimate crop pattern was projected to the adjusted net acreage of irrigable lands that would be irrigated in any one year. The projection was based on consideration of present crop patterns, knowledge of climatic conditions, and discussions with local authorities, particularly the Farm Advisor of Riverside County and the Farm Advisor and Agricultural Commissioner of San Diego County.

Table 34 presents the probable ultimate pattern of land use for each hydrographic unit in the Santa Margarita River watershed. In those hydrographic units which are partly in Riverside County and partly in San Diego County, the projected land use has been segregated by counties. In Hydrographic Units 2 and 3 a further segregation has been made for lands lying above and below elevation 3,000 feet.

TABLE 34

PROBABLE ULTIMATE PATTERN OF LAND USE IN HYDROGRAPHIC UNITS AND COUNTIES OF SANTA MARGARITA RIVER WATERSHED

In Acres

Class and type of land use	Inland area										
	Hydrographic Unit No. 1 Riverside County	Hydrographic Unit No. 2			Hydrographic Unit No. 3					Subtotal
		Riverside County			Riverside County		San Diego County			
		Below elevation 3000 feet	Above elevation 3000 feet	Total	Below elevation 3000 feet	Above elevation 3000 feet	Below elevation 3000 feet	Above elevation 3000 feet	Total	
Irrigated lands										
Alfalfa	5,130	620	1,880	2,500	540	240	270	70	1,120	8,750
Pasture	5,860	1,240	2,750	3,990	440	160	150	180	930	10,780
Truck	10,000	620	4,380	5,000	680	170	110	40	1,000	16,000
Deciduous	3,000	270	730	1,000	240	60	1,190	1,160	2,650	6,650
Citrus	1,570	0	0	0	0	0	0	0	0	1,570
Avocados	0	0	0	0	0	0	0	0	0	0
Field	3,000	330	1,170	1,500	250	50	110	40	450	4,950
Hay and grain	3,000	290	1,210	1,500	300	100	0	0	400	4,900
Vines	1,000	0	0	0	0	0	350	250	600	1,600
Flowers	0	0	0	0	0	0	0	0	0	0
Net irrigated area	32,560	3,370	12,120	15,490	2,450	780	2,180	1,740	7,150	55,200
Streets and roads and nonproductive area	14,550	1,750	4,850	6,600	1,090	380	750	560	2,780	23,930
Gross irrigated area	47,110	5,120	16,970	22,090	3,540	1,160	2,930	2,300	9,930	79,130
Nonirrigable lands not susceptible to extensive water service	94,430	26,550	52,130	78,680	21,120	21,960	7,890	43,080	94,050	267,160
TOTALS	141,540	31,670	69,100	100,770	24,660	23,120	10,820	45,380	103,980	346,290

PROBABLE ULTIMATE PATTERN OF LAND USE IN HYDROGRAPHIC UNITS AND COUNTIES
OF SANTA MARGARITA RIVER WATERSHED
(continued)

In Acres

Class and type of land use	Inland area (cont.)			Coastal area				Subtotals		Total for all hydrographic units
	Hydrographic Unit No. 4			Hydrographic Unit No. 5			Hydrographic Unit No. 6			
	Riverside County	San Diego County	Total	Riverside County	San Diego County	Total	San Diego County	Riverside County	San Diego County	
Irrigated lands										
Alfalfa	1,000	0	1,000	0	0	0	430	9,410	770	10,180
Pasture	600	0	600	230	0	230	0	11,280	330	11,610
Truck	3,000	0	3,000	200	1,010	1,210	2,240	19,050	3,400	22,450
Deciduous	600	0	600	200	180	380	200	5,100	2,730	7,830
Citrus	200	0	200	200	1,000	1,200	2,840	1,970	3,840	5,810
Avocados	200	0	200	200	1,000	1,200	2,840	400	3,840	4,240
Field	500	0	500	100	0	100	0	5,400	150	5,550
Hay and grain	500	0	500	100	0	100	0	5,500	0	5,500
Vines	250	0	250	0	0	0	0	1,250	600	1,850
Flowers	0	0	0	0	200	200	2,450	0	2,650	2,650
Net irrigated area	6,850	0	6,850	1,230	3,390	4,620	11,000	59,360	18,310	77,670
Streets and roads and nonproductive area	2,500	0	2,500	490	1,460	1,950	3,800	25,610	6,570	32,180
Gross irrigated area	9,350	0	9,350	1,720	4,850	6,570	14,800	84,970	24,880	109,850
Nonirrigable lands not susceptible to extensive water service	18,510	1,180	19,690	29,540	36,990	66,530	11,880	264,240	101,020	365,260
TOTALS	27,860	1,180	29,040	31,260	41,840	73,100	26,680	349,210	125,900	475,110

Unit Use of Water

The second step in the evalutaion of present and probable ultimate water requirements of the Santa Margarita River watershed involved determination of appropriate units of water use for each of the types of land use requiring water service, for native vegetation, and for other lands not requiring water service.

Unit Values of Consumptive Use

Unit values of seasonal and irrigation period consumptive use of water for irrigated crops were determined from data obtained from the field soil moisture depletion investigation conducted in the Santa Margarita River watershed during the growing period of 1953. This study was made in cooperation with the United States Department of Agriculture, Agricultural Research Service (formerly Division of Irrigation Engineering and Water Conservation of the Soil Conservation Service) in accordance with an agreement between that agency and the Division of Water Resources. Under the agreement, the Department of Agriculture suggested general field procedures, provided equipment, interpreted field data, and prepared a report on the investigation. This report appears herein as Appendix C. Field data at test plots were, for the most part, obtained by Division of Water Resources personnel, who also aided in preparation of the data for analysis and checked final results.

To obtain additional climatological information, three new Class A evaporation stations were established within the watershed early in 1953, and were operated through May 1954. Station equipment consisted of a United States Weather Bureau type four foot diameter evaporation pan, United States Weather Bureau standard eight-inch rain gage, totalizing anemometer, thermograph, and maximum and minumum thermometers. Stations were established at Murrieta, Oakgrove, and Anza, and all were equipped as indicated, except that the Oakgrove Station had no anemometer. Similar stations were established at Vail Reservoir and O'Neill Lake in 1952 by the United States Marine Corps under direction of the Department of Agriculture, both of these stations being presently active. In June, 1954, equipment at the Murrieta Station was moved about one mile northwest to a new site, where it is presently operated by the Soil Conservation Service. Locations of the stations are shown on Plates 21 A and B, entitled "Locations of Diversions and Irrigated and Irrigable Lands".

Thirteen test plots, the locations of which are also shown on the plates, were carefully selected for their representative characteristics of farm practice, type of crop, and depth of root zone, the object of the study being to obtain unit consumptive use values for irrigated crops having an adequate water supply. Field data collected included measurements of soil moisture content of samples taken throughout the root zone at each plot before and after each irrigation, moisture content being determined for each one foot increment of soil depth. Thus the soil moisture accretion from irrigation and soil moisture depletion between irrigations by evapo-transpiration processes (consumptive use), were determined for each plot. From these data, and estimates of additional evaporation immediately following irrigation and prior to post-irrigation sampling, the irrigation period consumptive use of the crop at each location was evaluated.

To illustrate the method used, there are plotted on Plate 22, "Soil Moisture Depletion and Accretion, Plot No. 2, Irrigated Pasture, Murrieta Valley", the results of the soil moisture depletion determinations, expressed in inches of depth of water, for all samples taken from plot No. 2. For each one foot increment the values of soil moisture at times of sampling are connected on the graph by solid lines and are extended by dashed lines to complete the graph for each interval between irrigations or times when precipitation occurred. The slopes of the lines indicate rates of consumptive use of water; therefore, the sum of the incremental differences in the ordinates of sloping lines represents the amount of total consumptive use of water for any period. Tabulations of measured and estimated rates of consumptive use at the test plots appear in Appendix C, Tables C-11 through C-20. Plots 4 and 7 were discontinued early in the season because the owners were unable to continue irrigating the fields. At all other sites, the sampling program was carried through to completion in November, 1953, but conditions at plot 10 were later found to be not representative of the average.

The consumptive use values so obtained are those for particular crops, during a particular year, and at particular locations. To obtain values which are applicable to these and other crops, during other periods of time, and at other locations, the Blaney-Criddle formula U=KF has been utilized. This formula employs the following relationship:

U = Consumptive use during the growing period.

K = Growing period consumptive use coefficient.

t = Mean monthly temperature in degrees Fahrenheit.

p = Monthly per cent of annual daytime hours.

$f = \frac{txp}{100}$ = Monthly consumptive use factor.

F = Sum of monthly consumptive use factors during the growing period. In general it has been found that the coefficient K is relatively constant for a particular crop and that consumptive use varies almost directly with the consumptive use factor (F). Thus, during any period and at any location where F can be evaluated, the equation U=KF can be utilized to obtain the value of the constant K if U has been determined experimentally as was done in this instance, or to obtain the value of U if K is known.

Values of (K) so determined from the test plot data are as follows:

Plot No.	Crop	Location	Coefficient (K)
1	Avocados	Fallbrook	0.56
2	Irrigated Pasture	Murrieta	0.85
5	Lettuce	Murrieta	0.58
6	Melons	Murrieta	0.68
8	Carrots	Temecula	0.68
9	Alfalfa	Temecula	0.83
11	Alfalfa	Aguanga	0.85
12	Irrigated Pasture	Anza	0.94
13	Alfalfa seed	Anza	0.86

In Tables C-6, C-7, and C-8, of Appendix C, estimates are presented of long term unit values of consumptive use of water by irrigated crops in the Coastal Area (Hydrographic Units 5 and 6), the Murrieta-Temecula Area (Hydrographic Units 1 and 4, and portions of Units 2 and 3 below elevation 3,000 feet), and the Anza Area (portions of Hydrographic Units 2 and 3 above elevation 3,000 feet).

The values of K utilized therein are based in part upon the values derived from the data obtained at the test plots and in part upon experience obtained elsewhere. An example of the modification based on experience is the reduction of the value for alfalfa from 0.85 determined experimentally in the Murrieta-Temecula Area, to 0.75 in the Coastal Area (Table C-6) and to 0.80 in the Anza Area (Table C-8). Values for crops not included in the

Santa Margarita tests are those which have been determined experimentally under similar conditions elsewhere.

For purposes of evaluating the consumptive use factor (F) and consumptive use of precipitation, it was assumed that temperature and precipitation at Escondido Church Ranch, at Elsinore, and at Warner Springs stations, are representative of the Coastal, the Murrieta-Temecula, and the Anza areas respectively.

In estimating the winter (nongrowing) period consumptive use, it was assumed that evaporation equals the precipitation up to 1.50 inches per month on the basis of 0.50 inch per storm and three storms per month. It was further assumed that 0.50 inch additional is transpired during November by alfalfa, pasture, and deciduous in the Anza Area; and that elsewhere in the watershed 0.50 inch additional is transpired during March by alfalfa and pasture, and 0.50 additional during November by alfalfa, pasture, citrus, avocados, and deciduous.

For purposes of this study it was assumed that precipitation during the growing period is all consumed. Precipitation during the non-growing period is disposed of by the evaporation and transpiration noted in the preceding paragraph, by runoff, by replenishment of the deficiency in soil moisture in the root zone at the end of the irrigation period, and finally--at times when there is precipitation in excess of all the foregoing--by percolation beyond the reach of vegetation.

Runoff was assumed to be negligible during months in which precipitation totals less than two inches. Ten per cent was assumed to run off when monthly precipitation ranges between two and four inches, and twenty per cent when it exceeds four inches.

The soil moisture deficiencies at the end of the respective growing periods for the various crops are assumed to be as follows:

Alfalfa, pasture, truck, and grain	4 inches
Alfalfa seed	12 inches
Citrus and avocados	3 inches
Deciduous	8 inches
Beans	6 inches

Estimated unit values of mean seasonal consumptive use of water by the irrigated crops on the three areas comprising the Santa Margarita River watershed are presented in Table 35. The values for a few crops not included in the studies described in Appendix C (Tables C-6, C-7, and C-8) are set forth in the Table. The values for flowers were assumed to be the same as for truck crops, and the values for vines the same as for citrus orchards. Unit consumptive use of applied water for field crops was assumed to be 10 per cent greater than for truck crops.

Summarized in Table 36 are the estimated unit values of seasonal consumptive use of applied water and precipitation by irrigated crops for the drought period 1944-45 through 1950-51. The values differ from those in Table 35 by (1) the decrease in consumptive use of precipitation occasioned by deficiences in growing and nongrowing period precipitation, and (2) the increase in consumptive use of applied water required to offset the decrease in quantity of carryover soil moisture at the start of the normal growing period and to offset the growing period precipitation.

TABLE 35

ESTIMATED UNIT VALUES OF MEAN SEASONAL CONSUMPTIVE USE OF WATER ON IRRIGATED LANDS IN SANTA MARGARITA RIVER WATERSHED

(In feet of depth)

Type of land use	Inland Area						Coastal Area		
	Hydrographic Units 1 and 4 and below elevation 3,000 ft. in Units 2 and 3			Hydrographic Units 2 and 3 above elevation 3,000 ft.			Hydrographic Units 5 and 6		
	Applied water	Precipitation	Total mean seasonal consumptive use	Applied water	Precipitation	Total mean seasonal consumptive use	Applied water	Precipitation	Total mean seasonal consumptive use
Alfalfa	2.8	0.9	3.7	2.1	1.2	3.3	2.1	1.1	3.2
Alfalfa seed	1.8	1.0	2.8	1.1	1.4	2.5	---	---	---
Pasture	2.8	0.9	3.7	2.1	1.2	3.3	2.1	1.1	3.2
Deciduous	1.9	1.0	2.9	1.2	1.3	2.5	1.6	1.2	2.8
Citrus	1.3	0.8	2.1	---	---	---	1.1	1.0	2.1
Vines	1.3	0.8	2.1	0.8*	1.1*	1.9*	1.1	1.0	2.1
Avocados	1.5	0.8	2.3	---	---	---	1.3	1.0	2.3
Truck	1.1	0.8	1.9	0.8	1.1	1.9	1.0	1.0	2.0
Flowers	1.1	0.8	1.9	0.8	1.1	1.9	1.0	1.0	2.0
Beans	1.0	0.9	1.9	---	---	---	0.8	1.1	1.9
Field	1.2	0.8	2.0	0.9	1.1	2.0	1.1	1.0	2.1
Grain	0.4	0.9	1.3	0.5	1.0	1.5	0.3	1.1	1.4

* Approximate.

TABLE 36

ESTIMATED UNIT VALUES OF CONSUMPTIVE USE
OF WATER ON IRRIGATED LANDS DURING DROUGHT PERIOD,
1944-45 THROUGH 1950-51, IN SANTA MARGARITA RIVER WATERSHED

(In feet of depth)

Type of land use	Inland Area						Coastal Area		
	Hydrographic Units 1 and 4 and below elevation 3,000 ft. in Units 2 and 3			Hydrographic Units 2 and 3 above elevation 3,000 ft.			Hydrographic Units 5 and 6		
	Applied water	Precipitation	Total drought period consumptive use	Applied water	Precipitation	Total drought period consumptive use	Applied water	Precipitation	Total drought period consumptive use
Alfalfa	3.0	0.6	3.6	2.2	1.1	3.3	2.2	1.0	3.2
Alfalfa seed	2.2	0.6	2.8	1.4	1.2	2.6	---	---	---
Pasture	3.0	0.6	3.6	2.2	1.1	3.3	2.2	1.0	3.2
Deciduous	2.2	0.6	2.8	1.3	1.2	2.5	1.8	1.0	2.8
Citrus	1.5	0.6	2.1	---	---	---	1.2	0.9	2.1
Vines	1.5	0.6	2.1	0.8*	1.1*	1.9*	1.2	0.9	2.1
Avocados	1.7	0.6	2.3	---	---	---	1.4	0.9	2.3
Truck	1.3	0.6	1.9	0.8	1.1	1.9	1.0	0.9	1.9
Flowers	1.3	0.6	1.9	0.8	1.1	1.9	1.0	0.9	1.9
Beans	1.2	0.6	1.8	---	---	---	0.9	1.0	1.9
Field	1.4	0.6	2.0	0.9	1.1	2.0	1.1	0.9	2.0
Grain	0.7	0.6	1.3	0.6	1.0	1.6	0.4	1.0	1.4

* Approximate

Two sample computations which illustrate the procedure for estimating seasonal consumptive use of water follow. The first of these shows the derivation of the value for percolation to the root zone of alfalfa in the Murrieta-Temecula area during the nongrowing period, November, 1939, through March, 1940. The second computation shows the derivation of the long time mean values of consumptive use of precipitation and applied water by the same crop in the same area.

Sample Computation of Disposition of Nongrowing Period Precipitation

In Inches

Month	Total precipitation	Use by evaporation	Use by transpiration	Runoff	Percolation to root zone for use in subsequent growing period
November, 1939	0.85	0.85	0.50*	0	-0.50
December	0.43	0.43	0	0	0
January, 1940	3.28	1.50	0	0.13	1.65
February	3.77	1.50	0	0.18	2.09
March	0.29	0.29	0.50	0	- .50
	8.62	4.57	1.00	0.31	2.74

* Assumed to be supplied temporarily by root zone soil moisture, which is replenished by rainfall in January.

SAMPLE COMPUTATION OF UNIT VALUES OF CONSUMPTIVE USE
OF WATER FOR LAND CROPPED TO ALFALFA
IN THE MURRIETA-TEMECULA AREA

Growing Period

Growing period assumed from April through October. Mean temperature and per cent of daytime hours assumed same as for Elsinore at latitude 33°45'. Mean growing period precipitation = 2.26 inches.

K = 0.85
F = 44.96 (April through October)
U = 38.22 inches

Consumptive use of water during growing period = U = KF = 0.85 x 44.96 = 38.22 inches of depth.

Nongrowing Period

Nongrowing period assumed from November through March. Nongrowing period transpiration by alfalfa assumed to be 0.50 inch in November and 0.50 inch in March. Moisture for transpiration in either month may be satisfied temporarily by soil moisture if monthly precipitation is insufficient, but is assumed ultimately to be supplied by nongrowing period precipitation.

Evaporation assumed equal to precipitation up to a total of 1.50 inches of depth for each month on the basis of evaporation of 0.50 inch of moisture per storm and three storms per month. Calculated monthly evaporation for the period 1936-37 through 1949-50 averages 4.81 inches for the period November through March. Total nongrowing season consumptive use is the sum of evaporation plus transpiration or 5.81 inches.

Total Seasonal Consumptive Use

Growing period consumptive use	38.2 inches of depth
Nongrowing period consumptive use	5.8 inches of depth
TOTAL	44.0 inches of depth

Moisture Retained in Root Zone

Assuming soil moisture deficiency of 4.0 inches at the start of each nongrowing period, precipitation as occurred at Elsinore, evaporation and transpiration for the nongrowing period as previously set forth, and runoff equal to 10 per cent of total precipitation between 2 and 4 inches and 20 per cent of precipitation greater than 4 inches; the nongrowing period precipitation retained in the root zone was calculated for each month for the period 1936-37 through 1949-50. The calculated average nongrowing period precipitation thus retained is 2.27 inches.

Seasonal Consumptive Use of Applied Water

		Inches of depth	Feet of depth
Total seasonal consumptive use of water		44.0	3.67
Deductions			
Precipitation occurring and consumptively used during growing period	2.3		
Precipitation consumptively used during nongrowing period	5.8		
Precipitation occurring during nongrowing period and retained in root zone for use by crop during growing period	2.3		
Seasonal consumptive use of precipitation		10.4	0.87
Seasonal consumptive use of applied water		33.6	2.80

Also included in the study of consumptive use of water in Santa Margarita River watershed was a determination of consumptive use by riparian vegetation along Temecula Creek in the vicinity of Aguanga. Discharge measurements were made above and below a reach of stream throughout the spring, summer, and fall of 1953, and the consumptive use along the reach was determined. Based on these and similar measurements elsewhere, estimated unit values of mean seasonal consumptive use of riparian vegetation were determined. These values are shown in Appendix C, Table C-10. The basic discharge measurements are tabulated in Appendix E, Tables E-1 and E-2.

As part of the cooperative study reported upon in detail in Appendix C, values of consumptive use by dry farmed crops and grass and brush are estimated to equal 95 per cent of rainfall up to a maximum quantity for the particular type of vegetation. Maximum values are 14 inches for grain-hay, 15 inches for beans, and 16 inches for grass and brush.

Factors of Water Demand

In the planning of water conservation projects and accompanying distribution systems, certain factors in addition to consumptive use of water must be given consideration in determining demands for water. Among these factors are necessary rates, times, and places of delivery of water. In considering such demands, irrigation efficiencies, irrecoverable losses, and permissible deficiencies must be considered.

Monthly Distribution of Demand for Water

Presented in Table 37, in terms of per cent of annual totals, are the recorded quantities of water supplied monthly for military use on Camp Pendleton, and for agricultural use in Fallbrook Public Utility District and on Vail Ranch. Although Fallbrook Public Utility District serves some domestic water, by far the largest use is for irrigation, and it is believed that the distribution shown is representative of irrigation use in the District.

TABLE 37

ESTIMATED AVERAGE MONTHLY DISTRIBUTION
OF SEASONAL MILITARY AND AGRICULTURAL DEMAND FOR WATER

In Per Cent

Month	Type of demand				
	Military	Agricultural			
	Camp Pendleton[a]	Camp Pendleton[b]	Fallbrook Public Utility District[a]	Vail Company[a]	Average monthly agricultural demand
October	8	9	9	10	10
November	8	6	8	6	6
December	8	3	7	4	4
January	7	2	3	3	3
February	6	2	2	3	3
March	8	5	4	6	5
April	8	9	8	7	8
May	9	12	8	11	10
June	9	12	11	12	12
July	10	14	12	14	14
August	10	14	14	12	13
September	9	12	14	12	12

a. Based on historic records of use.
b. Based on estimated use, U.S.A. vs. Fallbrook Public Utility District et al., Exhibit 36.

Also tabulated is the theoretical distribution of irrigation water for Camp Pendleton, which was estimated by personnel of the Marine Corps for purposes of the litigation, United States of America vs. Fallbrook Public Utility District et al., the values being based on a projected crop pattern covering all irrigable lands on the portion of Camp Pendleton within the Santa Margarita River watershed, and on assigned monthly demand values for each crop. The derived values agree closely with the recorded values for Fallbrook Public Utility District and the Vail Ranch, and are utilized with them to obtain the average values, shown in the last column of the table, which are considered herein to represent the distribution of agricultural demand throughout Santa Margarita River watershed.

Irrigation Efficiency

Satisfaction of the water requirements of irrigated crops requires the application of water on individual farms in excess of that consumptively used. The ratio of consumptive use of applied water to the total amount of applied water, expressed as a percentage, is termed "irrigation efficiency", and is useful as an indicator of prevailing irrigation practice. Irrigation efficiency varies widely between crops and among plots devoted to the same crop, the variations being accounted for by differences in depth of root zone, soil type, topography, method of irrigation, drainage characteristics, and the practices of the individual irrigators.

During the course of this investigation, a study was made to determine irrigation efficiencies under conditions prevailing in the watershed. Total applied water, determined by direct measurement or calculated from power consumption records and field pump tests, was compared with calculated consumptive use of applied water on 19 irrigated farms. The most important factor influencing the efficiencies appears to be the method of irrigation employed. Sprinkler irrigation was practiced at an average efficiency of about 70 per cent, while furrow and border check irrigation resulted in an indicated efficiency of about 40 per cent.

Irrecoverable Losses

Attendant with the beneficial use of water, including the irrigation of crop land and the delivery of urban supplies, there may occur certain losses which cannot be recovered for further beneficial use. As used in this report, the term "irrecoverable losses of water" refers to that portion of the transmission and delivery losses and return flow from irrigation which cannot be recovered, and to sewage effluent from urbanized areas which is discharged to the ocean or otherwise lost for re-use. These losses comprise an additional demand on the supplies of the watershed over and above consumptive use. They have not been evaluated directly but are considered in the evaluation of "overall application efficiency" which is utilized and discussed later in this chapter.

Permissible Deficiencies in Application of Water

Studies to determine deficiencies in the supply of irrigation water that might be endured without permanent injury to perennial crops were not made in connection with this investigation. Such studies made for other areas in California indicate that a maximum deficiency of 35 per cent of the full seasonal requirement can be endured if the deficiency occurs only at relatively long intervals. It has also been determined that small deficiencies occurring at relatively frequent intervals can be endured. In connection with studies for this report, water requirements were estimated on a mean seasonal basis and under the assumption that adequate water supplies will be provided to produce optimum crop yields. Thus, on the average, needs for such optimum crop yields will be supplied, and, provided sufficient carry-over storage is available, such needs will be satisfied each and every year.

Water Requirements

Estimates of present and probable ultimate water requirements in the Santa Margarita River watershed were made by applying appropriate unit values of water use to the present and probable ultimate areas requiring water service, and by utilizing records or estimates of historic water production. In portions of the watershed where water applied to lands in excess of consumptive use will either return to ground water storage and be available for re-use or will drain from the area under consideration and be available for re-use downstream, the measurement of water requirement was taken as the amount of consumptive use of applied water divided by an over-all application efficiency factor which takes attendant irrecoverable losses into account. Where water is exported or where water which is applied in excess of consumptive use is otherwise prevented from returning to ground water storage for subsequent re-use, the measure of water requirement is assumed to be the amount of applied water. In areas where excess irrigation water returns to tidal marsh lands or sewage is discharged directly to the ocean, water requirements are similarly measured in terms of applied water.

Present Water Requirement

Land use in 1953 is considered herein to represent "present" land use development in Santa Margarita River watershed. With the exception of Hydrographic Units 4 and 6, the present water requirement of the watershed was determined by applying mean seasonal values of consumptive use of applied water to the present pattern of land use, adding a minor amount for domestic use, and making allowance as described above for attendant irrecoverable losses. In Hydrographic Unit 4 the water requirement is measured by the calculated depletion of discharge in Temecula Creek caused by the combined operation of Vail Reservoir, pumping in Pauba Valley, and irrigation of Pauba Valley lands. In Hydrographic Unit 6 the water requirement was considered to be equal to the application of water within the watershed less the portion of that water which is returned as sewage effluent to Santa Margarita Coastal Basin, plus the evaporation from O'Neill Lake.

The estimated total present water requirement for the Santa Margarita River watershed is 16,200 acre-feet as shown in Table 38 "Present Mean Seasonal Water Requirement of Santa Margarita River Watershed". Comparison of the values presented therein with those for water applied in 1953 as presented in Table 29, indicate roughly the relationship between water consumed and unavoidably wasted, and water applied.

TABLE 38

PRESENT MEAN SEASONAL WATER REQUIREMENT OF
SANTA MARGARITA RIVER WATERSHED

In Acre-Feet

Hydrographic Unit	Present water requirement
1	5,800
2	1,300
3	1,000
4	3,800*
5	900
6	3,400
TOTAL	16,200

* Does not include Vail Reservoir evaporation.

Determination of the present mean seasonal water requirement is based on the following assumptions:

1. That the nature and extent of land use in the watershed in 1953 is representative of present conditions of development.

2. That the unit values of consumptive use of applied water presented in Table 35 are applicable to the three subdivisions of the watershed set forth therein.

3. That all presently irrigated lands are provided a water supply sufficient to meet the consumptive requirements of the various crops.

4. That lands devoted to truck crops are cropped an average of one and one-half times per year with a water requirement of one and one-half times that of a single crop.

5. That in Hydrographic Units 1, 2, 3, and 5, the water requirement of irrigated lands equals the consumptive use of applied water divided by an overall application efficiency factor of 95 per cent, and the domestic

Palomar Observatory

Courtesy Mount Wilson and Palomar Observatories

Oceanside

Courtesy Oceanside Chamber of Commerce

requirement equals one-half of the assumed application of 0.7 acre-foot per household.

6. That in Hydrographic Unit 4 the water requirement is the net depletion of outflow (5,550 acre-feet) from the unit, due to the combined operation of Vail Reservoir and Pauba Basin, less the net reservoir evaporation of 1,800 acre-feet. The data on which these values are based are presented in Appendix I.

7. That in Hydrographic Unit 6 the water requirement is the portion of the present extraction from Santa Margarita Coastal Basin applied on Camp Pendleton within the watershed (2,320 acre-feet), less the portion of the applied water presently returned to the Basin as sewage treatment plant effluent (680 acre-feet), plus the water presently applied within Fallbrook Naval Ammunition Depot and Fallbrook Public Utility District in the Unit (1,450 acre-feet), less the portion of this water returned to Santa Margarita Coastal Basin via the Naval Ammunition Depot sewage treatment plant and Fallbrook Creek (100 acre-feet), plus evaporation from O'Neill Lake (390 acre-feet) or a net total of 3,380 acre-feet.

Probable Ultimate Water Requirement

The probable ultimate mean seasonal water requirement of the Santa Margarita River watershed is estimated to be 155,200 acre-feet as shown in Table 39. Probable ultimate water requirements were estimated by multiplying the predicted acreages of each type of land use as shown in Table 34, by appropriate unit values of irrigation season consumptive use of applied water as shown in Table 35, and allowing for attendant irrecoverable losses. The calculation of the ultimate water requirements of the various hydrographic units was based on the following assumptions:

TABLE 39

PROBABLE UNTIMATE MEAN SEASONAL WATER REQUIREMENT OF SANTA MARGARITA RIVER WATERSHED

In Acre-Feet

Hydrographic unit	Probable ultimate water requirement *
1	71,300
2	29,100
3	14,500
4	14,200
5	7,300
6	18,800
TOTAL	155,200

* Includes requirement for lands presently receiving water service.

1. That in Hydrographic Units 1 through 5, and in the upstream portion of Hydrographic Unit 6, the over-all efficiency of application will be 85 per cent.

2. That in the portions of Hydrographic Unit 6, which are located near the ocean and drain to the Santa Margarita River downstream from Ysidora Narrows, where re-use of return flow cannot be effected, the over-all application efficiency will be 50 per cent.

3. That lands devoted to truck crops and flowers will be cropped an average of one and one-half times per year at a consumptive use rate of one and one-half times that for a single crop.

A corresponding estimate of the probable ultimate water requirement in a drought period was calculated by utilizing the unit values of consumptive use appearing in Table 36, with other assumptions as enumerated above. The resulting drought period seasonal water requirement under ultimate conditions is 172,900 acre-feet, or about 11 per cent in excess of the estimated ultimate mean seasonal requirement.

The over-all application efficiency factor referred to in the immediately preceding paragraphs is not to be confused with the irrigation efficiency discussed earlier in the chapter. The latter is the ratio of the water consumed on a field to the water which must be delivered to the field; the former is the ratio of water consumed on a large unit of area to the water supply required to serve that large area. The over-all application efficiency factor takes into account the re-use of a portion of the applied water; irrigation efficiency does not. Irrigation efficiency is useful in determining the required delivery capacity in various portions of the distribution system, but has little, if any, bearing on the total quantity of water required in an area where a portion of the return flow and distribution system leakage can be re-used. Reference to Plates 6 and 10A and 10B shows that in the lower portions of or downstream from all hydrographic units, except the coastal portion of Unit 6, there are ground water basins or surface reservoirs which can be so operated as to capture a major portion of the unconsumed applied water, making it available for re-use. It is believed that the assumed values of over-all application efficiency factor are conservative in that they probably indicate unavoidable waste somewhat greater than will be experienced.

Requirements of a Nonconsumptive Nature

In addition to the previously discussed consumptive water requirements there are water requirements of a basically nonconsumptive nature.

Recreational Use. Fresh-water fishing and duck hunting are presently available to sportsmen at the privately operated Vail Reservoir, and farm ponds provide warm water fishing. Reservoirs constructed in the future for storage of local or imported water will provide additional opportunity for recreation, but since the use for the most part is purely incidental to the uses previously described, and is nonconsumptive, such use is not considered herein in evaluating present and ultimate water requirements in the watershed. However, evaporation from O'Neill Lake, where recreation is the only major use, is included as a part of the present water requirement.

Flood Control. Existing flood control improvements in Santa Margarita River watershed are not considered adequate for the control of large floods. These improvements consist of short sections of wire-and-brush fences and enlargement of a section of the channel of Pechanga Creek in upper Pechanga Creek Valley; excavation of a flood channel and construction of levees along sections of Murrieta Creek in the vicinity of Temecula and Murrieta; levee and bank protection along Temecula Creek in Pauba Valley; and construction of earthwork levees, diversion groins, and large tetrahedrons made of old railroad rails along Santa Margarita River in the lower Santa Margarita River Valley on Camp Pendleton. The improvements are adequate for control of small floods only, but would be damaged and probably destroyed by a large flood.

Direct damage resulting from floods along the Santa Margarita River during the period January, 1916, through January, 1949, has been estimated by the Corps of Engineers to have totaled $2,093,000. More than half of this sum represents damage to railroads and highways. Because partial relocation of the branch railroad line to Fallbrook, and construction of the branch railroad line to Fallbrook, and construction of more substantial railroad and highway bridges, future flood damage to highways and railroads will probably not be as great as in the past. However, improvements installed on the Camp Pendleton Reservation since 1942 substantially increase the potential flood damage in that area. Operation of Vail Dam which was completed in 1949 will probably decrease flood damage to agricultural lands, particularly in Pauba Valley, in some years but, because of the probability that the reservoir would be full when the largest storms occur, the amount of protection to be effected downstream during such floods may be relatively small. Vail Reservoir is a water conservation reservoir and no special provisions are known to have been made for its operation for flood control purposes.

In 1949, the United States Corps of Engineers studied a dam and reservoir on Santa Margarita River at De Luz which would have a water conservation storage capacity of 188,000 acre-feet and a flood control storage reservation of 23,000 acre-feet. The annual flood control benefit from such storage was calculated to be $69,000 at that time. In the study the Corps of Engineers did not recommend construction of any channel improvements along the upper reaches of streams in the Santa Margarita stream system because of the adverse benefit-cost ratio of the plans considered. In the present investigation no study has been made of flood problems or facilities required for flood control.

Salinity Control. Subsurface outflow from the Santa Margarita Coastal Basin occurs under favorable ground water gradient. Under the maximum gradient attainable such outflow could be appreciable, but with planned operation of the Basin it is believed that it would be of relatively small magnitude on the average. Utilization of ground water basins for storage and re-use of return water from upstream application, requires that the mineral quality of ground water contained in the basins must be protected from excessive deterioration. This will require sufficient drainage from the basins to remove a quantity of dissolved salts equivalent to the amount of salt input to the basins. Quantitative estimates of the amount of water required for this purpose are dependent upon formulation of specific plans for each area and upon the quality of imported water. No estimates were made of such requirements in this investigation, but they should not be great enough to materially alter the estimate of over-all water requirement.

Supplemental Water Requirement

In general, supplemental water requirement may be defined as the amount by which the total requirement exceeds the presently available supply. As has been stated, none of the ground water basins in Santa Margarita River watershed, with the possible exception of Diamond Basin, have been utilized to their full capacity. Were these basins readily susceptible to further development at an early date, any additional water which might be so provided would be considered to be a part of the presently available supply. However, permitted extractions from the basins upstream from Temecula Canyon are limited to a considerable degree by the terms of the decree in Rancho Santa Margarita vs. Vail, and the cost of delivering water pumped there or from basins downstream, to areas where a significant increase in demand at an early date is probable, would be materially greater than that which is usually involved in pumping for use on overlying or nearby lands. Because of this, water which may be made available in the future through increased pumping from the ground water is, for purposes of this report, not considered to be a part of the presently available supply. Because of the limitations of the decree, the same is true of additional water which might be made available through changed operation of Vail reservoir. A material increase in the amount of water presently imported for use in the watershed, would involve construction of additional works, so this too is considered to constitute a source of supplemental water rather than a part of the presently available supply.

If present net extractions from the ground water were sufficient to produce an overdraft, the available supply would be less than present net extractions by the amount of the overdraft. Study of historical water table fluctuations, however, indicates that none of the basins in the watershed are overdrawn with the possible exception of Diamond Basin. Disregarding the small overdraft which may exist there, the supply which is considered to be presently available to the watershed is measured by the present net draft on various sources of supply -- surface flow, ground water and importation from Colorado River. The supplemental water requirement, as herein determined, is the difference between the total consumptive water requirement and the present net draft.

Present Net Draft

Estimated values of present net draft are presented in Table 40. It will be noted that the over-all total shown therein (18,700 acre-feet) is greater than the total present water requirement shown in Table 38 (16,200 acre-feet) by 2,500 acre-feet, which latter value represents the estimated present export from the watershed. The totals for Hydrographic Units 1 to 4, inclusive, are identical in the two tables. The total net draft on the water supply in Hydrographic Unit 5 shown in Table 40 is 1,000 acre-feet greater than the estimated present requirement in that unit because approximately that amount (950 acre-feet) is developed in Unit 5 but used in Unit 6. Subtracting this amount from the present water requirement in Unit 6 (3,400 acre-feet) and adding the 2,500 acre-feet presently exported from Unit 6, results in the 4,900 acre-feet shown in Table 40 as the total present net draft on the water supply in the unit.

TABLE 40

PRESENT NET DRAFT ON THE
WATER SUPPLY IN SANTA MARGARITA RIVER WATERSHED

In Acre-Feet

Hydrographic Unit Number	Surface water	Ground water	Import from Colorado River	Total
1	100	5,700		5,800
2	300	1,000		1,300
3	300	700		1,000
4	2,700	1,100		3,800
5	1,600[a]	300		1,900[a]
6	400	4,000[b]	500[c]	4,900[b]
TOTALS	5,400	12,800	500	18,700

a. Includes an estimated 950 acre-feet delivered to Hydrographic Unit 6.
b. Includes 2,500 acre-feet exported for agricultural and military use on Camp Pendleton outside Santa Margarita River watershed.
c. Part of this total import may be delivered to and used in Hydrographic Unit 5.

In Hydrographic Units 1, 2, and 3, the net draft on the surface and ground water, respectively, is assumed to be proportional to the acreages served from each source in 1953.

In Hydrographic Unit 4, practically the entire present water supply development is that by the Vail Company. Vail Reservoir is operated in conjunction with Pauba Basin downstream in that releases from the reservoir are used to irrigate lands overlying the basin, and replenishment of ground water also used to irrigate these lands is primarily derived from such irrigation.

Certain assumptions regarding future operation by the Vail Company, made in connection with the calculations, are enumerated in the explanation of deviation of data accompanying Appendix Table I-2, "Seasonal Runoff from Streams Within the Santa Margarita River Watershed, and Semiseasonal Inflow to Existing and Proposed Reservoirs". Under the assumed conditions, the depletion of stream flow in the Santa Margarita River attributable to the combined operation of Pauba Basin and Vail Reservoir totals 5,550 acre-feet per year. Of this amount 1,800 acre-feet is the net evaporation at Vail Reservoir and the remaining 3,750 acre-feet (called 3,800 in Table 40), is considered to be the consumptive use of applied water under present conditions plus unavoidable losses. Assuming that the 6,800 acre-feet of safe yield of Vail Reservoir is applied on lands overlying Pauba Basin with an irrigation efficiency of 40 per cent, 2,700 acre-feet is the net draft on the surface water. The remaining 1,100 acre-feet is obtained from the ground water of the Basin.

The estimated present net draft on the surface water in Hydrographic Unit 5, totaling 1,600 acre-feet, includes 300 acre-feet consumptive use of direct diversion applied on lands outside Fallbrook Public Utility District; 100 acre-feet diverted by Fallbrook Naval Ammunition Depot, none of which returns within Unit 5; and 1,200 acre-feet which is the average annual diversion from the River by Fallbrook Public Utility District during the period October,1951, through September, 1954. It is considered that any part of the 1,200 acre-feet which returns within Unit 5 is re-used by pumping from wells in the residuum. In addition to these extractions, which are not separately accounted for, an estimated 300 acre-feet of pumped ground water is consumed annually within the Unit.

In Hydrographic Unit 6, the present net draft on the ground water is estimated to equal the present ground water extraction less present sewage return to Santa Margarita Coastal Basin. Present extractions are assumed equal to the average for the period 1942 through 1953, or 5,800 acre-feet per year. The estimated 1,800 acre-feet of effluent from sewage treatment plants 1, 2, and 3, and the Naval Ammunition Depot treatment plant which was discharged to the basin either directly or through O'Neill Lake in 1953, is considered herein to represent the present seasonal return. The only surface water which is consumptively used for a beneficial purpose is the 400 acre-feet of evaporation from O'Neill Lake.

Present Supplemental Water Requirement

Study of historical water table fluctuations indicates that none of the basins in the watershed are overdrawn with the possible exception of Diamond Basin. As stated, disregarding the small overdraft which may exist there, the present mean seasonal water requirement of 16,200 acre-feet plus export of 2,500 acre-feet, is satisfied by the presently developed supply, and no supplemental water is presently required in the watershed.

Probable Ultimate Supplemental Water Requirement

In Table 40 it is shown that the present net draft on local water supplies plus 500 acre-feet from Colorado River, totals 18,700 acre-feet.

This net draft, which is herein considered to represent the presently available supply, satisfies the present requirements of lands now served in the Santa Margarita River watershed and provides for the exportation of 2,500 acre-feet per season for use on Camp Pendleton outside the watershed. In Table 40, estimated ultimate mean seasonal water requirements for lands within the watershed are shown to total 155,200 acre-feet. Assuming that the water presently exported on Camp Pendleton is to be available for use within the watershed, the difference between ultimate requirement and presently developed yield, or 136,500 acre-feet, represents the ultimate supplemental water requirement. This is in addition to the 500 acre-feet of presently imported Colorado River water. Values for each of the Hydrographic Units, derived under the foregoing assumptions, are presented in Table 41. If it is assumed that the 2,500 acre-feet of export is to continue as a part of the demand on the water supply of the Santa Margarita River watershed, the ultimate supplemental water requirement of Hydrographic Unit 6 will be increased to 16,400 acre-feet, and the total for the watershed to 139,000 acre-feet.

TABLE 41

PROBABLE ULTIMATE SUPPLEMENTAL WATER REQUIREMENT
OF SANTA MARGARITA RIVER WATERSHED

In Acre-Feet

Hydrographic unit	Ultimate water requirement	Presently developed water supply	Probable ultimate supplemental water requirement
1	71,300	5,800	65,500
2	29,100	1,300	27,800
3	14,500	1,000	13,500
4	14,200	3,800	10,400
5	7,300	1,900	5,400
6	18,800	4,900	13,900
TOTALS	155,200	18,700	136,500

The ultimate supplemental requirement can be satisfied partially by increased development of local supplies but a substantial increase in the quantity of water imported from sources outside the watershed will also be required. Possible means by which the supplemental supplies can be developed is the subject of Chapter V, "Plans for Water Development".

CHAPTER IV. LEGAL CONSIDERATIONS

Litigation

The riparian water rights of certain landowners in the Santa Margarita River watershed were adjudicated in an action entitled, Rancho Santa Margarita v. Vail, San Diego County Superior Court No. 42850. An appeal was taken from the judgment of the Superior Court, rendered after a lengthy trail which consumed 444 court days over a period of three years. The Supreme Court reversed the judgment and ordered a new trail upon certain issues of fact. The Supreme Court's opinion is published in California Reports, Volume 11, Second Series, at page 501 (81 P. 2d 533). A stipulated judgment was subsequently entered by the Superior Court in 1940 and became final. It apportioned 66-2/3 per cent of the natural flow of the Santa Margarita River and its tributaries to the Rancho Santa Margarita, a corporation, subject to the right of Philip Playtor to use one miner's inch upon his riparian land and the right of the Estate of Murray Schloss to use all of the summer flow of Stone Creek and five miner's inches of the winter flow of said creek upon a tract of land riparian thereto of approximately 20 acres. The remaining 33-1/3 per cent of the surface flow of the stream was apportioned to the Vail Company and members of the Vail family for use upon their lands described in the judgment, and, in addition, they were given the right to divert specified quantities of subsurface waters upon certain conditions. The judgment further provides that from May 1 to October 31 of each year the Vails shall, with certain exceptions, maintain a constant flow of water of not less than three cubic feet per second at the upper end of Temecula Gorge (Temecula Canyon).

Between 1941 and 1943 the United States acquired by condemnation approximately 135,000 acres of land, including the former Rancho Santa

Margarita. The land is the site of Camp Joseph H. Pendleton, the United States Naval Ammunition Depot, Fallbrook, and a United States Naval Hospital. In 1943 and 1944 the State of California ceded to the United States exclusive jurisdiction, with certain exceptions provided by law, over the lands used for military purposes.

On January 25, 1951, the United States of America filed an action in the United States District Court for the Southern District of California entitled, United States v. Fallbrook Public Utility District, et al., No. 1247-SD, to quiet its title to the waters of the Santa Margarita River and to enjoin interference with its asserted paramount right to the use of such waters. Defendants are all of the other landowners, water users and water right claimants in the watershed. The State of California intervened as a defendant in order to protect its own rights and those of its citizens and to establish that the United States acquired no greater water rights than would have a private successor to the Rancho and that state law should govern a determination of its rights. Thereafter it was stipulated between the United States and the State, among other things, that the rights of the United States are to be measured in accordance with the laws of the State.

A separate trial of the issues between the United States, Santa Margarita Mutual Water Company and the State of California was held. A judgment resulted which determined, in effect, that the United States owns prescriptive and riparian rights to the entire flow of the Santa Margarita River remaining after diversions by upstream riparian owners and by the Vail Company pursuant to the stipulated judgment in the former action, and that there is no surplus water available for appropriation by others. An appeal was taken by the State and the mutual water company to the United States Court of Appeals for the Ninth Circuit, which court reversed the judgment and ordered a new trial. It was held that the trial court was in error in entering a judgment purporting to finally determine water rights of the United States when the action had been tried against only the water company and the State. It was also held that declarations of the trial court that there is no surplus water subject to appropriation are clearly erroneous in light of facts disclosed by the record, and that there is no basis in the record for decreed rights of the United States to the use of water by prescription or use. The Court of Appeals declared that the State should not be denied the power of granting permits to appropriate surplus water, valid against private landowners.

In August, 1949, an action was filed in the Superior Court of San Diego County entitled Barbey v. Oviatt, No. 154140, for a determination of the rights of the parties to the water of Temecula Creek. By a cross complaint filed in May, 1950, the Vail Company joined as parties to the action other landowners within the watershed of Temecula Creek easterly of the Vail lands. The Department of Public Works, acting through the State Engineer, was appointed referee to investigate all physical facts involved and to report thereon. In 1951, after United States v. Fallbrook Public Utility District had been filed, the court in Barbey v. Oviatt directed the referee to restrict its investigation to the continuance of specified stream and well measurements until further order of the court, because of the pending federal action and the investigation of the Santa Margarita River Watershed that had been proposed. On April 11, 1955, the court ordered the referee to suspend all work on the investigation and to submit a report containing pertinent data and information collected to date. The "Report of Referee", which will contain data obtained during the restricted investigation and a portion of the information obtained during the Santa Margarita River investigation, is to be published in July, 1956.

Water Rights

All rights to water are usufructuary, that is, they consist only in rights to the beneficial use of water, for the water itself is incapable of private ownership so long as it remains in its natural state and before it is reduced to actual possession. A right to the use of water of a stream includes the right to the continued flow thereof to the owner's point of diversion or to riparian lands, without unlawful interference by others junior in right.

Both riparian and appropriative water rights are recognized in California. The former are paramount until lost or impaired by grant, condemnation, or prescription.

All water rights, both surface and underground, are subject to the doctrine of reasonable use expressed in Section 3 of Article 14 of the California Constitution which limits the right to the quantity of water reasonably required for beneficial use and which prohibits waste, unreasonable use, or unreasonable methods of use or diversion.

Riparian rights are part and parcel of riparian lands, i.e., lands abutting upon a natural watercourse within the watershed. They do not authorize use of water on nonriparian land nor do they permit seasonal storage of water. They are not created by use or lost by disuse. They extend to future reasonable requirements for beneficial use upon riparian land, although they do not prevent temporary appropriation by others of water not presently required upon such lands. Each riparian right is correlative with each and every other such right and in the event of insufficient water for all, the available supply must be prorated, except that an upper riparian owner may take the whole supply if necessary for strictly domestic use.

The riparian right attaching to a particular parcel of land is subject to appropriative rights established by diversions upon vacant public domain before the first valid steps were taken to acquire said parcel of land from the United States, whether diversion was made on said parcel or at points upstream or downstream.

The riparian right may be severed and lost in whole or in part by grant or condemnation and cannot thereafter be restored. A parcel of land loses its riparian right when separated from contact with the stream by conveyance unless the right is reserved by the grantor. It cannot be transferred for use upon another parcel of land.

Prior to enactment of the Water Commission Act, a right to appropriate water could be acquired by simply diverting water to beneficial use without complying with any formality. Consequently, many such rights exist which, like riparian rights, are not of record. The Water Commission Act established an exclusive procedure for initiating and perfecting appropriations of water and since its effective date (December 19, 1914), no right to appropriate water can be acquired without filing an application and receiving a permit from the State. Whether acquired by beneficial use prior to 1914 or under the Water Commission Act, an appropriative right is always subject to previously vested rights, riparian and appropriative, unless it has ripened into a prescriptive right as against such previous rights by continuous use adverse to them for a period of five years or more under certain requisite circumstances.

A valid appropriation initiated prior to 1914 has priority as of either the date of its initiation or the time of actual beneficial use of water, depending upon whether provisions of the Civil Code then in effect were followed. Under the Water Commission Act (now Divisions 1 and 2 of the Water

Code) an application to appropriate water, properly made, has priority as of the date it is filed, and a defective application which is made in a bona fide attempt to conform to legal requirements also has such priority until applicant is notified of the defects and is given a prescribed time within which to remedy them.

Once initiated, an appropriation of water must be diligently prosecuted to completion in order to maintain its priority. Water may not be appropriated for a future use, although a reasonable time is allowed for completing use of the full amount of water within the original intent of the appropriator. A right to appropriate water is lost by abandonment or by continuous nonuse for a prescribed period--five years in the case of appropriations initiated prior to 1914 and three years under appropriations pursuant to the Water Commission Act or Water Code.

It is provided in the Water Code that domestic use of water is the highest use and that the next highest use is for irrigation.

The permit and license procedure established by the Water Commission Act (now Division 2, Part 2, of the Water Code) applies only to streams and other bodies of surface water and to subterranean streams flowing through known and definite channels. Percolating ground water is therefore excluded and rights to its use are governed by judicial decisions rather than by statute. Ground waters are presumed to be percolating in the absence of evidence to the contrary.

The owner of land overlying a ground water basin or stratum has, like the riparian owner, a paramount right to the reasonable beneficial use of the natural supply upon his overlying land, which right he holds in common with all other landwoners similarly situated. Only surplus water in excess of reasonable requirements for beneficial use upon overlying lands is subject to appropriation for beneficial use upon other lands. However, a prescriptive right to appropriate ground water may be acquired under the same circumstances as prescriptive rights to appropriate water of surface streams may be acquired.

Where ground water and surface water are interconnected, one acting as a tributary to the other, both are treated as part of a common supply and users of water from either source are entitled to protection from substantial injury as a result of use by others of water from the other source. Thus, an owner of land riparian to a stream may have his right to the use of water protected against impairment by an appropriator of percolating ground water tributary to the stream and required for the maintenance and support of its flow. Likewise, where water from a stream percolates to a ground water basin or stratum, the owner of land overlying such ground water may be protected from an appropriation of water of the stream that causes a substantial impairment of the ground water supply. As between riparian use of surface water and overlying use of ground water tributary to the stream, an equitable apportionment of the water should be made.

There has not been a comprehensive adjudication of water rights within the Santa Margarita River watershed by the courts. As discussed under the heading "Litigation" in this chapter, rights between certain landowners have been adjudicated and other rights are now before the courts. Water of the Santa Margarita River system has been put to beneficial use under claim of riparian, overlying, and appropriative right.

Riparian lands have not been determined in this investigation, but it is apparent that the water requirements therefor greatly exceed the available water supply. Because of the erratic regimen of stream flow, as described in Chapter II and indicated by the data tabulated in Appendix I, riparian use is limited and at the present time appears to have reached a maximum level of development. Further development on riparian lands with use of the waters of the Santa Margarita River will require regulation of the flood flows by surface or ground water storage. The right to store water can only be acquired through the filing of an application with the Division of Water Resources as set forth in the Water Code.

Overlying rights to the use of ground water have been exercised throughout the Santa Margarita River watershed, as shown by location of wells presented on Plates 9A and 9B. Because of limitations imposed by difficulties in obtaining wells of sufficient yield for irrigation purposes, further large-scale ground water development appears to be improbable in the "Inland Area". With a proper pattern of pumping, additional ground water development is possible in the "Coastal Area". The possible extent of further development of ground water is discussed in Chapter V. Appropriation of ground water for use on nonoverlying lands is exercised by Camp Pendleton.

Any prescriptive rights that may have been obtained against other downstream vested riparian and appropriative rights have not been adjudicated in the Santa Margarita River watershed.

Appropriations for diversion and storage of surface water on the Santa Margarita River, initiated since 1914, on record with the Division of Water Resources are listed in a table in Appendix K. Information on similar appropriations initiated prior to 1914 or appropriations of water made from public lands are not of record with this Division. No attempt has been made in this investigation to define the water use reported in Chapter III by type of water right, whether riparian, overlying, appropriative or otherwise.

Action by the Division of Water Resources on pending applications in the Santa Margarita River watershed has been withheld awaiting further clarification of the issues involved in <u>United States v. Fallbrook Public Utility</u>

District, et al. Efforts to settle the controversy between the United States and local interests by legislation resulted in conditional authorization by Congress of construction of a storage reservoir on the Santa Margarita River at the De Luz site (Public Law 547, 83d Congress, Second Session, 1954). The stored water would be apportioned 60 per cent to the Navy for use at Camp Pendleton and 40 per cent to the Fallbrook Public Utility District. However, the statute provides that none of the water to which the United States is entitled under its existing rights is to be subject to such apportionment, and the authorization is made dependent upon, among other things, issuance of permits by the State to the District and the United States to appropriate water for the project. The United States Department of Justice has indicated that in its opinion it would be inimical to the existing rights of the United States as determined by the trial court to proceed with its application for such permit. Therefore, construction of the reservoir is uncertain and may depend upon final outcome of the litigation.

CHAPTER V. PLANS FOR WATER DEVELOPMENT

A need for additional water to supply potential demands exists throughout the Santa Margarita River watershed. While there is, with a minor exception, no overdraft of the present supplies, there are few locations within the area where additional water could not be utilized if economically available. Two of the largest water service agencies operating in the area are presently actively engaged in studying methods of developing more water for use in their respective service areas. The United States Navy has variously estimated its seasonal applied water requirements under conditions of full development of Camp Pendleton at from 12,500 to 23,500 acre-feet. Fallbrook Public Utility District has estimated its ultimate seasonal water needs at 11,000 to 13,000 acre-feet of applied water. These values may be compared with present utilization of 5,800 and 7,300 acre-feet, respectively, in the two service areas, which in both instances are partly within and partly outside the Santa Margarita River watershed.

The water requirement under ultimate conditions of development in the watershed as set forth in Chapter III, totals about 155,000 acre-feet. It will undoubtedly be economically infeasible to supply this total amount for many years to come, especially to the irrigable lands at higher elevations. However, it is believed that certain portions of the watershed would exhibit a rapid and substantial increase in irrigation development were supplemental water made available.

Supplemental water may be obtained locally by conserving a portion of the runoff which presently wastes to the ocean through Santa Margarita River. Under present conditions of land use and water supply development, waste to the ocean is estimated to average 25,200 acre-feet per season. The derivation of this value is illustrated on Plate 23, "Occurrence and Disposition of Mean Seasonal Runoff, in Santa Margarita River, Under Present Conditions of Development, 1953", which represents symbolically the origin of and uses made of discharge of Santa Margarita River water at the present time. Utilization of the presently wasted water will require the development of equalizing storage capacity either in ground water basins or in surface reservoirs, and construction of facilities to equitably distribute the water so conserved to areas of need. The approximate magnitude of such required storage and the degree of possible conservation by surface storage alone are illustrated on Plate 24, "Storage Development Curve for Santa Margarita River at Ysidora". The plate depicts the approximate relationship between storage capacity and yield of a reservoir on the lower Santa Margarita River, and the data presented thereon indicate that additional storage capacity of about 800 per cent of the mean seasonal natural runoff in Santa Margarita River at Ysidora or about 290,000 acre-feet would be required to completely conserve present waste to the ocean by such a reservoir. Under such conditions and taking into account reservoir evaporation losses, the increased net safe seasonal yield would be about 20,000 acre-feet.

Studies described in this chapter indicate that the local water which could be conserved by construction of a maximum of additional storage capacity would be insufficient to satisfy the ultimate supplemental water requirement, and that final solution of the water resources problems of the Santa Margarita River watershed lies in importation of water from outside sources.

As was stated in Chapter I, the Division of Water Resources has for the past several years conducted surveys and studies for the State Water Resources Board. The investigation has resulted in the formulation of The

California Water Plan for full conservation, control, and utilization of the State's water resources to meet present and future water needs for all beneficial purposes and uses in all parts of the State, insofar as practicable. Bulletin No. 3 of the State Water Resources Board entitled "Report on The California Water Plan", was issued in preliminary form in May, 1956, for comment by interested local agencies. In addition to plans for development of the water resources of the Santa Margarita River, which plans are based on studies conducted during this investigation, plans are also presented therein to satisfy the ultimate water requirements of the watershed in excess of the water made available by maximum practicable development of local supplies. Projects for importing water to the watershed under The California Water Plan are described in general terms in this chapter under the section entitled "The California Water Plan".

In general, the major features of The California Water Plan are large multipurpose projects requiring relatively large capital expenditures. Plans presented in this report for the further development of local supplies would be such that the works could be integrated into the major features of The California Water Plan.

Descriptions of various plans considered for local conservation of water supplies in the Santa Margarita River watershed, and for importing water from available sources outside the watershed, are presented in this chapter. Included therein are estimates of the amounts of supplemental water that would be made available by their adoption and construction, and an evaluation and comparison of the plans.

Design features of plans presented herein are necessarily of a preliminary nature and primarily for cost estimating purposes. More detailed investigation, which would be required in order to prepare construction plans and specifications, might result in designs differing in detail from those presented in this report. However, it is believed that such changes would not result in significant modifications in estimated costs. The capital costs of dams, reservoirs, diversion works, conduits, pumping plants, and appurtenances included in the considered conservation, conveyance, and distribution systems, were estimated from preliminary designs based largely on data from surveys made during the current investigation and the related State-Wide Water Resources Investigation. Approximate construction quantities were estimated from these preliminary designs. Unit prices of construction items were determined from recent bid data on projects similar to those under consideration or from manufacturers' cost lists, and are considered representative of prices prevailing in the spring of 1955. Estimates of capital costs include costs of dewatering and care of stream, acquisition of lands and rights of way, and construction, plus 10 per cent of the above costs for administration and engineering and 15 per cent for contingencies. Also included is interest during one-half of the estimated construction period at four per cent per annum. Estimates of annual costs include interest on the capital investment at 3½ per cent per annum, amortization over a 40-year period on a 3½ per cent sinking fund basis, operation and maintenance costs, and costs of electrical energy required for pumping, if applicable.

Plans for Local Conservation Development

As stated, a source of supplemental water exists in the waste to the ocean from the watershed which it is estimated would amount to about 25,000 acre-feet per season on the average over a mean period of water supply and climate with the present pattern of land use and water supply development.

Of this amount it is indicated that about 80 per cent or 20,000 acre-feet per season is probably the physical maximum that could be conserved. Further, it is indicated that something less than this amount could be salvaged for beneficial use.

Investigated methods by which a portion of the wasted water might be captured include direct diversion of surface runoff, increased development of ground water supplies, and storage of runoff in surface reservoirs. In the following paragraphs, the nature and extent of development by each of these methods are discussed.

Direct Diversion of Surface Streams

It is anticipated that major future water use in Santa Margarita River watershed will be for agriculture, as previously stated. Farming operations require large quantities of water in summer months, and little during the rainy season, the average peak demand of 14 per cent of the seasonal total occurring in July as set forth in Table 37. When such operations are dependent upon direct diversion from surface streams, the water supply available in the summer months is the limiting factor in determination of the amount of land which can be irrigated. From the stream discharge data depicted on the "Hydrographic Map", Plate 6, it is evident that there are few locations in the watershed where there was summer surface flow of 0.01 second-foot or more in 1953. With few exceptions these flows are already fully utilized.

The largest flow which could possibly be diverted is in Temecula Creek in Pauba Valley. Water rises in the Valley and increases in quantity to a discharge of slightly greater than four second-feet just above Temecula Canyon. Formerly this rising water was diverted by the Vail Company for irrigation, but the diversion was completely abandoned in 1930 in favor of pumping from ground water. The rising water has been adequate, except for one short period, to supply the flow of three second-feet necessary to satisfy provisions of the judgment in "Rancho Santa Margarita vs. Vail, et al.", referred to in Chapter IV. It is assumed that the Vail Company will continue to pump ground water and that it will allow the rising water to supply the required minimum flow under terms of the afore-mentioned judgment. Furthermore, water flowing through Temecula Canyon in the dry portion of the year is fully utilized, and any increased diversion in Pauba Valley at that time would not increase the water supply by drecreasing waste to the ocean but would merely shift the point of use.

A stream discharge of less than 0.5 second-foot occurs in the lower reaches of Murrieta Valley. This water could possibly be diverted, but it occurs on lands of the Vail Company and it is presumed, as above, that the Company will continue to allow this discharge to flow downstream. Of the remaining streams in the watershed, the largest has a critical summer discharge sufficient to irrigate only about 25 acres of alfalfa. In the light of these considerations, it is concluded that there is no surface stream in Santa Margarita River watershed susceptible of further development by direct diversion.

Further Development of Ground Water Storage

Certain of the ground water basins in the watershed are not now being exploited to their maximum potential, and with increased utilization thereof a portion of the present waste to the ocean could be salvaged.

As is indicated by the estimated usable ground water storage capacities of basins itemized in Table 15, some of the basins have large capacities and others are extremely small. Increased salvage of now wasted water by ground water storage can be effected only by increased extraction and use of ground water and consequent lowering of the water table during dry periods with increased replenishment during ensuing wet periods. Under conditions of operation of ground water basins for maximum yield, the storage of ground water changes from a maximum at the start of a critical dry period to a minimum at the end. Ground water yield equals the average seasonal change in storage plus average seasonal percolation to the basin during the critical period.

Generally speaking the small basins are limited in yield of ground water by their capacities and serve at best to regulate stream flow to the extent that winter runoff can be stored for use in the subsequent summer months. Since winter runoff is often extremely meager during dry periods, the safe seasonal yield of such ground water basins is likewise very small. On the other hand, the larger basins are generally limited in yield, not by their capacities, but by the amount of water which reaches the ground water by percolation from precipitation on the surface of the basin or from runoff from surrounding areas. In such large basins, the safe yields approach the long time mean percolation to the ground water.

As regards the small basins, possible increased yield over the present is herein considered negligible. It is recognized that in some cases operation of such basins in lieu of direct diversion from surface streams might improve local operating conditions, and through lowering of the water table might result in decreased losses to native vegetation. In considering an entire hydrographic unit, however, it is not believed that such changes would materially affect over-all consumptive use within or outflow from the unit.

Possible increased use of the larger basins has been studied in the light of the above considerations and results are discussed by hydrographic units in the following paragraphs.

Hydrographic Unit 1. This unit consists of the drainage area of Murrieta Creek and contains the following ground water basins: Diamond, Domenigoni, French, Los Alamos, Murrieta, Santa Gertrudis, and Wildomar. There are stringers of Recent alluvium, Qal, along stream valleys in addition to the pervious materials comprising the ground water basins, as herein defined, but otherwise the drainage area consists of about three-fourths igneous and metamorphic rocks, and one-fourth older alluvium, Qtca.

The estimated mean seasonal runoff in Murrieta Creek at the United States Geological Survey gaging station at Temecula is 8,630 acre-feet. This value is the average of measured flow at the station indicated, and correlations therewith, and it therefore takes into account the average effect of ground water development upstream from the gaging station during the period of record which started in 1930.

A number of the basins in this hydrographic unit are of small capacity and the ground water yield in them is probably limited by storage capacity. Other basins, however, have considerable size, the Recent alluvium of Murrieta Basin alone being estimated to have a usable capacity of 136,000 acre-feet. Considering the entire unit, it is believed that possible ground water yield is limited by percolation capacity rather than by storage capacity. It is estimated that maximum utilization of ground water in the entire unit would result in a mean seasonal increase of about 3,600 acre-feet in the amount percolating. Present outflow would thus be decreased and the yield from the unit increased by approximately that amount.

Coohuila Valley

Los Alamos Valley

Hydrographic Units 2 and 3. Some of the basins in these units are of sufficient capacity to store water in usable quantities throughout dry periods. However, the extremely complicated interrelationships between extractions from ground water in the numerous basins, direct diversions from surface streams, storage in Vail Reservoir, and the water rights problems attendant therewith, preclude the direct determination of possible increased yield from ground water sources. Considering, however, that the yield from Vail Reservoir is developed from runoff in Hydrographic Units 2 and 3, and that the average spill from that reservoir is estimated to be 3,100 acre-feet per year if the reservoir is operated on a safe yield basis, it is believed unlikely that more than 2,000 acre-feet of water in addition to the safe yield of the reservoir, could be developed within these units. There being no feasible surface storage sites available in these units, it is considered that such development would be by further exploitation of ground water supplies. Of the total, 500 acre-feet per season may be attributed to Hydrographic Unit 2 and 1,500 acre-feet to Hydrographic Unit 3.

Hydrographic Unit 4. Lands of the Vail Company encompass the major portion of Unit 4. The quantity of water which the Company is permitted to divert from surface flow or pump from the ground water in the Unit is limited by the stipulated judgment in "Rancho Santa Margarita vs Vail". After allotting minor quantities to a few intervenors in the suit the judgment provides that the Company may use on certain specified lands, either by surface diversion or by pumping from the ground water, one-third of the natural flow in Santa Margarita River at Ysidora Narrows, or at Temecula Canyon just below the confluence of Murrieta Creek and Temecula Creek, whichever is the greater. It is believed that the present operations of the Company are in close accord with the terms of the judgment, and although some increase in use by the Company might be permitted under the controlling provision that such use may at all times be at least one-half that diverted and used by Rancho Santa Margarita as determined by measurement, data presently available do not justify an assumption that present yield of local water can be materially increased in Unit 4.

Hydrographic Unit 5. Since ground water bodies in this unit are extremely small, no further increase in yield from ground water supplies is considered feasible.

Hydrographic Unit 6. Santa Margarita Coastal Basin is the only ground water basin in this hydrographic unit. As has been stated, the estimated usable storage capacity of the Basin, 24,000 acre-feet, is only partially utilized at present. Complete development of the basin by use of this entire capacity would result in an increase in ground water yield for the unit. To calculate the possible yield from the Basin it was assumed that percolation from Santa Margarita River in accordance with the percolation diagram, Plate 19, and direct percolation of rainfall and runoff from adjacent hills comprise the total supply available to the Basin. The critical dry period utilized in this study extends from April, 1947 through September, 1951. Estimated safe yield of the Basin under present conditions of supply, with extractions in accordance with the military demand schedule shown in Table 37, would have been 10,100 acre-feet per season. With extractions on an irrigation demand schedule, the corresponding safe yield is 9,700 acre-feet per year for the same period. These values may be compared with a present net extraction from the Basin of 4,000 acre-feet per season. Thus with maximum utilization of usable basin storage capacity, new water in the amounts of 6,100 and 5,700 acre-feet per season, respectively, would be developed by the foregoing operations. With increases or decreases in upstream use of water the foregoing values would be modified accordingly.

Further, continuance of the current drought period would also lower these values. In the foregoing calculations, no allowance was made for increased yield due to salvage of water presently used by phreatophytes. Some salvage of natural water losses by virtue of the lowered ground water levels under conditions of full operation of the Basin would undoubtedly occur but its amount has not been estimated. Any such salvage would increase the safe yield of the Basin by the amount of the salvage.

A seasonal total of 5,700 acre-feet of water could be pumped from the Basin to a regulatory reservoir on Camp Pendleton at elevation of 440 feet at a cost of about $11 per acre-foot. The cost estimate for the required facilities, comprising 8 wells, a booster pumping plant, conduit, and reservoir is presented in Appendix J, page J-32. Location of the facilities is shown on Plate 25.

Increased use of ground water in Hydrographic Units 1, 2, and 3 will result in less inflow to downstream Units. However, any decrease in flow in Temecula Canyon will be offset in part by a decrease in the use in Unit 4 permitted under the terms of the judgment previously referred to. Thus, even though the safe yield of the upstream units were fully developed, the decrease in flow to downstream units would be less than the 5,600 acre-feet set forth in the preceding paragraphs. Furthermore it is highly improbable that the estimated safe yields will be fully developed prior to the importation of water to the upstream units, if ever. The decrease in flow which is likely to occur within a reasonable period of time is relatively so small and so uncertain as to quantity that it is not herein considered in estimating the supplemental supply which must be developed by other means, although it does provide a safety factor. For the same reason the possible decrease in inflow is neglected in estimating the yield of downstream reservoirs and basins.

Other Means of Increasing Ground Water Supplies

Means of increasing ground water yields, other than the more intensive use of basins by lowering of water levels discussed above, have been considered. These include salvage of natural water losses along stream channels and in high water areas, use of reclaimed waters, and construction of a subsurface barrier to prevent intrusion of sea water to Santa Margarita Coastal Basin.

Large quantities of water are potentially salvageable from losses to water-loving vegetation, or phreatophytes. However, no effective economically feasible plan has as yet been evolved to control such waste except for that portion which may be conserved by lowering of ground water levels under planned basin operation. In this report no evaluation of this source of water has been made.

Reclamation of sewage which would waste to the ocean or otherwise be lost to the watershed is a potential source of supplemental water supply. Sewage treatment plant effluent of usable quality which is returned to a ground water basin adds directly to the supply available for extraction from the basin. Unlimited sewage reclamation may, however, introduce a salt balance problem.

In the Santa Margarita River watershed, the only sewered areas are located within the community of Fallbrook, the Naval Ammunition Depot, and Camp Pendleton. Sewage from Fallbrook and the Naval Ammunition Depot returns to Fallbrook Creek after treatment and reaches Santa Margarita Coastal Basin via O'Neill Lake. Some of the Camp Pendleton treatment plant effluent returns to the Basin and the remainder flows directly to the ocean. Details of the sewerage systems are discussed in the Chapter II section on exports, and the disposition of sewage is shown symbolically on Plate 23. It is assumed that the limited upstream urban development projected for future conditions, as discussed in the Chapter III section on land use, would either be unsewered or sewage treatment plant effluent would be returned to natural water courses and not to the ocean or otherwise transported outside the watershed. Under present and probable future conditions, therefore, Camp Pendleton is believed to be the only large source for reclamation of water from sewage which might otherwise waste directly to the ocean.

It should be noted, however, that not all of the effluent which might percolate into a basin could be considered as salvage on a safe yield basis. Safe yield of a basin could be augmented by such percolate to the extent of the average amount of percolation during the critical dry period, but any water spread in the basin during a wet period is entirely lost if the supply from other sources alone would fillthe basin. Such loss would occur either through transpiration by phyreatophytes, under high water level conditions which would prevail at such times, or by earlier filling of the basin and consequent increased waste to the ocean in a succeeding wet season or seasons. Under the present mode of operation of Santa Margarita Coastal Basin, it is unlikely that increased spreading of reclaimed water would result in increased ground water yield, but if the available storage capacity of the Basin were more fully developed, or if dams and reservoirs described later in this chapter were constructed upstream and the supply to the Basin thus decreased, salvage of sewage would result in an increase in the available water supply.

Treated sewage may also be salvaged by direct use. Conservation by this means has been practiced since July, 1952, on Camp Pendleton by irrigation of a golf course which is located in the San Luis Rey River watershed.

Ground water basins close to the coast are generally limited in yield by the severe restriction that ground water levels cannot be allowed to decline below sea level, except for very limited periods of time, without subjecting the basins to damage by intrusion of sea water. Immediately adjacent to the coast below Ysidora Narrows on Santa Margarita River, sea water moves inland during dry years and retracts in following wet years. As discussed in the water quality section of Chapter II, such intrusion probably extended as far inland as well 11S/5W-2E1 in 1951.

In the watershed, only Santa Margarita Coastal Basin is near the coast, and in this Basin the storage capacity is restricted largely by the sea level limitation. A barrier to sea water in this Basin would increase the usable capacity by about 13,500 acre-feet, if it is assumed that only the basin fill from 10 feet to 100 feet below ground surface is usable. This additional capacity would increase the safe seasonal yield of the Basin under present conditions of upstream development and with military demand, from a total of 10,100 acre-feet to 12,400 acre-feet, or a net increase of 2,300 acre-feet. Construction of a sea-water barrier at Ysidora Narrows would, therefore, be a desirable project if feasible from economic and engineering standpoints.

Underground barriers of the puddled clay cutoff wall type have been constructed to a depth of 60 feet by the United States Army Corps of Engineers at Pasco-Kennewick, Washington, as part of the McNary Dam project on the Columbia River. At Wilmington, California, over 18,000 lineal feet of 3-foot wide clay cutoff walls ranging from 15 to 45 feet in depth below land surface were installed on Union Pacific Railroad property in 1950. In the same area, shorter walls were constructed on properties of Southern California Edison Company and General Petroleum Corporation.

The narrow canyon at Ysidora Narrows appears to be an ideal location for construction of such a barrier. Depth of permeable materials on the order of 180 to 200 feet at the Narrows would require development of construction techniques of mixing and placing of backfill, but preliminary estimates based on experience gained from the projects mentioned above indicate that an impervious cutoff wall could be constructed at this location for a total maximum cost of about $275,000.

Assuming that the barrier would have perpetual life with no maintenance required and that the real cost of money to the Government is five per cent, the estimated cost of increasing the yield by 2,300 acre-feet would be $6 per acre-foot. This is considerably less than the cost required to develop the same additional yield by means of a surface reservoir. It is emphasized that construction of such a barrier would be of an experimental nature, but the relatively low cost, should it prove engineeringly feasible, would indicate that it merits further consideration.

Surface Storage Projects

Construction of dams in Santa Margarita River watershed for water conservation purposes has been under consideration for many years. The four principal sites studied in the past are located on Temecula Creek at Nigger Canyon and on Santa Margarita River at Temecula Canyon, Fallbrook, and De Luz. Of these sites, construction has been undertaken only at Nigger Canyon, where Vail Dam and Reservoir were completed in 1949. The location of this reservoir and other existing and proposed water supply facilities discussed in this section are presented on Plate 25, "Potential Water Supply Development".

In 1947, Commander G. E. Fischer, United States Navy, reported on "The Proposed Reservoir Developments on Temecula-Santa Margarita River", wherein he discussed the effects of such projects on relationships between Vail Company and the Navy with respect to water rights on the River and the stipulated judgment in the litigation "Rancho Santa Margarita vs. Vail, et al." Preliminary studies of reservoir sites in the vicinity of Fallbrook were made by the Division of Water Resources in 1948, the work being discontinued in 1949 when the United States Army Corps of Engineers undertook a comprehensive flood control investigation of the Santa Margarita River, including studies of the four afore-mentioned sites.

In the course of the investigation herein reported upon, studies were made of dams and reservoirs at all major dam sites considered feasible of construction, and preliminary studies were made of several smaller sites. Seasonal yields were estimated for present conditions of development on the River upstream for each site and cost estimates were made for the various dams and reservoirs considered. Present water rights or water right applications were not considered as limitations on maximum size of reservoirs in these estimates, because the objective of the studies was to determine the most feasible method of development of water resources regardless of possible legal restrictions or differences which could better be resolved at a later date in the light of physical facts developed herein.

In calculations of net safe seasonal yield of surface reservoir developments presented herein, present development upstream from the considered reservoirs was accounted for in the derivation of inflow to the reservoirs (Table I-2), which reservoirs were all located on the "lower river", defined as the section of Santa Margarita River including and extending downstream from Diversion 9S/3W-7D1 of Fallbrook Public Utility District.

Present development on the lower river was accounted for in determining net safe seasonal yield or "new water" for each considered development. For each reservoir capacity considered the net safe seasonal yield was taken as the difference between the calculated gross seasonal yield of the reservoir, operated without regard to present supplies of existing water supply developments and the reduction in the safe supplies of such developments resulting from operation of the considered reservoir.

Presently developed firm water supplies in the lower river amount to 5,700 acre-feet per season, comprising the yield of 4,000 acre-feet from Santa Margarita Coastal Basin, 1,200 acre-feet diversion by Fallbrook Public Utility District, and 100 acre-feet diversion by the Naval Ammunition Depot. In addition there is a consumptive use of 400 acre-feet representing annual evaporation from O'Neill Lake. A further criteria in the determination of net safe yield or new water developed by a given reservoir was that the ground water levels in Santa Margarita Coastal Basin would fluctuate over the same range as under present conditions, and that a reservoir would not be credited for new water developed by greater utilization of the storage capacity of the basin.

In succeeding paragraphs, results of yield studies and dam and reservoir cost estimates are presented for two sites on the Santa Margarita River in the vicinity of Fallbrook, for the De Luz site on Santa Margarita River, and for Upper De Luz site on De Luz Creek. A number of minor sites are also considered. Yield studies were made for capacities with and without silt allowance, and the average of the two determinations is the yield presented herein for each reservoir considered. The allowance made for reduction in effective reservoir storage capacity due to sedimentation represents the loss after 50 years of operation estimated to be 0.8 per cent by volume of the reservoir inflow for that period. Demand for the Fallbrook Lippincott and Fallbrook Border reservoirs was distributed in accordance with historical data for Fallbrook Public Utility District presented in Table 37, the October-March and April-September demands being 33 and 67 per cent of the seasonal total, respectively. Demand at the Upper De Luz Reservoir was distributed in accordance with historical data for Camp Pendleton military use presented in Table 37, the October-March and April-September demands being 45 and 55 per cent of the seasonal total, respectively. Demand at the De Luz reservoirs was approximately that which would result from delivery of 60 per cent of the yield on a military basis and 40 per cent on an agricultural basis, the October-March and April-September demands being 40 and 60 per cent of the seasonal total, respectively. Estimated mean seasonal precipitation at each site was distributed semi-seasonally in accordance with precipitation at the key stations for which indices of wetness are presented in Table 4. An estimated average gross seasonal depth of evaporation from the reservoir water surface of four feet was distributed as follows:

Period	Net evaporation in feet depth
October - March	1.12
April - September	2.88
TOTAL	4.00

A factor which must be recognized in considering construction of the dams and reservoirs discussed herein is the probable occurrence of droughts more severe than those within the period of recorded hydrologic data. There is ample evidence that the southern portion of California has experienced much longer sequences of consecutive dry years than the droughts of the 20th century. The prospective recurrence of such periods lends some uncertainty to the yield estimates of any proposed water conservation project in this part of the State. The larger the reservoir, with the attendant longer carry-over period, the greater is the inherent uncertainty as to the probable yield therefrom. Of significance in this regard is the current and continuing drought now being experienced in southern California. Continuation of the drought period would tend to lower any estimates of yield presented hereinafter.

Another factor which should be taken into consideration in planning for reservoir construction in the southern part of the State, is the lapse of time after such construction prior to the time any benefit would be realized therefrom. This results from the apparent cyclic occurrence of the runoff in California streams previously described. If a reservoir were to be constructed at the beginning of a long drought period little value would be received until an ensuing wet period or possibly 18 years or longer. Thus it is apparent under such conditions that planning for local water resource development must be intiated many years in advance of actual need.

<u>Fallbrook Lippincott Dam and Reservoir</u>. The Fallbrook Lippincott dam site is located on Santa Margarita River about 600 feet below its confluence with Sandia Creek in the NE 1/4 of Section 12, T. 9 S., R. 4 W., and the NW 1/4 of Section 7, T. 9 S., R. 3 W., S.B.B.&M., and about two miles north of Fallbrook. Stream bed elevation at the site is about 314 feet, United States Geological Survey datum. The drainage area of Santa Margarita River above the dam site comprises about 645 square miles, which produced an estimated average natural seasonal runoff of 27,300 acre-feet during the 48-year mean period, 1895-96 through 1942-43. Corresponding estimated mean seasonal runoff is 21,600 acre-feet under present upstream conditions

including the average diversion by Fallbrook Public Utility District and Naval Ammunition Depot of 1,300 acre-feet per season. Precipitation at the site is estimated to average 1.46 feet in depth seasonally.

Two sizes of dam and reservoir were considered at this site, a dam of 168 feet in height, which would store 35,000 acre-feet of water, and a dam 211 feet high with a storage capacity of 65,000 acre-feet.

This dam site was mapped in April 1955, by the Division of Water Resources up to an elevation of 560 feet on the right abutment and 600 feet on the left abutment at a scale of 1" = 100' with a 10-foot contour interval (See Plate 26).

The geology of the site was studied by F. L. Ransome in 1928, and by J. F. Mann, Jr., in 1951. During the course of the present investigation, geologists of the Division of Water Resources examined the site and reviewed the prior geologic reports. Based on such preliminary geological reconnaissance, this dam site is considered suitable for a properly constructed earthfill or concrete dam up to a maximum height of about 220 feet, which appears to be about the upper limit for the site from a topographic standpoint.

A fairly hard fresh coarse-grained granitic rock is well exposed over both abutments. This area has been intruded by basic dikes and some are found just downstream from the axis, while at a distance of a few hundred feet downstream considerable areas of dioritic material are exposed. About 300 feet downstream from the axis is an old shear zone cutting across the channel. It appears to be a shear along the contact between schist and granite and has been healed at various times by dioritic and granitic dikes. Grout would be required to seal this zone.

The right abutment is moderately steep with numerous granite outcrops. Rock appears to be uniform, though strongly jointed, thereby necessitating the removal, for a concrete gravity dam, of about two feet of loose soil and rock and 15 feet of blocky weathered granite. For an earthfill dam the removal of the loose soil and about five feet of the granite would be required. Approximately 10 feet of unconsolidated material would have to be removed from the channel. The left abutment is very steep and uniform in slope. Stripping required there for a concrete gravity dam is estimated to be two feet of loose rock and soil and an average of 15 feet of broken rock. For an earthfill dam about two feet of loose soil and rock and an average of five feet of broken rock would have to be removed.

The small saddle, or notch, located beyond the right abutment is formed by a stringer of soft schist which appears to be sheared and cut by thin dikes. This material is soft and weathered, and extends to considerable depth. Location of the spillway there would require heavy protection.

Reservoir areas and capacities at various stages of water surface elevation, estimated from United States Geological Survey maps at a scale of 1:24,000 with a 20-foot contour interval, are presented in Table 42.

TABLE 42

AREAS AND CAPACITIES OF
FALLBROOK LIPPINCOTT RESERVOIR

Depth of water at dam, in feet	Water surface elevation, U.S.G.S. datum, in feet	Water surface area, in acres	Storage capacity, in acre-feet
0	314	0	0
6	320	6	18
26	340	74	820
46	360	130	2,860
66	380	190	6,060
86	400	260	10,600
106	420	370	16,900
126	440	480	25,400
143	457	590	35,000
146	460	610	36,300
166	480	770	50,100
183	497	960	65,000
186	500	980	67,600
206	520	1,200	89,400
226	540	1,420	116,000
246	560	1,650	146,000

Based on measurements and estimates of runoff during the period 1894-95 through 1952-53, yield studies were made for reservoir storage capacities at the Fallbrook Lippincott site of 35,000 acre-feet and 65,000 acre-feet. Estimated inflows to the reservoirs were based on values of measured runoff at the United States Geological Survey stream gaging station on Santa Margarita River near Fallbrook plus historic diversions by Fallbrook Public Utility District. The semiseasonal values so estimated are presented in Appendix I, Table I-2. In the reservoir yield studies, an allowance was made for reduction in effective reservoir storage capacity due to sedimentation in the amount of 8,700 acre-feet.

Results of studies covering the conjunctive operation of Fallbrook Lippincott Reservoir and Santa Margarita Coastal Basin during the most critical dry period, April, 1895, through September, 1904, are presented in Table 43. For purpose of illustration, the semiannual yield study for the 65,000 acre-foot reservoir is presented in Appendix I, Table I-1.

TABLE 43

ESTIMATED NET SAFE SEASONAL YIELD
OF FALLBROOK LIPPINCOTT RESERVOIR

In Acre-Feet

Reservoir size	Critical dry period	Gross seasonal yield	Reduction in yield of present water supply development	Net safe seasonal yield
35,000	April, 1895 through September, 1904	9,100	4,000	5,100
65,000	April, 1895 through September, 1904	11,600	4,000	7,600

The net safe seasonal yields of the 35,000 and 65,000 acre-foot reservoirs, calculated in accordance with the discussion preceding this section, would be 5,100 and 7,600 acre-feet, respectively. New water developed by construction of the reservoir could be utilized by either diversion at the reservoir or by pumping from Santa Margarita Coastal Basin after release from the reservoir.

Estimates of cost were prepared for dams at this site with heights of 168 feet and 211 feet from stream bed to crest, which, as stated, would create reservoirs with capacities of 35,000 and 65,000 acre-feet, respectively. For both heights of dam, a rolled fill structure was contemplated, comprising an impervious core of select earth material and upstream and downstream sections of pervious material. Preliminary calculations indicate that costs of concrete gravity dams would be approximately twice those of comparable earthfill structures. Both upstream and downstream slopes of the dam would be 2.5:1 for the dam of 168-foot height and 3:1 for the dam of 211-foot height. The impervious section would have an upstream and downstream slope of 0.8:1. Crest widths would be 30 feet, comprising a 10-foot width for the impervious core and 10-foot width each for the upstream and downstream pervious sections. The upstream face of the dam would be protected against wave action by rock riprap placed to a depth of three feet normal to the slope. For the dam with a capacity of 65,000 acre-feet an auxiliary dam similar to the main dam in all respects save height, would be located in the previously mentioned saddle westerly of the main dam.

For purposes of the cost estimates, it was assumed that under the impervious core a depth of 10 feet of sand and gravel would be stripped in the channel, and that seven feet of soil and broken rock would be removed from the abutments. For the pervious section of the dam, it was assumed that stripping of loose surface material and vegetation to a depth of three feet only would be necessary.

Earth materials adequate in quantity and quality for the impervious section of the dam occur in terraces within two miles upstream from the site. However, more detailed study of the materials from this area would be required to select specific borrow areas and to determine the character of the materials, in detail, prior to the preparation of final plans and specifications. Stream bed sands and gravel and materials salvaged from foundation and spillway excavation would be suitable for the outer pervious zones. It was assumed that the granite of the immediate area would be quarried for riprap although it might be possible to salvage sufficient rock from spillway excavation. It was further assumed that compaction of fill material in both the impervious and pervious sections of the dam would be effected by either sheepsfoot or pneumatic rollers, and that moderate grouting would be necessary to prevent minor leakage in the foundation and abutments.

The estimated peak inflow of a once in one thousand year flood at this site is 142,000 second-feet. The routed peak reservoir outflows were 136,000 and 130,000 second-feet for dams with reservoir capacities of 35,000 acre-feet and 65,000 acre-feet, respectively. Spillways were designed as concrete-lined overpour chutes with ogee weir control sections. The maximum depth of water above the spillway lip would be about 20 feet for the smaller dam and about 23 feet for the larger dam and an additional five feet residual freeboard was planned for both. The spillway weir for the smaller dam would be located partly in the saddle and partly in the nose of the right abutment between the saddle and main dam. The spillway chute would be excavated across the right abutment and would discharge into Santa Margarita River downstream from the toe of the dam. For the larger dam the previously described earthfill dike would be built in the saddle, the spillway would be located on the nose of the right abutment between the dike and the main dam, and the spillway chute would be excavated across the abutment.

It was estimated that the dam of 168-foot height could be constructed in two years and the higher dam would require three years. It was assumed that during construction, diversion of the summer flows in Santa Margarita River would be effected through the outlet works, and that winter flows would pass through an uncompleted portion of the dams in the channel section.

The outlet works intake structure located at the upstream toe near the left abutment would be a short submerged concrete tower, with steel trash rack at the entrance. A concrete pressure conduit beneath either dam would extend from the intake structure to the valve chamber located upstream from the axis of the dam. A high pressure slide gate would be installed within the valve chamber, and a reinforced concrete culvert, varying in diameter depending upon the capacity of the reservoir, would extend from the valve chamber to a control valve house at the downstream toe of the dam. A steel pipe supported on cradles would extend through the culvert from the valve chamber to the control valve house, where a bifurcation structure would be located, permitting the discharge of water to either Santa Margarita River or to a possible pumping plant and conduit for the Fallbrook area. Downstream releases would be controlled by a Howell-Bunger valve, and a needle valve would control releases to the conduit.

Lands within the Fallbrook Lippincott Reservoir area are held in private ownership. The cost of acquisition of these lands was estimated on a preliminary basis by the Division of Water Resources during the investigation. It was estimated that about 580 acres and 960 acres of clearing would be required for the reservoirs with capacities of 35,000 and 65,000 acre-feet, respectively. The existing diversion works of the Fallbrook Public Utility District, located about 1,500 feet upstream from the site, would be submerged together with portions of minor county roads which lie within the reservoir areas.

Presented in Table 44 are pertinent data with respect to general features, and capital and annual costs of the dams and reservoirs. Detailed estimates of safe yield and cost of dams and reservoirs are included in Appendixes I and J, respectively. For illustrative purposes, a plan, profile, and section of the dam creating a reservoir with storage capacity of 65,000 acre-feet are shown on Plate 26, entitled "Fallbrook Lippincott Dam on Santa Margarita River".

TABLE 44

GENERAL FEATURES OF TWO SIZES OF DAM AND RESERVOIR AT THE FALLBROOK LIPPINCOTT SITE ON SANTA MARGARITA RIVER

Characteristics of Site
Drainage area--645 square miles
Estimated mean seasonal runoff--21,800 acre-feet
Estimated mean gross seasonal depth of evaporation--4.00 feet
Estimated mean seasonal depth of precipitation--1.46 feet
Estimated sedimentation--8,700 acre-feet
Elevation of stream bed, U.S.G.S. datum--314 feet

	Gross reservoir storage capacity, in acre-feet	
	35,000	65,000
Earthfill Dam		
Crest elevation, in feet, U.S.G.S. datum	482	525
Crest length, in feet	695	870
Crest width, in feet	30	30
Height, spillway lip above stream bed, in feet	143	183
Side slopes, upstream and downstream	2.5:1	3:1
Freeboard, above spillway lip, in feet	25	28
Volume of fill, in cubic yards	1,166,000	2,518,000
Reservoir		
Surface area at spillway lip, in acres	580	960
Net storage capacity at spillway lip, in acre-feet	26,300	56,300
Type of spillway	Ogee weir and concrete lined chute	
Spillway discharge capacity, in second-feet	136,000	130,400
Type of outlet	42-inch diameter steel pipe beneath dam	54-inch diameter steel pipe beneath dam
Estimated net safe seasonal yield, in acre-feet	5,100	7,600
Capital Costs		
Dam and reservoir	$3,043,000	$4,823,000
Per acre-foot of storage	87	74
Per acre-foot of net safe yield	597	635
Annual Costs		
Dam and reservoir	$ 148,500	$ 235,400
Per acre-foot of net safe yield	29.10	31.00
Per acre-foot of incremental net safe yield	--	34.80

Fallbrook Border Dam and Reservoir. The Fallbrook Border dam site is located on Santa Margarita River about one and one-quarter miles north of Fallbrook and about 250 feet west of the eastern boundary of Camp Pendleton Naval Reservation, on the boundary between Sections 12 and 13, Township 9 South, Range 4 West, S.B.B.&M. The drainage area of Santa Margarita River above the site comprises about 647 square miles. Runoff at the site was assumed equal to that measured at the Fallbrook gaging station a short distance upstream, which produced an estimated average natural seasonal runoff of 27,300 acre-feet during the 48-year mean period 1895-96 through 1942-43. Corresponding estimated mean seasonal runoff is 21,600 acre-feet under present conditions, assuming that present diversions by Fallbrook Public Utility District were not made. Precipitation at the site is estimated to average 1.46 feet depth seasonally. Three sizes of dam and reservoir were considered at this site, dams of 223, 273, and 288 feet in height with reservoir storage capacities of 65,000, 125,000, and 150,000 acre-feet, respectively.

The Fallbrook Border dam site was mapped up to an elevation of 650 feet on both abutments in June, 1947, by the United States Department of the Interior, Bureau of Reclamation, at a scale of 1" = 50' with a 10-foot contour interval.

The geology of the site was studied by F. L. Ransome in 1928, and by the United States Army Corps of Engineers in 1949. During the course of the present investigation, geologists from the Division of Water Resources examined the site and reviewed the prior geologic reports. Based on such preliminary geologic reconnaissance, the Fallbrook Boarder dam site is considered suitable for a properly constructed earthfill, rockfill, or concrete dam.

The site is located in a rather extended narrows in the canyon of the Santa Margarita River. The canyon sides here are moderately uniform in contour but are cut by several ravines. The rock on both abutments is a granitic type, probably principally a granodiorite. In addition, some zones of dark, fine-grained material of probable dioritic composition are present. The rock is moderately jointed but no shears of any appreciable magnitude were noted.

The left abutment slopes about 40° to approximately 100 feet above stream bed. Prominent joints on this abutment include systems having the following attitudes: strike north 65° west, dip 70° northeast; strike north 45° east, dip 80° northwest. A thin cover of soil supports a heavy growth of brush on this north facing abutment. The right abutment slopes generally about 40° to an abandoned road at an elevation of about 120 feet above stream bed, although locally the slope is as steep as 55°. Above the road, the slope averages about 35°. Stripping required for a concrete dam is estimated to be one to two feet of soil plus about 30 feet of fractured and weathered rock on both abutments. Required stripping under the impervious section of an earthfill or rockfill dam is estimated to be one to two feet of soil and about 10 feet of fractured and weathered bedrock. In the approximately 200-foot wide channel, it is estimated that about 12 feet of sand and gravel plus about five feet of rock for a concrete structure, and somewhat less rock for an earthfill or rockfill dam, would have to be removed. Grouting required at the site is believed to be moderate.

Reservoir areas and capacities for various heights of dam were derived from United States Geological Survey topographic quadrangle sheets at a scale of 1:24,000 and with 20-foot contour interval. The values so determined are presented in Table 45.

TABLE 45

AREAS AND CAPACITIES OF
FALLBROOK BORDER RESERVOIR

Depth of water at dam, in feet	Water surface elevation, U.S.G.S. datum, in feet	Water surface area, in acres	Storage capacity, in acre-feet
0	277	0	0
23	300	23	260
43	320	73	1,220
63	340	160	3,550
83	360	230	7,450
103	380	300	12,700
123	400	390	19,600
143	420	520	28,700
163	440	650	40,400
183	460	790	54,800
195	472	900	65,000
203	480	980	72,500
223	500	1,210	94,400
243	520	1,460	121,000
246	523	1,490	125,000
261	538	1,660	150,000
263	540	1,700	153,000

Based on measurements and estimates of runoff during the period 1894-95 through 1952-53, yield studies were made for reservoir storage capacities at the Fallbrook Border site of 65,000, 125,000, and 150,000 acre-feet. Estimated inflows to the reservoirs were based on values of measured runoff at the United States Geological Survey stream gaging station on Santa Margarita River near Fallbrook, plus historic diversions by Fallbrook Public Utility District. The semiseasonal values so estimated are presented in Appendix I, Table I-2.

In the reservoir yield studies, an allowance was made for reduction in effective reservoir storage capacity due to sedimentation in the amount of 8,700 acre-feet. Results of yield studies for the considered capacities of Fallbrook Border Reservoir for the critical dry periods April, 1895, through September, 1904, and April, 1895 through September, 1914, depending upon size of reservoir, are presented in Table 46. Assumptions as to operation of the reservoir and method of determination of net safe yield are identical with those set forth in the discussion of Fallbrook Lippincott Reservoir, and comments relative to the operation of that reservoir are equally applicable here.

TABLE 46

ESTIMATED NET SAFE SEASONAL YIELD
OF FALLBROOK BORDER RESERVOIR

In Acre-Feet

Reservoir size	Critical dry period	Gross seasonal yield	Reduction in yield of present water supply development	Net safe seasonal yield
65,000	April, 1895 through September, 1904	11,600	4,000	7,600
125,000	April, 1895 through September, 1914	14,700	2,000	12,700
150,000	April, 1895 through September, 1914	15,700	1,200	14,500

There is an apparent anomaly indicated in Table 46, wherein it appears that a lesser effect on the yield of present water supply development is obtained with increasing capacity of reservoir. This results from the difference in length of critical periods for the 125,000 and 150,000 acre-foot surface developments and the 6,000 acre-foot capacity underground reservoir in Santa Margarita Coastal Basin. The conjunctive operation of the surface and underground facilities in this instance enhances somewhat the utility of both.

Estimates of cost were prepared for dams at this site with heights of 223 feet, 273 feet, and 288 feet from stream bed to crest. For all dams, a rolled fill structure was contemplated, comprising an impervious core of select earth material and upstream and downstream sections of pervious material. Preliminary cost estimates of concrete gravity dams of comparable size indicated that earthfill dams would be considerably less expensive. Upstream and downstream slopes would be 3:1 for the smallest dam, 3-1/4:1 for the dam of intermediate size, and 3-1/2:1 for the largest dam. The impervious section of all dams would have upstream and downstream slopes of 0.8:1. Crest width would be 30 feet, comprising a 10-foot width for the impervious core and 10-foot width each for the upstream and downstream pervious sections. The upstream face of the dam would be protected against wave action by rock riprap placed to a depth of three feet normal to the slope.

For purposes of the cost estimates, it was assumed that under the impervious section an average depth of 12 feet of sand and gravel plus 5 feet of rock would be stripped in the channel, and depths of 2 feet of soil and 10 feet of fractured and weathered bedrock would be removed from the abutments. For the pervious sections, a nominal depth of stripping of 2 feet was assumed throughout the contact area.

Earth materials considered suitable for the impervious section of the dam occur in terraces upstream from the dam. However, more detailed study of these materials would be required prior to the preparation of final plans and specifications. Pervious materials are available in the channel and in nearby terraces. It was assumed that 85 per cent of the impervious core stripping and spillway excavation could be salvaged for use in the pervious section of the dam, and that riprap for the dam could be salvaged from the spillway excavation or quarried nearby. It was also assumed that compaction of the impervious section of the dam would be effected by either sheepsfoot or pneumatic rollers, and that pneumatic rollers would be used to compact the pervious sections. Moderate grouting would be necessary to prevent minor leakage in the foundation and abutments.

The estimated peak inflow of a once in 1,000 year flood is 142,000 second-feet, the same as that estimated for the Fallbrook Lippincott site about one mile upstream. The routed peak reservoir outflows were 129,000 second-feet for the reservoir with capacity of 65,000 acre-feet and 128,000 second-feet for reservoirs with capacities of 125,000 acre-feet, and 150,000 acre-feet. Concrete-lined spillways would be of the side channel type, located on the right abutment of the dam and would discharge through concrete-lined chutes into the Santa Margarita River about 150 feet below the dam. The maximum depth of water over the spillway would be 22 feet for the 65,000 acre-foot reservoir, and 21 feet for the 125,000 acre-foot and 150,000 acre-foot reservoirs, and an additional six feet of residual free-board would be provided.

It was estimated that the smaller dam at the Border site could be constructed in three years and the larger dams in four years each. During construction, summer flow would be diverted through the outlet conduit while diversion of winter flows would be effected through an uncompleted portion of the dam in the channel section.

The outlet works intake structure located at the upstream toe near the left abutment would be a short submerged concrete tower with steel trash rack at the entrance. A concrete pressure conduit beneath each dam considered would extend from the intake structure to the valve chamber, located somewhat upstream from the axis of the dam. A high pressure slide gate would be installed within the valve chamber, and a reinforced concrete culvert, varying in diameter depending upon the capacity of the reservoir, would extend from the valve chamber to a control valve house at the downstream toe of the dam. A steel pipe supported on cradles would extend through the culvert from the valve chamber to the control valve house where a bifurcation structure would be located permitting discharge of water to either Santa Margarita River or to a possible pumping plant and conduit for the Fallbrook area. Downstream releases would be controlled by a Howell-Bunger valve, and a needle valve would control releases to the conduit.

Most of this dam site is on the Naval Reservation, but nearly all the reservoir area is held in private ownership; estimates for acquiring these lands were made during this investigation. It was estimated that clearing of about 900, 1,250, and 1,660 acres of land would be required for the three sizes of dam considered. Costs of construction of about one mile of access road to the crest of dam and necessary relocation of county roads within the reservoir area, depending on the height of dam considered, were included in the estimates.

Presented in Table 47 are pertinent data with respect to general features and capital and annual costs of the dams and reservoirs considered at this site. Detailed estimates of cost are included in Appendix J.

TABLE 47

GENERAL FEATURES OF THREE SIZES OF DAM AND RESERVOIR AT THE FALLBROOK BORDER SITE ON SANTA MARGARITA RIVER

Characteristics of Site
Drainage area--647 square miles
Estimated mean seasonal runoff--21,800 acre-feet
Estimated mean gross seasonal depth of evaporation--4.00 feet
Estimated mean seasonal precipitation--1.46 feet
Estimated sedimentation--8,700 acre-feet
Elevation of stream bed, U.S.G.S. datum--277 feet

	Gross reservoir storage capacity, in acre-feet		
	65,000	125,000	150,000
Earthfill Dam			
Crest elevation, in feet, U.S.G.S. datum	500	550	565
Crest length, in feet	720	870	920
Crest width, in feet	30	30	30
Height, spillway lip above stream bed, in feet	195	246	261
Side slopes, upstream and downstream	3:1	3.25:1	3.5:1
Freeboard, above spillway lip, in feet	28	27	27
Volume of fill, in cubic yards	2,041,000	3,522,000	5,300,000
Reservoir			
Surface area at spillway lip, in acres	900	1,250	1,660
Net storage capacity at spillway lip, in acre-feet	56,300	116,300	141,300
Type of spillway	Side channel	Side channel	Side channel
Spillway discharge capacity, in second-feet	129,000	128,000	128,000
Type of outlet	54-inch diameter steel pipe beneath dam	72-inch diameter steel pipe beneath dam	72-inch diameter steel pipe beneath dam
Estimated net safe seasonal yield, in acre-feet	7,600	12,700	14,500
Capital Costs			
Dam and reservoir	$5,964,000	$9,121,000	$11,150,000
Per acre-foot of storage	92	73	74
Per acre-foot of net safe yield	785	718	769
Annual Costs			
Dam and reservoir	$ 288,300	$ 441,100	$ 537,600
Per acre-foot of net safe yield	37.90	34.70	37.10
Per acre-foot of incremental net safe yield	--	30.00	53.60

De Luz Dam and Reservoir. The De Luz dam site is located on Santa Margarita River within Camp Pendleton Naval Reservation about one-quarter mile south of its confluence with De Luz Creek, a principal tributary, in Section 32, Township 9 South, Range 4 West, S.B.B.&M. Santa Margarita Road, paralleling Santa Margarita River, passes along the left abutment of the dam site and traverses a portion of the reservoir area.

From its 1949 flood control investigation on Santa Margarita River, the United States Army Corps of Engineers concluded that no project for flood control only could be justified, but that a multiple-purpose project for both water conservation and flood control at the De Luz site would be economically feasible. Congress in 1954 passed a bill for construction of a dam at this site to be constructed by the United States Department of the Interior, Bureau of Reclamation, the yield of which would be divided into a 60-40 proportion between the United States Navy and Fallbrook Public Utility District. The bill also authorized the Secretary of the Army, through the Chief of the Corps of Engineers, to utilize for purposes of flood control such portion of the capacity of the reservoir "as may be available therefor". No funds have been appropriated by Congress for construction of the dam, and construction is contingent upon certain determinations by the Secretary of the Interior. This legislation was briefly reviewed in Chapter IV of this report, and because of the above restrictions in the bill it was concluded that construction of the reservoir is uncertain and may depend upon final outcome of the legislation, United States vs. Fallbrook Public Utility District, et al.

The drainage area of Santa Margarita River above the De Luz dam site comprises about 700 square miles and produced an estimated average seasonal natural runoff during the 48-year mean period, 1895-96 through

1942-43, of about 37,000 acre-feet. Corresponding runoff is 31,500 acre-feet under present conditions without deducting present diversions by Fallbrook Public Utility District and the Fallbrook Naval Ammunition Depot. Precipitation at the site is estimated to average 1.30 feet depth seasonally.

In this investigation four sizes of dams and reservoirs were considered at the De Luz site. All reservoir capacity was assumed to be used for water conservation purposes only, but as previously indicated in discussion of flood control possibilities, it is recognized that flood control storage could be provided in addition to water conservation storage. The dams considered would be 145, 170, 209, and 230 feet in height from stream bed to crest, with reservoir capacities of 50,000, 75,000, 143,000, and 188,000 acre-feet, respectively.

The De Luz dam site was mapped up to an elevation of 610 feet on the right abutment and to an elevation of 470 feet on the left abutment in October, 1951, by the Corps of Engineers, U. S. Army, at a scale of 1" = 200' with 10-foot contour interval.

The geology of the site was studied by Rancho Santa Margarita, Incorporated, in 1934, and by the Corps of Engineers in 1948, the work done including trenching, subsurface foundation exploration, and sampling and testing of potential borrow areas for select earth materials. Reports on the studies were reviewed by geologists from the Division of Water Resources, and based on such preliminary geological reconnaissance, the De Luz dam site is considered suitable for an earth fill dam up to heights considered.

Rock underlying the right and left abutments is closely jointed granite with a small amount of gneiss and schist. Required stripping on the abutments will average from 3 to 10 feet. The channel section is filled with alluvium to a maximum depth of 140 feet. The underlying bedrock is granite. The spillway would occupy about 290 feet along the axis of the dam just beyond the east end of the main embankment. A fault was found 7,000 feet north of the site, in the west bank of De Luz Creek; another fault is located about 7,000 feet south-southwest of the site within an old rock quarry west of Santa Margarita River. The region is seismically active.

Reservoir areas and capacities for various heights of dam were derived from United States Geological Survey quadrangles at a scale of 1:24,000 with a 20-foot contour interval. The values so determined are presented in Table 48.

TABLE 48

AREAS AND CAPACITIES OF
DE LUZ RESERVOIR

Depth of water at dam, in feet	Water surface elevation, U.S.G.S. datum, in feet	Water surface area, in acres	Storage capacity, in acre-feet
0	125	0	0
5	130	20	65
15	140	60	465
25	150	140	1,470
35	160	240	3,370
45	170	300	6,070
55	180	370	9,420
65	190	450	13,500
75	200	540	18,500
85	210	640	24,400
95	220	730	31,300
105	230	840	39,100
115	240	940	48,000
125	250	1,060	58,000
135	260	1,200	69,000
145	270	1,330	82,000
155	280	1,490	96,000
165	290	1,640	111,000
175	300	1,810	129,000
185	310	1,980	148,000
195	320	2,140	169,000
205	330	2,370	191,000
215	340	2,570	217,000
225	350	2,780	243,000

Based on estimates of runoff during the period 1894-95 through 1952-53, yield studies were made for reservoir storage capacities at the De Luz site of 50,000, 75,000, 143,000, and 188,000 acre-feet, respectively. Estimated inflows to the reservoir were based on values of measured runoff at the United States Geological Survey stream gaging station on Santa Margarita River near Fallbrook plus historic diversions by Fallbrook Public Utility District, and estimates of runoff from additional tributary area below the station. The semiseasonal values so estimated are presented in Appendix I, Table I-2. In all of the reservoir yield studies, an allowance was made for the reduction in effective reservoir storage capacity due to sedimentation in the amount of 14,000 acre-feet.

Results of studies covering the conjunctive operation of De Luz Reservoir and Santa Margarita Coastal Basin, during the most critical dry periods, April, 1895, through September, 1904, extending through September, 1914, for the larger capacities studied, are presented in Table 49. Assumptions as to operation of the reservoir and Basin are identical with those set forth in the discussion of Fallbrook Lippincott and Fallbrook Border Reservoirs, and comments relative to the operation of those reservoirs are equally applicable here.

TABLE 49

ESTIMATED NET SAFE SEASONAL YIELD
OF DE LUZ RESERVOIR

In Acre-Feet

Reservoir size	Critical dry period	Gross seasonal yield	Reduction in yield of present water supply development*	Net safe seasonal yield
50,000	April, 1895 through September, 1904	12,400	6,100	6,300
75,000	April, 1895 through September, 1904	14,600	6,200	8,400
143,000	April, 1895 through September, 1914	20,100	6,100	14,000
188,000	April, 1895 through September, 1914	21,800	6,100	15,700

* Values in excess of present yield result from necessity to release water to maintain present range of water level fluctuations in Santa Margarita Coastal Basin.

Estimates of cost were prepared for dams at this site with heights of 145, 170, 209, and 230 feet from stream bed to crest of dam. For all heights of dam, a rolled fill structure was contemplated, comprising an impervious core of select earth material, and upstream and downstream sections of pervious material. Upstream and downstream slopes of the dam would be 2.5:1 for the dams of 145 and 170 feet in height and 3:1 for the dams 209 and 230 feet in height. The impervious sections would have upstream and downstream slopes of 1:1. Crest widths would be 30 feet, comprising a 10-foot width for the impervious core and 10-foot widths each for the upstream and downstream pervious sections. The upstream face of the dam would be protected against wave action by rock riprap placed to a depth of three feet normal to the slope.

For the two larger dams, an auxiliary dam similar to the main dam in allrespects save height, would be located in a saddle east of the spillway.

For purposes of the cost estimates, it was assumed that under the impervious section an average depth of 40 feet of sand, gravel, boulders, and small lenses of sandy silt, all unconsolidated, would be stripped in the channel, and 10 feet of mantle would be removed from the abutments. Stripping required under the pervious sections of the dam was assumed to be a two-foot depth of loose surface material and vegetation.

Earth materials considered suitable for the impervious section of the dam occur in terraces downstream from the dam within a radius of 2-1/2 miles. An estimated 85 per cent of the core and spillway excavation could be salvaged for use in the pervious section of the dam. Other pervious materials are available upstream in the channel section within two miles of the dam site. The granite within the reservoir area could be quarried for riprap. It was assumed that compaction of the impervious section of the dam would be effected by either sheepsfoot or pneumatic rollers, and that pneumatic rollers would be used to compact the pervious sections. Moderate grouting would be necessary to prevent minor leakage in the foundation and abutments.

The estimated peak inflow of a once in 1,000 year flood is 164,000 second-feet. The routed peak reservoir outflows were 151,000 second-feet for reservoirs of capacities of 50,000 and 75,000 acre-feet, and 141,000 second-feet and 137,000 second-feet for reservoirs of capacities of 143,000 and 188,000 acre-feet, respectively. The spillways were designed as concrete-lined overpour chutes, with ogee-weir control sections. The maximum depth of water above the spillway lip would be 23 feet for the two smaller dams and 22 feet for the others, and an additional five feet of residual freeboard would be provided. The spillways would be located in the saddle on the left abutment and would discharge into Santa Margarita River downstream from the toe of the dam. The spillway chutes would be concrete-lined for a portion of their lengths.

It was estimated that the construction period would be 1-1/2 years, 2 years, 2-1/2 years, and 3 years for the respective sizes of dam considered. During construction, summer flow would be diverted through the outlet conduit, while diversion of winter flows would be effected through an uncompleted portion of the dams in the channel section.

The outlet works intake structure located at the upstream toe near the left abutment would be a short concrete tower, with steel trash rack at the entrance. A concrete pressure conduit beneath all dams would extend from the intake structure to the valve chamber located upstream from the axis of the dam. A high pressure slide gate would be installed within the gate valve chamber and a reinforced concrete culvert, varying in diameter depending upon the capacity of the reservoir, would extend from the valve chamber to a control valve house at the downstream toe of the dam. A steel pipe supported on cradles would extend through the culvert from the valve chamber to the control valve house where a bifurcation structure would be located permitting the discharge of water to either Santa Margarita River or a possible conduit. Downstream releases would be controlled by a Howell-Bunger valve, and a needle valve would control releases to the conduit.

The dam site and a major portion of the lands in the De Luz reservoir area are located within Camp Pendleton Naval Reservation, while the remainder of the reservoir area is held in private ownership. It was estimated that about 980, 1,260, 1,940, and 2,340 acres of minor clearing would be required for the respective sizes of reservoirs considered. Minor county roads within the reservoir area would be relocated where necessary.

Presented in Table 50 are pertinent data with respect to general features and capital and annual costs of dams and reservoirs considered at the De Luz site. Detailed cost estimates of safe yield and cost of dams and reservoirs are included in Appendixes I and J, respectively. For illustrative purposes, a plan, profile, and section of the dam creating a reservoir with storage capacity of 188,000 acre-feet are shown on Plate 27, entitled "De Luz Dam on Santa Margarita River".

TABLE 50

GENERAL FEATURES OF FOUR SIZES OF DAM AND RESERVOIR AT THE DE LUZ DAM SITE ON SANTA MARGARITA RIVER

Characteristics of Site
Drainage area--700 square miles
Estimated mean seasonal runoff--31,500 acre-feet
Estimated mean gross seasonal depth of evaporation--4.00 feet
Estimated mean seasonal precipitation--1.30 feet
Estimated sedimentation--14,000 acre-feet
Elevation of stream bed, U.S.G.S. datum--125 feet

	Gross reservoir storage capacity, in acre-feet			
	50,000	75,000	143,000	188,000
Earthfill Dam				
Crest elevation, in feet, U.S.G.S. datum	270	293	334	355
Crest length, in feet	1,860	2,170	3,195	3,400
Crest width, in feet	30	30	30	30
Height, spillway lip above stream bed, in feet	117	140	182	203
Side slopes, upstream and downstream	2-1/2:1	2-1/2:1	3:1	3:1
Freeboard, above spillway lip, in feet	28	28	27	27
Volume of fill, in cubic yards	1,550,000	2,715,000	5,829,000	8,252,000
Reservoir				
Surface area at spillway lip, in acres	980	1,260	1,940	2,340
Net storage capacity at spillway lip, in acre-feet	36,000	61,000	129,000	174,000
Type of spillway		Ogee weir and chute		
Spillway discharge capacity, in second-feet	151,000	151,000	141,000	137,000
Type of outlet	42-inch diameter steel pipe beneath dam	48-inch diameter steel pipe beneath dam	66-inch diameter steel pipe beneath dam	72-inch diameter steel pipe beneath dam
Estimated net safe seasonal yield, in acre-feet	6,300	8,400	14,000	15,700
Capital Costs				
Dam and reservoir	$3,153,000	$4,462,000	$9,609,000	$13,205,000
Per acre-foot of storage	63	60	67	70
Per acre-foot of net safe yield	500	531	686	841
Annual Costs				
Dam and reservoir	$ 155,100	$ 220,000	$ 465,000	$ 636,200
Per acre-foot of net safe yield	24.60	26.20	33.20	40.50
Per acre-foot of incremental net safe yield	--	30.90	43.80	100.70

<u>Upper De Luz Dam and Reservoir</u>. The Upper De Luz dam site is located on De Luz Creek about two miles north of its confluence with Santa Margarita River, and is located in Section 20, Township 9 South, Range 4 West, S.B.B.&M. Camp De Luz Road, paralleling De Luz Creek, passes along the right abutment of the dam site and traverses the reservoir area. Stream bed elevation at the dam site is about 185 feet, U.S.G.S. datum. Consideration was given to the construction of a small dam and reservoir at the Upper De Luz site for storage of flood waters in De Luz Creek and utilization of the water so conserved by Camp Pendleton. This was a reconnaissance type study based on limited information. The purpose was to determine the feasibility of this site as an alternate to a similar small dam and reservoir at the De Luz dam site.

The drainage area of De Luz Creek above the Upper De Luz site comprises about 44 square miles, and on the assumption that runoff at the site is 86 per cent of the runoff between the United States Geological Survey gaging station near Fallbrook and the De Luz dam site, produced an estimated average seasonal natural runoff during the 48-year mean period, 1895-96 through 1942-43, of about 8,350 acre-feet. Runoff under present conditions is assumed to be equal to the natural runoff. Precipitation at the site is estimated to average 1.30 feet in depth seasonally.

No geologic survey was made during this investigation at the Upper De Luz site, all data used being obtained from previous reports. The abutments and foundation at the dam site are in an area of intrusive rock related to the Santiago Peak volcanics. They are characterized here by fine-grained granodiorites and related rocks which occur as small outcrops, and comprise a series of agglomerates, tuffs, shallow intrusives, and flows with associated shales and quartzites which are mildly metamorphosed. According to previous geologic studies, De Luz Creek may be controlled by an active fault and the region should be considered seismically active.

Reservoir areas and capacities for various heights of dam were derived from United States Geological Survey quadrangles at a scale of 1:24,000 with a 20-foot contour interval. The values so determined are presented in Table 51.

TABLE 51

AREAS AND CAPACITIES OF UPPER DE LUZ RESERVOIR

Depth of water at dam, in feet	Water surface elevation, U.S.G.S. datum, in feet	Water surface area, in acres	Storage capacity, in acre-feet
0	185	0	0
15	200	26	200
35	220	78	1,240
55	240	130	3,320
75	260	170	6,320
95	280	230	10,300
115	300	310	15,700
135	320	390	22,700
155	340	500	31,600
175	360	620	42,800
195	380	700	56,000
215	400	900	72,000
235	420	1,150	92,500

Based on estimates of runoff during the critical dry period from April, 1895, through September, 1914, a yield study was made for a reservoir storage capacity of 50,000 acre-feet. In the study, an allowance was made for reduction in effective storage capacity due to sedimentation in the amount of 3,300 acre-feet. The resulting estimated gross and net safe seasonal yield was 6,000 acre-feet for both, there being no change in the amount of water available by direct diversion to Fallbrook Public Utility District and the Naval Ammunition Depot or in the yield of Santa Margarita Coastal Basin.

Based on the limited data available, an estimate of cost was prepared for a dam at the Upper De Luz site with a height of 207 feet from stream bed to crest of dam. A rolled fill structure was contemplated, comprising an impervious core of select earth material, and upstream and downstream sections of pervious free draining material. Upstream and downstream slopes of the dam would be 3:1. The impervious section would have upstream and downstream slopes of 0.8:1. Crest width would be 30 feet, comprising a 10-foot width for the impervious core and 10-foot widths each for the upstream and downstream pervious sections. The upstream face of the dam would be protected against wave action by rock riprap placed to a depth of three feet normal to the slope. Earth fill quantities were estimated from enlarged copies of United States Geological Survey Quadrangles, edition of 1949, at a scale of 1:24,000 with a 20-foot contour interval.

For purposes of the cost estimates, it was assumed that under the impervious section an average depth of 25 feet of sand and gravel would be stripped in the channel, a depth of 15 feet of broken rock and mantle would be removed on the left abutment, and 10 feet of broken rock and mantle would be removed on the right abutment. For the pervious sections, a depth of stripping of 3 feet was assumed throughout the contact area. It was assumed that foundation treatment would include moderate grouting.

Earth material considered suitable for the impervious section of the dam occurs in terraces both upstream and downstream from the site within an assumed average haul distance of two miles. Pervious material is available in the channel and in nearby terraces. It is estimated that 80 per cent of the material removed under the impervious section and the spillway could be used in the pervious section and that riprap could be quarried from rock within the reservoir area. It was assumed that compaction of the impervious section of the dam would be effected by either sheepsfoot or pneumatic rollers, and that pneumatic rollers would be used to compact the pervious sections.

The spillway considered would have a discharge capacity of 41,000 second-feet, which is the estimated peak discharge of a once in one thousand year flood. The spillway was designed as a concrete-lined overpour chute, with an ogee weir control section. The spillway weir and channel would be excavated through the saddle on the right abutment and would discharge into De Luz Creek downstream from the dam. Depth of water above the spillway lip at design discharge capacity would be 15 feet and an additional 5 feet of residual freeboard would be provided.

It was estimated that the Upper De Luz Dam would require about two years for construction. During construction, summer flow would be diverted through the outlet conduit, while diversion of winter flows would be effected through an uncompleted portion of the dams in the channel section.

The outlet works would have a submerged concrete inlet structure at the upstream toe near the left abutment. A concrete pressure conduit beneath the dam would extend from the intake tower to the valve chamber, located somewhat upstream from the axis of the dam. A high pressure slide gate would be installed within the valve chamber, and a reinforced concrete culvert would extend from the valve chamber to a control valve house at the downstream toe of the dam. A steel pipe supported on cradles would extend through the culvert from the valve chamber to the control valve house where a bifurcation structure would be located permitting discharge of water to either Santa Margarita River or to a conduit. Downstream releases would be controlled by a 30-inch diameter Howell-Bunger valve, and a 30-inch diameter needle valve would control releases to the conduit.

The dam site and a major portion of the land in the Upper De Luz reservoir area are in Camp Pendleton Naval Reservation, while the remainder is held in private ownership. It was estimated that about 675 acres of land would have to be cleared, and a short length of the county road to De Luz would be relocated.

Presented in Table 52 are pertinent data with respect to general features and capital and annual costs of the dam and reservoir considered at this site. A detailed cost estimate is included in Appendix J.

TABLE 52

GENERAL FEATURES OF DAM AND
RESERVOIR AT THE UPPER DE LUZ SITE ON DE LUZ CREEK

Characteristics of Site

Drainage area--44 square miles
Estimated mean seasonal runoff--8,350 acre-feet
Estimated mean gross seasonal depth of evaporation--4.00 feet
Estimated mean seasonal precipitation--1.30 feet
Estimated sedimentation--3,300 acre-feet
Elevation of stream bed, U.S.G.S. datum--185 feet

Earthfill Dam	
Crest elevation, in feet, U.S.G.S. datum	392
Crest length, in feet	1,120
Crest width, in feet	30
Height, spillway lip above stream bed, in feet	187
Side slopes, upstream and downstream	3:1
Freeboard, above spillway lip, in feet	20
Volume of fill, in cubic yards	3,540,000
Reservoir	
Surface area at spillway lip, in acres	675
Gross reservoir storage capacity, in acre-feet	50,000
Net storage capacity at spillway lip, in acre-feet	46,700
Type of spillway	Ogee weir with concrete-lined chute
Spillway discharge capacity, in second-feet	41,000
Type of outlet	42-inch diameter steel pipe beneath dam
Estimated net safe seasonal yield, in acre-feet	6,000
Capital Costs	
Dam and reservoir	$4,938,000
Per acre-foot of storage	99
Per acre-foot of net safe yield	823
Annual Costs	
Dam and reservoir	$ 238,700
Per acre-foot of net safe yield	39.80

Other Dam and Reservoir Sites. In addition to the four dams and reservoir sites considered in the previous paragraphs, a number of other sites were studied in much less detail, and on the basis of such reconnaissance were dismissed from further consideration. These sites are discussed briefly in the following paragraphs.

There is a good dam site at the head of Temecula Canyon. However, the reservoir would cover a large area in relation to the quantity of water stored, and because of the consequent high evaporation loss a 50,000 acre-foot reservoir at this site would probably yield less than 2,400 acre-feet annually. A large area of irrigable land would be flooded, and relocation of about four miles of modern two-lane limited access highway together with the construction of a bridge across the spillway, with expensive bridge approaches, would be required. Because much more attractive sites are available, no further consideration was given to this site.

A dam and reservoir site on Tucalota Creek, about one mile east of Murrieta Hot Springs, was considered for conservation of local runoff. The most feasible size of reservoir at the site appears to be 2,500 acre-feet. Such a reservoir would have a gross seasonal yield of about 675 acre-feet, and, assuming no releases would be required to satisfy present downstream uses, reconnaissance cost estimates indicate that water at the reservoir would cost about $62.00 per acre-foot. Since such a small quantity of water could be conserved, and since imported water will probably become available at less cost, this site was not further considered.

A dam and reservoir site on Warm Springs Creek about one mile northwest of Murrieta Hot Springs was also considered for conservation of local runoff. The most feasible size at this site for such a purpose is believed to be about 5,000 acre-feet, for which the gross yield would be about 560 acre-feet per year. Again assuming no releases would be required to satisfy present downstream uses, reconnaissance cost estimates indicate the cost of conserved water to be about $62.00 per acre. This site was given no further consideration for conservation of local runoff because of the low yield and high unit cost of water, but it is believed to be feasible for use in regulation of imported supplies of water and such a use is discussed later in this chapter.

A site in Cole Canyon about two miles west of Murrieta was considered for construction of a dam and reservoir to conserve local runoff. The size believed to be most feasible at this site is 1,000 acre-feet, and the gross seasonal yield of such a reservoir was calculated to be 160 acre-feet. The small yield, at an estimated cost of over $70.00 per acre-foot at the reservoir, eliminated this site from further consideration.

The area upstream from Vail Reservoir was also considered as a possible location for a reservoir or reservoirs to conserve local waters. However, since the Vail Company has a permit to appropriate and has, since 1948, appropriated waters from Temecula Creek by storage in Vail Reservoir, any further appropriation of water by surface storage upstream from Vail Dam would be subject to the prior appropriation. Under these circumstances, it is assumed that the only water which could be stored is that which would otherwise spill over the dam. Spills would have been infrequent with the regimen of runoff which occurred in the past, and, for the critical 20-year period from 1895-96 through 1914-15, no water would have gone over the spillway had the dam been in existence and had it been operated on a safe yield basis. No single dam could be built to conserve Vail spills since three tributaries, Temecula Creek, Lancaster Creek, and Arroyo Seco Creek, flow into the reservoir. Furthermore, if it were possible to store the spills in a single reservoir, 20,000 acre-feet of storage would yield only about 600 acre-feet of water a year. On the basis of this analysis it is apparent that surface reservoirs upstream from Vail Dam are infeasible and no sites in that area were inspected.

Comparison of Reservoir Projects

In preceding paragraphs, estimated safe yields of reservoirs of various capacities at four sites, together with estimates of cost therefor have been presented and discussed. Derived values for items which are useful in comparing the accomplishments of these reservoirs are summarized in Table 53, and a discussion of these accomplishments is presented in this section. Also presented in this section is an evaluation of the accomplishments of the combined operation of various sizes of reservoirs at the Fallbrook Lippincott and De Luz sites.

Prepared for purposes of graphic analysis were Plates 28, 29 and 30, which respectively, depict the relationships between reservoir storage capacity and capital cost, storage capacity and net safe seasonal yield, and net safe seasonal yield and annual unit cost of water at the reservoirs.

On the basis of reconnaissance estimates it was found that costs for conveyance of water from the reservoirs on the lower river, found herein feasible of construction, to irrigable lands in Hydrographic Units 1 through 4 would be prohibitive. The water supply developed at the considered reservoirs was therefore assumed to be delivered to the large areas of demand in Hydrographic Units 5 and 6, namely the Fallbrook area and lands presently within Camp Pendleton Naval Reservation.

TABLE 53

SUMMARY OF DAM AND RESERVOIR DATA

Reservoir	Storage capacity, in acre-feet: Gross	Net	Type of dam	Net safe seasonal yield, in acre-feet	Capital cost	Annual cost	Cost per acre-foot of net safe yield	Cost per acre-foot of incremental net safe yield
De Luz	50,000	36,000	Earthfill	6,300	$ 3,152,700	$155,100	$24.60	---
	75,000	61,000	Earthfill	8,400	4,461,900	220,000	26.20	$ 30.90
	143,000	129,000	Earthfill	14,000	9,609,200	465,000	33.20	43.80
	188,000	174,000	Earthfill	15,700	13,205,200	636,200	40.50	100.70
Fallbrook Lippincott	35,000	26,300	Earthfill	5,100	3,043,000	148,500	29.10	---
	65,000	56,300	Earthfill	7,600	4,823,300	235,400	31.00	34.80
Fallbrook Border	65,000	56,300	Earthfill	7,600	5,963,900	288,300	37.90	---
	125,000	116,300	Earthfill	12,700	9,121,400	441,100	34.70	30.00
	150,000	141,300	Earthfill	14,500	11,149,900	537,600	37.10	53.60
Upper De Luz	50,000	46,700	Earthfill	6,000	4,938,300	238,700	39.80	---

The curves on Plate 29 indicate that all reservoirs studied have comparable ratios of storage capacity to net safe seasonal yield for all sizes of reservoir when each reservoir is considered alone. The curves on Plates 28 and 30 indicate that, from considerations of yields and costs alone, without regard to cost of transportation of water to the place of use, reservoirs at the De Luz site when compared with single reservoirs at any of the other sites considered offer the largest gross storage capacity for any given capital cost and less unit cost for any given net safe seasonal yield.

The 50,000 acre-foot reservoir at the Upper De Luz site on De Luz Creek was considered as a possible substitute for a reservoir of similar size at the De Luz dam site, but, despite lower spillway costs at Upper De Luz resulting from the fact that smaller flood flows would pass the site, greater costs for other features more than offset this advantage, and both capital cost and cost per acre-foot of water conserved are much greater than at De Luz dam site. The Upper De Luz site, therefore, was eliminated from further consideration.

Reservoirs at the Fallbrook Lippincott and Fallbrook Border sites were considered as alternatives to reservoirs at the De Luz site. These sites are at higher elevations than De Luz and are closer to portions of the potential service area. The Lippincott site has a practical height of dam limitation which would preclude construction of a reservoir larger than about 65,000 acre-foot capacity. For sizes up to this maximum the site is superior to the Border site in capital cost and unit cost of water. The Border site, however, is suitable for higher dams and greater reservoir capacities than the Lippincott site and cost estimates were made for reservoir sizes from 65,000 to 150,000 acre-foot capacity.

Reservoirs at the Fallbrook Border site of the largest sizes, particularly the 150,000 acre-foot size, yield nearly the same quantities of water for about the same unit cost as reservoirs of similar size at the De Luz site. For purpose of comparison of cost of delivered water it was assumed that 40 per cent of the new water would be supplied to a terminal reservoir in the Fallbrook area at an elevation of 840 feet, and 60 per cent to Camp Pendleton, one-half at an elevation of 275 feet and one-half at an elevation of 440 feet, in approximate accordance with present practice at the Camp. It was further assumed that water would be lifted from the elevation of the water surface in the reservoir at average capacity. Examples of detailed cost estimates of conveyance works are presented in Appendix J. It should be noted that, for purpose of this comparison only, a De Luz reservoir of 152,000 acre-foot capacity, yielding 14,500 acre-feet of new water per season was employed although a detailed estimate of cost and an operation study were not made for this capacity. Values used in the comparison were obtained from the curves on Plates 28, 29 and 30. Results of the calculations of cost of water delivered from each of the sites are set forth in the following tabulation:

	Net safe seasonal yield	Average annual cost of water per acre-foot				
			Fallbrook Area		Camp Pendleton	
		At reservoir	Conveyance cost	Total cost	Conveyance cost	Total cost
Fallbrook Border, 150,000 acre-foot capacity	14,500	$37.10	$ 9.00	$46.00	$9.00	$46.00
De Luz, 152,000 acre-foot capacity	14,500	35.00	14.00	49.00	4.00	39.00

Although the unit cost of water delivered to the Fallbrook area from Fallbrook Border reservoir is slightly less than that for water from De Luz reservoir, the converse is true for water delivered to Camp Pendleton. Under the assumed allocation of water in the comparison, the average cost of delivered water obtained from De Luz reservoir is about $3 less per acre-foot than water from Border reservoir. Although it is recognized that other assumptions regarding the allocation of water to the potential service areas could be made which would tend to alter the indicated advantage of De Luz over the Border site it is not believed that under any reasonable assumption would there be indicated a decided advantage in constructing a reservoir of relatively large capacity at this site in lieu of such construction at De Luz. Further, the superiority of the De Luz site would be greater for reservoirs of smaller sizes.

As indicated on Plate 30 and in Table 53, reservoirs of 35,000 and 65,000 acre-foot capacity at the Fallbrook Lippincott site produce water at the reservoir at greater costs than those at the De Luz reservoirs of similar yield, but at less cost than at Fallbrook Border reservoir. Water conserved at the Lippincott site would probably be utilized primarily in the Fallbrook area. Cost of water at the reservoir would be about $29 per acre-foot for the smaller reservoir and $31 per acre-foot for the larger, and delivery of water to Fallbrook from these reservoirs, in accordance with the cost estimates for conduits and pumping costs presented in Appendix J, pages J-28 and J-29, would cost an additional $9 per acre-foot of water delivered. Total unit cost of water at Fallbrook would, therefore, be about $38 and $40, respectively, from the two reservoirs.

It is anticipated that reservoirs of the smaller sizes considered at the De Luz site would be used primarily to supply water to Camp

Pendleton, but that the larger sizes would be used to supply both the Camp Pendleton and Fallbrook areas. As shown in Table 53, unit costs of water at the reservoir vary from $24.60 for the 50,000 acre-foot capacity reservoir to $40.50 for the 188,000 acre-foot reservoir.

Analysis of Table 53 and Plate 30 indicates that a reservoir at the De Luz site in the 143,000 acre-foot capacity range is at the breakoff point in regard to the cost-yield relationship. The cost of incremental yield developed by larger reservoirs increases quite rapidly. This is exemplified by the reservoir of 188,000 acre-foot capacity, the total yield from which has an average unit cost of about $40 but with a cost of about $100 per acre-foot for incremental yield developed by increasing the capacity from 143,000 acre-feet.

Calculated costs of water per acre-foot delivered from De Luz reservoirs of 75,000, 143,000, and 188,000 acre-foot capacities to Camp Pendleton and to Fallbrook, are set forth in the following tabulation, the distribution of water being 60 per cent to Camp Pendleton and 40 per cent to Fallbrook, and delivery cost being derived as in the detailed examples of cost estimates of conveyance works in Appendix J:

		Annual cost of water per acre-foot				
			Delivered to Fallbrook area		Delivered to Camp Pendleton	
Reservoir	Net safe seasonal yield	At reservoir	Delivery cost	Total cost	Delivery cost	Total cost
De Luz 75,000 acre-foot capacity	8,400	$26.20	---	---	$4.00	$30.00
De Luz 143,000 acre-foot capacity	14,000	$33.20	$14.00	$47.00	4.00	37.00
De Luz 188,000 acre-foot capacity	15,700	40.50	13.00	54.00	4.00	45.00

Because of a possible advantage in having part of the supply from a reservoir developed as high as possible on the Santa Margarita River and because of the possibility of construction of a small reservoir at the Fallbrook Lippincott site for local use, combinations of dams at the Lippincott site with reservoirs at De Luz were considered. The 35,000 and 65,000 acre-foot reservoirs were each considered as being in combination with De Luz reservoirs of 50,000, 75,000, and 143,000 acre-foot capacities. In the operation studies it was assumed that all stream flow, except spill, would be stopped at Fallbrook Lippincott reservoir, all remaining stream flow, except spill, tributary to De Luz would likewise be stopped at that reservoir, and Santa Margarita Coastal Basin would be operated to maintain existing conditions, i.e. to utilize only the storage capacity presently utilized and thus maintain ground water levels as at present. For purposes of illustration, details of the study of De Luz reservoir of 75,000 acre-foot capacity operated simultaneously with Fallbrook Lippincott reservoir of 65,000 acre-foot capacity are presented in Appendix I, page I-6. Results of all combination studies, including the costs of delivery of water to Camp Pendleton and the Fallbrook area, are presented in Table 54. In the studies no consideration was given to priority of reservoir construction, and in each instance the sum of the costs of the reservoirs is divided by the yield of the combination development to obtain an average unit cost of water at the reservoirs. It was then assumed that 40 per cent of the supply would be delivered to the Fallbrook area and 60 per cent to Camp Pendleton area, and costs of conveyance were added.

TABLE 54

SUMMARY OF COMBINATION DAM AND RESERVOIR STUDIES

Item	Reservoir combination: Fallbrook Lippincott Reservoir 35,000 acre-feet, With De Luz Reservoir 50,000 acre-feet	75,000 acre-feet	143,000 acre-feet	Fallbrook Lippincott Reservoir 65,000 acre-feet, With De Luz Reservoir 50,000 acre-feet	75,000 acre-feet	143,000 acre-feet
Gross storage capacity, acre-feet	85,000	110,000	178,000	115,000	140,000	208,000
Net safe seasonal yield, acre-feet	8,900	10,900	14,300	11,400	13,100	15,500
Cost of dams and reservoirs:						
Capital	$6,195,700	$7,504,900	$12,652,200	$7,976,000	$9,285,200	$14,432,500
Annual	303,600	368,500	613,500	390,500	455,400	700,400
Average cost of water per acre-foot:						
At reservoir:	$34.10	$33.80	$42.90	$34.30	$34.80	$45.20
Delivered to Fallbrook area from Fallbrook Lippincott Reservoir:						
Conveyance cost	9.00	9.00	9.00	9.00	9.00	9.00
Total cost	43.00	43.00	52.00	43.00	44.00	54.00
Delivered to Camp Pendleton from De Luz Reservoir:						
Conveyance cost	4.00	4.00	4.00	4.00	4.00	4.00
Total cost	38.00	38.00	47.00	38.00	39.00	49.00

Costs of water delivered to Fallbrook and Camp Pendleton from the most desirable reservoirs are summarized in Table 55.

TABLE 55

SUMMARY OF ANNUAL COSTS OF WATER DELIVERED TO FALLBROOK AND CAMP PENDLETON

Source	Net safe seasonal yield	Supply to Fallbrook Area		Supply to Camp Pendleton	
		Acre-feet	Cost per acre-foot	Acre-feet	Cost per acre-foot
De Luz Reservoir, 50,000 acre-foot capacity	6,300	---	---	6,300	$29.00[a]
De Luz Reservoir, 75,000 acre-foot capacity	8,400	---	---	8,400	30.00[a]
De Luz Reservoir, 143,000 acre-foot capacity	14,000	5,600	$47.00[b]	8,400	37.00[a]
De Luz Reservoir, 188,000 acre-foot capacity	15,700	6,300	54.00[b]	9,400	45.00[a]
Fallbrook Lippincott, 35,000 acre-foot capacity	5,100	5,100	38.00[c]	---	---
Fallbrook Lippincott, 65,000 acre-foot capacity	7,600	7,600	40.00[c]	---	---
Fallbrook Lippincott, 35,000 acre-foot plus De Luz 143,000 acre-foot capacity	14,300	5,700	52.00	8,600	47.00[a]
Fallbrook Lippincott, 65,000 acre-foot plus De Luz 75,000 acre-foot capacity	13,100	5,200	44.00	7,900	39.00[a]

a. One-half of supply delivered at elevation of about 275 feet and one-half at elevation 440 feet.
b. Supply delivered at elevation 840 feet.
c. Supply delivered at elevation 830 feet.

Importation of Water

As has been stated, satisfaction of the largest portion of the estimated ultimate supplemental water requirement in the Santa Margarita River watershed of about 136,000 acre-feet per season, must lie in importation of water from outside sources. As shown on Plate 24, full development of local waters now wasting to the ocean would provide in the order of 20,000 acre-feet per season. However, from an engineering and economic standpoint, it appears that something less than this amount of local water is feasible of development and that under conditions of ultimate development, imported water in the amount of about 120,000 acre-feet per season will be required in the watershed.

The only imported water available to the Santa Margarita River watershed in the relatively near future is Colorado River water distributed through facilities of The Metropolitan Water District of Southern California and the San Diego County Water Authority, a member agency thereof. At such time as the Colorado River supply is completely utilized and additional waters are needed in the southern California area, preliminary plans by the State of California provide for the transportation of northern California waters to this area. By these plans, northern California waters could be served to the Santa Margarita River watershed and adjacent areas through facilities of The California Aqueduct System, hereinafter described.

Plans for Importation from Colorado River

The San Diego County Water Authority operates the existing San Diego Aqueduct which crosses Santa Margarita River watershed from north to south a few miles east of Temecula. The aqueduct extends from the main Colorado River Aqueduct at San Jacinto tunnel to San Vicente Reservoir on the route shown on Plate 25. Ownership of the line from San Jacinto tunnel to San Luis Rey River is vested in The Metropolitan Water District of Southern California and the remainder is owned by San Diego County Water Authority. The aqueduct consists of two parallel conduits with a combined capacity of about 190 second-feet, or about 138,000 acre-feet per year. It is presently operated at peak capacity to satisfy present water requirements within the service area of San Diego County Water Authority, including Fallbrook Public Utility District and Rainbow Municipal Water District. All member agencies of the Authority are not now using their estimated preferential right based on assessed valuations to purchase Colorado River water, some agencies using less and others using more than their right. In some cases one member agency sells water from the unused portion of its right to other member agencies.

Preliminary plans and estimates of cost of providing Colorado River water to various portions of the Santa Margarita River watershed are presented herein primarily to provide a basis of comparison of the cost of Colorado River water with the cost of developing local water. It is recognized that the existing San Diego Aqueduct is being utilized to capacity and that additional Colorado River water would not be available to the watershed until additional aqueduct capacity to serve the San Diego County Water Authority is constructed. Plans for such a second aqueduct are now under consideration by the Authority, The Metropolitan Water District, and the State of California.

The San Diego County Water Authority now charges $12 per acre-foot for water at the aqueduct. The Metroplitan Water District similarly sells untreated water to its member agencies at a cost of $10 per acre-foot. In addition to these charges, member agencies must pay annual District and Authority taxes, and in the case of a recently annexed agency must repay with interest the taxes to the District that the agency would have paid had it been a member of the District since its inception in 1929. Officials of the Fallbrook Public Utility District report that current taxes paid to the Authority average about $10 per acre-foot of water purchased directly from the Authority.

The price of Colorado River water served to a federal entity such as Camp Pendleton could not be definitely determined. However, in the case of March Air Force Base in Riverside County a price of $30 per acre-foot at Lake Matthews was charged by the Metropolitan Water District.

To determine approximate costs of conveyance of Colorado River water to points of use, preliminary study was made of a system to distribute water from San Diego Aqueduct to Fallbrook and to Camp Pendleton. These facilities would consist of Vallecitos regulatory reservoir south of Rainbow and gravity pipe lines to small terminal reservoirs at Fallbrook and Camp Pendleton. Cost estimate for Vallecitos Reservoir of 3,000 acre-foot capacity is presented in Appendix J, page J-24. Estimates of costs of distribution systems are presented in Appendix J, pages J-30 and J-31. Locations of the reservoir and conduits are shown on Plate 25.

The 3,000 acre-foot capacity reservoir would regulate a supply of 12,000 to 15,000 acre-feet per year of water released from San Diego Aqueduct on a uniform flow basis. The cost for such storage would average about two dollars per acre-foot of water regulated. Annual cost of operation of a conduit to deliver 6,000 acre-feet of water from the regulatory reservoir to a terminal reservoir at elevation 775 feet in Fallbrook would be $46,000, or about $8.00 per acre-foot. The unit cost of water regulated and delivered to a terminal reservoir in Fallbrook therefore would be about $22.00 per acre-foot exclusive of taxes. Similarly, if it were assumed that water were purchased at the aqueduct for $30.00 per acre-foot, delivery of 9,000 acre-feet of Colorado River water to a small terminal reservoir at elevation 440 feet at Camp Pendleton would cost about $40.00 per acre-foot.

On the basis of the foregoing and assuming no increase in District and Authority taxes as a result of construction necessary to make additional Colorado River water available to the Santa Margarita River watershed and adjacent areas, it would appear that where such water is available it could be delivered to the cited service areas at a unit cost comparable to or somewhat less than that of water from considered local surface storage developments.

Plans have not been developed in this investigation to provide delivery of Colorado River water to all areas within the watershed which will ultimately need water service, but preliminary studies of two such projects were made to show their physical and engineering feasibility.

Preliminary layout of a gravity system to serve supplemental water to a portion of Murrieta Valley and surrounding areas is delineated on Plate 25. The system consists of a 9,000 acre-foot capacity storage reservoir on Warm Springs Creek to regulate a uniform supply from San Diego Aqueduct (or Second San Diego Aqueduct), and a pipe line gravity distribution system from the reservoir to irrigable lands below. An annual supply of 36,200 acre-feet released from the aqueduct at a uniform rate of 50 second-feet would supply about 10,000 acres of land having an average applied water requirement of 3.5 acre-feet per acre.

Preliminary layout of another gravity distribution system to serve water to the Sedco, Wildomar, and Murrieta Valley areas is also shown on Plate 25. This system would serve a portion of the area served by the project described above. It would comprise a turnout from San Diego Aqueduct to a stream channel tributary to Railroad Canyon Reservoir on San Jacinto River near Elsinore, utilization of Railroad Canyon Reservoir for regulation of the supply, and a pipe line through Sedco to Murrieta Valley. Both of the systems described above could utilize a water supply either from Colorado River or from northern California through one of the aqueducts of The California Water Plan. Other irrigable lands in the watershed could be served by distribution systems from San Diego Aqueduct, but much of the land could best be served by aqueducts at higher elevation which are discussed below.

The California Water Plan

California is noted for the sporadic occurrence of its water supply. At times there are devastating floods causing loss of life and tremendous damage to property. At other times, contrasting water shortages exist which threaten the security of our State's economy. Further, the wet and dry phases of this apparent cyclic occurrence of water supply extend over protracted periods. Finally, there exists a geographical maldistribution of water resources. In this connection, the conservable water supplies in the area north of Sacramento greatly exceed all possible future water requirements; whereas, the portion of the State to the south of Sacramento has a potential need for water far in excess of available local supplies. The solution of these problems lies in the development of large reservoir storage capacity in the northern portion of the State to control flood waters and provide the seasonal and cyclic regulation necessary for their later use, and in the construction of works to convey the regulated supplies southerly to areas of deficiency. This is the basic principle of "The California Water Plan".

The State Water Resources Board in May, 1956, issued in preliminary form Bulletin No. 3, "Report on The California Water Plan", which sets forth this plan. Under the plan as presented therein, a regulated supply of water would be discharged into the Sacramento-San Joaquin Delta from stored surplus flood waters in surface and ground water reservoirs in the Sacramento Valley. These flows would be further augmented by similar stored waters from the Klamath-Trinity and Eel River developments in the North Coastal Area, all of which would be conveyed southerly in The California Aqueduct System to areas of deficiency as far south as the Mexican border. The plan envisions some 260 major reservoirs in our State and about 88 major hydroelectric plants. These reservoirs would add about 60,000,000 acre-feet of surface storage, as compared to a total of 20,000,000 acre-feet today. The use of large amounts of ground water storage capacity in the San Joaquin Valley is also planned. Added hydroelectric power installations of some 11,800,000 kilowatts are planned as compared to present installations of about 2,900,000 kilowatts.

The first step in the realization of "The California Water Plan" is the Feather River Project, which was authorized by the Legislature in 1951. This multipurpose project is truly state-wide in its accomplishments. It will provide greatly needed flood protection to the Sacramento Valley in the Marysville-Yuba City area, as well as other highly developed areas along the Feather River. It will provide an additional water supply of nearly 1,000,000 acre-feet per season to lands along the Feather River. It will develop 1,600,000,000 kilowatt-hours of electrical energy at Oroville Dam. And, finally, it will make available for exportation to water-deficient areas to the south a firm supply in excess of 4,000,000 acre-feet per season.

Further studies of Feather River Project Aqueduct routes will be made commencing in fiscal year 1956-57. These studies will include methods of delivering Feather River Project water to San Diego County and adjacent areas, including the Santa Margarita River watershed.

As described in the preliminary draft of Bulletin No. 3, ultimately it is believed three aqueducts in addition to the existing San Diego Aqueduct will be required to convey supplemental water to San Diego County and southwestern Riverside County. These aqueducts, shown on Plate 25, are designated in Bulletin No. 3 as: Second San Diego Aqueduct, terminating at Lower Otay Reservoir; Barona Aqueduct, terminating at Barona Reservoir; and the San Diego High Line Aqueduct, terminating at Santa Ysabel Reservoir. The alignment of this latter aqueduct is that of the Feather River Project Aqueduct as it is presently authorized, as shown on Plate 25. Regulation for the Barona Aqueduct would be provided at Keys Canyon Reservoir.

The hydraulic grade line of the Second San Diego Aqueduct would be about the same as the present aqueduct, and that of the Barona Aqueduct about 200 feet higher. Capacities of and seasonal deliveries of water in these aqueducts and of the existing San Diego Aqueduct are set forth in the following tabulation:

Aqueduct	Capacity, in second-feet	Seasonal delivery, in acre-feet
Existing San Diego Aqueduct	190	138,000
Second San Diego Aqueduct	500	362,000
Barona Aqueduct	505	366,000
San Diego High Line Aqueduct	540	390,000
TOTALS	1,735	1,256,000

The foregoing aqueduct system would be so constructed that it would be physically possible to deliver either Colorado River water or northern California water in all aqueducts except the San Diego High Line. By this system water service could be provided to nearly all portions of the Santa Margarita River watershed.

CHAPTER VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Santa Margarita River watershed comprises an area of 742 square miles in northern San Diego and western Riverside Counties, draining into the Pacific Ocean a short distance north of Oceanside, California. A total of about 172 square miles is irrigable, and of this 6,440 acres, or about six per cent, is irrigated. The population occupying the watershed in 1950, was about 4,000, that of the largest town, Fallbrook, being 1,735 persons. Industrial development is limited to fruit packing and light manufacturing. A major development in the area is the Camp Pendleton Marine Corps training base.

The climate, topography and soils of the watershed are similar to those in other portions of San Diego County where extensive development to high value crop production has been rapid. One factor limiting such development in Santa Margarita River watershed may have been the large areas concentrated in single ownerships, 122 square miles being held by the Vail Company and about 170 square miles by the United States. A more potent factor has been the lack of water supply which could be developed conveniently and economically. Prior to the construction of Vail Dam in 1949, the water supply was limited to that pumped from the ground water, or diverted from the unregulated stream flow, augmented by a relatively small importation of Colorado River water.

There are a few water quality problems in the watershed. Ground water containing a higher percentage of sodium ion than is desirable in irrigation water occurs naturally at several points in the watershed, and some spring waters are higher in total dissolved solids, chlorides, flourides, and hardness than is desirable for domestic use. High nitrate concentration at a few wells, most of them in Murrieta Valley or in the Fallbrook area, indicate localized degradation in the immediate vicinity of each well. Some degradation also is evidenced in Santa Margarita Coastal Basin where, as a result of the lowered water table, saline waters which are probably connate have been drawn into a few wells, and sea water has periodically invaded the alluvial deposits downstream from Ysidora Narrows and in 1951 reached a point one-half mile inside the Basin. It was recently discovered that ground water in the vicinity of Murrieta was being contaminated as a result of the discharge of hexavalent chromium plating wastes to the ground surface and a cesspool. Evidence as to the persistence of the contamination since abatement of the waste is not yet conclusive. Although these problems exist, those that are not readily susceptible of correction are not widespread, and for the most part the surface and ground waters in the watershed are of suitable quality for irrigation and domestic use.

It is estimated that 155,000 acre-feet of water exclusive of rainfall or about 136,500 acre-feet more than is presently usefully consumed, will be required to satisfy the ultimate needs of lands within the watershed. In addition to this, more water is needed immediately by agencies serving areas both inside and adjacent to the watershed. A portion of this requirement might be met by salvage of local water presently wasting to the ocean. The remainder must be imported from sources outside the watershed.

The local water supply all originates in precipitation on the watershed and the availability of ground water or unregulated stream flow at times when it is needed is determined in large measure by the quantity and regimen of the precipitation and resulting runoff. Estimated mean seasonal precipitation has ranged in depth from less than 10 inches in Lancaster Valley to a little more than 40 inches in the vicinity of Palomar Mountain on the southern boundary of the watershed, and in quantity has averaged 698,500 acre-feet seasonally. Over the years since 1886-87, the precipitation has ranged from an estimated 47 per cent of the mean in 1933-34 to 197 per cent in 1936-37. Runoff from the watershed is still more erratic, estimated seasonal natural flow in the principal streams having ranged between 15 and 700 per cent of the mean.

Of the local and presently imported water supply, it is estimated that 18,700 acre-feet per season exclusive of precipitation is usefully consumed on or exported from the watershed, and that on the average, 25,200 acre-feet of runoff wastes to the ocean seasonally. As regards the portion of this waste which might be salvaged, cyclical variation in its amount is of even greater moment than the seasonal variation noted above. Analysis indicates that complete regulation of the flow would require reservoir capacity in the order of 300,000 acre-feet and that the net safe seasonal yield of a surface reservoir of that capacity at Ysidora would be about 20,000 acre-feet. During the course of the investigation, increased diversion of unregulated stream flow, increased use of ground water, and regulation of stream flow through construction and operation of surface reservoirs were all considered as possible means of salvaging as much as possible of the waste.

Estimated present net draft on the surface waters of the watershed is 5,400 acre-feet per season. The extent to which water can be utilized by direct diversion from an unregulated stream is dependent upon the flow in the stream at the time when the water is needed. In Santa Margarita River watershed, as elsewhere, agricultural demands for water are greatest during the summer months when flow in the streams is least.

There are few locations on any of the streams in the watershed at which summer flow exceeded 0.01 second-foot in 1953 and these are already fully utilized. Increased diversion of the unregulated flow at any point would not add to the useful supply but would merely change the place of use.

Present net draft on the ground water is estimated to be 12,800 acre-feet per season. One small area, namely Diamond Basin may have been slightly overdrawn, but over the watershed as a whole the regulatory storage capacity of the basins has not been fully developed and it would be physically possible to materially reduce the waste through increased pumping from the ground water.

The usable storage capacity of Santa Margarita Coastal Basin, which lies adjacent to the coast, is limited by the restriction that the water table must not fall below sea level for any protracted period of time. Heavy pumping in Ysidora Sub-basin, the farthest downstream of three sub-basins has, as previously stated, resulted in intrusion of sea water some one-half mile into the basin, while at the same time the water table in Chappo and Upper Sub-basins has remained well above sea level at all times. It is estimated that by increasing extractions there and reducing those from Ysidora Sub-basin, 24,000 acre-feet of storage capacity could be safely utilized, thereby increasing the yield of the basin to 9,700 acre-feet, 5,700 acre-feet more than the present net extraction. The estimated cost of the new water so developed and delivered for use on Camp Pendleton is $11 per acre-foot.

It is believed that it would be possible to further increase the safe yield of Santa Margarita Coastal Basin, by an estimated 2,300 acre-feet per season, through construction of a barrier to sea water intrusion at Ysidora Narrows. Cost of a puddled clay cutoff at that site is estimated to be in the order of $275,000, or $6 per acre-foot of new water which might be developed thereby. While no such cutoff wall has been constructed to the depth which would be required here, it is believed that the plan merits further consideration.

As regards the basins upstream from Temecula Canyon, where a reduction in outflow of some 5,600 acre-feet per season is estimated to be physically possible, the poorly defined effects of legal restrictions imposed by the terms of the stipulated judgement in "Rancho Santa Margarita vs. Vail, et al" as well as difficulties which have been experienced in obtaining good wells in the past, make it inadvisable to consider any part of the physically possible reduction there, otherwise than as a safety factor in estimating the required ultimate import.

To date, Vail Dam and Reservoir on Temecula Creek at Nigger Canyon, with a capacity of 49,500 acre-feet and an estimated safe yield of 6,800 acre-feet per season is the only project of significant size which has been constructed in the watershed to regulate surface flow. Operation of this project was considered in estimating present waste to the ocean. Of surface storage projects considered for salvage of the present waste, the De Luz and Fallbrook Lippincott sites are thought to be best.

It is estimated that the greatest salvage, namely 15,700 acre-feet per season, would be accomplished by a reservoir at the De Luz site having a storage capacity of 188,000 acre-feet. Under this plan 6,300 acre-feet of water per season could be delivered to the Fallbrook area at an estimated cost of $54 per acre-foot, and 9,400 acre-feet to Camp Pendleton at $45 per acre-foot. With a 143,000 acre-foot reservoir at this site, 5,600 acre-feet seasonally could be delivered to the Fallbrook area at a cost of $46 per acre-foot, and 8,400 acre-feet to Camp Pendleton at $37 per acre-foot. Combined operation of a 65,000 acre-foot reservoir at the Fallbrook Lippincott site with one of 75,000 acre-foot capacity at De Luz would salvage an estimated 13,100 acre-feet of water, with 5,200 acre-feet going to Fallbrook at an estimated cost of $44 per acre-foot and 7,900 acre-feet to Camp Pendleton at $39 per acre-foot. A smaller quantity of water could be salvaged, at still less cost per acre-foot, by means of a reservoir at the Fallbrook Lippincott site serving the Fallbrook area alone, or one at De Luz serving Camp Pendleton alone. Operation of a 65,000 acre-foot reservoir at the Fallbrook Lippincott site would provide an estimated 7,600 acre-feet of water to the Fallbrook area at a cost of $40 per acre-foot, and a 75,000 acre-foot reservoir at De Luz would provide 8,400 acre-feet for Camp Pendleton at $30 per acre-foot.

Estimated capital costs of the above reservoirs are as follows:

Reservoir	Capital Cost
188,000 acre-feet at De Luz	$13,205,200
143,000 acre-feet at De Luz	9,609,200
75,000 acre-feet at De Luz	4,461,900
65,000 acre-feet at Fallbrook Lippincott	4,823,300

Legal considerations have an important bearing on the implementation of plans for the salvage of presently wasting local water. The stipulated judgment in "Rancho Santa Margarita vs. Vail" places a limitation on diversion of stream flow and extractions from the ground water upstream from Temecula Canyon. The action entitled "United States vs. Fallbrook Public Utility District, et al.", in which the judgment rendered in favor of the United States in the Unites States District Court for the Southern District for California was recently reversed and a new trial ordered by the United States Court of Appeals for the Ninth Circuit, precludes any construction of surface reservoirs for conservation purposes, prior to final settlement of the suit.

Estimates of the yields of new water which might be developed through salvage of presently wasting local water were based on stream flow records prior to and including September, 1953. The current drought period which may continue for an indeterminate number of years demonstrates the probability that drought periods more severe than those considered herein as critical, will occur occasionally in the future. Costs, too, change from year to year. Because of the inherent uncertainty as to yields and costs, and the relatively high capital costs of reservoirs and unit cost of delivered water, it is unsafe to assume that use of local water will ever increase by more than 16,500 acre-feet per season, and therefore, that the need for imported water to supply lands within Santa Margarita River watershed only, will ultimately be in the order of 120,000 acre-feet or greater.

Two potential sources of imported water are considered herein, The Colorado River, and northern California streams. The Metropolitan Water District of Southern California is presently delivering Colorado River water, for use in San Diego County, to the San Diego County Water Authority, a member agency. The San Diego Aqueduct, through which this water is delivered, is presently operated to its full capacity of 190 second feet or 138,000 acre-feet per year. Plans are under consideration, however, for additional aqueducts, and the Colorado River is the logical source of water to satisfy demands in the early future.

Under direction of the State Water Resources Board, as authorized by Chapter 1541, Statutes of 1947, the Division of Water Resources has conducted studies which resulted in formulation, in preliminary form, of The California Water Plan. Under the plan, of which the Feather River Project is authorized as the first unit, it is proposed to supply San Diego County as well as lands elsewhere in California with northern California water as needed. To supply San Diego County and portions of Riverside County lands, three additional aqueducts have been studied: Second San Diego Aqueduct, terminating at Lower Otay Reservoir; Barona Aqueduct, terminating at Barona Reservoir; and San Diego High Line Aqueduct terminating at Santa Ysabel Reservoir. Both Colorado River water and water from northern California streams can be delivered through all but the High Line Aqueduct. The capacities of the existing aqueducts and of those studied are as follows:

	Second-feet	Acre-feet per season
Existing San Diego Aqueduct	190	138,000
Second San Diego Aqueduct	500	362,000
Barona Aqueduct	505	366,000
High Line Aqueduct	540	390,000
	1,735	1,256,000

In the course of this investigation, additional conduit and regulatory reservoir systems to supply Colorado River on northern California water to Murrieta Valley, and to Camp Pendleton and the Fallbrook area, were studied on a preliminary basis. An important consideration in such systems is the necessity for storage reservoirs, either as part of the distribution facilities or on the main aqueduct, to regulate the supply which would be available essentially on a uniform flow basis. The aqueducts, reservoirs, and conduits, existing and considered herein as potential water supply development, are depicted on Plate 25.

Conclusions

As a result of this investigation it is concluded that:

1. Economic development of lands within the watershed has been largely limited in extent to those activities which could be served with water conveniently and economically obtained. With a possible minor exception, this has caused no overdraft on local water sources. Therefore, the presently developed supply, including both local and imported water, is generally sufficient to meet present demands within the watershed provided present import is continued.

2. There are few areas in the watershed or in areas adjacent thereto where more water would not be put to beneficial use in expansion of water using activities if it were available at a price which the user considered attractive. In the case of Fallbrook Public Utility District, which serves water both inside and outside but adjacent to the watershed, difficulty has been experienced since the close of the period on which analyses in this investigation were based (September, 1953), in adequately supplying lands presently developed to irrigated agriculture and domestic occupancy within the District's service area. The basic cause of the difficulty is presumably the curtailment by court action of the supply from San Luis Rey River in 1954, the decrease in availability of of surplus Colorado River water in San Diego Aqueduct, and the lack of

storage capacity to store for future use Colorado River water which has been available in off peak periods.

3. A portion of the ultimate supplemental water requirement of the watershed can be met by conservation of waters now wasting to the ocean, either by construction of additional surface storage capacity or by increased utilization of available underground storage capacity. Present waste to the ocean averages only about 25,000 acre-feet per season, therefore, final satisfaction of the ultimate supplemental water requirement of about 136,000 acre-feet must lie in importation of large quantities of water from outside sources.

4. The greatest opportunity for increased utilization of underground storage capacity exists in Santa Margarita Coastal Basin, where supplemental water can be developed at a cost considerably less than from possible surface storage developments or from potential sources of imported water.

5. Suitable reservoir sites on the Santa Margarita River exist only in the lower reaches of the stream, and water service therefrom within the watershed could feasibly be provided only to the Fallbrook and Camp Pendleton areas.

6. Considering a single reservoir development, construction of a dam and reservoir at the De Luz site to a water conservation capacity of about 143,000 acre-feet appears to be the most economical as regards magnitude of yield and unit cost. The cost of incremental yield developed by larger capacities at this site increases rapidly. Based on available past records of runoff, net safe yield of this reservoir would be about 14,000 acre-feet per year, which could be developed at an annual cost at the reservoir of about $33.00 per acre-foot.

7. Considering a jointly operated two reservoir development, construction of reservoirs at the Fallbrook Lippincott and De Luz sites

with capacities of 65,000 acre-feet and 75,000 acre-feet, respectively, appears to be the most economical as regards magnitude of yield and unit cost. The cost of incremental yield developed by increasing the capacity of De Luz Reservoir, in such a two reservoir development, increases rapidly. Based on available past records of runoff, net safe yield of the development would be about 13,100 acre-feet per year, which could be developed at an average annual cost at the reservoirs of about $35.00 per acre-foot.

8. Water could be delivered to the Fallbrook service area at a lesser cost with the two reservoir development cited in (7) than with the single reservoir development cited in (6) because part of the supply would be available closer to the service area, although such costs under both plans would be of comparable magnitude.

9. Water could be delivered to the Camp Pendleton service area at a lesser cost under the single reservoir development (6) than under the two reservoir development (7) although such costs under both plans would be of comparable magnitude.

10. No consideration was given in this investigation to construction of flood control facilities. However, storage capacity for flood control purposes could be provided in addition to the water conservation capacities considered herein for reservoirs at the De Luz site.

11. Additional imported water is not now available in the watershed but, with construction of the additional aqueduct capacity contemplated for the near future, Colorado River water will be available through facilities of Metropolitan Water District and San Diego County Water Authority.

12. Ultimately the Santa Margarita River watershed will be provided water service by facilities of The California Aqueduct system.

13. Further conservation of local waters in surface reservoir developments will require relatively large capital expenditure to obtain a water supply of a magnitude inherently uncertain because of the erratic nature of runoff and relatively short length of records.

14. Imported water potentially available to the watershed is a more assured supply, is of greater magnitude, and can be obtained at a unit cost comparable to that of local water developed by reservoir construction.

15. Selection of a plan of local water resource development is a matter for local decision, and will depend on, among other factors, the financial capacity of the constructing agency, the amount of water required at the time construction is contemplated, and the availability of a firm supply of imported water at that time.

16. Pending water rights litigation in the watershed has hindered local water resource development and until such litigation is settled a program of construction of local water resource development projects cannot be successfully prosecuted.

Recommendations

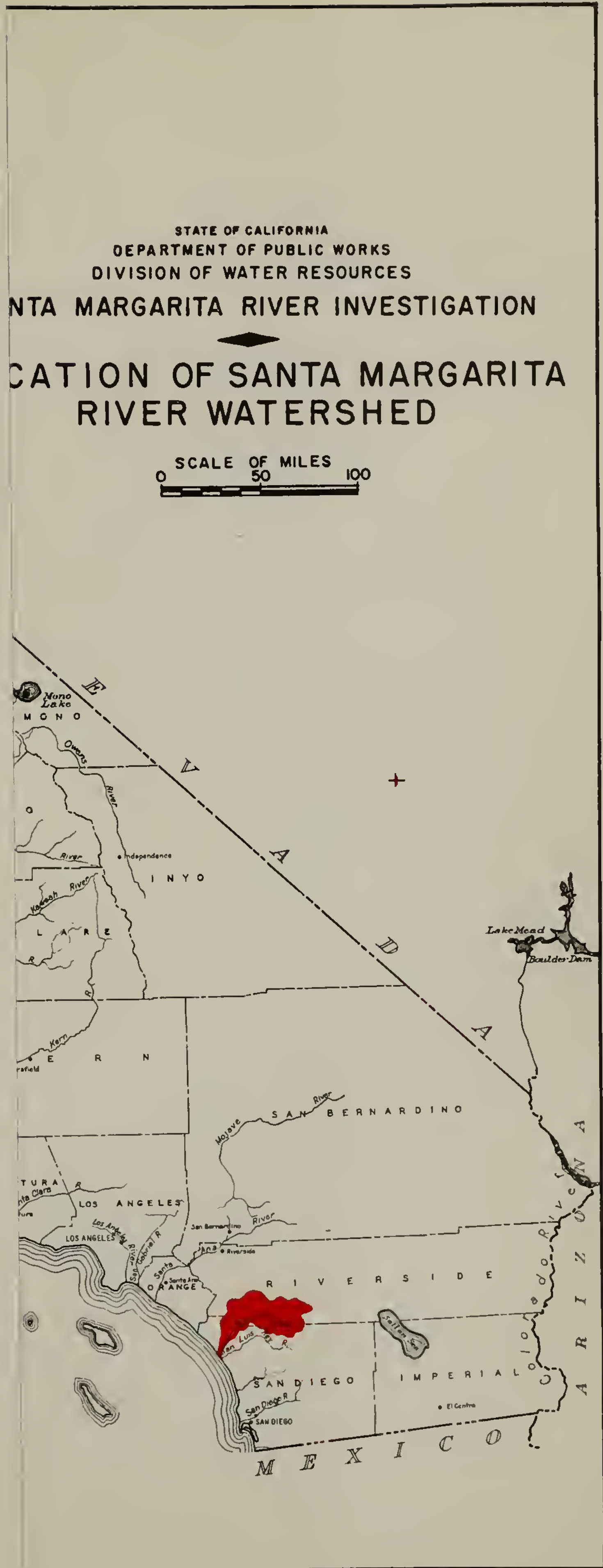
It is recommended that:

1. Steps be taken to settle pending water rights litigation in the Santa Margarita River watershed.

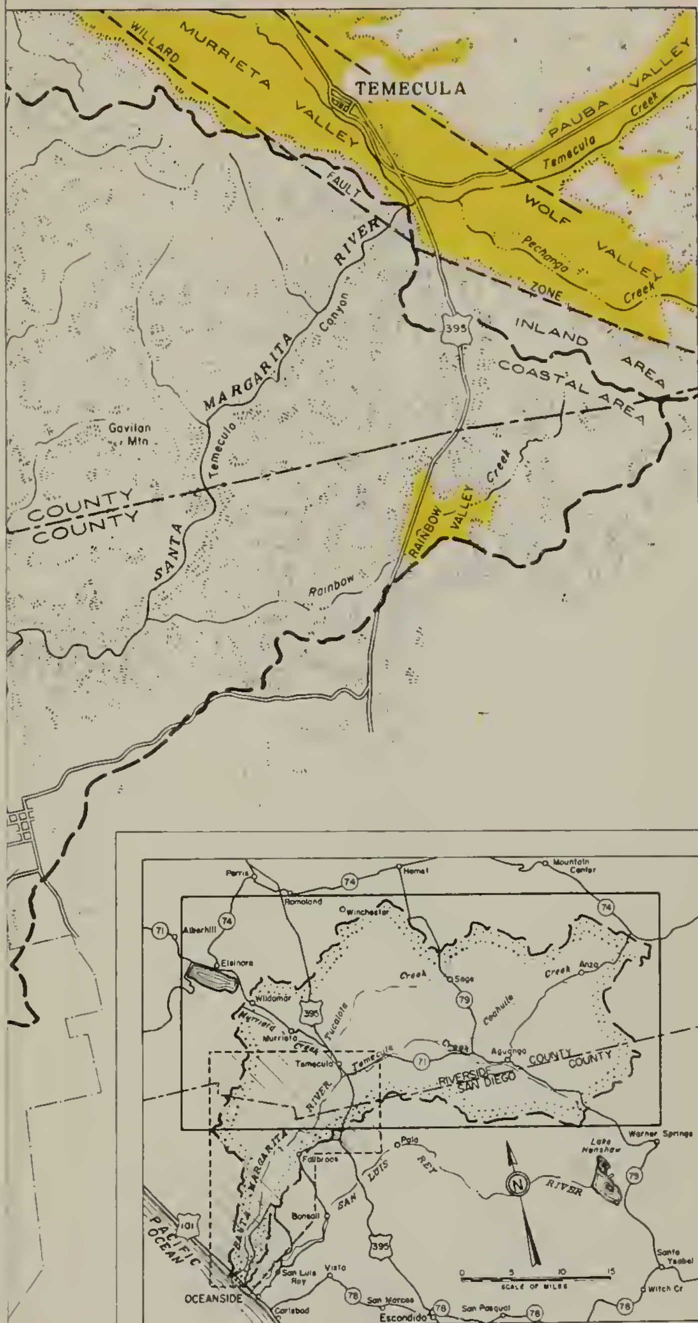
2. Water using entities and individuals in the watershed give continuing support to the Feather River Project and The California Water Plan, of which it is the initial unit, and also to those agencies responsible for the construction of additional facilities to bring Colorado River water to the watershed and adjacent areas, so that such construction can be initiated as expeditiously as possible.

3. Agencies considering construction of local water resource developments in the watershed give consideration to the plans presented herein, and that these plans be reevaluated in the future under economic condition extant at that time.

4. A continuing systematic program of basic hydrologic data collection throughout the watershed be instituted and coordinated by responsible local agencies.


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
NTA MARGARITA RIVER INVESTIGATION
CATION OF SANTA MARGARITA
RIVER WATERSHED
SCALE OF MILES
0
50
100
Mono Lake
MONO
Owens
River
Independence
INYO
Kaweah River
Lake Mead
Boulder Dam
KERN
SAN BERNARDINO
Mojave
River
LOS ANGELES
LOS ANGELES
San Bernardino
River
Riverside
ORANGE
RIVERSIDE
SAN DIEGO
San Diego R
SAN DIEGO
IMPERIAL
El Centro
Salton Sea
Colorado
ARIZONA
MEXICO


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
LOCATION OF SANTA MARGARITA RIVER WATERSHED
SCALE OF MILES
0
50
100
OREGON
NEVADA
ARIZONA
MEXICO
PACIFIC OCEAN
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
COLUSA
LAKE
YUBA
NEVADA
PLACER
SONOMA
YOLO
SACRAMENTO
EL DORADO
ALPINE
AMADOR
SOLANO
MARIN
CONTRA COSTA
SAN JOAQUIN
CALAVERAS
TUOLUMNE
MONO
ALAMEDA
STANISLAUS
MARIPOSA
MERCED
SANTA CLARA
SANTA CRUZ
MADERA
FRESNO
SAN BENITO
INYO
MONTEREY
KINGS
TULARE
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
ORANGE
RIVERSIDE
SAN DIEGO
IMPERIAL
Goose Lake
Eagle Lake
Honey Lake
Lake Almanor
Clear Lake
Lake Tahoe
Mono Lake
Salton Sea
Lake Mead
Boulder Dam
SAN FRANCISCO
OAKLAND
SACRAMENTO
STOCKTON
LOS ANGELES
SAN DIEGO
Colorado River



KEY MAP

LEGEND

WATERSHED BOUNDARY

FAULT

VALLEY AREA

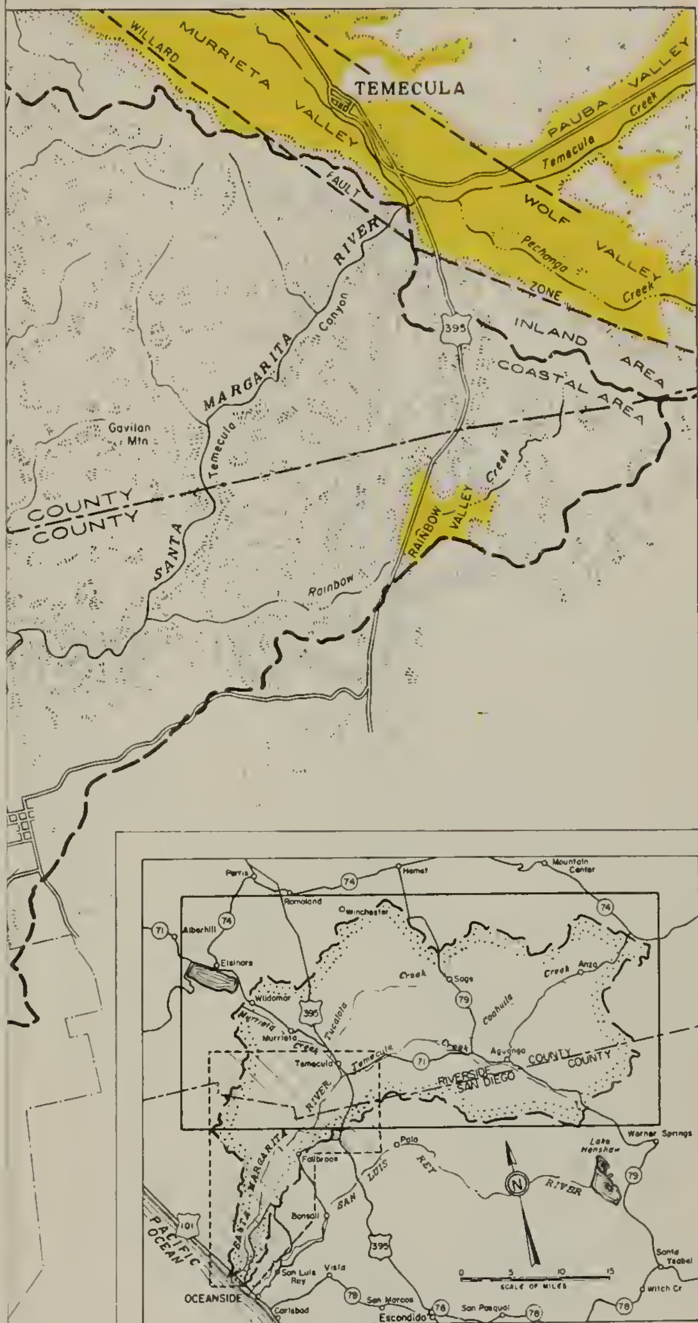
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

PHYSIOGRAPHY
COASTAL AREA

SCALE OF MILES

1 0 1 2 3 4



KEY MAP

LEGEND

WATERSHED BOUNDARY

FAULT

VALLEY AREA

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

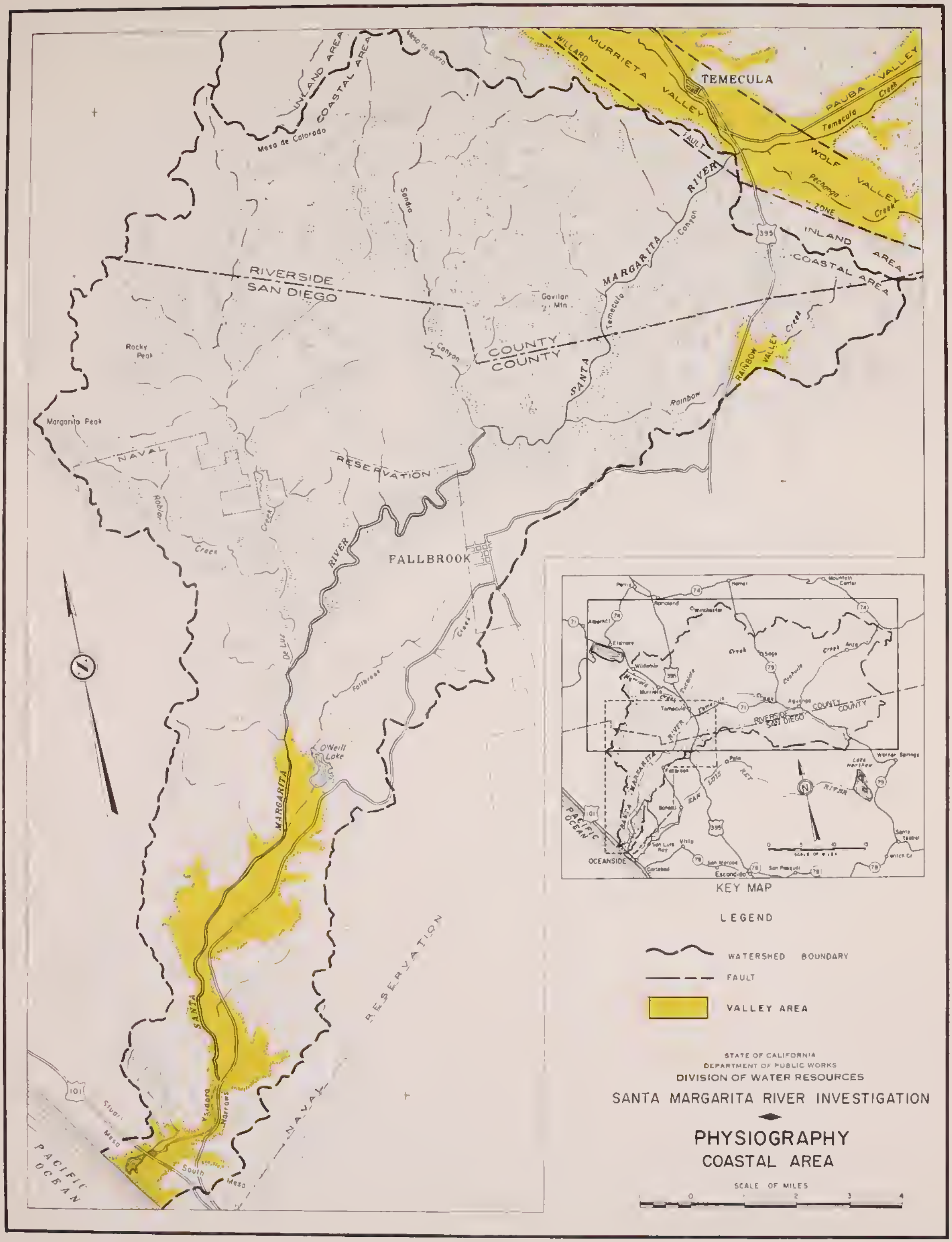
SANTA MARGARITA RIVER INVESTIGATION

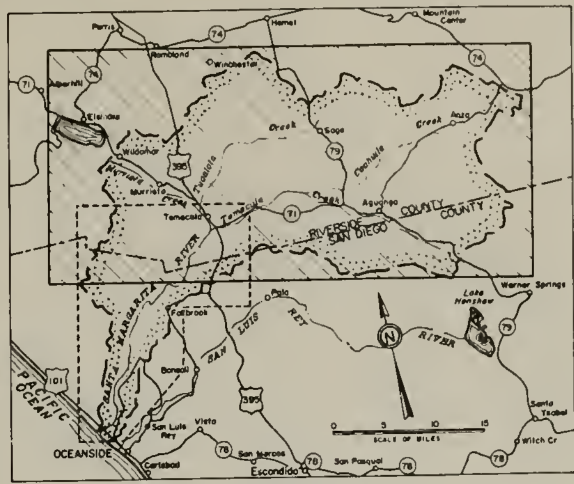
PHYSIOGRAPHY
COASTAL AREA

SCALE OF MILES

1 0 1 2 3 4

PLATE 2A


TEMECULA
MURRIETA VALLEY
WILLARD FAULT ZONE
PAUBA VALLEY
WOLF VALLEY
Temecula Creek
Pechanga Creek
INLAND AREA
COASTAL AREA
Mesa de Burro
Mesa de Colorado
Sandia
SANTA MARGARITA RIVER
Temecula Canyon
Gavilan Mtn
RIVERSIDE
SAN DIEGO
COUNTY
COUNTY
RAINBOW VALLEY
Rainbow Creek
Rocky Peak
Margarita Peak
NAVAL RESERVATION
Roblar Creek
De Luz Creek
FALLBROOK
Fallbrook Creek
O'Neill Lake
Ysidora Narrows
Stuart Mesa
South Mesa
PACIFIC OCEAN
101
395
KEY MAP
OCEANSIDE
LEGEND
WATERSHED BOUNDARY
FAULT
VALLEY AREA
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
PHYSIOGRAPHY
COASTAL AREA
SCALE OF MILES
0
1
2
3
4



KEY MAP

LEGEND

WATERSHED BOUNDARY

FAULT

VALLEY AREA

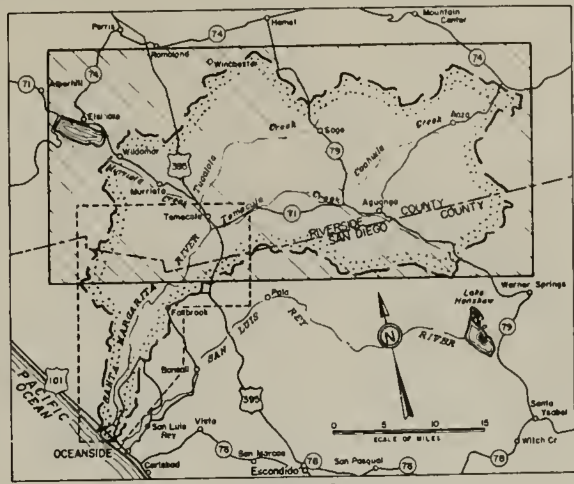
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

PHYSIOGRAPHY
INLAND AREA

SCALE OF MILES

1 0 1 2 3 4



KEY MAP

LEGEND

WATERSHED BOUNDARY

FAULT

VALLEY AREA

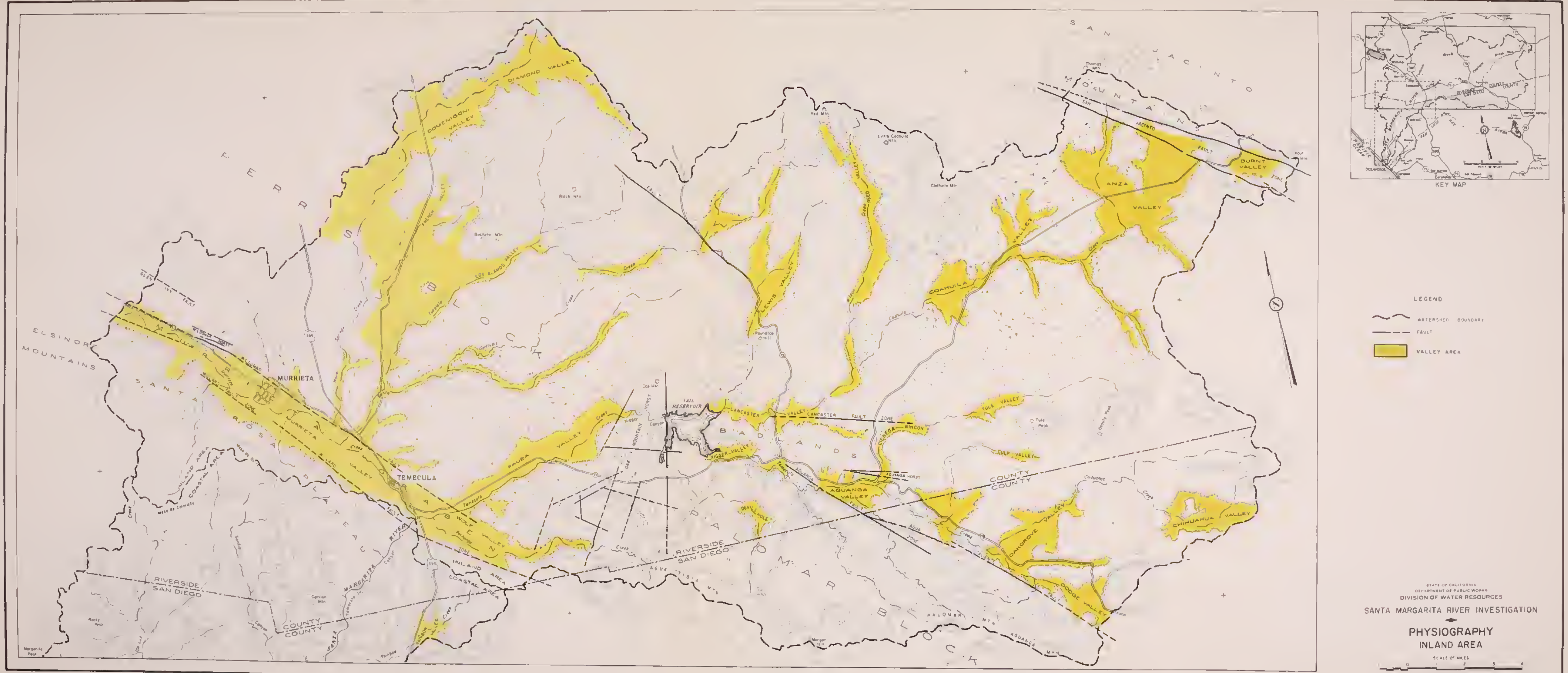
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

PHYSIOGRAPHY
INLAND AREA

SCALE OF MILES

1 0 1 2 3 4


SAN JACINTO MOUNTAINS
FERRIS BLOCK
ELSINORE MOUNTAINS
SANTA ROSA PLATEAU
PALOMAR BLOCK
BADLANDS
DIAMOND VALLEY
DOMENIGONI VALLEY
FRENCH VALLEY
LOS ALAMOS VALLEY
MURRIETA
MURRIETA VALLEY
TEMECULA
WOLF VALLEY
PAUBA VALLEY
VAIL RESERVOIR
LANCASTER VALLEY
LANCASTER FAULT ZONE
NIGGER VALLEY
DEVILS HOLE
AGUANGA VALLEY
LEWIS VALLEY
COAHUILA VALLEY
ANZA VALLEY
BURNT VALLEY
SAN JACINTO FAULT ZONE
TULE VALLEY
CULP VALLEY
CIENEGA
RINCON
OAKGROVE VALLEY
DODGE VALLEY
CHIHUAHUA VALLEY
AGUA TIBIA MTN
PALOMAR MTN
AGUANGA MTN
RIVERSIDE COUNTY
SAN DIEGO COUNTY
INLAND AREA
COASTAL AREA
SANTA MARGARITA RIVER
KEY MAP
LEGEND
WATERSHED BOUNDARY
FAULT
VALLEY AREA
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
PHYSIOGRAPHY
INLAND AREA
SCALE OF MILES

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL MEAN SEASONAL PRECIPITATION

MEAN PERIOD 1897—1947

SCALE OF MILES

0 1 2 3 4

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

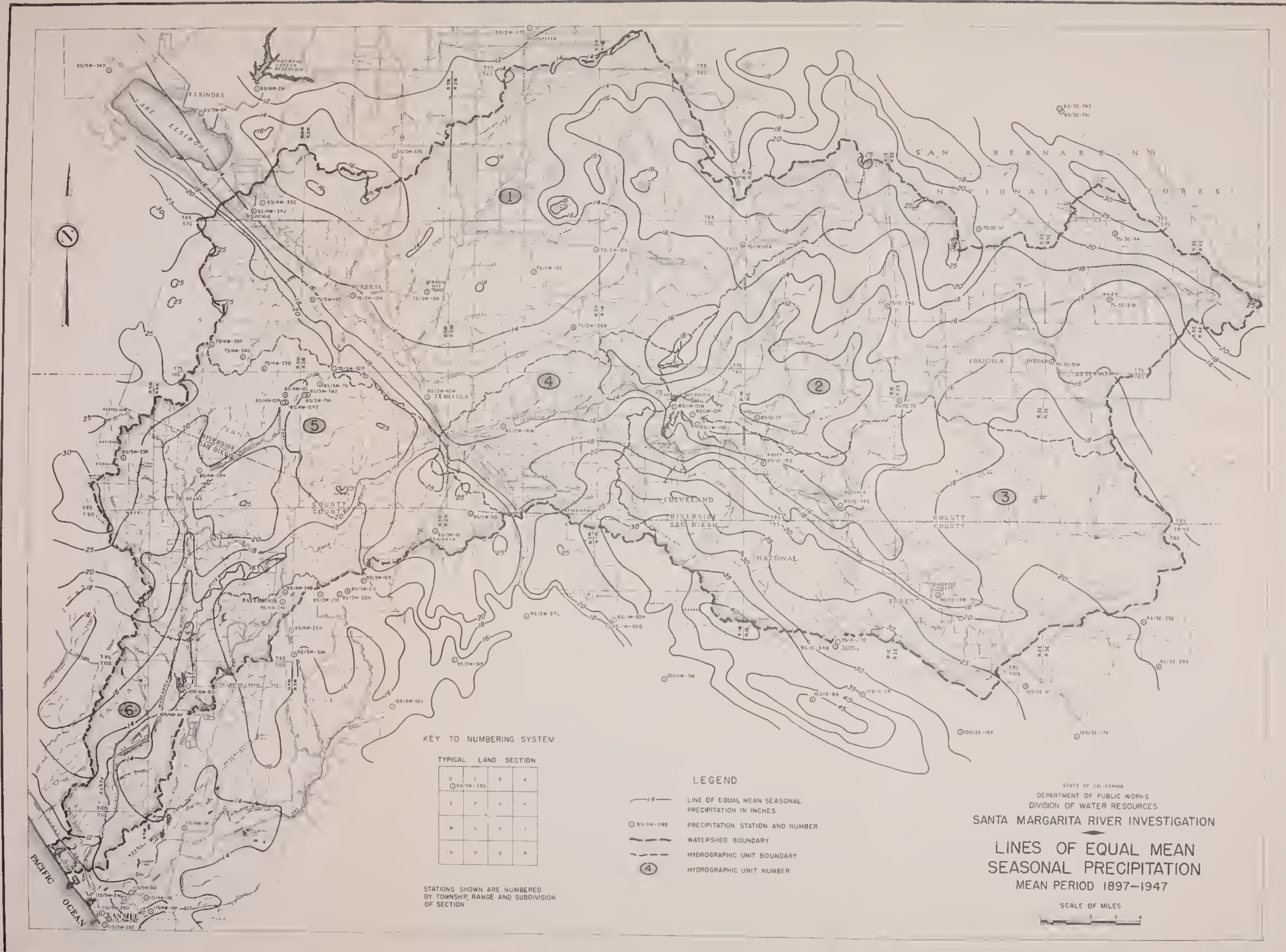
SANTA MARGARITA RIVER INVESTIGATION

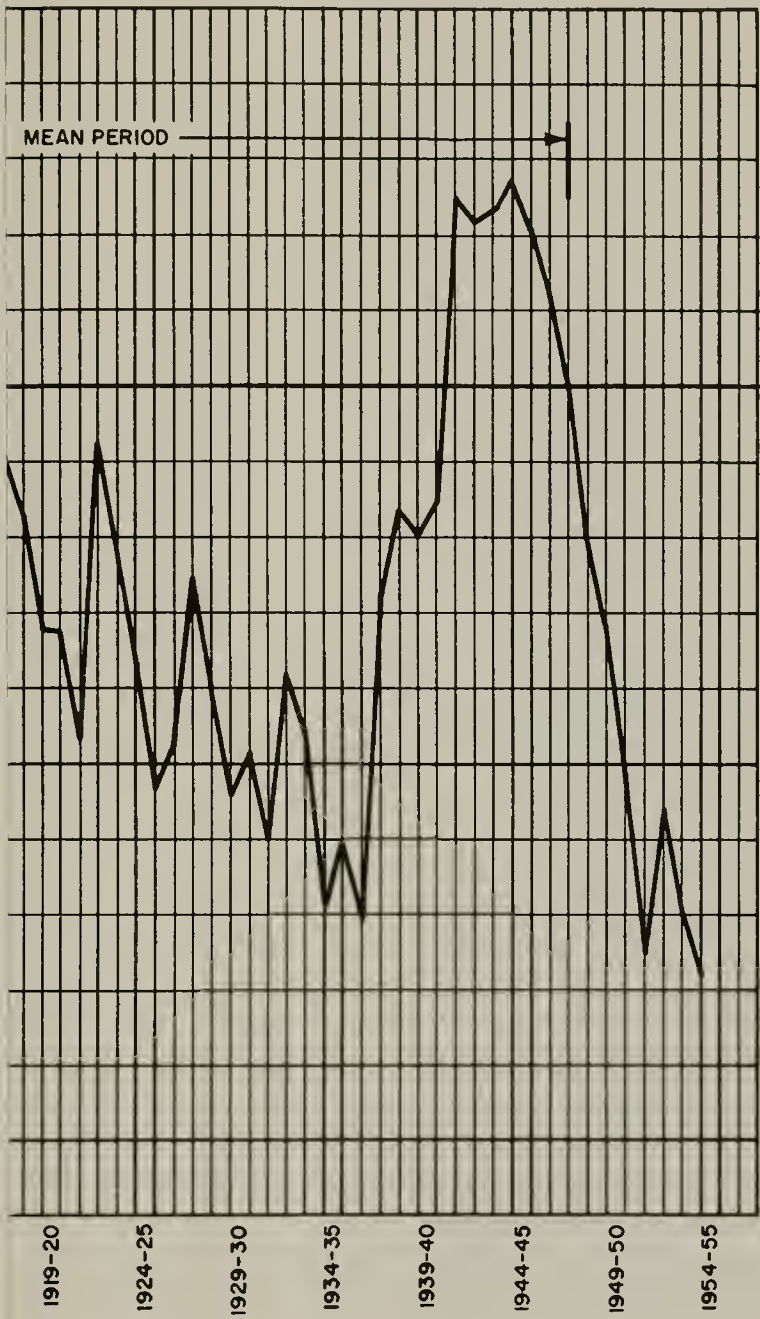
LINES OF EQUAL MEAN SEASONAL PRECIPITATION

MEAN PERIOD 1897—1947

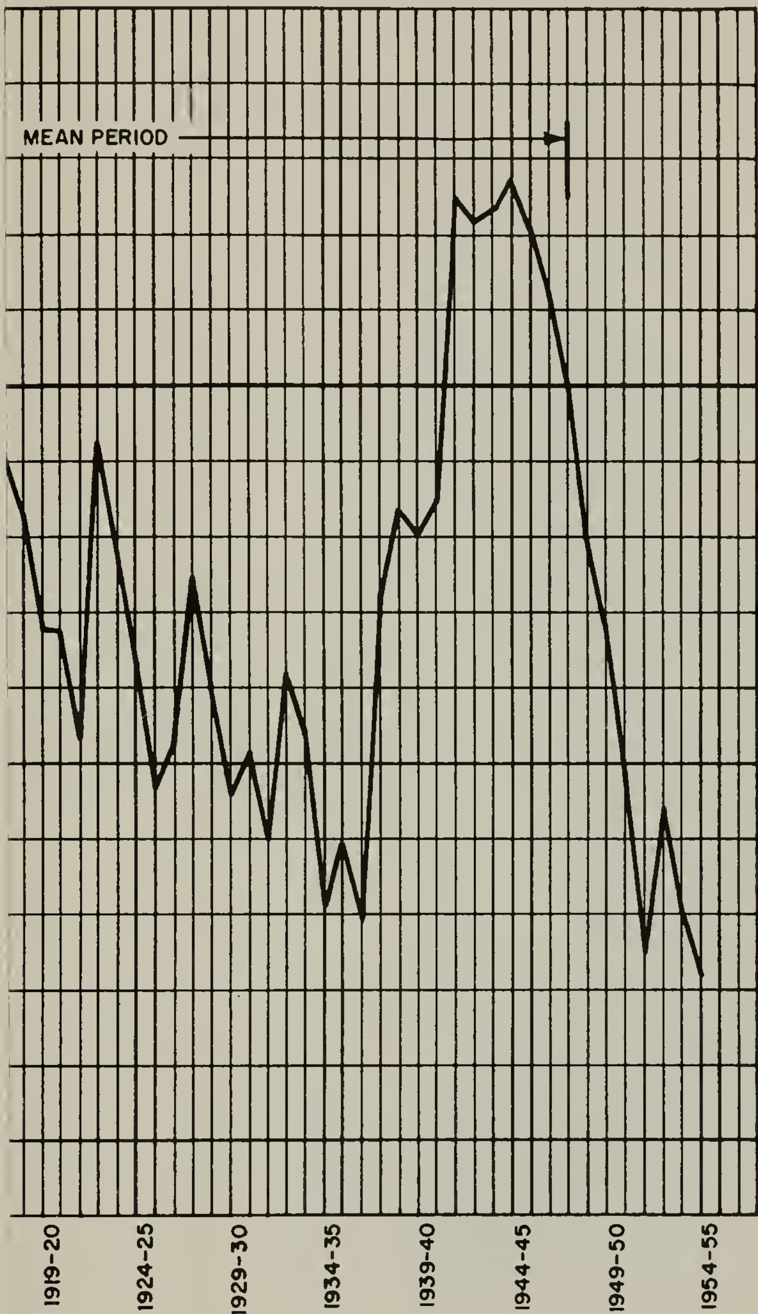
SCALE OF MILES

0 1 2 3 4

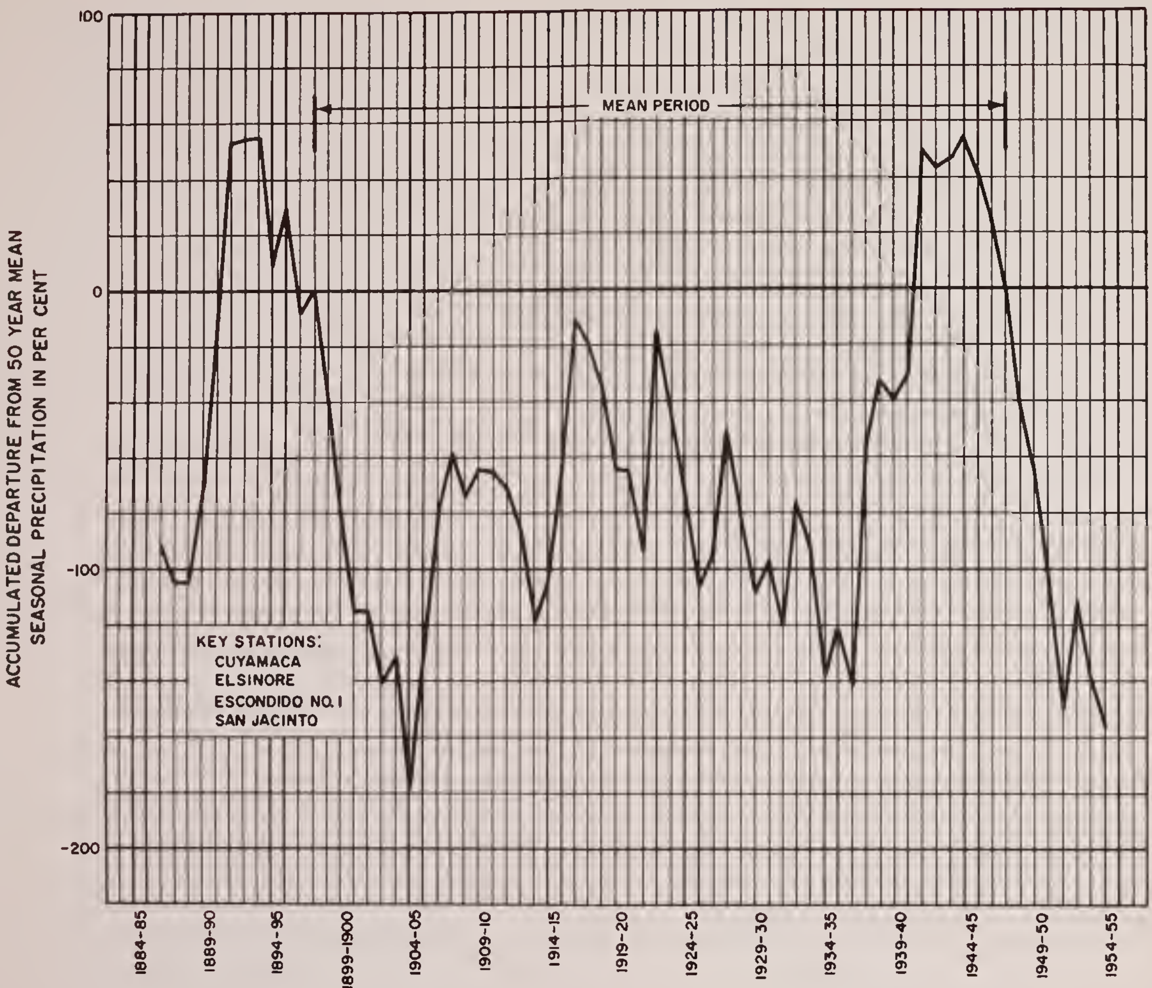

ELSINORE
LAKE ELSINORE
MURRIETA
TEMECULA
SAN BERNARDINO NATIONAL FORES
COAHUILA INDIAN RESERVATION
CLEVELAND NATIONAL FORES
RIVERSIDE COUNTY
SAN DIEGO COUNTY
PACIFIC OCEAN
KEY TO NUMBERING SYSTEM
TYPICAL LAND SECTION
STATIONS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION
LEGEND
LINE OF EQUAL MEAN SEASONAL PRECIPITATION IN INCHES
PRECIPITATION STATION AND NUMBER
WATERSHED BOUNDARY
HYDROGRAPHIC UNIT BOUNDARY
HYDROGRAPHIC UNIT NUMBER
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
LINES OF EQUAL MEAN SEASONAL PRECIPITATION
MEAN PERIOD 1897–1947
SCALE OF MILES



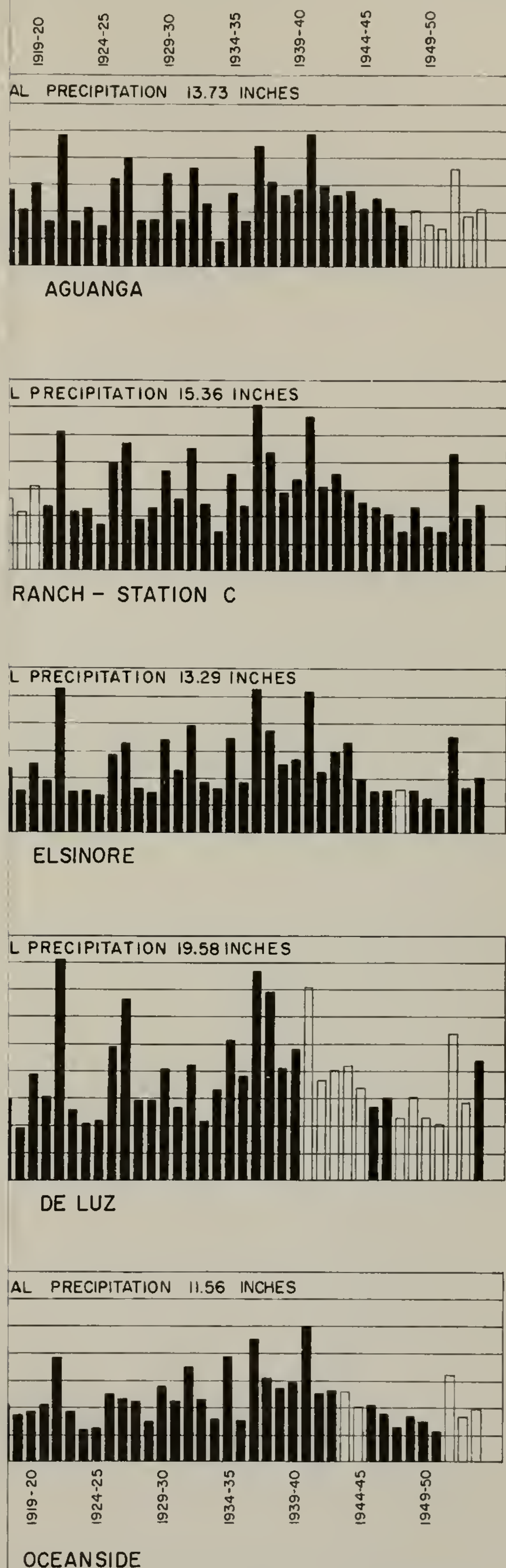
) DEPARTURE FROM MEAN
TION AT KEY STATIONS



) DEPARTURE FROM MEAN
TION AT KEY STATIONS

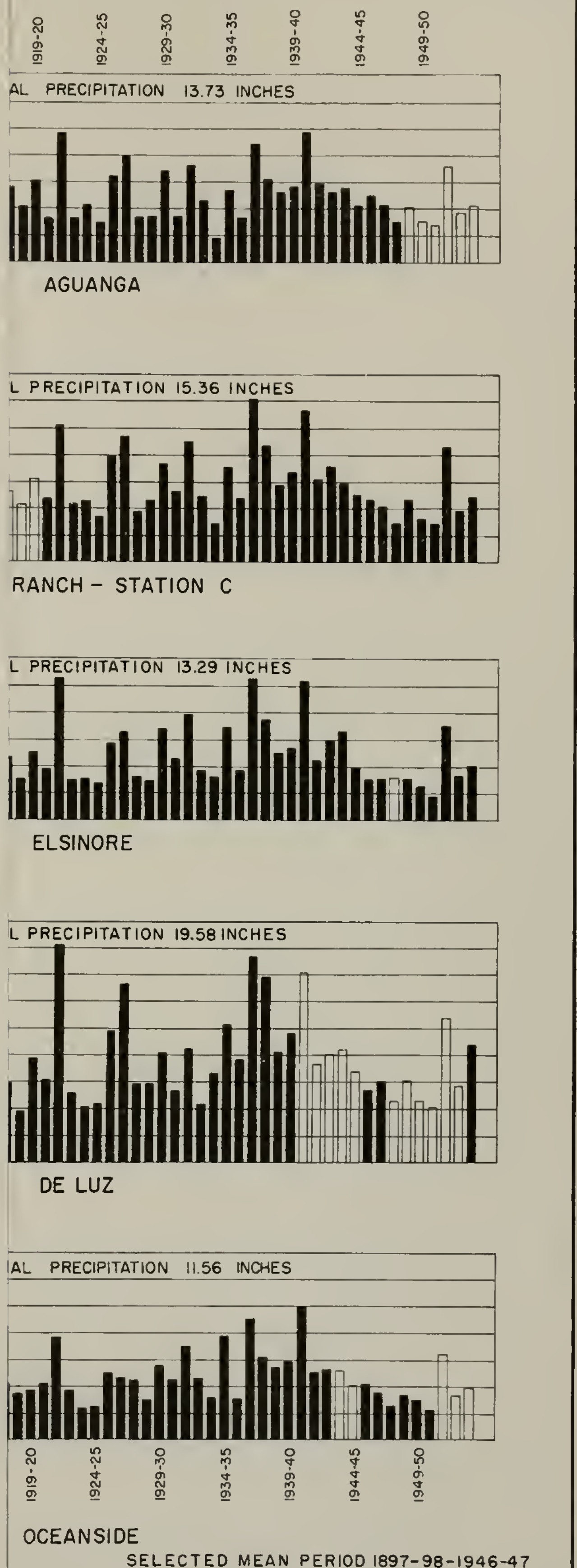


COMPOSITE ACCUMULATED DEPARTURE FROM MEAN SEASONAL PRECIPITATION AT KEY STATIONS

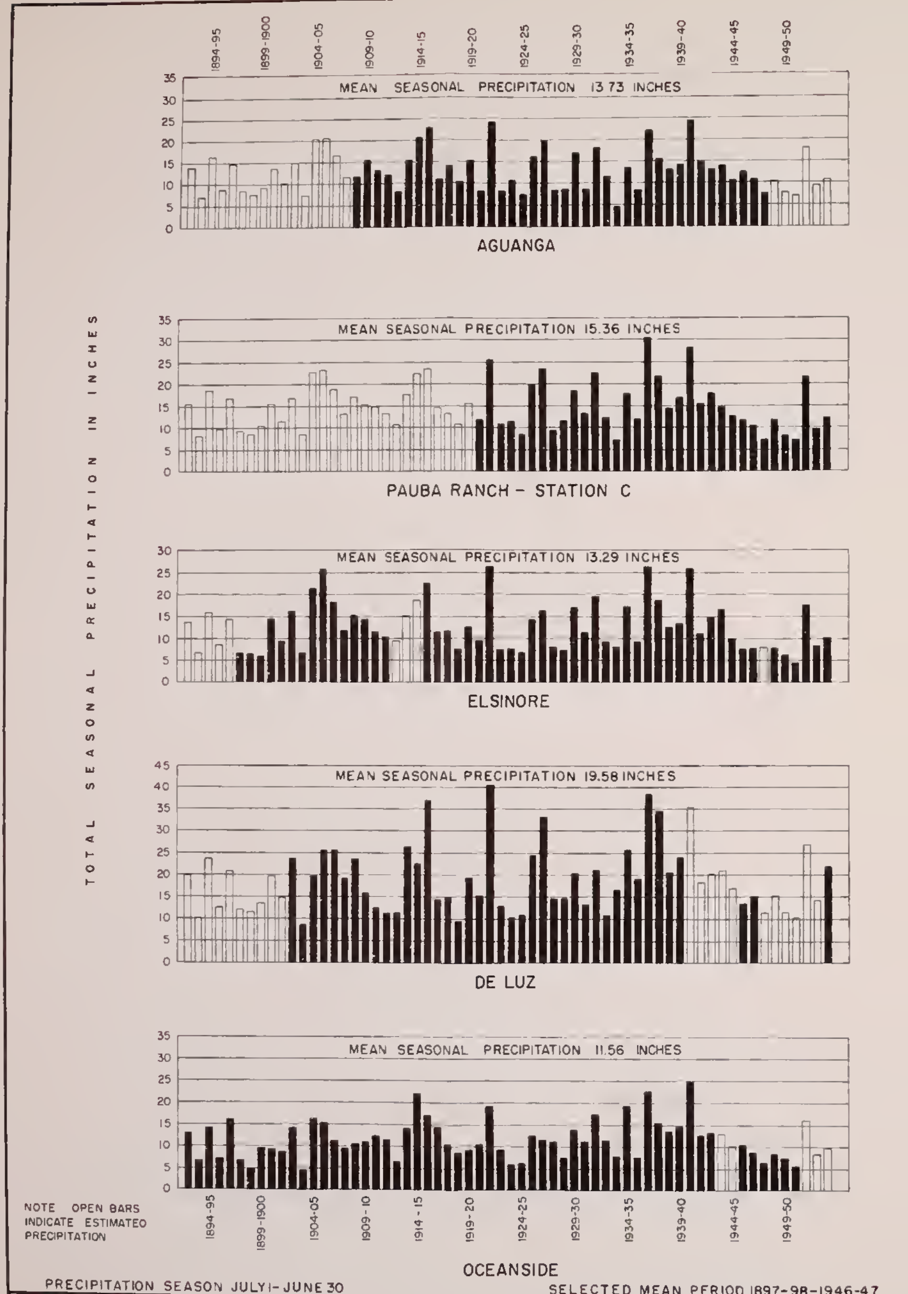


SELECTED MEAN PERIOD 1897-98-1946-47

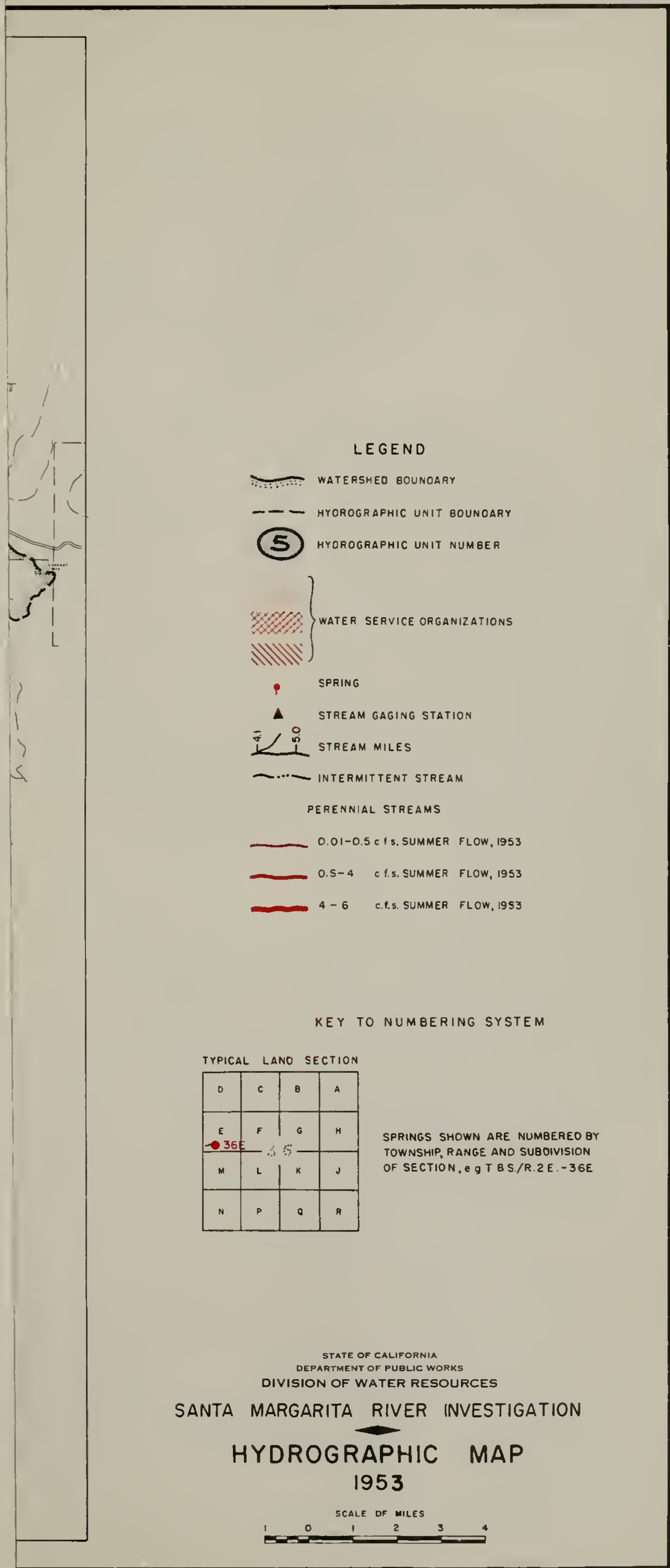
D SEASONAL PRECIPITATION
ED STATIONS

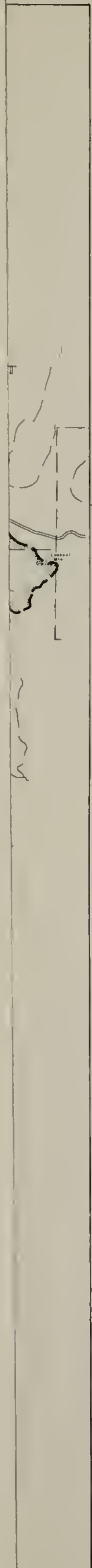


D SEASONAL PRECIPITATION
D STATIONS



RECORDED AND ESTIMATED SEASONAL PRECIPITATION AT SELECTED STATIONS


LEGEND
WATERSHED BOUNDARY
HYDROGRAPHIC UNIT BOUNDARY
5
HYDROGRAPHIC UNIT NUMBER
WATER SERVICE ORGANIZATIONS
SPRING
STREAM GAGING STATION
4.1
5.0
STREAM MILES
INTERMITTENT STREAM
PERENNIAL STREAMS
0.01–0.5 c f s. SUMMER FLOW, 1953
0.5–4 c f.s. SUMMER FLOW, 1953
4 – 6 c.f.s. SUMMER FLOW, 1953
KEY TO NUMBERING SYSTEM
TYPICAL LAND SECTION
D C B A
E F G H
36E
M L K J
N P Q R
SPRINGS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e g T 8 S./R.2 E.-36E
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
HYDROGRAPHIC MAP
1953
SCALE OF MILES
1 0 1 2 3 4



LEGEND

WATERSHED BOUNDARY

HYDROGRAPHIC UNIT BOUNDARY

(5) HYDROGRAPHIC UNIT NUMBER

WATER SERVICE ORGANIZATIONS

SPRING

STREAM GAGING STATION

4.1 5.0 STREAM MILES

INTERMITTENT STREAM

PERENNIAL STREAMS

0.01–0.5 c.f.s. SUMMER FLOW, 1953

0.5–4 c.f.s. SUMMER FLOW, 1953

4 – 6 c.f.s. SUMMER FLOW, 1953

KEY TO NUMBERING SYSTEM

TYPICAL LAND SECTION

D	C	B	A
E 36E	F 35	G	H
M	L	K	J
N	P	Q	R

SPRINGS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e.g. T 8 S/R.2 E.-36E

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

HYDROGRAPHIC MAP
1953

SCALE OF MILES

1 0 1 2 3 4

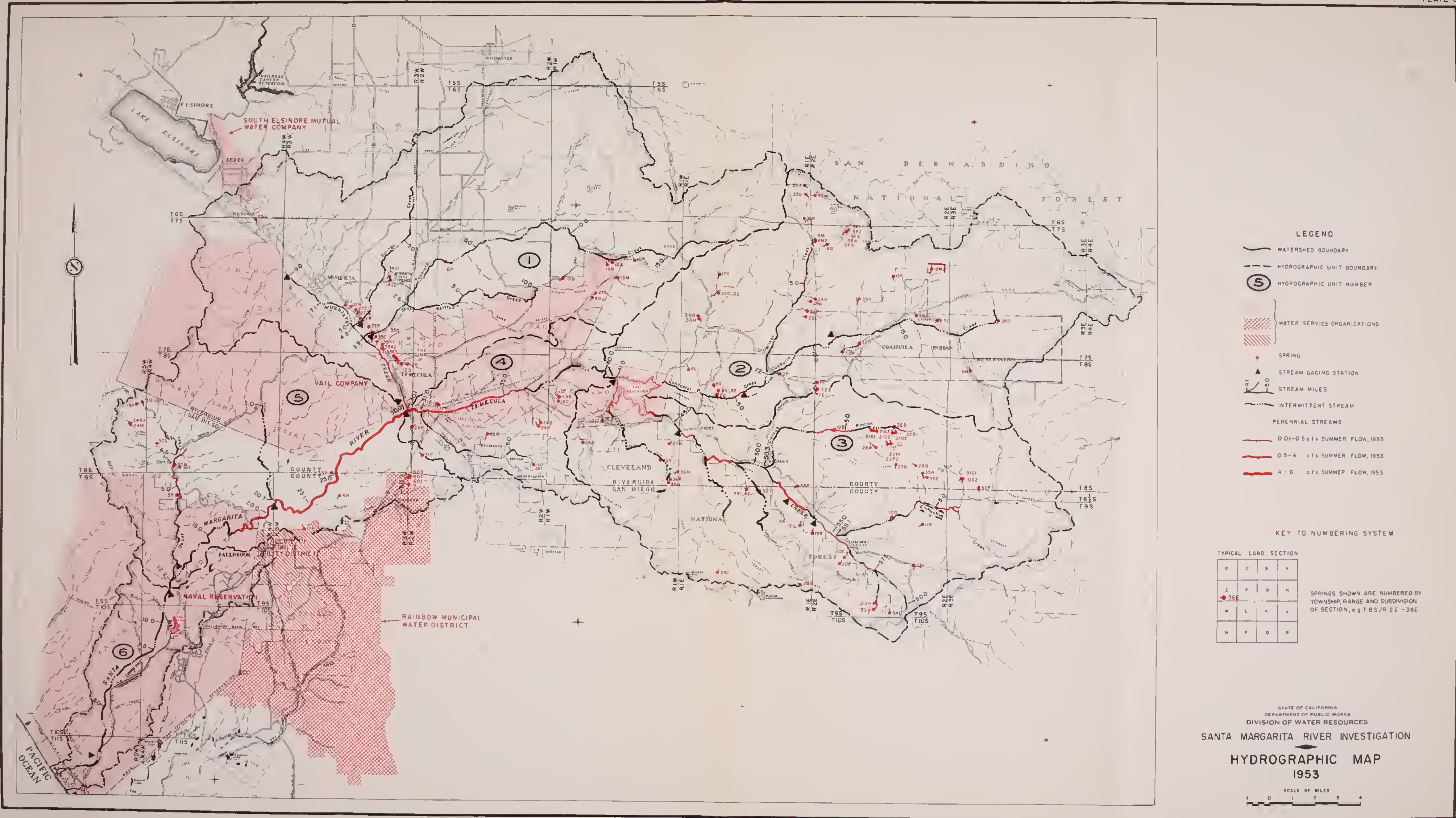
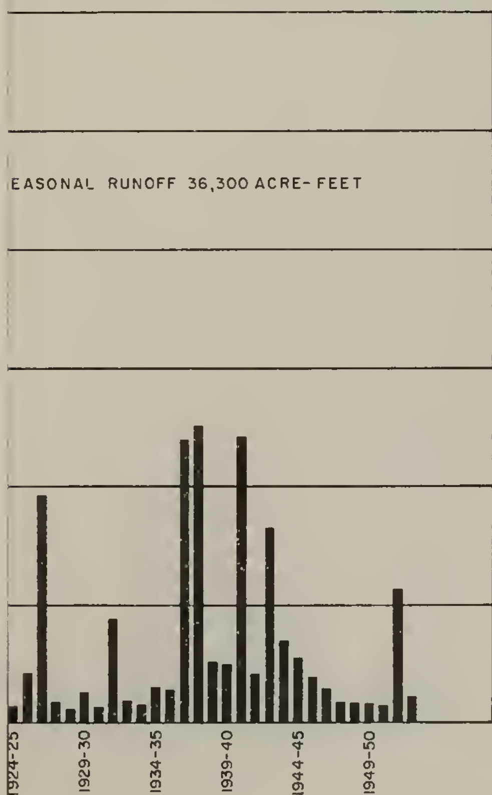

LEGEND
WATERSHED BOUNDARY
HYDROGRAPHIC UNIT BOUNDARY
HYDROGRAPHIC UNIT NUMBER
WATER SERVICE ORGANIZATIONS
SPRING
STREAM GAGING STATION
STREAM MILES
INTERMITTENT STREAM
PERENNIAL STREAMS
0.01-0.5 c.f.s. SUMMER FLOW, 1953
0.5-4 c.f.s. SUMMER FLOW, 1953
4-6 c.f.s. SUMMER FLOW, 1953
KEY TO NUMBERING SYSTEM
TYPICAL LAND SECTION
SPRINGS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e.g. T 8S/R 2E -36E
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
HYDROGRAPHIC MAP
1953
SCALE OF MILES
LAKE ELSINORE
ELSINORE
SOUTH ELSINORE MUTUAL WATER COMPANY
SEDCO
MURRIETA
TEMECULA
VAIL COMPANY
RANCHO
RIVERSIDE COUNTY
SAN DIEGO COUNTY
CLEVELAND NATIONAL FOREST
SAN BERNARDINO NATIONAL FOREST
COAHUILA INDIAN RESERVATION
FALLBROOK
FALLBROOK PUBLIC UTILITY DISTRICT
NAVAL RESERVATION
RAINBOW MUNICIPAL WATER DISTRICT
SANTA MARGARITA RIVER
TEMECULA
PACIFIC OCEAN

PLATE 7

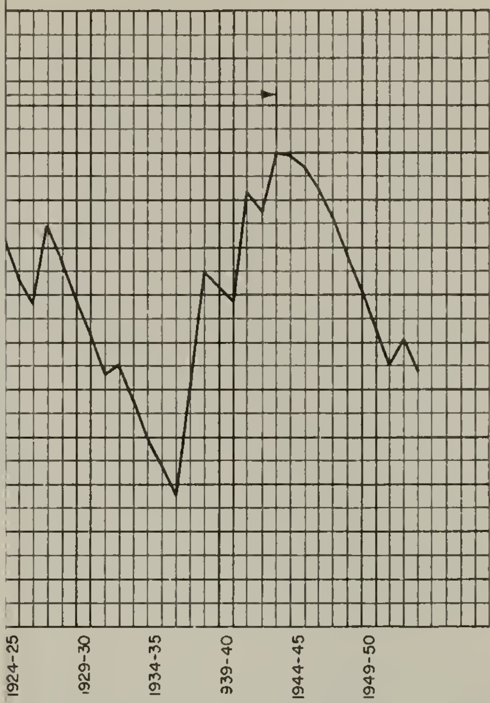
MEAN SEASONAL NATURAL RUNOFF
A RIVER AT YSIDORA

PLATE 8



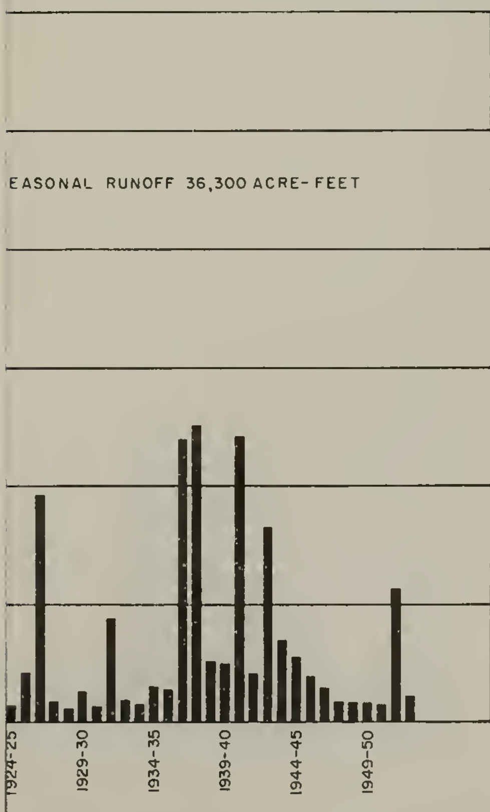
NAL NATURAL RUNOFF
A RIVER AT YSIDORA

PLATE 7

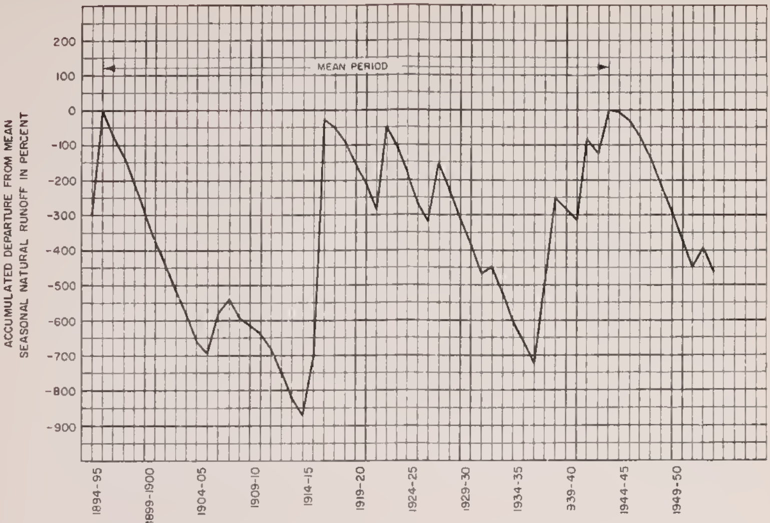


MEAN SEASONAL NATURAL RUNOFF
A RIVER AT YSIDORA

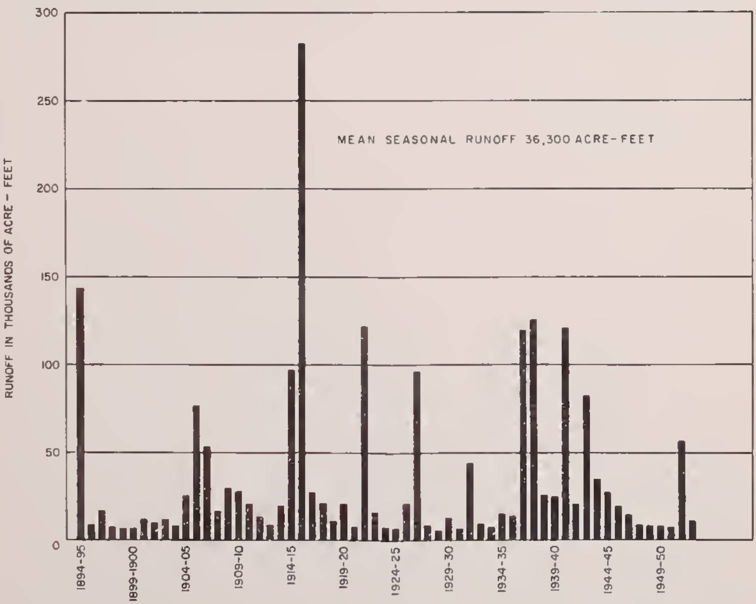
PLATE 8



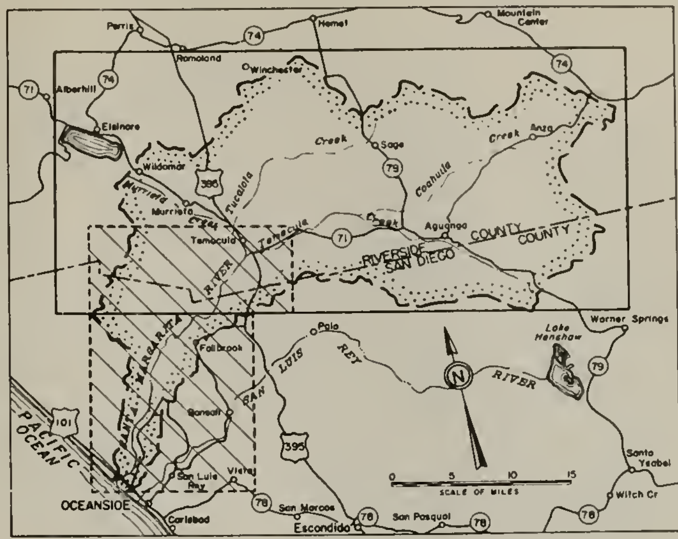
NAL NATURAL RUNOFF
A RIVER AT YSIDORA



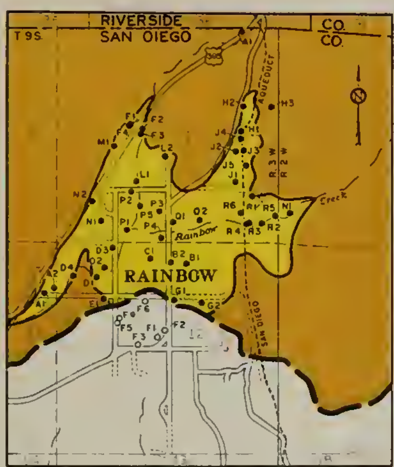
ACCUMULATED DEPARTURE FROM MEAN SEASONAL NATURAL RUNOFF OF SANTA MARGARITA RIVER AT YSIDORA



ESTIMATED SEASONAL NATURAL RUNOFF OF SANTA MARGARITA RIVER AT YSIDORA



KEY MAP



DETAIL

SCALE OF FEET

LEGEND

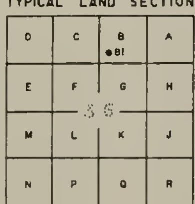
- ● K2 LOCATION OF WELL
- ○ F1 LOCATION OF WELL OUTSIDE WATERSHED
- WATERSHED BOUNDARY
- HYDROGRAPHIC UNIT BOUNDARY
- (5) HYDROGRAPHIC UNIT NUMBER
- U.S. LAND SURVEY SECTION LINE — FROM U.S.G.S. QUADRANGLE
- U.S. LAND SURVEY SECTION LINE — APPROX LOCATION BY D.W.R.
- U.S LAND SURVEY SECTION LINE — PROJECTED

WATER-BEARING CHARACTERISTICS OF UNDERGROUND FORMATIONS

- MODERATE TO HIGH PERMEABILITY
  RECENT ALLUVIUM, PRINCIPAL SOURCE OF GROUND WATER
- LOW PERMEABILITY
  OLDER ALLUVIUM AND DEEP RESIDUUM IN FALLBROOK AREA; MINOR GROUND WATER YIELD
- GENERALLY IMPERMEABLE
  IGNEOUS, METAMORPHIC, AND CEMENTED SEDIMENTS; PRACTICALLY NONWATER-BEARING, BUT LIMITED QUANTITIES OF WATER OBTAINED FROM JOINTS, FRACTURES, AND HIGHLY WEATHERED ZONES

KEY TO NUMBERING SYSTEM

TYPICAL LAND SECTION



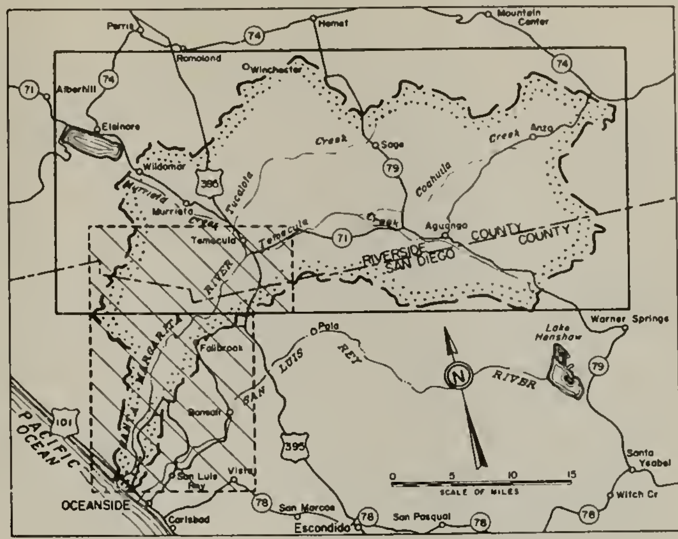
WELLS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e.g., T9S/R3W-36B1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

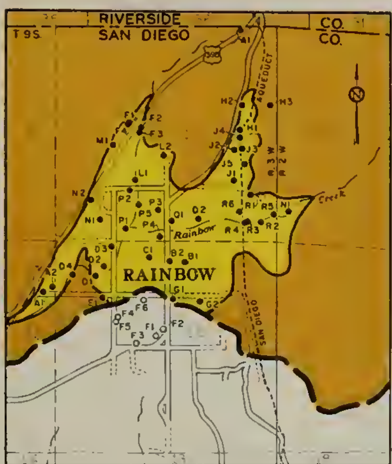
SANTA MARGARITA RIVER INVESTIGATION

LOCATION OF WELLS
COASTAL AREA
1953

SCALE OF MILES



KEY MAP



DETAIL

SCALE OF FEET

LEGEND

- ● K2 — LOCATION OF WELL
- ○ F1 — LOCATION OF WELL OUTSIDE WATERSHED
- WATERSHED BOUNDARY
- HYDROGRAPHIC UNIT BOUNDARY
- (5) HYDROGRAPHIC UNIT NUMBER
- U.S. LAND SURVEY SECTION LINE — FROM U.S.G.S. QUADRANGLE
- U.S. LAND SURVEY SECTION LINE — APPROX LOCATION BY D. W. R.
- U S LAND SURVEY SECTION LINE — PROJECTED

WATER-BEARING CHARACTERISTICS OF UNDERGROUND FORMATIONS

- MODERATE TO HIGH PERMEABILITY
  RECENT ALLUVIUM, PRINCIPAL SOURCE OF GROUND WATER
- LOW PERMEABILITY
  OLDER ALLUVIUM AND DEEP RESIDUUM IN FALLBROOK AREA; MINOR GROUND WATER YIELD
- GENERALLY IMPERMEABLE
  IGNEOUS, METAMORPHIC, AND CEMENTED SEDIMENTS; PRACTICALLY NONWATER-BEARING, BUT LIMITED QUANTITIES OF WATER OBTAINED FROM JOINTS, FRACTURES, AND HIGHLY WEATHERED ZONES

KEY TO NUMBERING SYSTEM

TYPICAL LAND SECTION

D	C	B ●B1	A
E	F	G	H
M	L	K	J
N	P	Q	R

(section 36)

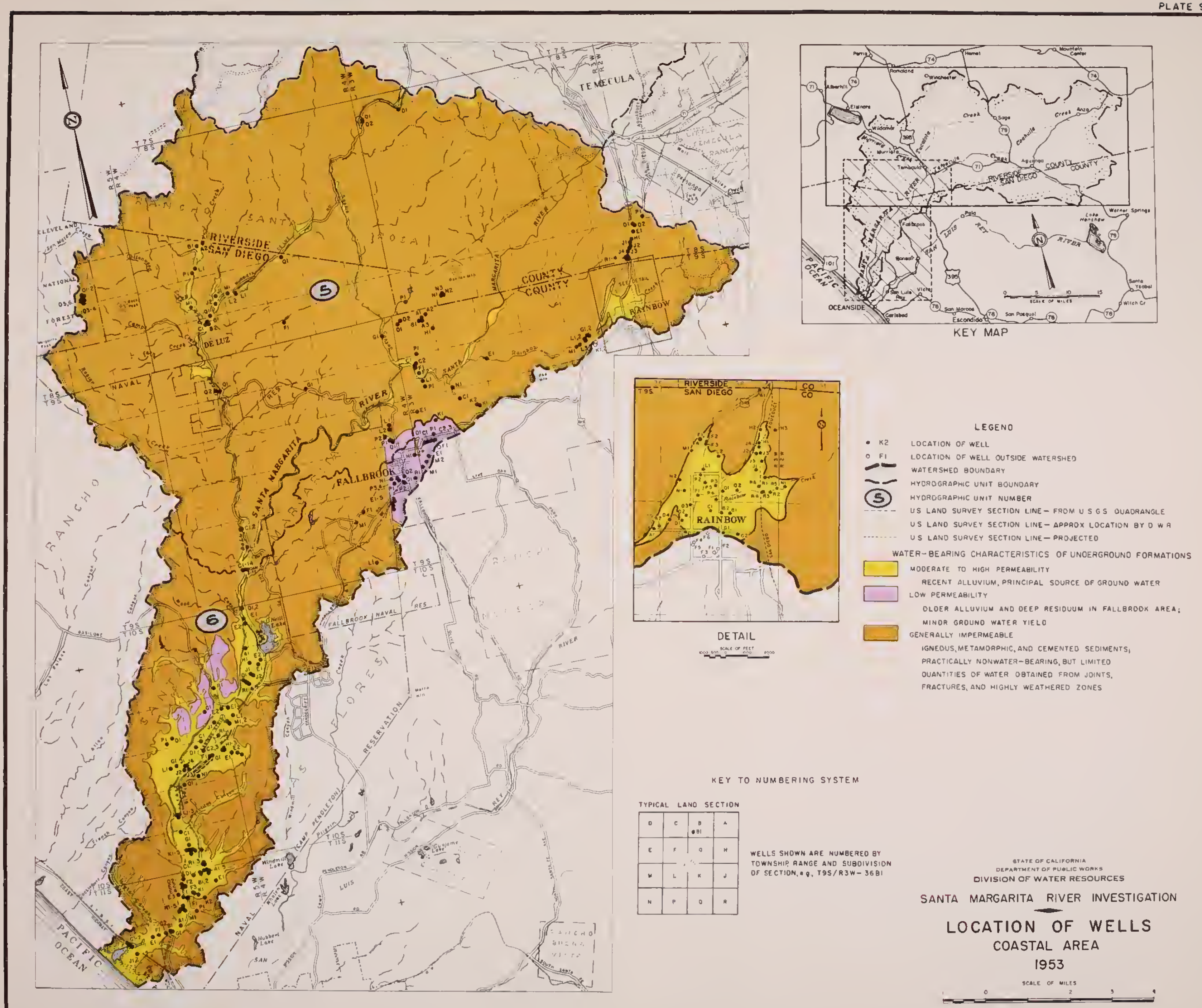
WELLS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e g, T9S/R3W-36B1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

LOCATION OF WELLS
COASTAL AREA
1953

SCALE OF MILES


KEY MAP
DETAIL
LEGEND
LOCATION OF WELL
LOCATION OF WELL OUTSIDE WATERSHED
WATERSHED BOUNDARY
HYDROGRAPHIC UNIT BOUNDARY
HYDROGRAPHIC UNIT NUMBER
U S LAND SURVEY SECTION LINE — FROM U S G S QUADRANGLE
U S LAND SURVEY SECTION LINE — APPROX LOCATION BY D W R
U S LAND SURVEY SECTION LINE — PROJECTED
WATER-BEARING CHARACTERISTICS OF UNDERGROUND FORMATIONS
MODERATE TO HIGH PERMEABILITY
RECENT ALLUVIUM, PRINCIPAL SOURCE OF GROUND WATER
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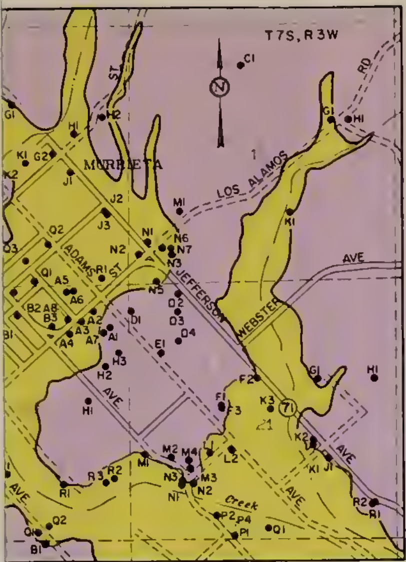
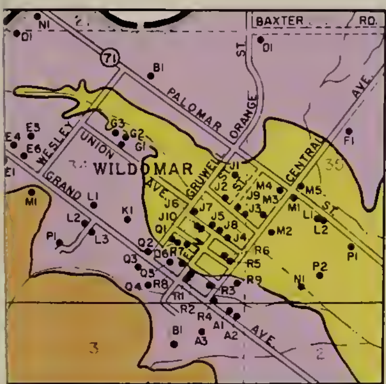
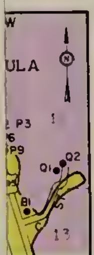
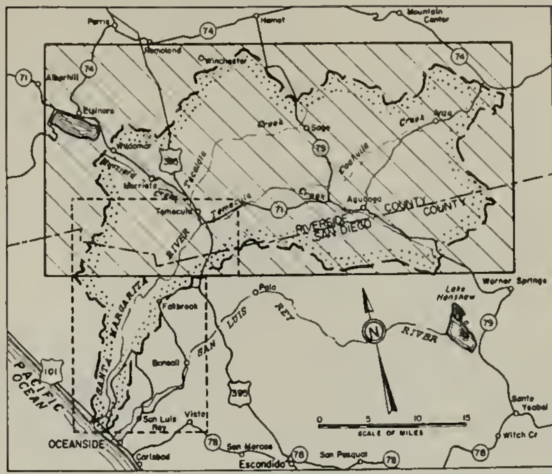
KEY TO NUMBERING SYSTEM
TYPICAL LAND SECTION
WELLS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e.g., T9S/R3W-36B1
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
LOCATION OF WELLS
COASTAL AREA
1953
SCALE OF MILES
TEMECULA
FALLBROOK
RAINBOW
DE LUZ
RIVERSIDE
SAN DIEGO
COUNTY
SANTA MARGARITA
RIVER
PACIFIC OCEAN
OCEANSIDE









KEY MAP

LEGEND

Symbol	Description
● B3	LOCATION OF WELL
○ H1	LOCATION OF WELL OUTSIDE WATERSHED
	WATERSHED BOUNDARY
	HYDROGRAPHIC UNIT BOUNDARY
(4)	HYDROGRAPHIC UNIT NUMBER
— — —	U.S. LAND SURVEY SECTION LINE — FROM U.S.G.S. QUADRANGLE
· · · ·	U.S LAND SURVEY SECTION LINE — APPROX. LOCATION BY D.W.R.
- - - - - -	U.S. LAND SURVEY SECTION LINE — PROJECTED

WATER-BEARING CHARACTERISTICS OF UNDERGROUND FORMATIONS

- MODERATE TO HIGH PERMEABILITY
  RECENT ALLUVIUM; PRINCIPAL SOURCE OF GROUND WATER
- LOW PERMEABILITY
  OLDER ALLUVIUM AND UPPER PLEISTOCENE SEDIMENTS; MINOR GROUND WATER YIELD.
- GENERALLY IMPERMEABLE
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DETAILS

SCALE OF FEET

1000 500 0 1000 2000

KEY TO NUMBERING SYSTEM

TYPICAL LAND SECTION

D	C	B ●B1	A
E	F	G	H
M	L	K	J
N	P	Q	R

(Section 36)

WELLS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e.g., T9S/R3W-36B1

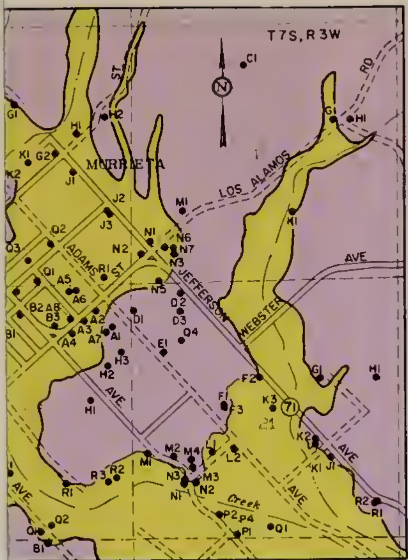
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

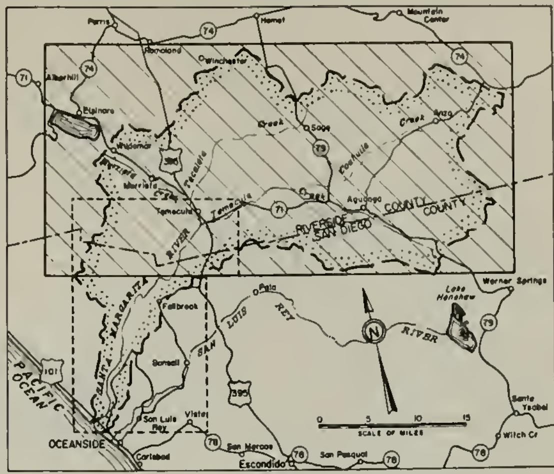
SANTA MARGARITA RIVER INVESTIGATION

LOCATION OF WELLS
INLAND AREA
1953

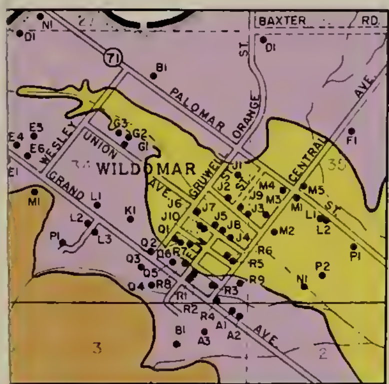
SCALE OF MILES

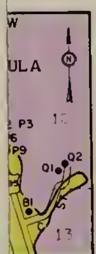
1 0 1 2 3 4





KEY MAP





DETAILS

SCALE OF FEET
1000 500 0 1000 2000

LEGEND

●B3	LOCATION OF WELL
○H1	LOCATION OF WELL OUTSIDE WATERSHED
	WATERSHED BOUNDARY
	HYDROGRAPHIC UNIT BOUNDARY
(4)	HYDROGRAPHIC UNIT NUMBER
— — —	U.S. LAND SURVEY SECTION LINE — FROM U.S.G.S. QUADRANGLE
....	U.S LAND SURVEY SECTION LINE — APPROX. LOCATION BY D.W.R.
- - - - - -	U.S. LAND SURVEY SECTION LINE — PROJECTED

WATER-BEARING CHARACTERISTICS OF UNDERGROUND FORMATIONS

MODERATE TO HIGH PERMEABILITY
RECENT ALLUVIUM; PRINCIPAL SOURCE OF GROUND WATER

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KEY TO NUMBERING SYSTEM

TYPICAL LAND SECTION

D	C	B ●B1	A
E	F	G	H
M	L	K	J
N	P	Q	R

36

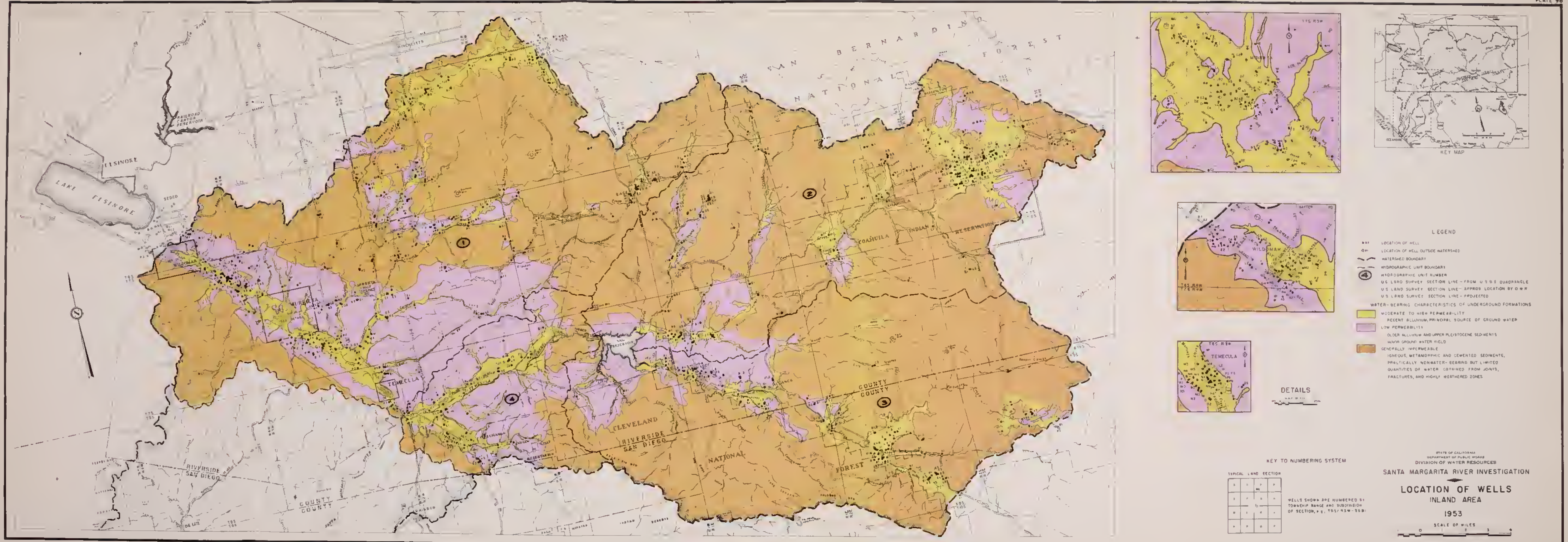
WELLS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e.g., T9S/R3W-36B1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

LOCATION OF WELLS
INLAND AREA
1953

SCALE OF MILES
1 0 1 2 3 4

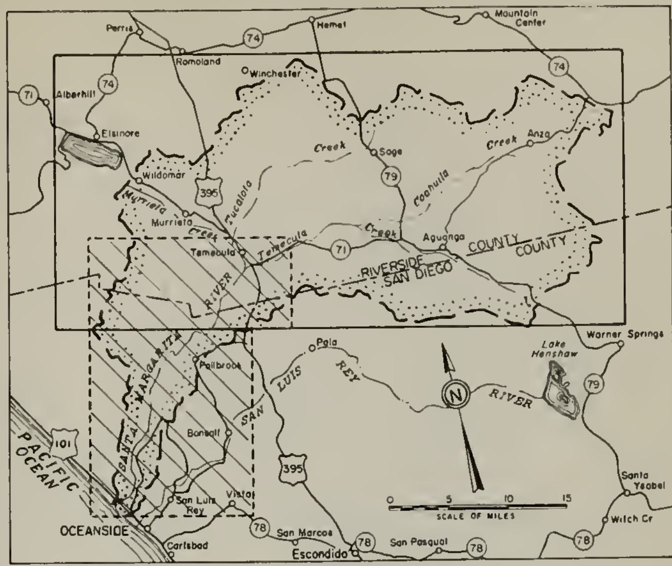


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

LOCATION OF WELLS
INLAND AREA

1953



KEY MAP

LEGEND

WATERSHED BOUNDARY

GROUND WATER BASIN BOUNDARY

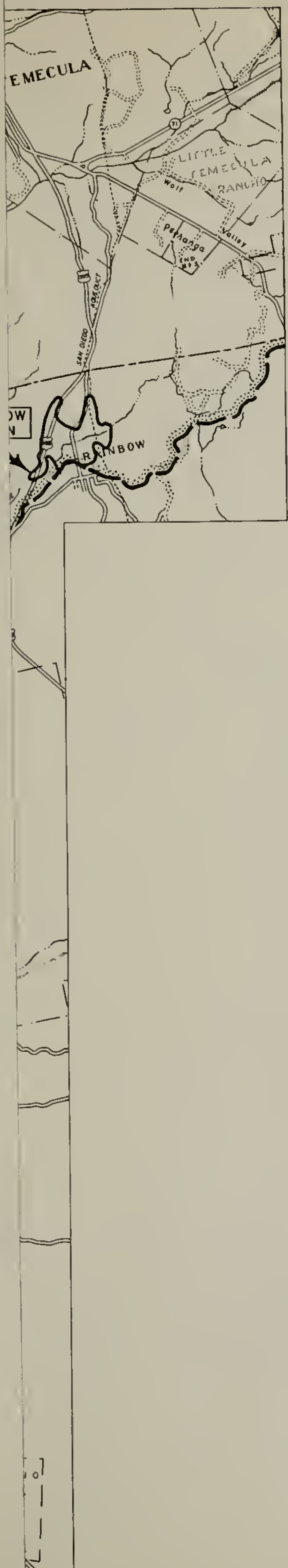
—40— LINES OF EQUAL ELEVATION OF GROUND WATER

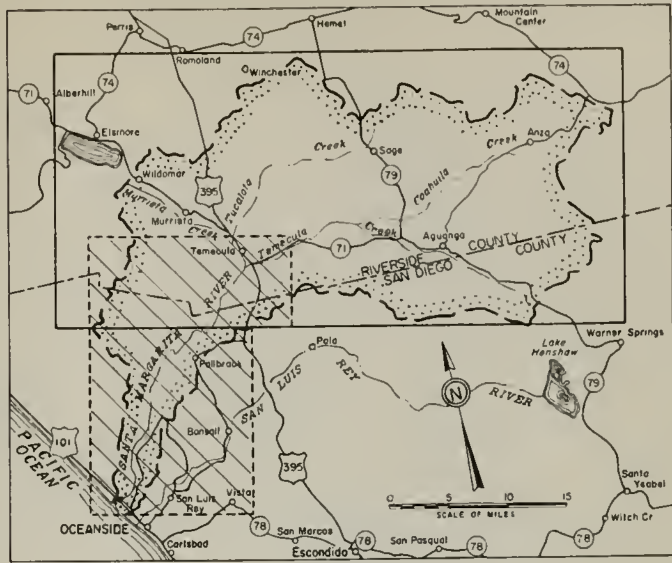
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL ELEVATION OF GROUND WATER
COASTAL AREA
SPRING 1927

SCALE OF MILES
1 0 1 2 3 4





KEY MAP

LEGEND

WATERSHED BOUNDARY

GROUND WATER BASIN BOUNDARY

—40— LINES OF EQUAL ELEVATION OF GROUND WATER

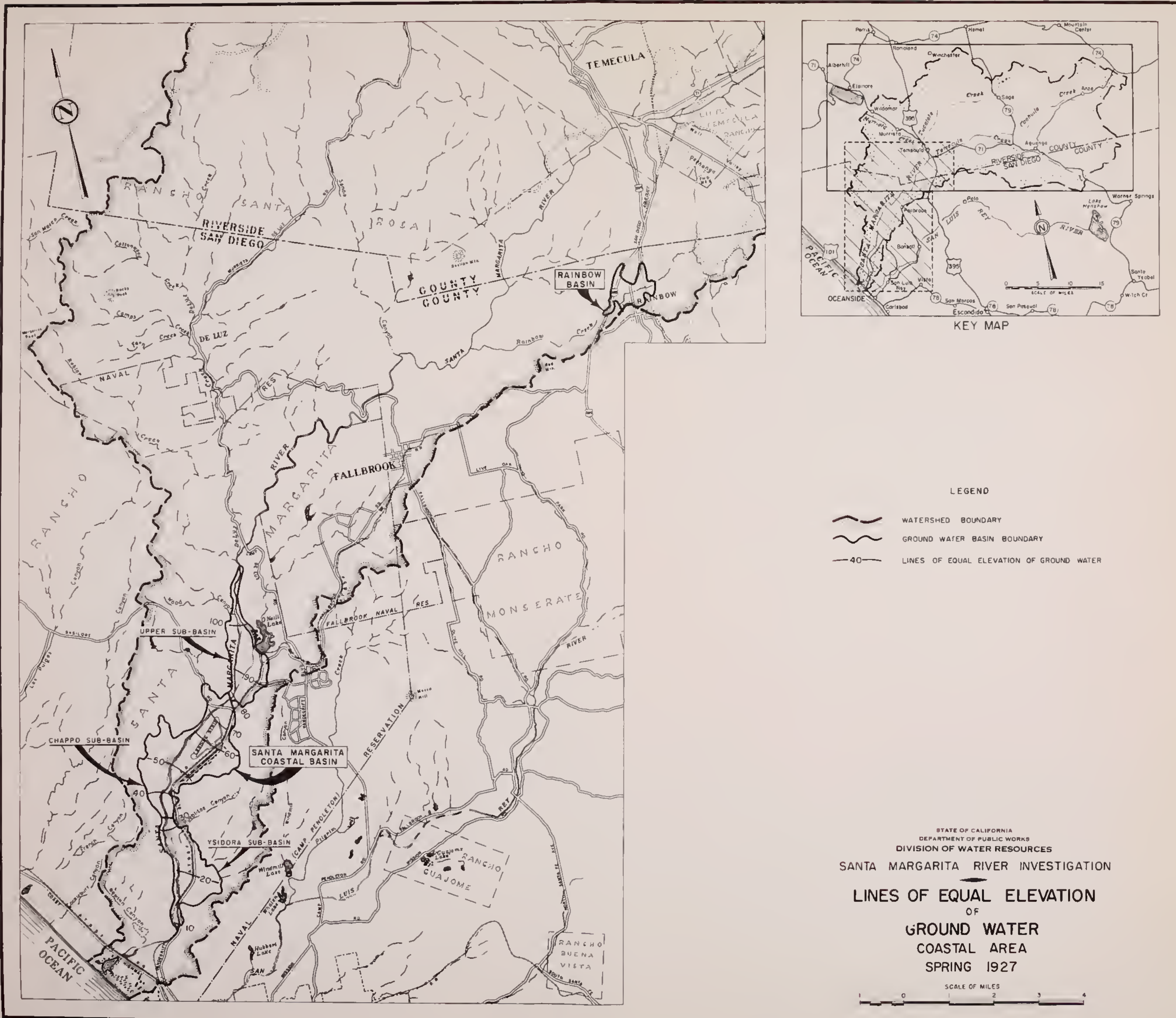
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL ELEVATION OF GROUND WATER
COASTAL AREA
SPRING 1927

SCALE OF MILES

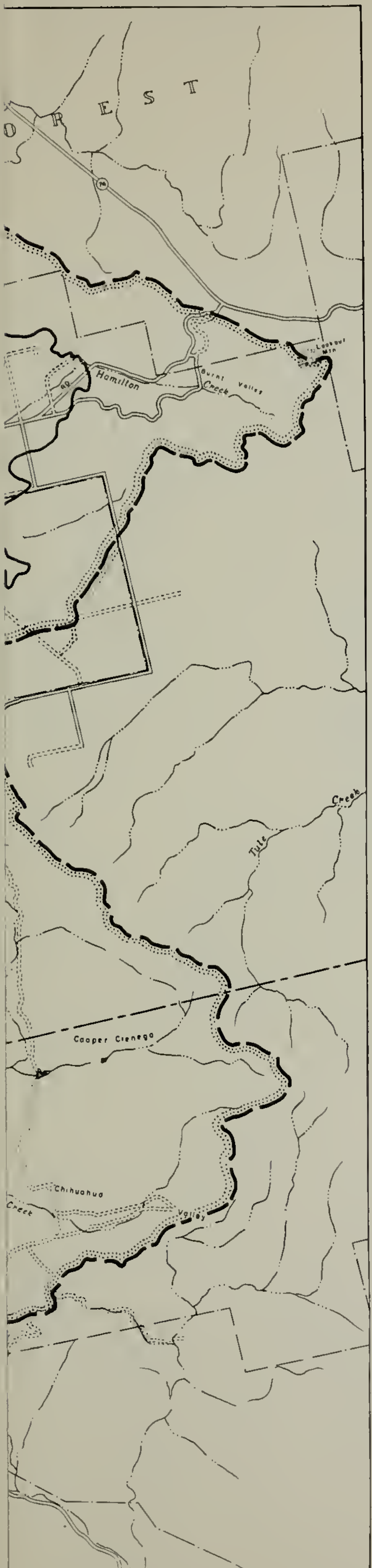
1 0 1 2 3 4

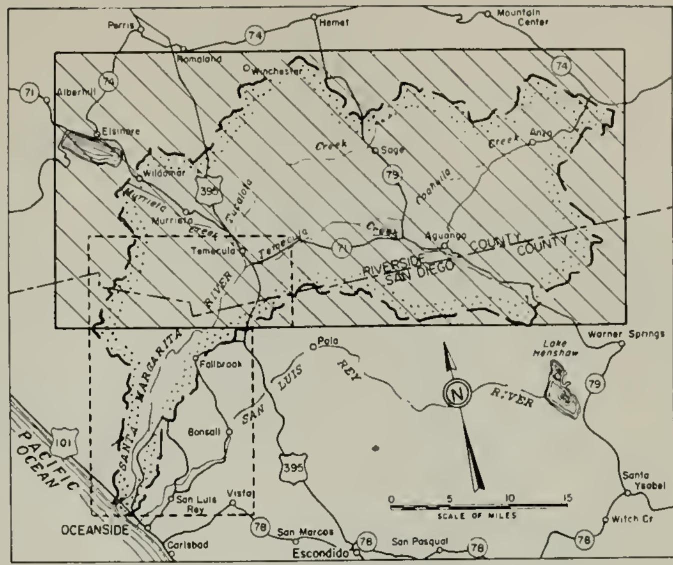


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL ELEVATION OF GROUND WATER
COASTAL AREA
SPRING 1927

SCALE OF MILES





KEY MAP

LEGEND

- WATERSHED BOUNDARY
- GROUND WATER BASIN BOUNDARY
- FAULT
- —990— LINES OF EQUAL ELEVATION OF GROUND WATER
- --1120-- LINES OF EQUAL ELEVATION OF PRESSURE SURFACE IN CONFINED AQUIFER OF PAUBA VALLEY, MARCH 1926
- APPARENT AREAS OF CONFINED WATER

STATE OF CALIFORNIA
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SANTA MARGARITA RIVER INVESTIGATION

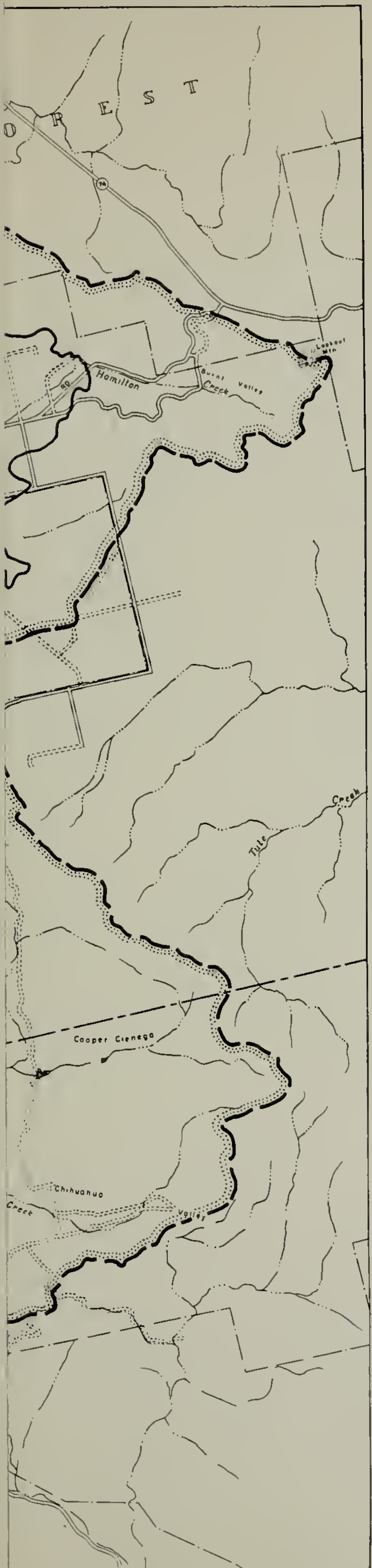
LINES OF EQUAL ELEVATION OF GROUND WATER

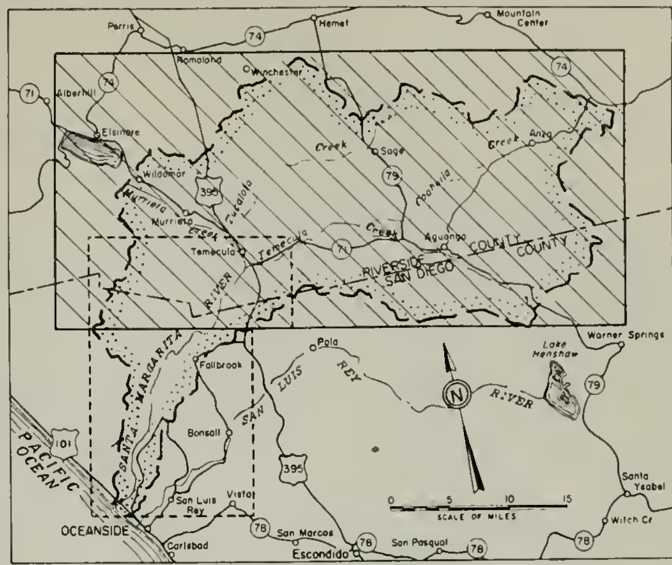
INLAND AREA

SPRING 1927

SCALE OF MILES

1 0 1 2 3 4





KEY MAP

LEGEND

WATERSHED BOUNDARY

GROUND WATER BASIN BOUNDARY

FAULT

—990— LINES OF EQUAL ELEVATION OF GROUND WATER

---1120--- LINES OF EQUAL ELEVATION OF PRESSURE SURFACE IN CONFINED AQUIFER OF PAUBA VALLEY, MARCH 1926

APPARENT AREAS OF CONFINED WATER

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL ELEVATION OF GROUND WATER

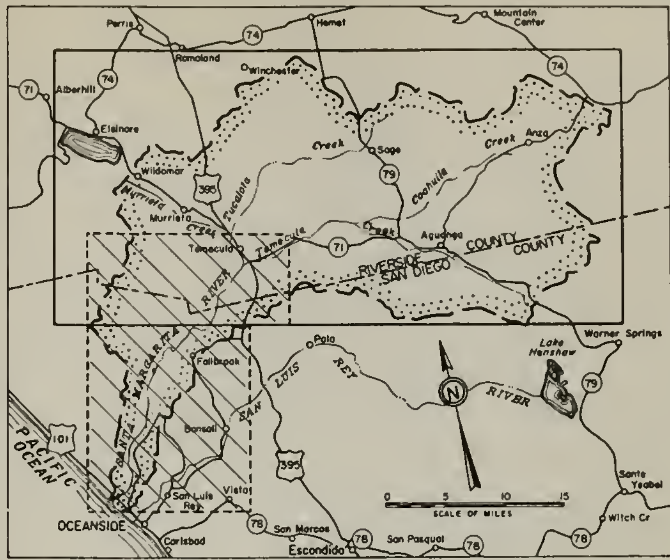
INLAND AREA

SPRING 1927

SCALE OF MILES

1 0 2 3 4

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
LINES OF EQUAL ELEVATION
OF
GROUND WATER
INLAND AREA
SPRING 1927
LEGEND
WATERSHED BOUNDARY
GROUND WATER BASIN BOUNDARY
FAULT
LINES OF EQUAL ELEVATION OF GROUND WATER
LINES OF EQUAL ELEVATION OF PRESSURE SURFACE IN CONFINED AQUIFER OF PAUBA VALLEY MARCH 1926
APPARENT AREAS OF CONFINED WATER
KEY MAP
OCEANSIDE
LAKE ELSINORE
ELSINORE
RAILROAD CANYON RESERVOIR
WILDOMAR BASIN
DOMENIGONI BASIN
DIAMOND BASIN
FRENCH BASIN
LOS ALAMOS BASIN
SANTA GERTRUDIS BASIN
MURRIETA
MURRIETA BASIN
TEMECULA
PAUBA BASIN
PECHANGA BASIN
TUCALOTA BASIN
LOWER LANCASTER BASIN
UPPER LANCASTER BASIN
VAIL RESERVOIR
NIGGER BASIN
RADEC BASIN
AGUANGA BASIN
LOWER CULP BASIN
OAKGROVE BASIN
DODGE BASIN
UPPER COAHUILA BASIN
LOWER COAHUILA BASIN
ANZA BASIN
COAHUILA INDIAN RESERVATION
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
RIVERSIDE COUNTY
SAN DIEGO COUNTY



KEY MAP

LEGEND

- WATERSHED BOUNDARY
- GROUND WATER BASIN BOUNDARY
- —80— LINES OF EQUAL ELEVATION OF GROUND WATER
- ·····5····· LINES OF EQUAL ELEVATION OF GROUND WATER INTERMEDIATE CONTOURS

STATE OF CALIFORNIA
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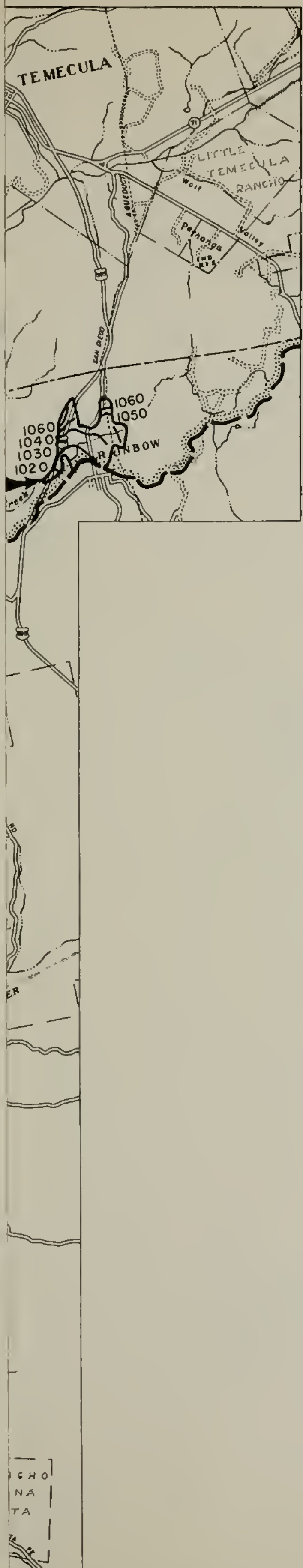
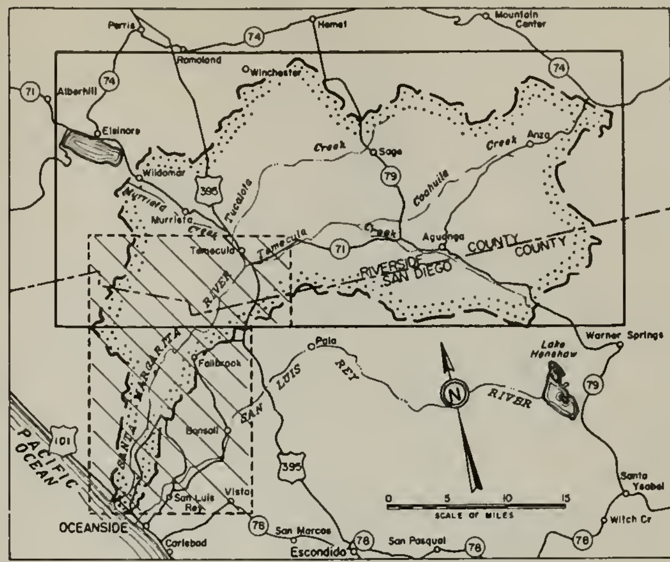
SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL ELEVATION OF GROUND WATER
COASTAL AREA
FALL 1953

SCALE OF MILES
1 0 1 2 3 4





KEY MAP

LEGEND

(symbol)	WATERSHEO BOUNOARY
(symbol)	GROUND WATER BASIN BOUNDARY
—80—	LINES OF EOUAL ELEVATION OF GROUND WATER
......5......	LINES OF EQUAL ELEVATION OF GROUND WATER INTERMEOIATE CONTOURS

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

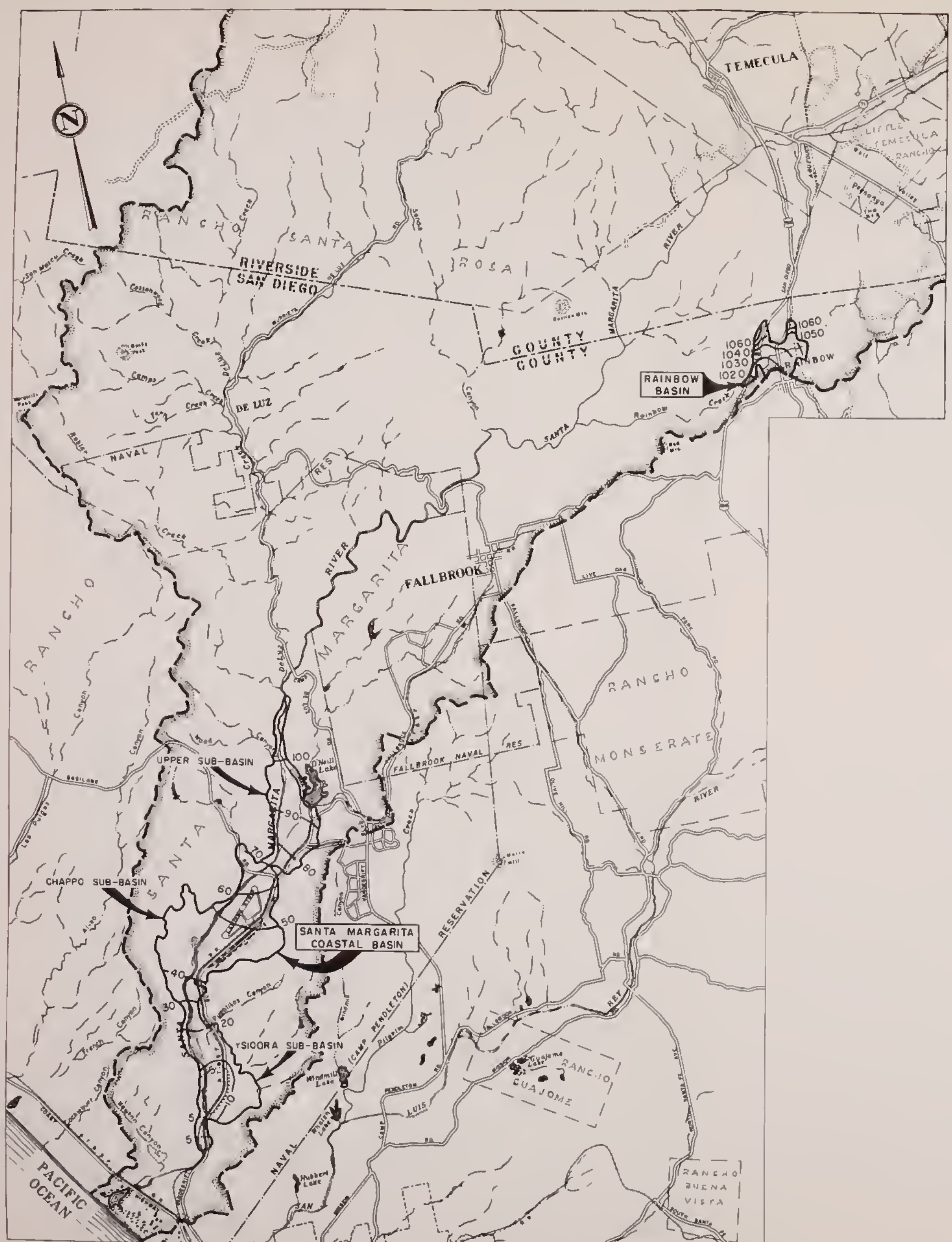
SANTA MARGARITA RIVER INVESTIGATION

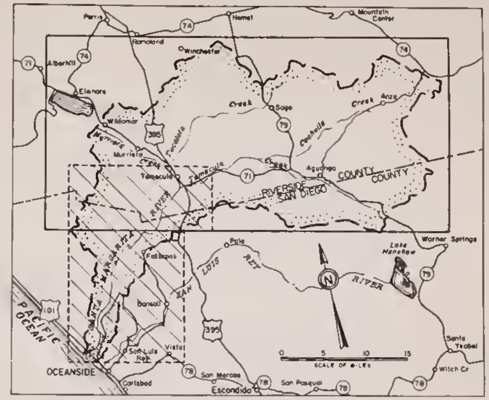
LINES OF EQUAL ELEVATION OF GROUND WATER COASTAL AREA FALL 1953

SCALE OF MILES

1 0 1 2 3 4

PLATE 11A





KEY MAP

LEGEND

(line symbol)	WATERSHED BOUNDARY
(line symbol)	GROUND WATER BASIN BOUNDARY
—80—	LINES OF EQUAL ELEVATION OF GROUND WATER
5	LINES OF EQUAL ELEVATION OF GROUND WATER INTERMEDIATE CONTOURS

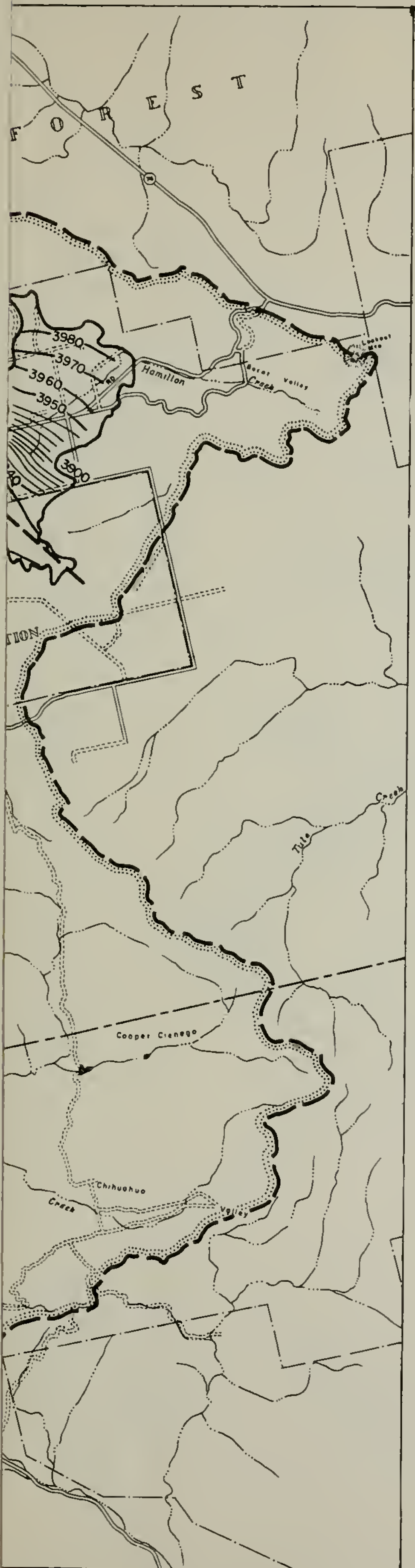
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

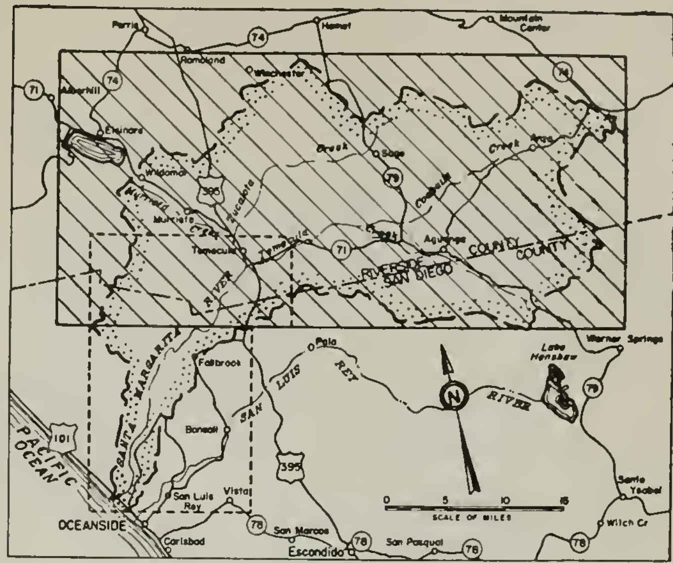
SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL ELEVATION OF GROUND WATER COASTAL AREA FALL 1953

SCALE OF MILES

1 0 1 2 3 4





KEY MAP

LEGEND

- WATERSHED BOUNDARY
- GROUND WATER BASIN BOUNDARY
- FAULT
- —990— LINES OF EQUAL ELEVATION OF GROUND WATER
- --1120-- LINES OF EQUAL ELEVATION OF PRESSURE SURFACE IN CONFINED AQUIFER OF PAUBA VALLEY, JANUARY 1954
- APPARENT AREAS OF CONFINED WATER

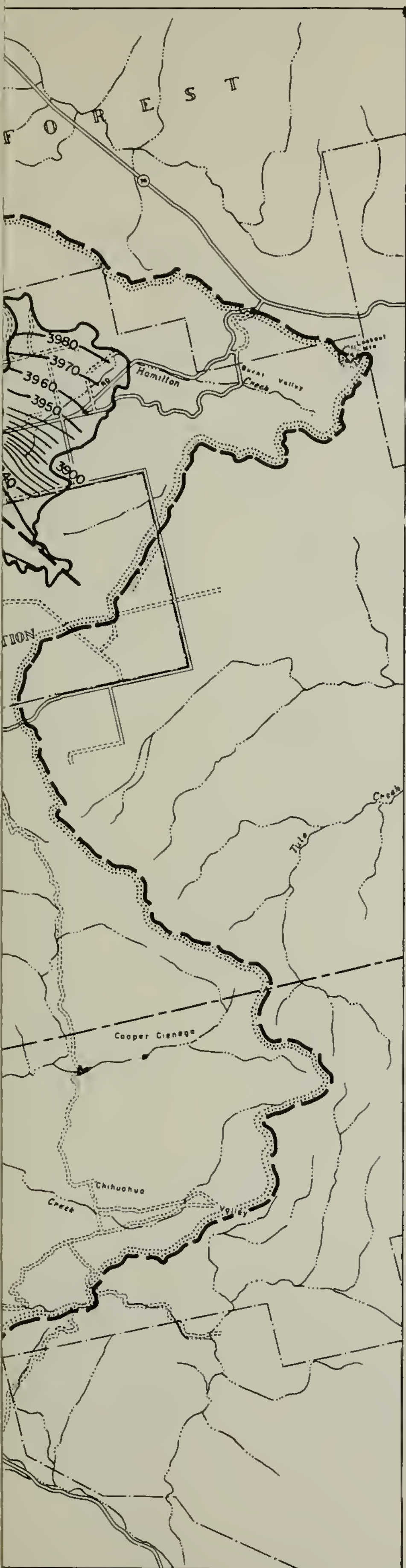
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

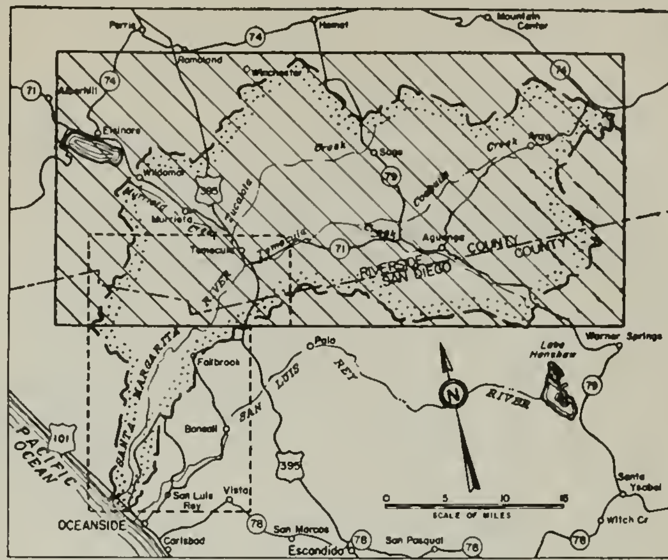
SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL ELEVATION OF GROUND WATER
INLAND AREA
FALL 1953

SCALE OF MILES

1 0 1 2 3 4





KEY MAP

LEGEND

- WATERSHED BOUNDARY
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- FAULT
- —990— LINES OF EQUAL ELEVATION OF GROUND WATER
- --1120-- LINES OF EQUAL ELEVATION OF PRESSURE SURFACE IN CONFINED AQUIFER OF PAUBA VALLEY, JANUARY 1954
- APPARENT AREAS OF CONFINED WATER

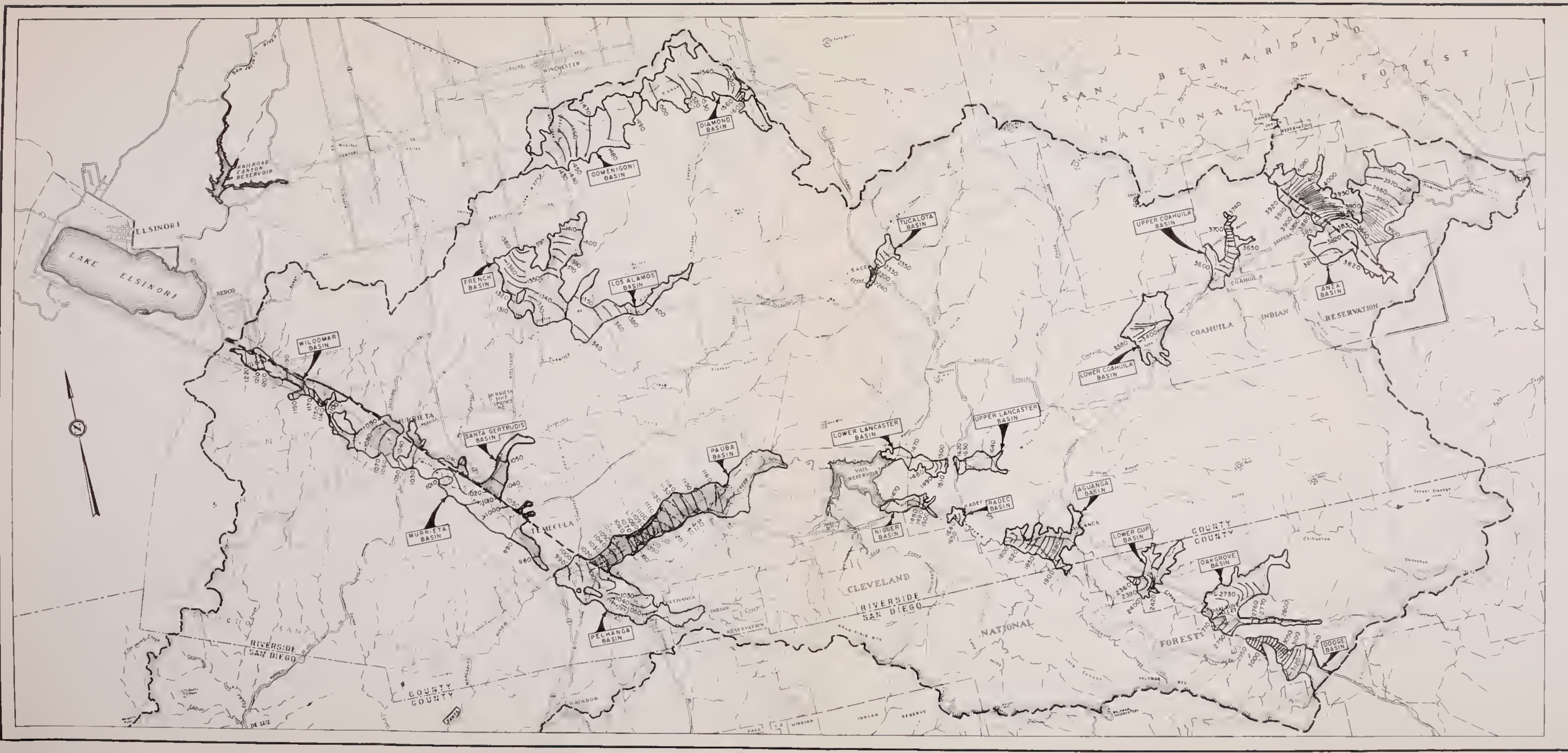
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

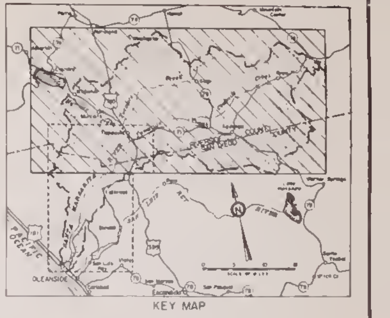
SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL ELEVATION OF GROUND WATER INLAND AREA FALL 1953

SCALE OF MILES

1 0 1 2 3 4





KEY MAP

LEGEND

- WATERSHED BOUNDARY
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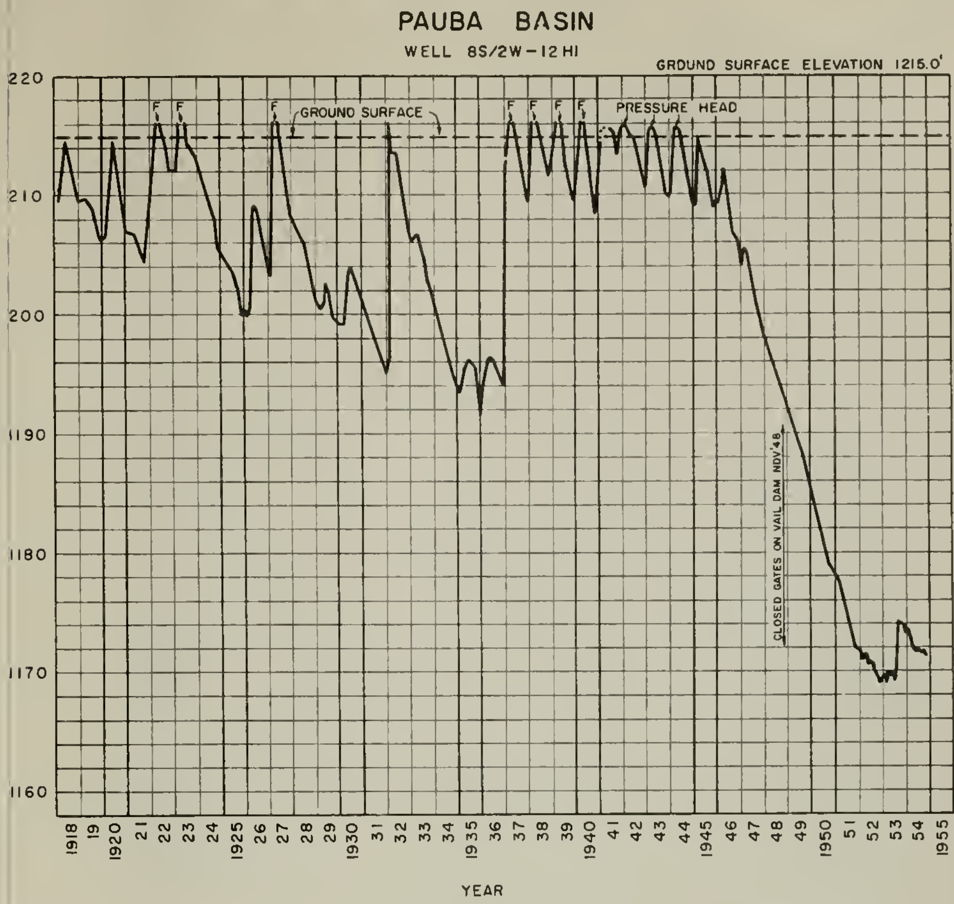
- FAULT
- 990 — LINES OF EQUAL ELEVATION OF GROUND WATER
- LINES OF EQUAL ELEVATION OF PRESSURE SURFACE IN CONFINED AQUIFER OF PAUBA VALLEY, JANUARY 1954
- APPARENT AREAS OF CONFINED WATER

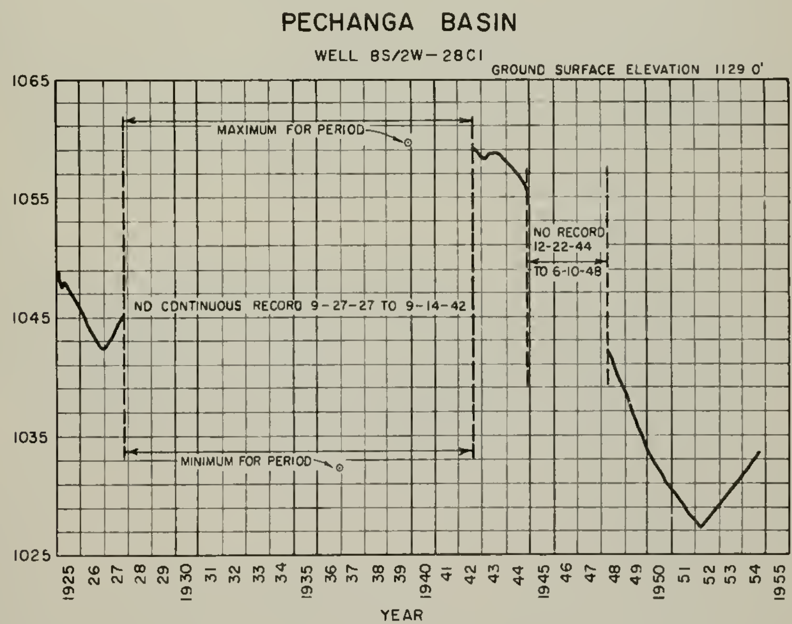
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

LINES OF EQUAL ELEVATION OF GROUND WATER INLAND AREA FALL 1953

SCALE OF MILES
0 1 2 3 4



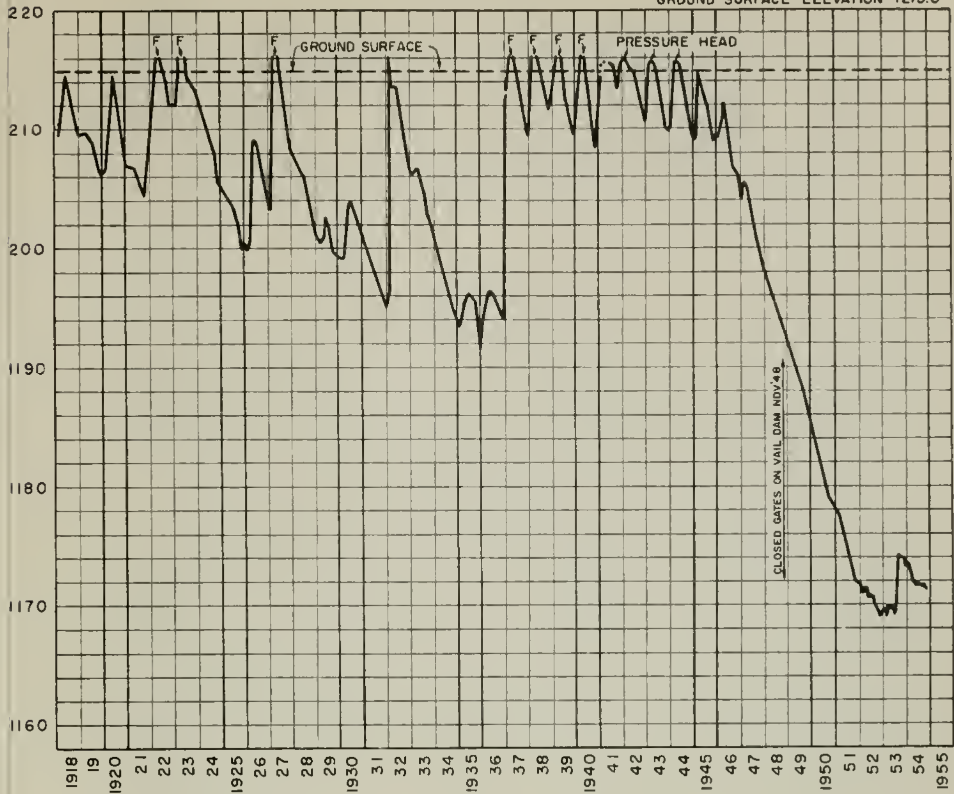


FLUCTUATION OF WATER LEVELS AT SELECTED WELLS

'F' INDICATES PERIOD DURING WHICH WELL FLOWED

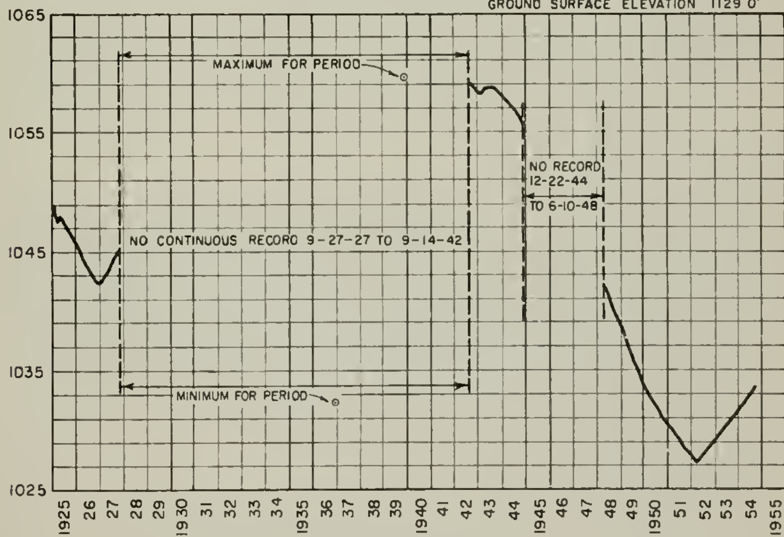
PAUBA BASIN

WELL 8S/2W-12H1



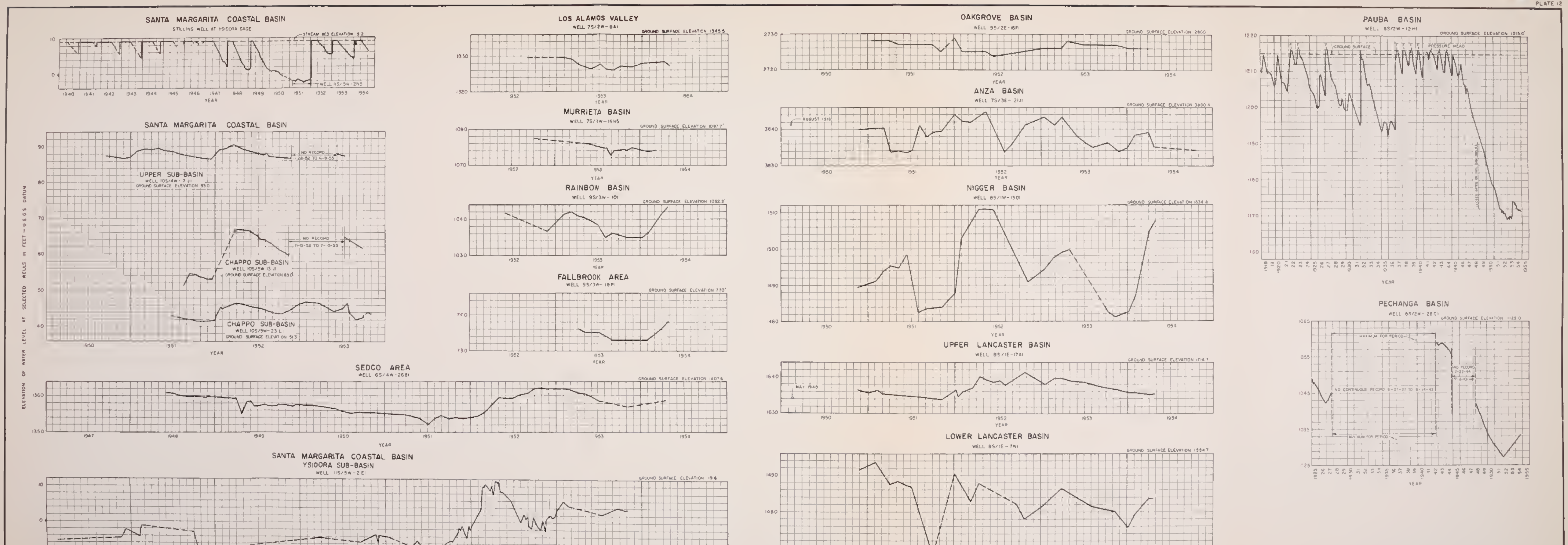
PECHANGA BASIN

WELL 8S/2W-28C1



FLUCTUATION OF WATER LEVELS AT SELECTED WELLS

'F' INDICATES PERIOD DURING WHICH WELL FLOWED



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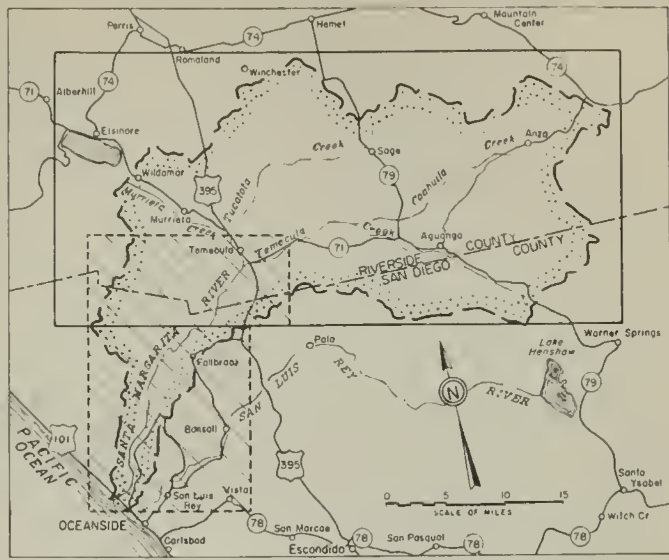


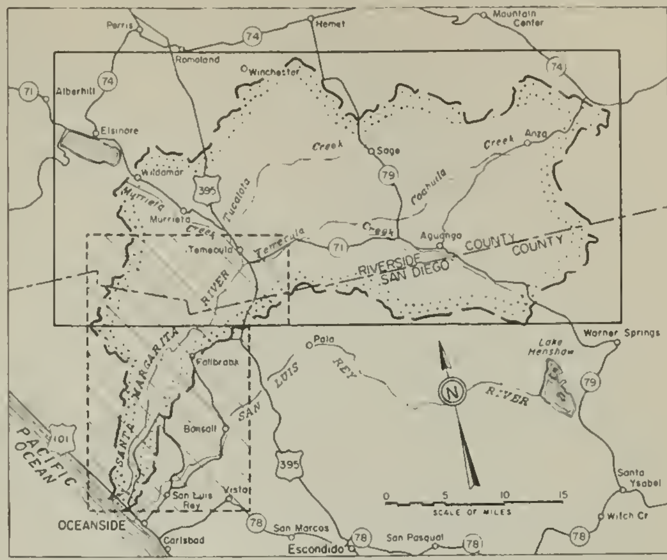
KEY MAP

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

AREAL GEOLOGY
COASTAL AREA
1954

SCALE OF MILES



KEY MAP

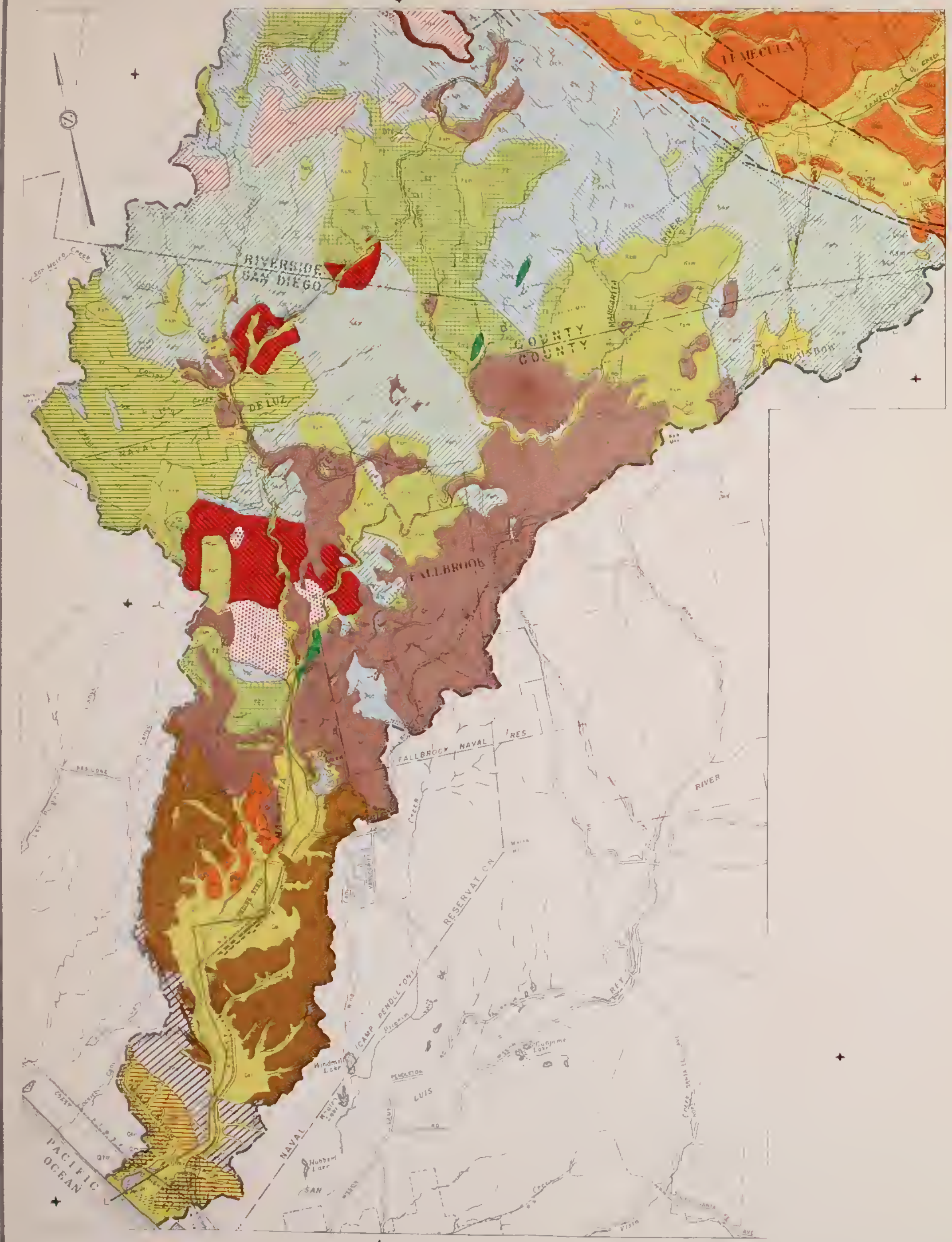
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

AREAL GEOLOGY
COASTAL AREA
1954

SCALE OF MILES

0 1 2 3 4



LEGEND

SEDIMENTARY ROCKS

CENOZOIC — QUATERNARY — RECENT

Qal ALLUVIUM
GRAVEL, SAND, SILT, AND CLAY. GENERALLY UNCONSOLIDATED. OCCURS AS VALLEY FILL AND BEACH DEPOSITS.

Qr RESIDUUM
RESIDUAL MATERIAL RESEMBLING SANDY CLAY. PRODUCT OF THE DECOMPOSITION AND DISINTEGRATION OF UNDERLYING CRYSTALLINE ROCK IN SITU.

CENOZOIC — QUATERNARY — PLEISTOCENE

Qtoa TERRACE DEPOSITS AND OLDER ALLUVIUM
BOULDER- TO COBBLE-SIZED FRAGMENTS, GRAVELS, AND SAND. UNCONSOLIDATED TO SEMICONSOLIDATED. TERRACES GENERALLY FLAT; OLDER ALLUVIUM DISSECTED AND ROLLING.

Qtm MARINE AND TERRACE DEPOSITS
GRAVEL, SAND, SILT, AND CLAY. DIFFERENTIATED FROM OTHER MARINE SEDIMENTS BY TOPOGRAPHIC POSITION AND PECULIAR REDDISH-BROWN COLOR.

Qm MARINE DEPOSITS
GRAVEL, SAND, SILT, AND CLAY. PRINCIPALLY LITTORAL AND ESTUARINE, OR BAY, SEDIMENTS.

CENOZOIC — TERTIARY — MIOCENE

Tmso SAN ONOFRE BRECCIA
ANGULAR SLABS, BLOCKS, AND CHIPS OF GLAUCOPHANE AND RELATED SCHISTS EMBEDDED IN AN EARTHY OR SANDY MATRIX. MINOR AMOUNTS OF SANDSTONE AND BOULDER AND COBBLE CONGLOMERATE. VERY WELL CEMENTED.

CENOZOIC — TERTIARY — EOCENE

Telj LA JOLLA FORMATION
INCLUDES: ROSE CANYON SHALE, A BLUE TO GRAY SANDY SHALE AND SOFT MUDSTONE; TORREY SAND, A LIGHT-COLORED, COARSE, POROUS, MASSIVE SANDSTONE; AND DELMAR SAND, A MODERATELY HARD, GREENISH TO BROWN, FINE- TO MEDIUM-GRAINED SANDSTONE WITH ASSOCIATED MINOR SHALES.

CENOZOIC — TERTIARY — PALEOCENE

MARTINEZ FORMATION
ARKOSIC SAND AND GRAVEL, FERRUGINOUS, WHERE BAKED BY OVERLYING BASALT, AND WELL INDURATED.

IGNEOUS ROCKS

CENOZOIC — TERTIARY — PLIOCENE

Tsr SANTA ROSA BASALT
OLIVINE BASALT, CHARACTERIZED BY A REDDISH-BROWN COLOR. OCCURS AS FLAT LYING FLOWS CAPPING MESAS.

MESOZOIC — CRETACEOUS

Kr ROBLAR LEUCOGRANITE
FLESH-COLORED INTRUSIVES, UNIFORM IN CHARACTER AND APLITIC IN APPEARANCE. DEEPLY WEATHERED.

Kwm WOODSON MOUNTAIN GRANODIORITE
BIOTITE-GRANODIORITE, RATHER COARSE GRAINED, AND WHITE TO PALE BROWN. OCCASIONALLY DISPLAYS GNEISSOID OR BANDED STRUCTURE. FORMS PROMINENT PEAKS.

Kmg MISCELLANEOUS GRANODIORITES
MEDIUM-GRAINED INTRUSIVES, CHARACTERIZED BY LIGHT COLOR, AND SMALL OUTCROPS.

Kb BONSALL TONALITE
INTRUSIVES, CONTAINING ABUNDANT HORNBLENDE AND NUMEROUS SCHLIEREN AND INCLUSIONS.

Ksm SAN MARCOS GABBRO
INTRUSIVES, DISPLAYING EXTREME VARIATIONS IN COLOR, COMPOSITION, AND TEXTURE.

MESOZOIC — JURASSIC

Jsp SANTIAGO PEAK VOLCANICS
A SERIES OF AGGLOMERATES, TUFFS, SHALLOW INTRUSIVES, AND FLOWS, WITH ASSOCIATED SHALES, QUARTZITES, AND CONGLOMERATES. MILDLY METAMORPHOSED.

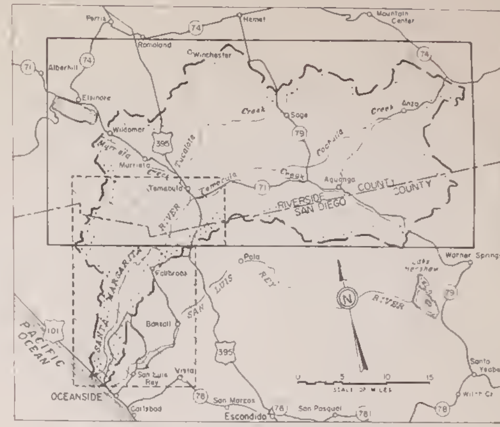
INTRUSIVE ROCKS RELATED TO THE SANTIAGO PEAK VOLCANICS
FINE-GRAINED GRANODIORITES AND RELATED ROCKS. OCCUR AS SMALL OUTCROPS. BELIEVED TO BE THE SAME AGE AS THE SANTIAGO PEAK VOLCANICS.

METAMORPHIC ROCKS

MESOZOIC — TRIASSIC

Ꞧbc BEDFORD CANYON FORMATION
SLATES, QUARTZITES, QUARTZ-MICA SCHISTS, MILDLY METAMORPHOSED ARGILLITES, AND A FEW THIN LENSES OF LIMESTONE.

WATERSHED BOUNDARY
FORMATION CONTACT
FAULT (DASH LINE INDICATES CONCEALMENT OR APPROXIMATE LOCATION)
L——L' LINE OF GEOLOGIC SECTION



KEY MAP

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

AREAL GEOLOGY
COASTAL AREA
1954

SCALE OF MILES
0 1 2 3 4

EGEND

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VALLEY FILL AND BEACH DEPOSITS.

ATERIAL RESEMBLING SANDY CLAY. PRODUCT OF THE
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SITS AND OLDER ALLUVIUM
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ATED UPPER PLEISTOCENE SEDIMENTS
ND, SILT, CLAY, CONGLOMERATE, AND MINOR AMOUNTS
ALICHE, AND TUFF. WHITE TO RED, POORLY CON-
STREAM AND LACUSTRINE DEPOSITS. INCLUDES PAUBA
DRIPPING SPRINGS FANGLOMERATE, AND TEMECULA ARKOSE.

ATION
ND AND GRAVEL, FERRUGINOUS, WHERE BAKED BY OVER-
T, AND WELL INDURATED.

VOLCANICS
UFFS, AGGLOMERATES, DIKES, AND FLOWS.

ASALT
ALT, CHARACTERIZED BY A REDDISH-BROWN COLOR.
FLAT LYING FLOWS CAPPING MESAS.

RANITE
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CE. DEEPLY WEATHERED.

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NODIORITE, RATHER COARSE GRAINED, AND WHITE TO
OCCASIONALLY DISPLAYS GNEISSOID OR BANDED
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LLEY GRANODIORITE
RANGES FROM TONALITE TO GRANODIORITE AND CON-
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GRANODIORITES
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NOT MAPPED SEPARATELY.

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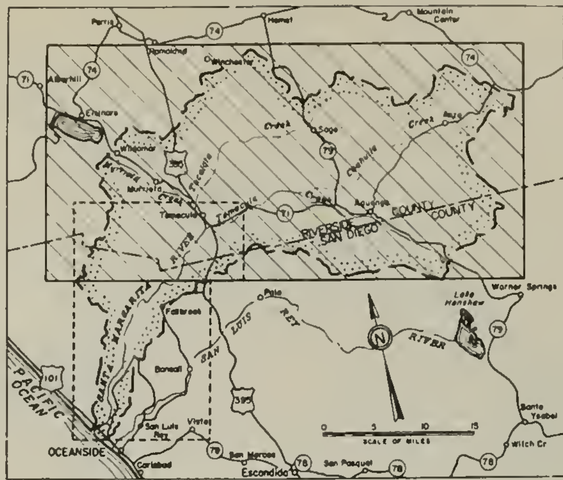

KEY MAP

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

AREAL GEOLOGY
INLAND AREA
1954

SCALE OF MILES

1 0 1 2 3 4

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VALLEY FILL AND BEACH DEPOSITS.

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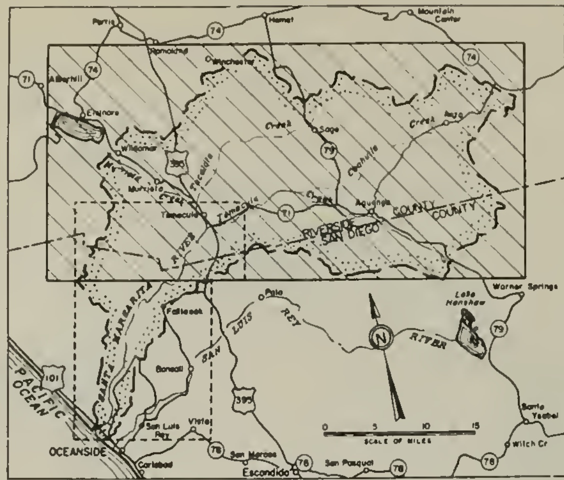


KEY MAP

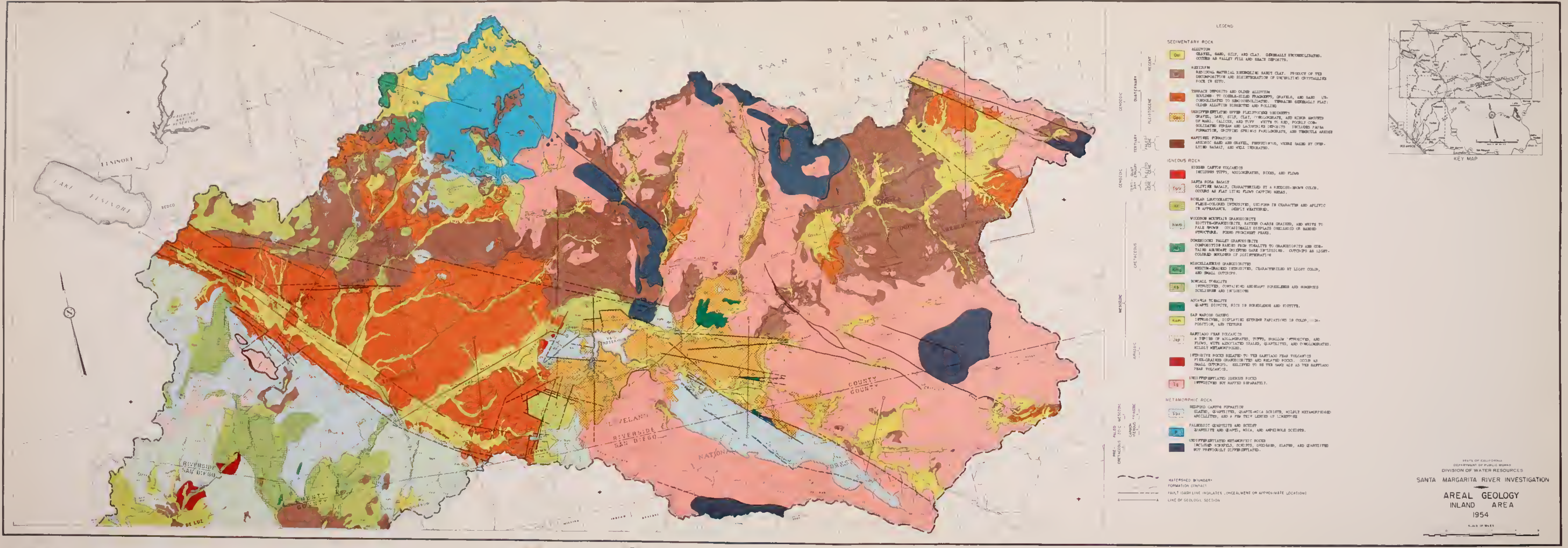
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

AREAL GEOLOGY
INLAND AREA
1954

SCALE OF MILES
1 0 1 2 3 4

PLATE 13B


LEGEND
SEDIMENTARY ROCK
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PALEOZOIC QUARTZITE AND SCHIST
UNDIFFERENTIATED METAMORPHIC ROCKS
WATERSHED BOUNDARY
FORMATION CONTACT
FAULT (DASH LINE INDICATES CONCEALMENT OR APPROXIMATE LOCATION)
LINE OF GEOLOGIC SECTION
RECENT
PLEISTOCENE
QUATERNARY
TERTIARY
CRETACEOUS
JURASSIC
KEY MAP
SAN BERNARDINO NATIONAL FOREST
ELSINORE
LAKE ELSINORE
CLEVELAND NATIONAL FOREST
RIVERSIDE
SAN DIEGO
COUNTY
DE LUZ
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
AREAL GEOLOGY
INLAND AREA
1954
SCALE OF MILES

LEGEND

Symbol	Description
Qal	RECENT ALLUVIUM
Qtoa	TERRACES AND OLDER ALLUVIUM
Tsrv	SANTA ROSA BASALT
Tmz	MARTINEZ FORMATION
Kdv	DOMENIGONI VALLEY GRANODIORITE
Kb	BONSALL TONALITE
Ksm	SAN MARCOS GABBRO
Ig	UNDIFFERENTIATED IGNEOUS ROCKS
TRbc	BEDFORD CANYON FORMATION
P	PALEOZOIC SCHISTS AND QUARTZITES
	FAULT (DASHED WHERE APPROXIMATED)

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS
A—A', B—B', AND C—C'

1954

LEGEND

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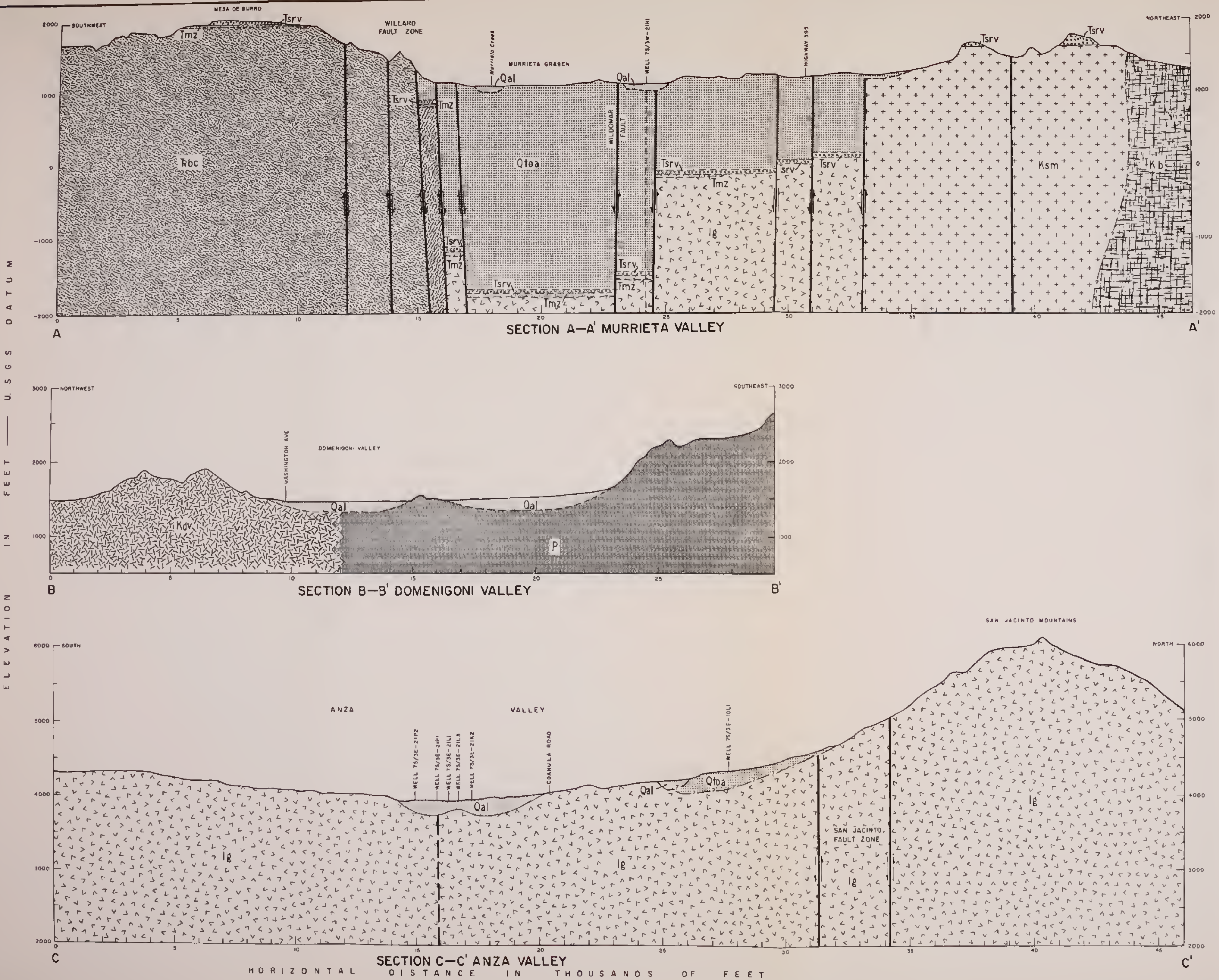
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS
A—A', B—B', AND C—C'

1954



LEGEND

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Rbc	BEDFORD CANYON FORMATION
P	PALEOZOIC SCHISTS AND QUARTZITES
	FAULT (DASHED WHERE APPROXIMATED)

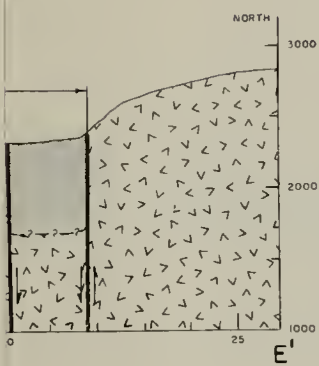
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

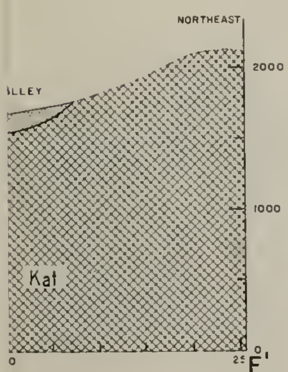
SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS
A—A', B—B', AND C—C'
1954

LEGEND

Qal	RECENT ALLUVIUM
Qps	UNDIFFERENTIATED UPPER PLEISTOCENE SEDIMENTS
Kat	AGUANGA TONALITE
Ig	UNDIFFERENTIATED IGNEOUS ROCKS
Ћbc	BEDFORD CANYON FORMATION
	FAULT (DASHED WHERE APPROXIMATED)





OF FEET

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS

D—D', E—E', AND F—F'

1954

LEGEND

Qal	RECENT ALLUVIUM
Qps	UNDIFFERENTIATED UPPER PLEISTOCENE SEDIMENTS
Kat	AGUANGA TONALITE
Ig	UNDIFFERENTIATED IGNEOUS ROCKS
Ʀbc	BEDFORD CANYON FORMATION
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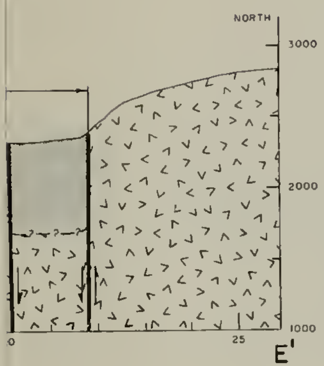
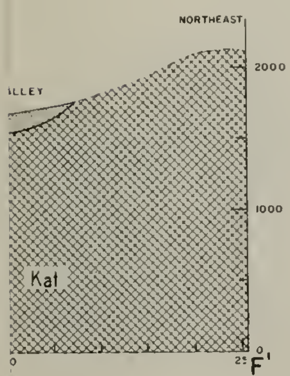


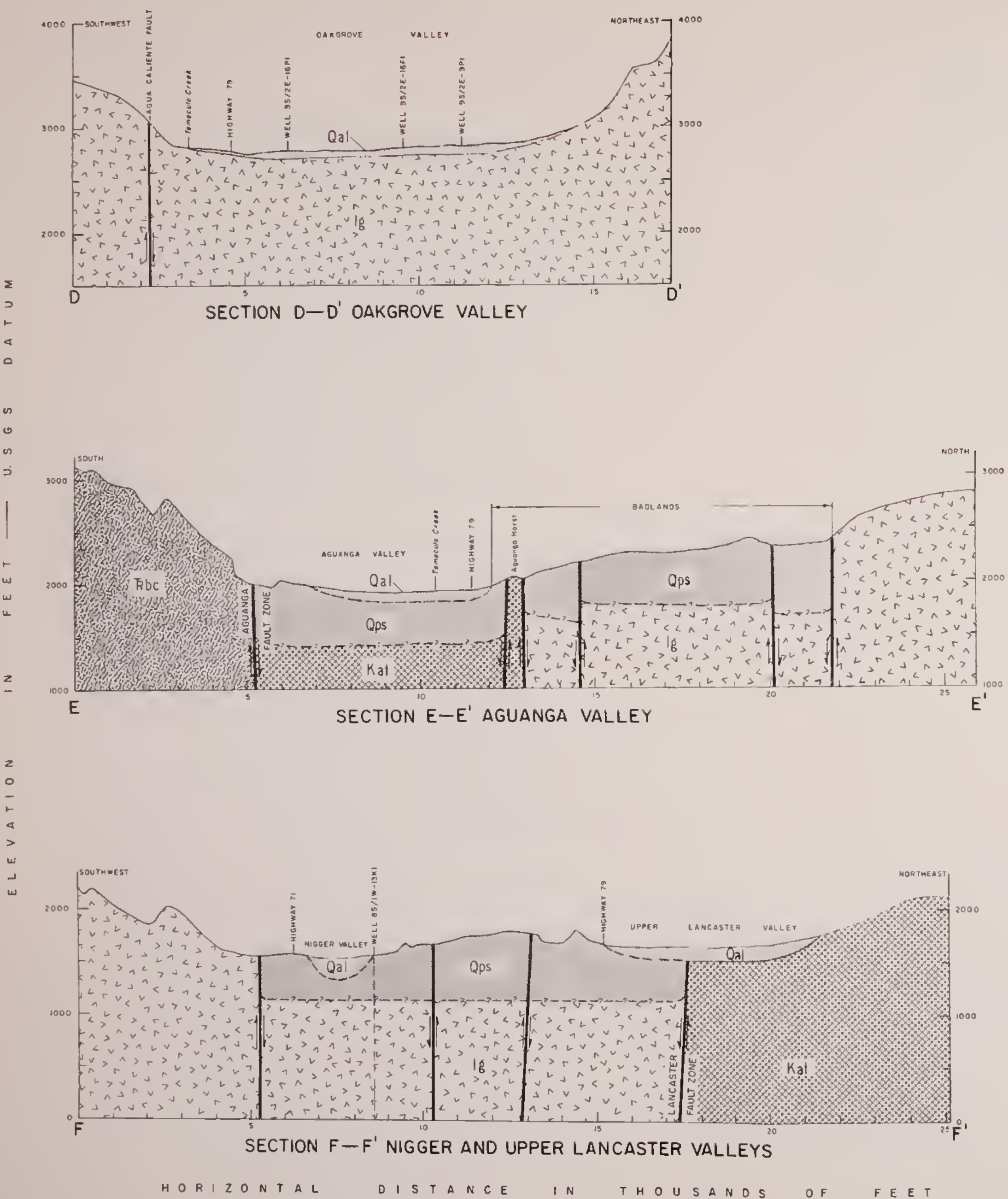


OF FEET

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS
D—D', E—E', AND F—F'
1954



LEGEND

- Qal — RECENT ALLUVIUM
- Qps — UNDIFFERENTIATED UPPER PLEISTOCENE SEDIMENTS
- Kat — AGUANGA TONALITE
- Ig — UNDIFFERENTIATED IGNEOUS ROCKS
- Ꞧbc — BEDFORD CANYON FORMATION
- FAULT (DASHED WHERE APPROXIMATED)

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS D—D', E—E', AND F—F'

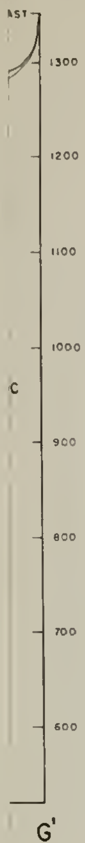
1954

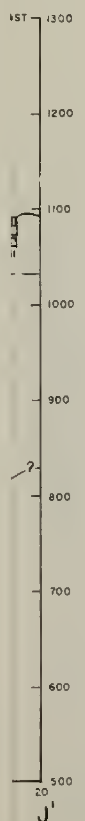
LEGEND

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS
G—G', H—H', AND J—J'
1954





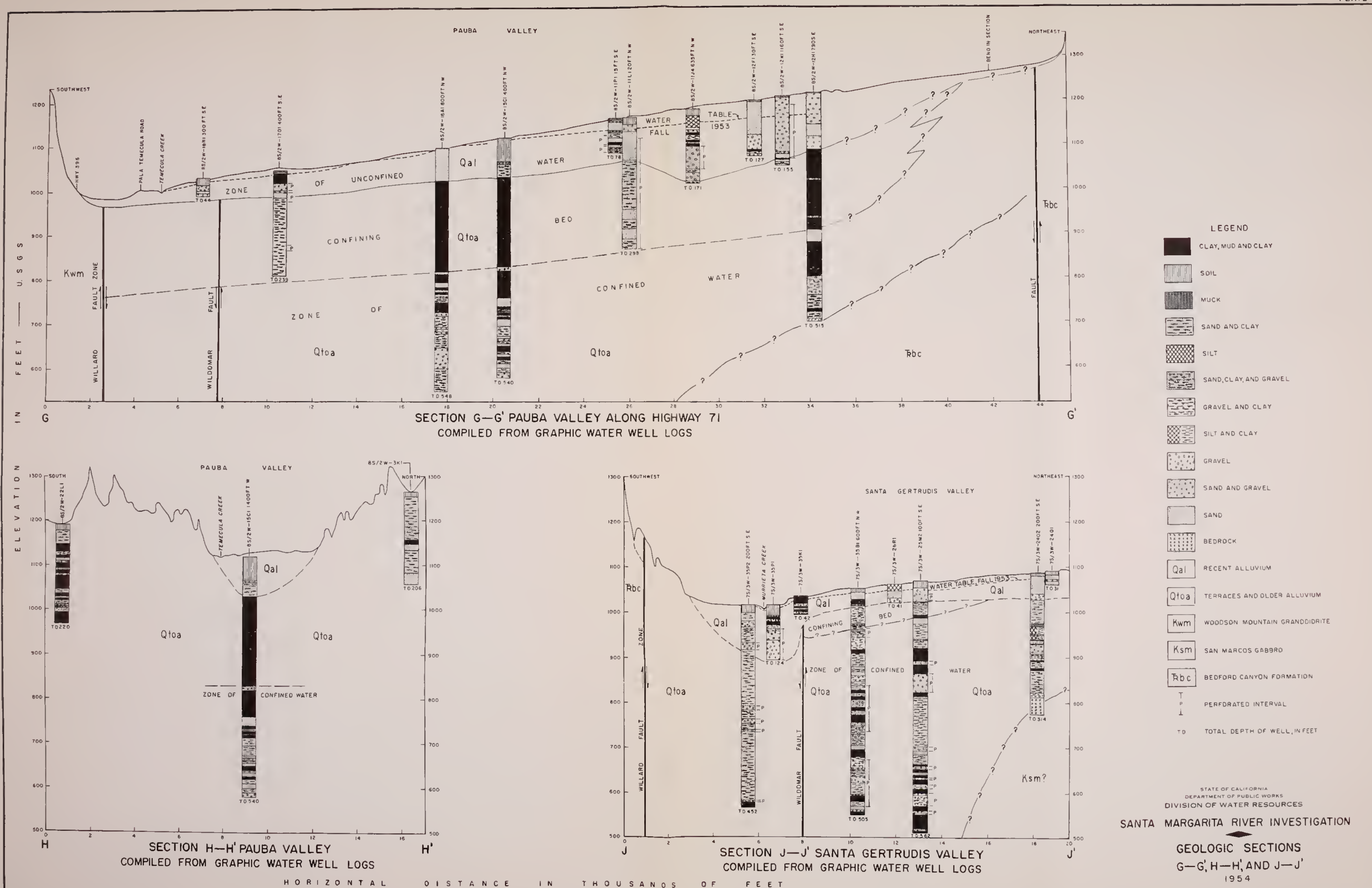
LEGEND

	CLAY, MUD AND CLAY
	SOIL
	MUCK
	SAND AND CLAY
	SILT
	SAND, CLAY, AND GRAVEL
	GRAVEL AND CLAY
	SILT AND CLAY
	GRAVEL
	SAND AND GRAVEL
	SAND
	BEDROCK
Qal	RECENT ALLUVIUM
Qtoa	TERRACES AND OLDER ALLUVIUM
Kwm	WOODSON MOUNTAIN GRANODIORITE
Ksm	SAN MARCOS GABBRO
Ћbc	BEDFORD CANYON FORMATION
T P ⊥	PERFORATED INTERVAL
TD	TOTAL DEPTH OF WELL, IN FEET

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS
G—G', H—H', AND J—J'
1954



PAUBA VALLEY
SOUTHWEST
NORTHEAST
WATER TABLE
FALL 1953
ZONE OF UNCONFINED WATER
CONFINING BED
ZONE OF CONFINED WATER
Qal
Qtoa
Kwm
Ŧbc
WILLARD FAULT ZONE
WILDOMAR FAULT
FAULT
HWY 395
PALA TEMECULA ROAD
TEMECULA CREEK
BEND IN SECTION
ELEVATION IN FEET — U S G S
SECTION G—G' PAUBA VALLEY ALONG HIGHWAY 71
COMPILED FROM GRAPHIC WATER WELL LOGS
SOUTH
NORTH
ZONE OF CONFINED WATER
SECTION H—H' PAUBA VALLEY
COMPILED FROM GRAPHIC WATER WELL LOGS
SANTA GERTRUDIS VALLEY
MURRIETA CREEK
WATER TABLE, FALL 1953
Ksm?
SECTION J—J' SANTA GERTRUDIS VALLEY
COMPILED FROM GRAPHIC WATER WELL LOGS
HORIZONTAL DISTANCE IN THOUSANDS OF FEET
LEGEND
CLAY, MUD AND CLAY
SOIL
MUCK
SAND AND CLAY
SILT
SAND, CLAY, AND GRAVEL
GRAVEL AND CLAY
SILT AND CLAY
GRAVEL
SAND AND GRAVEL
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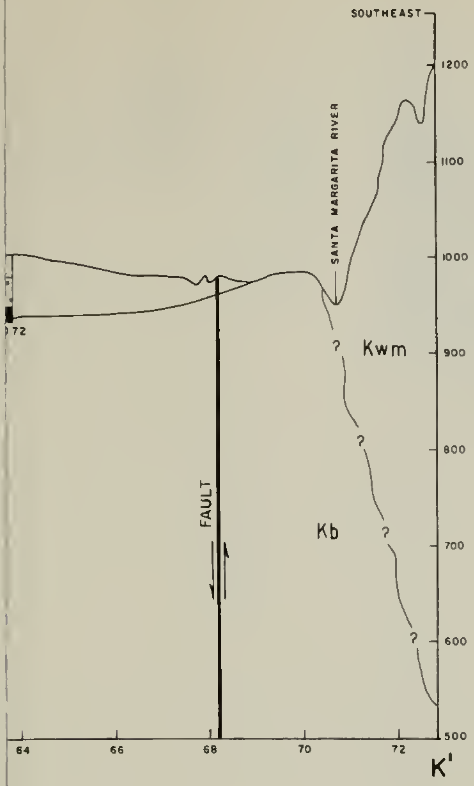
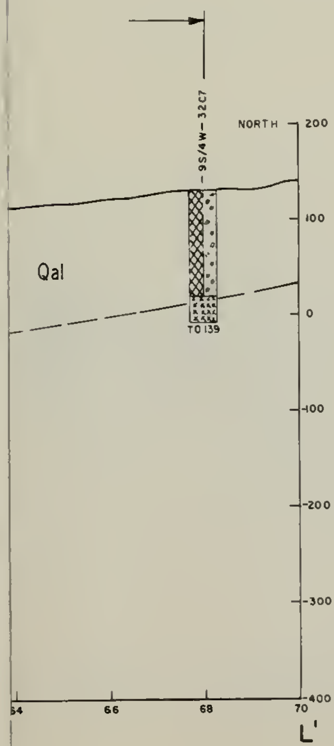




LEGEND

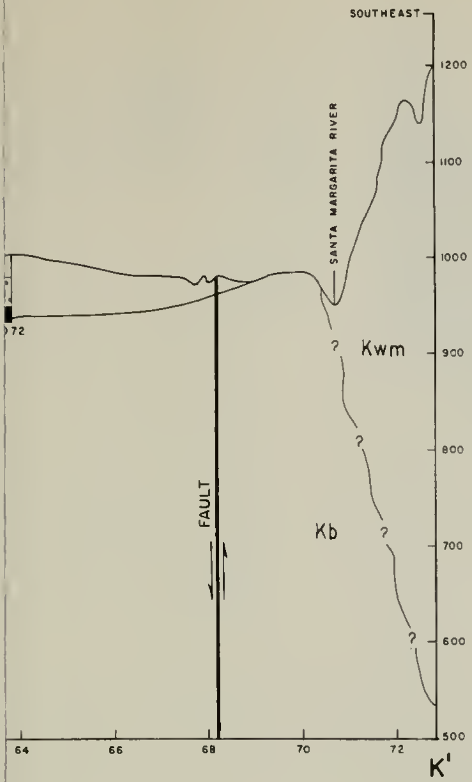
- CLAY, MUD AND CLAY, MUD, SHALE
- SOIL
- MUCK
- SAND AND CLAY, SANDY CLAY
- SILT
- SAND, CLAY, AND GRAVEL
- GRAVEL AND CLAY
- SILT AND CLAY
- SILT, SAND, AND CLAY
- SILT AND SAND
- SILT, SAND, AND GRAVEL
- GRAVEL, BOULDERS
- SAND AND GRAVEL
- SAND
- BEDROCK
- Qal RECENT ALLUVIUM
- Qtoa TERRACES AND OLDER ALLUVIUM
- Tmso SAN ONOFRE FORMATION
- Telj LA JOLLA FORMATION
- Kwm WOODSON MOUNTAIN GRANODIORITE
- Kb BONSALL TONALITE
- Ig UNDIFFERENTIATED IGNEOUS ROCKS
- P PERFORATED INTERVAL
- TD TOTAL DEPTH OF WELL, IN FEET

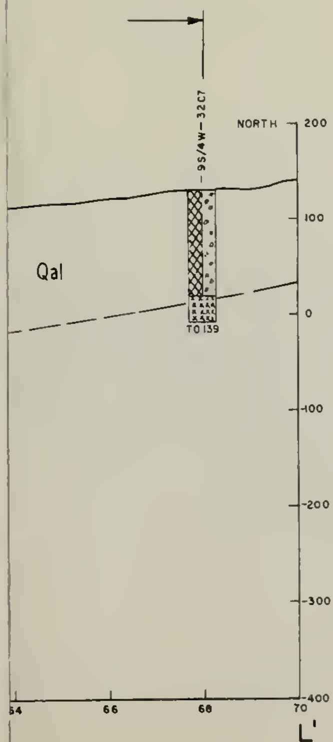
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS K—K', AND L—L'

1954





LEGEND

- CLAY, MUD AND CLAY, MUD, SHALE
- SOIL
- MUCK
- SAND AND CLAY, SANDY CLAY
- SILT
- SAND, CLAY, AND GRAVEL
- GRAVEL AND CLAY
- SILT AND CLAY
- SILT, SAND, AND CLAY
- SILT AND SAND
- SILT, SAND, AND GRAVEL
- GRAVEL, BOULDERS
- SAND AND GRAVEL
- SAND
- BEDROCK
- Qal RECENT ALLUVIUM
- Qtoa TERRACES AND OLDER ALLUVIUM
- Tmso SAN ONOFRE FORMATION
- Telj LA JOLLA FORMATION
- Kwm WOODSON MOUNTAIN GRANODIORITE
- Kb BONSALL TONALITE
- Ig UNDIFFERENTIATED IGNEOUS ROCKS
- P PERFORATED INTERVAL
- TD TOTAL DEPTH OF WELL, IN FEET

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

GEOLOGIC SECTIONS K—K', AND L—L'

1954

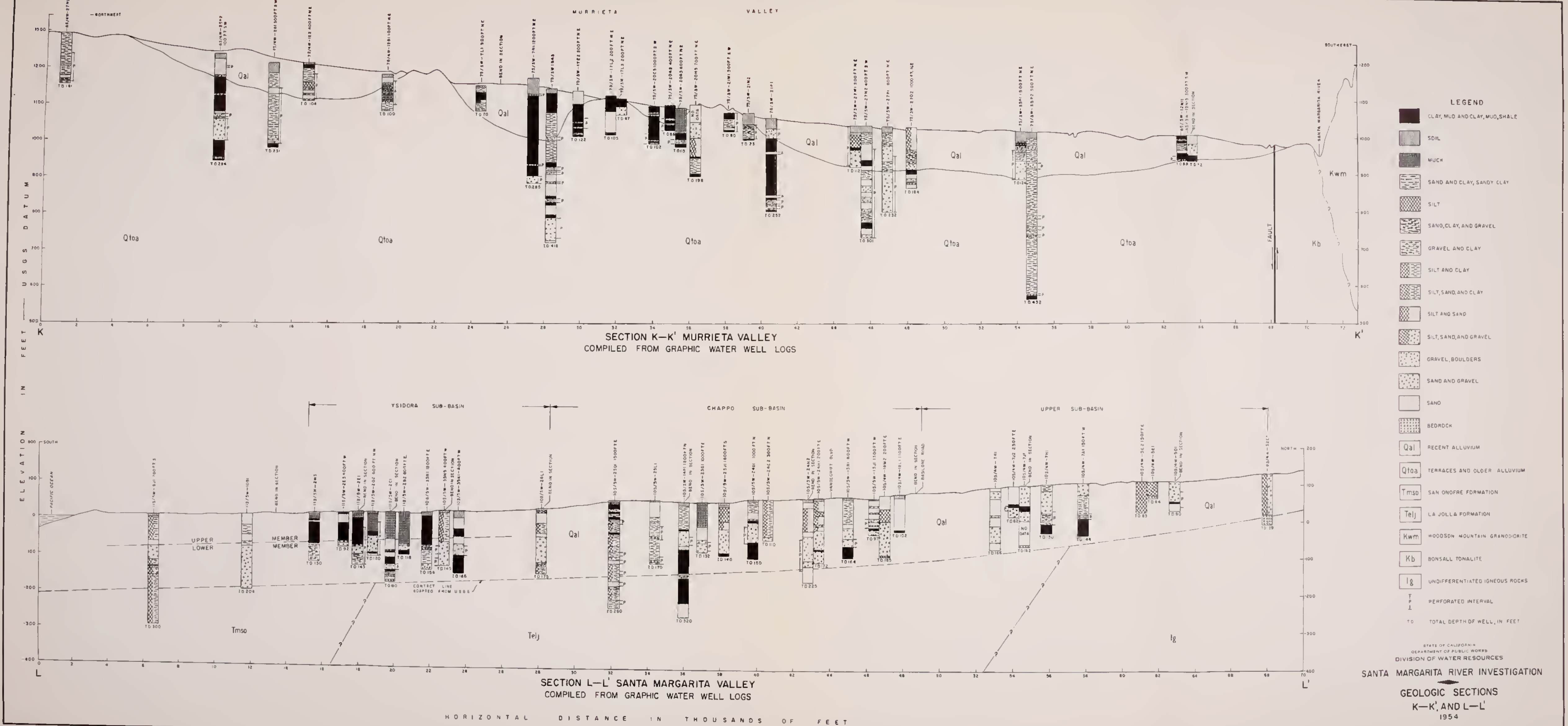
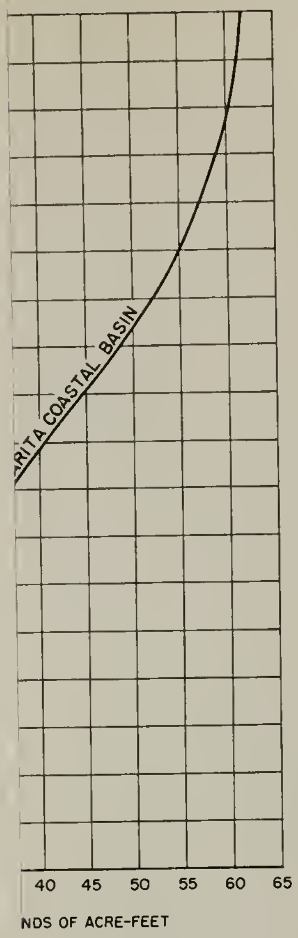
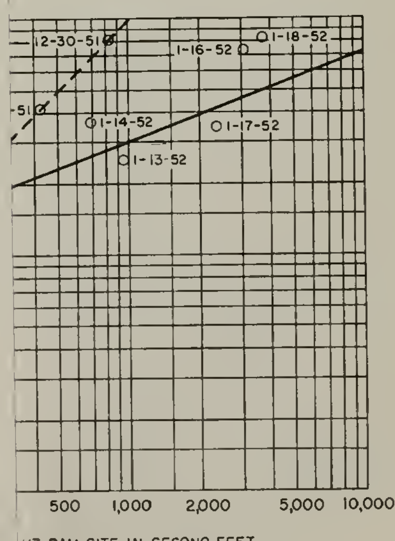

MURRIETA VALLEY
NORTHWEST
SOUTHEAST
SECTION K—K' MURRIETA VALLEY
COMPILED FROM GRAPHIC WATER WELL LOGS
Qal
Qtoa
Kwm
Kb
FAULT
SANTA MARGARITA RIVER
ELEVATION IN FEET USGS DATUM
YSIDORA SUB-BASIN
CHAPPO SUB-BASIN
UPPER SUB-BASIN
SOUTH
NORTH
PACIFIC OCEAN
UPPER MEMBER
LOWER MEMBER
CONTACT LINE ADAPTED FROM U.S.G.S.
Tmso
Telj
Ig
SECTION L—L' SANTA MARGARITA VALLEY
COMPILED FROM GRAPHIC WATER WELL LOGS
HORIZONTAL DISTANCE IN THOUSANDS OF FEET
LEGEND
CLAY, MUD AND CLAY, MUD, SHALE
SOIL
MUCK
SAND AND CLAY, SANDY CLAY
SILT
SAND, CLAY, AND GRAVEL
GRAVEL AND CLAY
SILT AND CLAY
SILT, SAND, AND CLAY
SILT AND SAND
SILT, SAND, AND GRAVEL
GRAVEL, BOULDERS
SAND AND GRAVEL
SAND
BEDROCK
Qal RECENT ALLUVIUM
Qtoa TERRACES AND OLDER ALLUVIUM
Tmso SAN ONOFRE FORMATION
Telj LA JOLLA FORMATION
Kwm WOODSON MOUNTAIN GRANODIORITE
Kb BONSALL TONALITE
Ig UNDIFFERENTIATED IGNEOUS ROCKS
PERFORATED INTERVAL
TD TOTAL DEPTH OF WELL, IN FEET
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
GEOLOGIC SECTIONS
K—K', AND L—L'
1954

PLATE 18

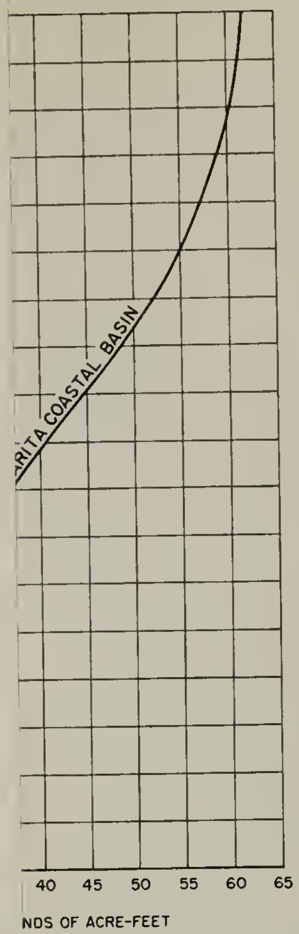


WATER STORAGE CAPACITY AND
ITA MARGARITA COASTAL BASIN

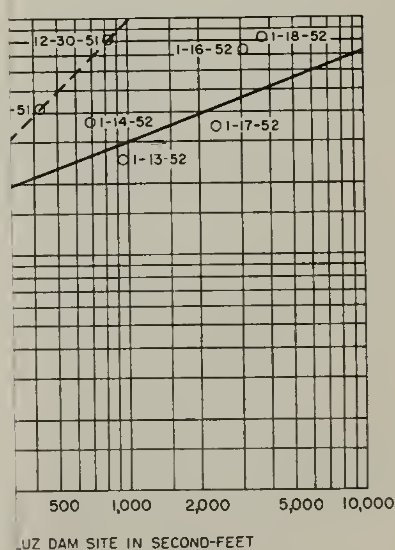
PLATE 19



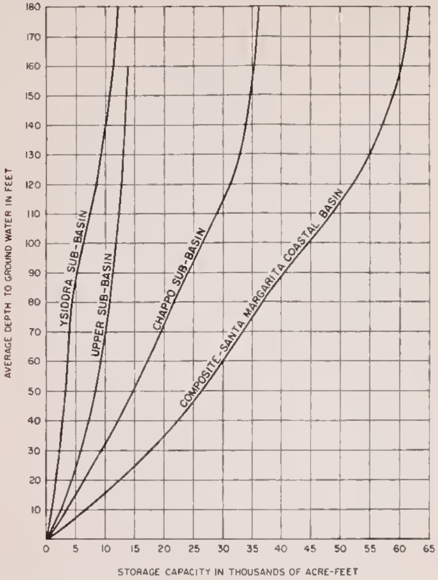
RGE OF SANTA MARGARITA RIVER
MARGARITA COASTAL BASIN



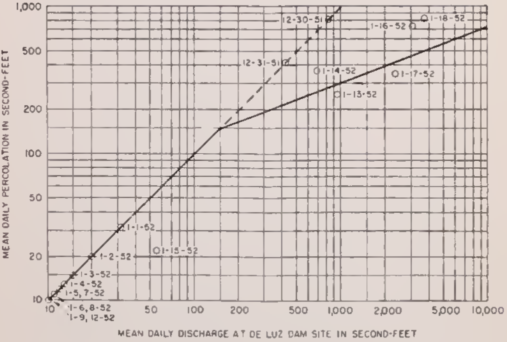
WATER STORAGE CAPACITY AND
NTA MARGARITA COASTAL BASIN



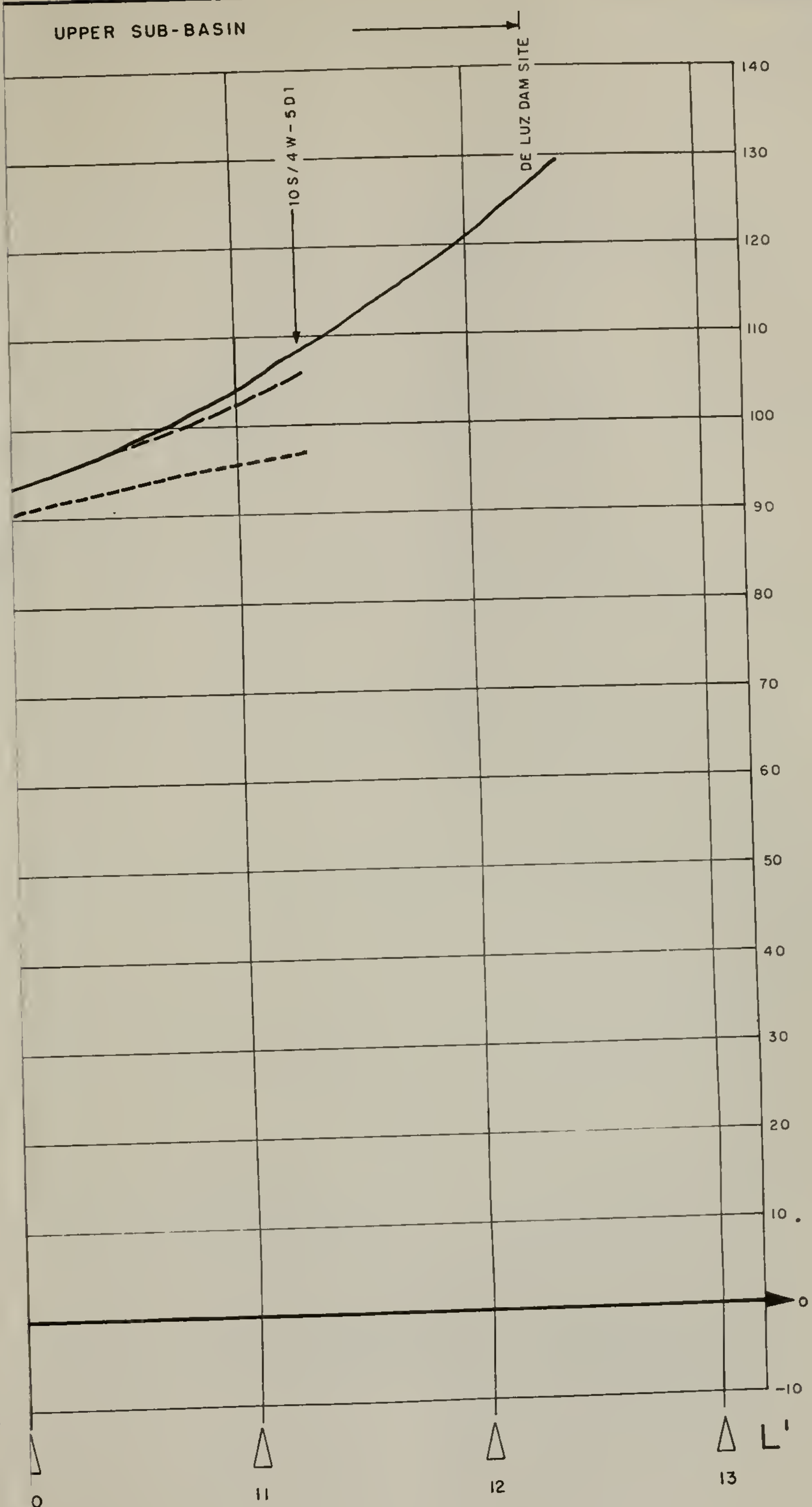
RGE OF SANTA MARGARITA RIVER
MARGARITA COASTAL BASIN



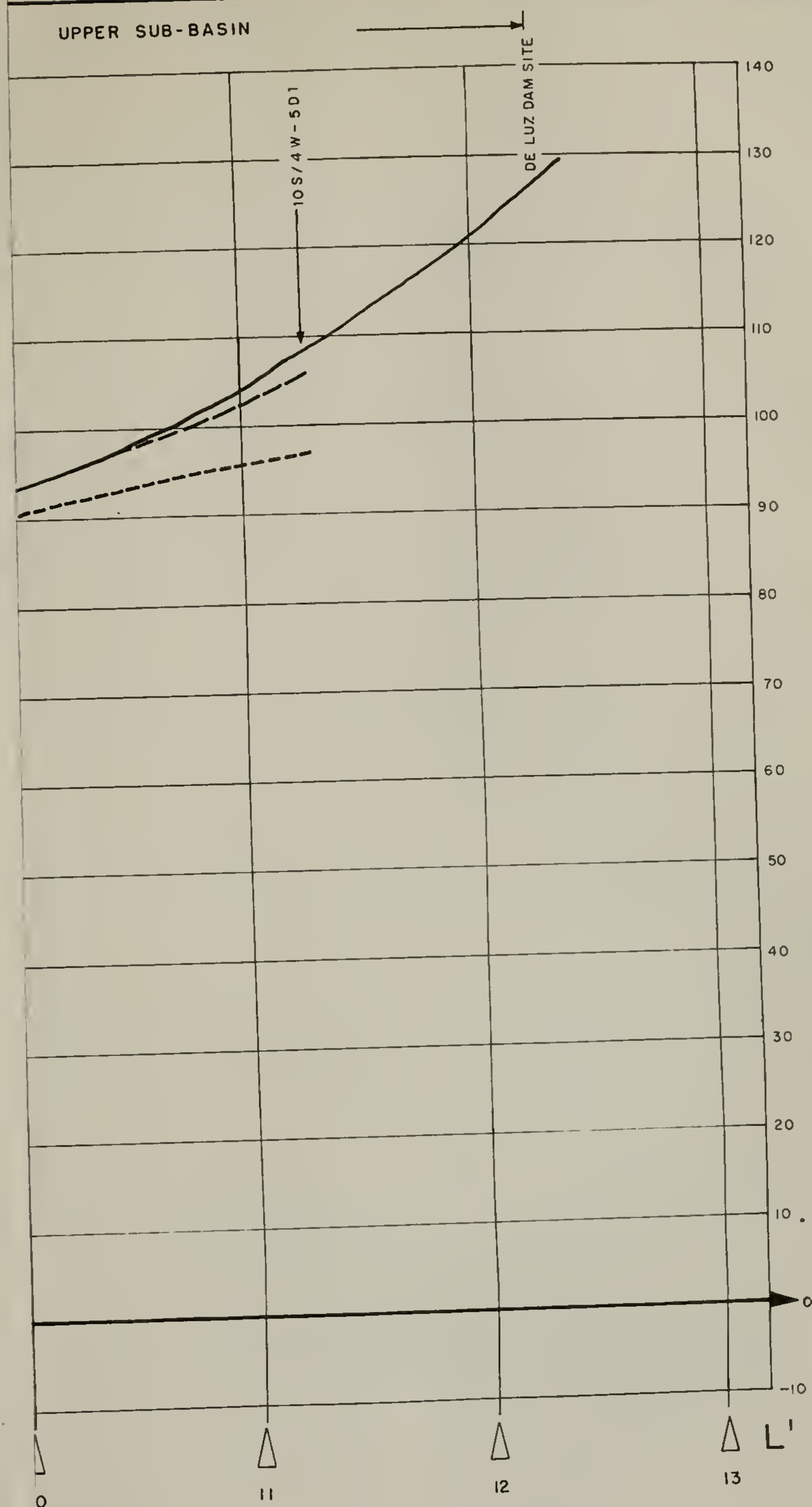
RELATIONSHIP BETWEEN GROUND WATER STORAGE CAPACITY AND DEPTH TO GROUND WATER IN SANTA MARGARITA COASTAL BASIN



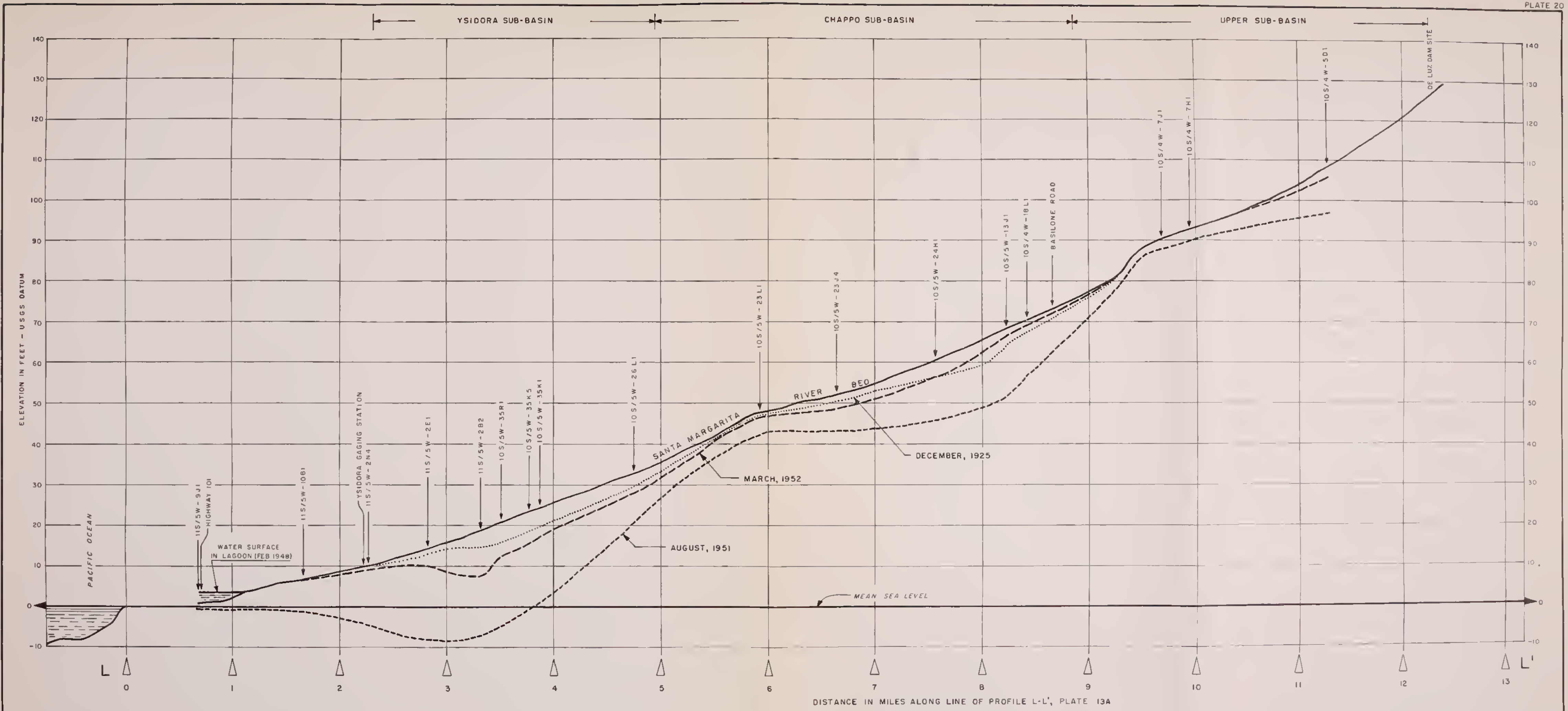
RELATIONSHIP BETWEEN DISCHARGE OF SANTA MARGARITA RIVER AND PERCOLATION IN SANTA MARGARITA COASTAL BASIN



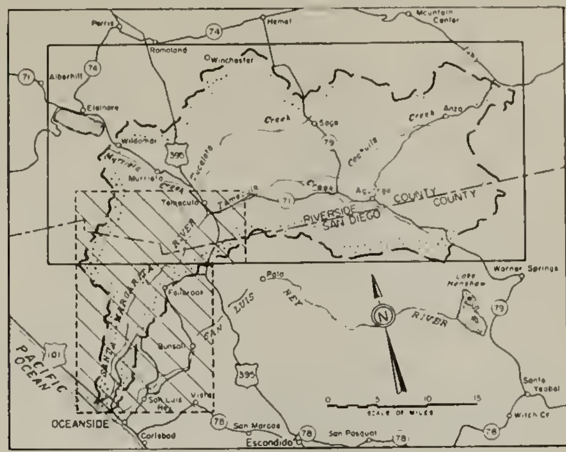
ROFILES OF HISTORICAL GROUND WATER LEVELS
SANTA MARGARITA COASTAL BASIN



ROFILES OF HISTORICAL GROUND WATER LEVELS
SANTA MARGARITA COASTAL BASIN



PROFILES OF HISTORICAL GROUND WATER LEVELS
SANTA MARGARITA COASTAL BASIN



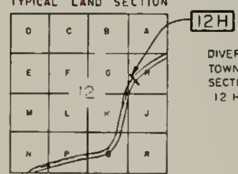
KEY MAP

LEGEND

- WATERSHED BOUNDARY
- HYDROGRAPHIC UNIT BOUNDARY
- (5) HYDROGRAPHIC UNIT NUMBER
- IRRIGATED LAND
- IRRIGABLE LAND
- [5 R] DIVERSION LOCATION AND NUMBER
- DIVERSION CONDUIT
- (1) LOCATION OF CONSUMPTIVE USE STUDY PLOT
- LOCATION OF CLIMATOLOGICAL STATION
- URBAN AND MILITARY LANDS RECEIVING WATER SERVICE COAST

KEY TO NUMBERING SYSTEM

TYPICAL LAND SECTION



DIVERSIONS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e g, DIVERSION NUMBER T9S/R4W–12 H IS SHOWN

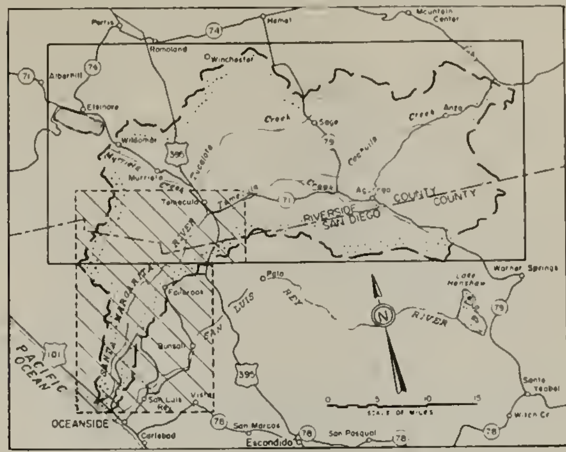
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

LOCATION OF DIVERSIONS
AND
IRRIGATED AND IRRIGABLE LANDS
COASTAL AREA
1953

SCALE OF MILES

1 0 1 2 3 4



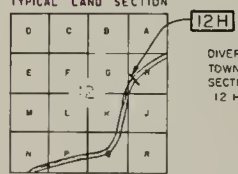
KEY MAP

LEGEND

- WATERSHED BOUNDARY
- HYDROGRAPHIC UNIT BOUNDARY
- (5) HYDROGRAPHIC UNIT NUMBER
- IRRIGATED LAND
- IRRIGABLE LAND
- [5 R] DIVERSION LOCATION AND NUMBER
- DIVERSION CONDUIT
- (1) LOCATION OF CONSUMPTIVE USE STUDY PLOT
- ▲ LOCATION OF CLIMATOLOGICAL STATION
- URBAN AND MILITARY LANDS RECEIVING WATER SERVICE COAST

KEY TO NUMBERING SYSTEM

TYPICAL LAND SECTION



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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

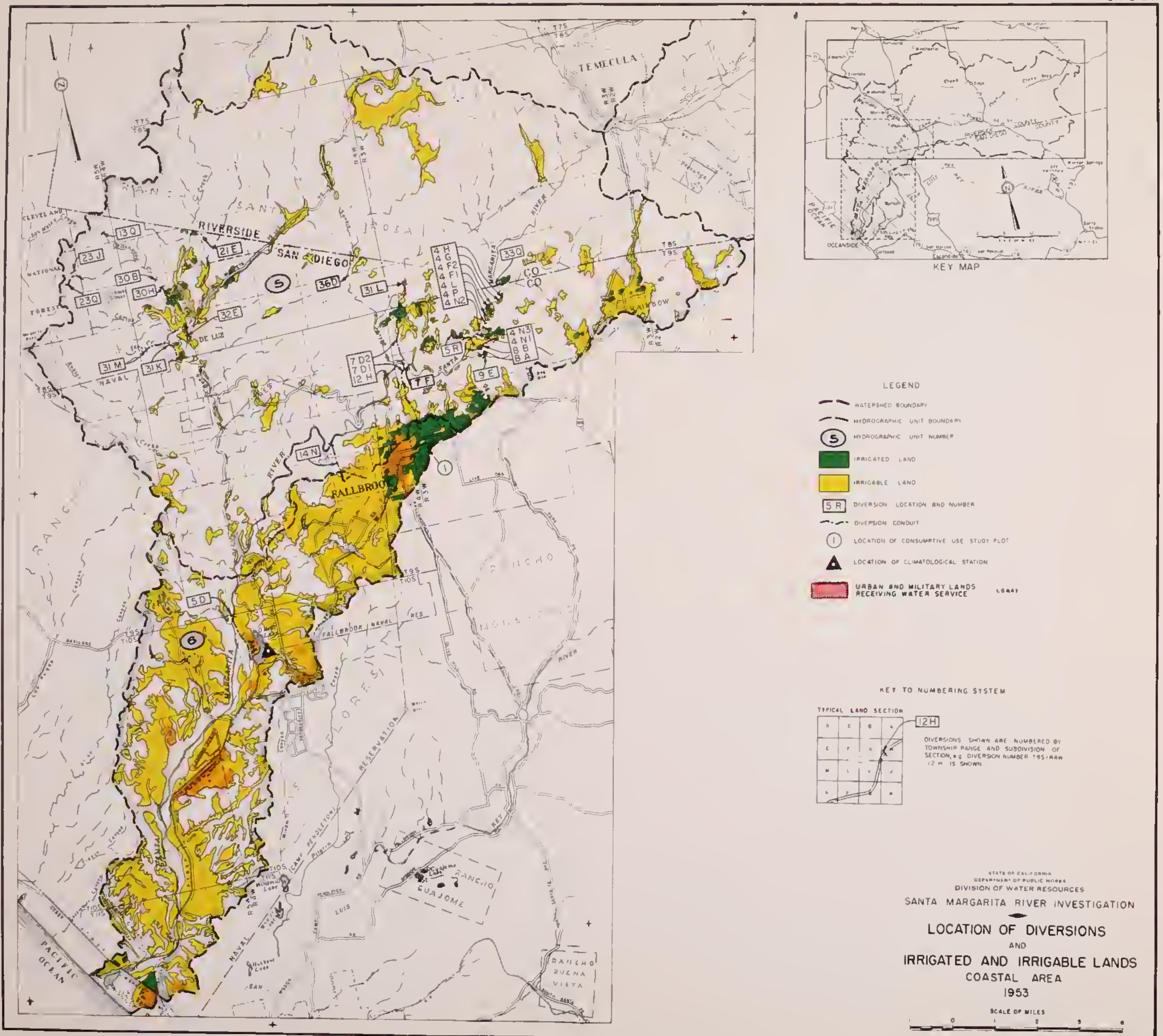
LOCATION OF DIVERSIONS AND IRRIGATED AND IRRIGABLE LANDS

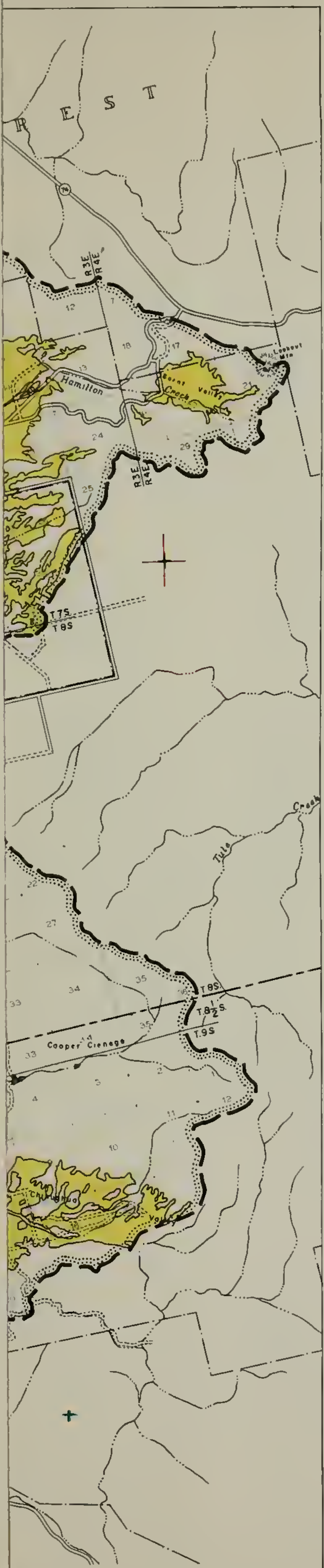
COASTAL AREA

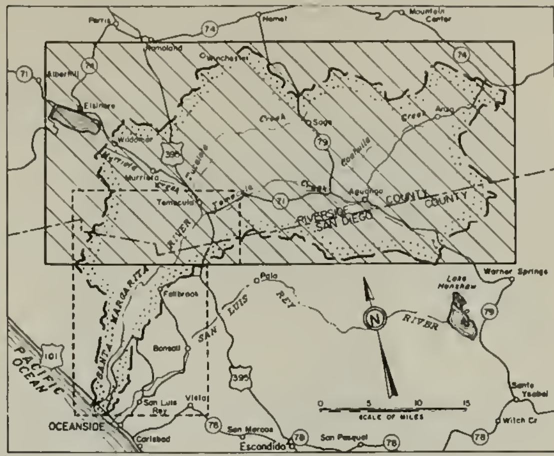
1953

SCALE OF MILES

1 0 1 2 3 4


TEMECULA
RIVERSIDE
SAN DIEGO
SANTA ROSA
FALLBROOK
RAINBOW
DE LUZ
NAVAL
RANCHO
PACIFIC OCEAN
FALLBROOK NAVAL RES
CAMP PENDLETON
NAVAL RESERVATION
RANCHO GUAJOME
RANCHO BUENA VISTA
SAN LUIS REY RIVER
5
6
13 Q
23 J
21 E
30 B
30 H
23 Q
32 E
36 D
31 L
33 Q
31 M
31 K
14 N
5 R
7 F
9 E
5 D
7 D2
7 D1
12 H
4 H
4 G
4 F2
4 F1
4 L
4 P
4 N2
4 N3
4 N1
8 B
8 A
KEY MAP
LEGEND
WATERSHED BOUNDARY
HYDROGRAPHIC UNIT BOUNDARY
HYDROGRAPHIC UNIT NUMBER
IRRIGATED LAND
IRRIGABLE LAND
DIVERSION LOCATION AND NUMBER
DIVERSION CONDUIT
LOCATION OF CONSUMPTIVE USE STUDY PLOT
LOCATION OF CLIMATOLOGICAL STATION
URBAN AND MILITARY LANDS RECEIVING WATER SERVICE
KEY TO NUMBERING SYSTEM
TYPICAL LAND SECTION
DIVERSIONS SHOWN ARE NUMBERED BY TOWNSHIP RANGE AND SUBDIVISION OF SECTION, e.g. DIVERSION NUMBER T9S/R4W 12 H IS SHOWN
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
LOCATION OF DIVERSIONS
AND
IRRIGATED AND IRRIGABLE LANDS
COASTAL AREA
1953
SCALE OF MILES





KEY MAP

LEGEND

WATERSHED BOUNDARY

HYDROGRAPHIC UNIT BOUNDARY

2 HYDROGRAPHIC UNIT NUMBER

IRRIGATED LAND

IRRIGABLE LAND

31K DIVERSION LOCATION AND NUMBER

DIVERSION CONDUIT

DIVERSION FROM SPRING

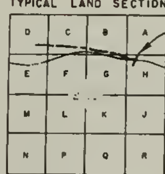
5 LOCATION OF CONSUMPTIVE USE STUDY PLOT

LOCATION OF CLIMATOLOGICAL STATION

URBAN LANDS RECEIVING WATER SERVICE

KEY TO NUMBERING SYSTEM

TYPICAL LAND SECTION



DIVERSIONS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e.g., DIVERSION NUMBER T8S / R2E-22H IS SHOWN

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

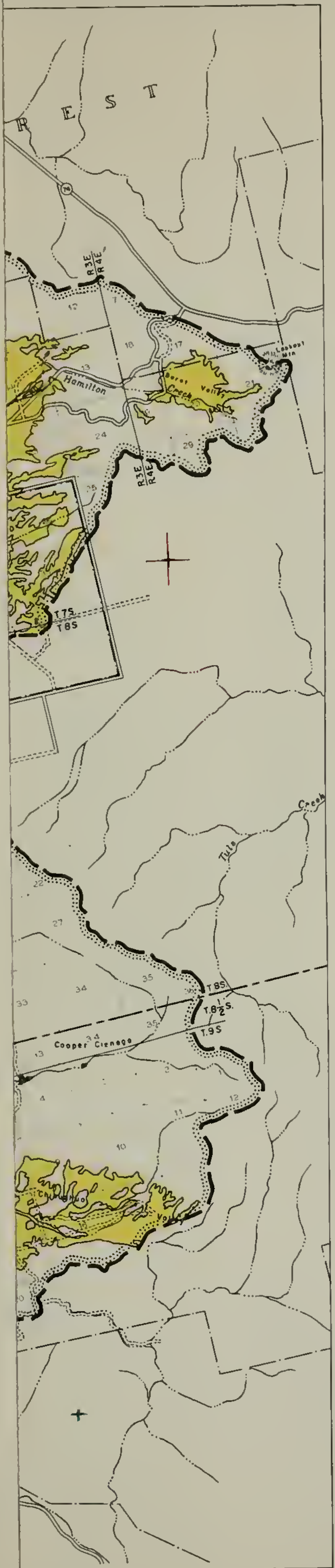
LOCATION OF DIVERSIONS AND IRRIGATED AND IRRIGABLE LANDS

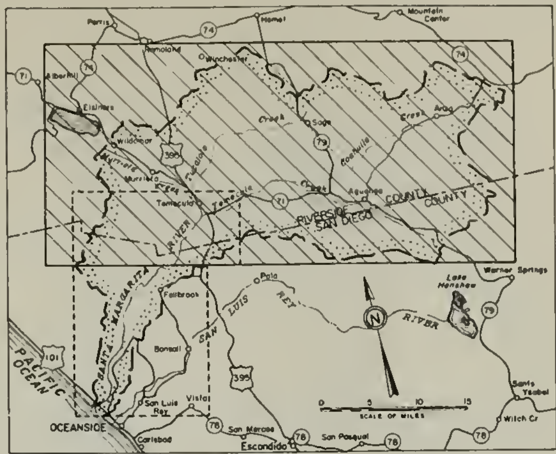
INLAND AREA

1953

SCALE OF MILES

1 0 1 2 3 4





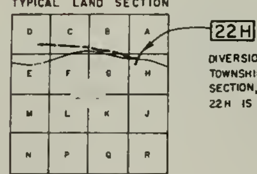
KEY MAP

LEGEND

- WATERSHED BOUNDARY
- HYDROGRAPHIC UNIT BOUNDARY
- (2) HYDROGRAPHIC UNIT NUMBER
- IRRIGATED LAND
- IRRIGABLE LAND
- 31K DIVERSION LOCATION AND NUMBER
- DIVERSION CONDUIT
- DIVERSION FROM SPRING
- (5) LOCATION OF CONSUMPTIVE USE STUDY PLOT
- LOCATION OF CLIMATOLOGICAL STATION
- URBAN LANDS RECEIVING WATER SERVICE

KEY TO NUMBERING SYSTEM

TYPICAL LAND SECTION



DIVERSIONS SHOWN ARE NUMBERED BY TOWNSHIP, RANGE AND SUBDIVISION OF SECTION, e g, DIVERSION NUMBER T8S / R2E-22H IS SHOWN

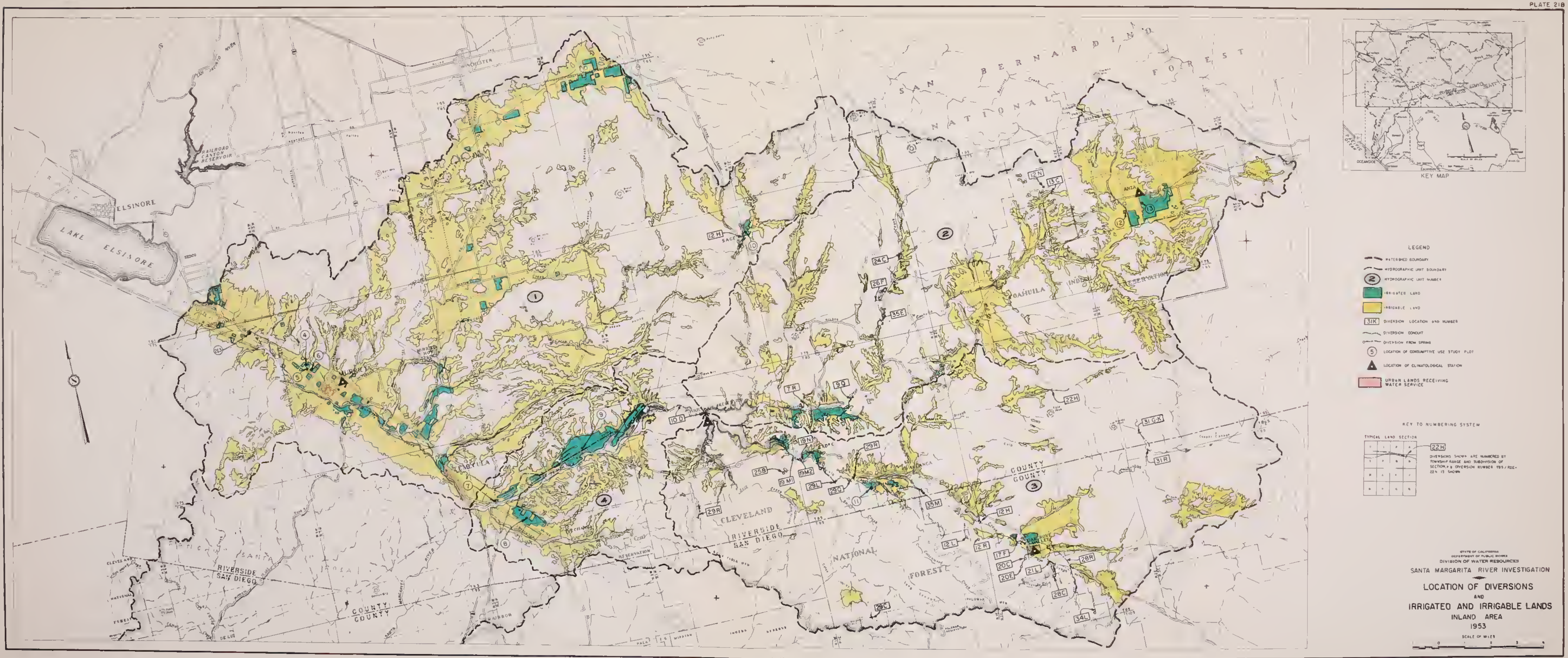
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

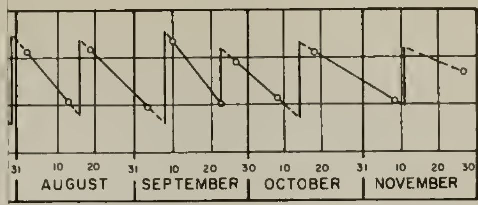
SANTA MARGARITA RIVER INVESTIGATION

LOCATION OF DIVERSIONS
AND
IRRIGATED AND IRRIGABLE LANDS
INLAND AREA
1953

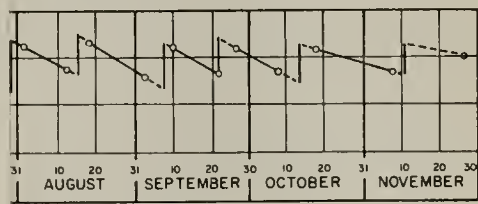
SCALE OF MILES

1 0 1 2 3 4

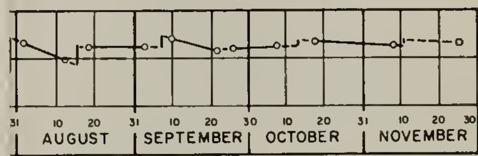

KEY MAP
LEGEND
WATERSHED BOUNDARY
HYDROGRAPHIC UNIT BOUNDARY
HYDROGRAPHIC UNIT NUMBER
IRRIGATED LAND
IRRIGABLE LAND
DIVERSION LOCATION AND NUMBER
DIVERSION CONDUIT
DIVERSION FROM SPRING
LOCATION OF CONSUMPTIVE USE STUDY PLOT
LOCATION OF CLIMATOLOGICAL STATION
URBAN LANDS RECEIVING WATER SERVICE
KEY TO NUMBERING SYSTEM
TYPICAL LAND SECTION
LAKE ELSINORE
ELSINORE
RAILROAD CANYON RESERVOIR
WINCHESTER
SAN BERNARDINO NATIONAL FOREST
CAHUILLA INDIAN RESERVATION
ANZA
CLEVELAND NATIONAL FOREST
RIVERSIDE
SAN DIEGO
COUNTY
COUNTY
TEMECULA
MURRIETA
SAGE
AGUANGA
12H
12N
13C
24C
26F
35E
7R
9Q
10D
19N
19M1
19M2
25B
29L
29R
31G-K
31R
22H
35M
12L
12R
17F
20C
20E
21L
28C
28R
34L
29C
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
LOCATION OF DIVERSIONS
AND
IRRIGATED AND IRRIGABLE LANDS
INLAND AREA
1953
SCALE OF MILES



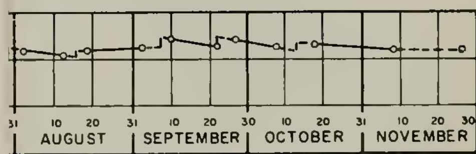
SOIL ZONE



OOT SOIL ZONE



OOT SOIL ZONE



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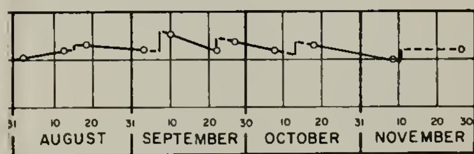

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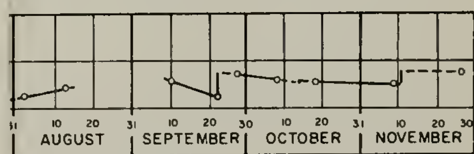
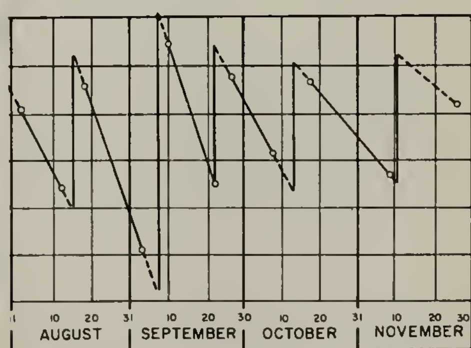


OOT SOIL ZONE

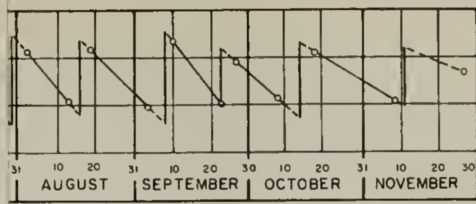


OIL ZONE

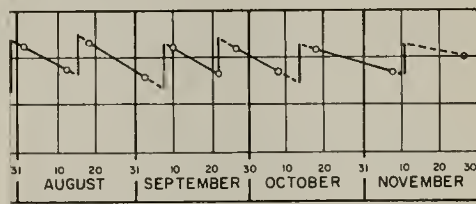
ETION AND ACCRETION

TURE, MURRIETA VALLEY

3



' SOIL ZONE



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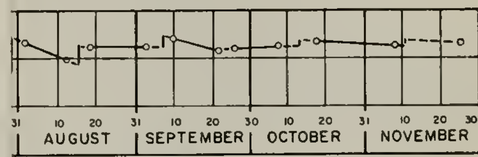

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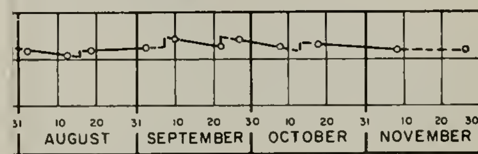
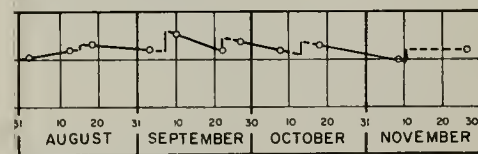


OOT SOIL ZONE



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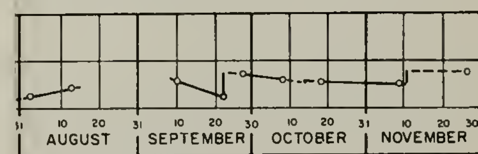
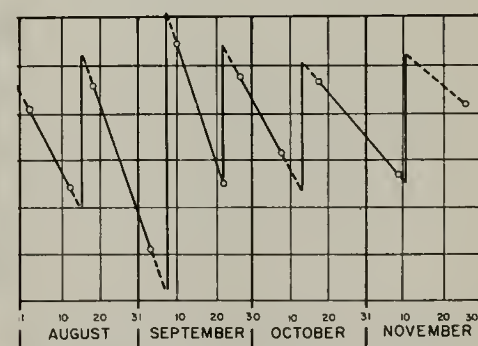


OOT SOIL ZONE

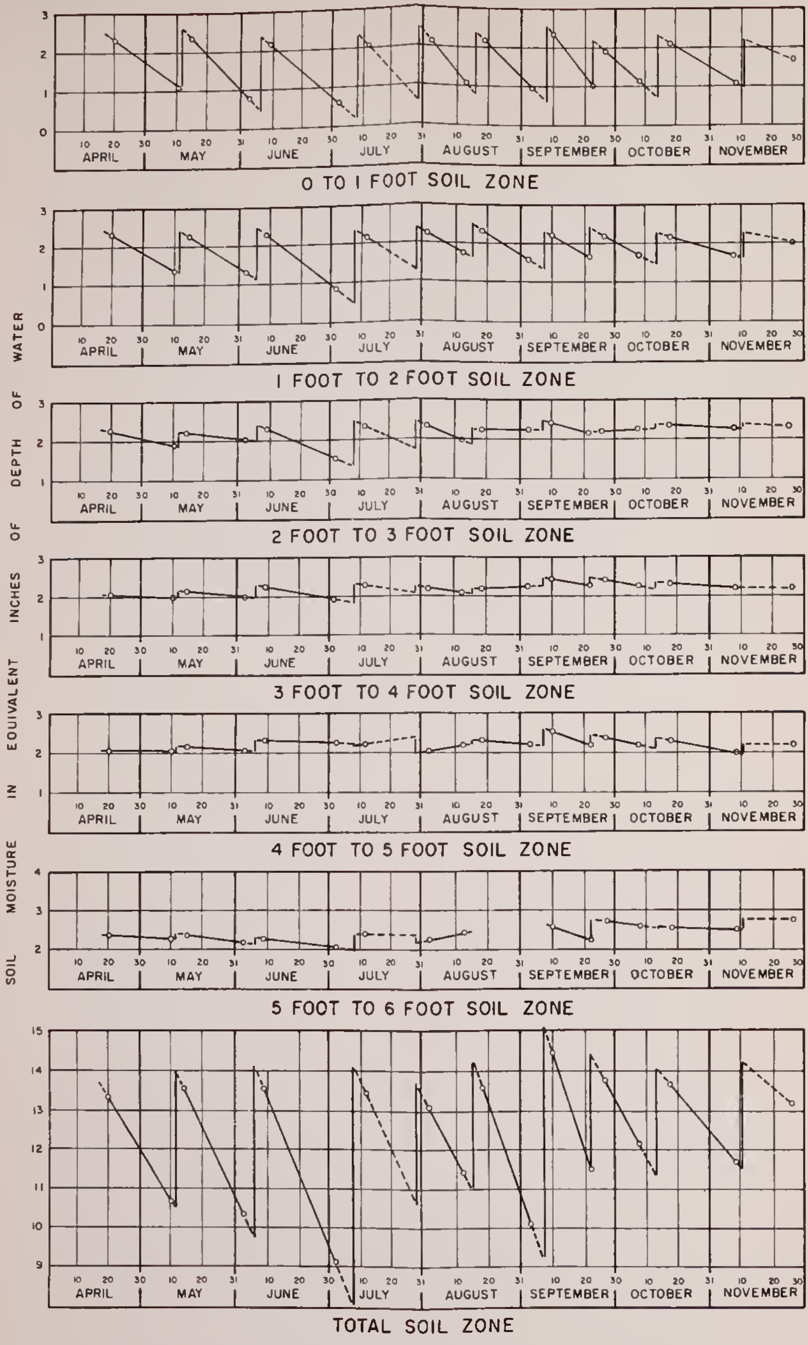


)IL ZONE

ETION AND ACCRETION

TURE, MURRIETA VALLEY

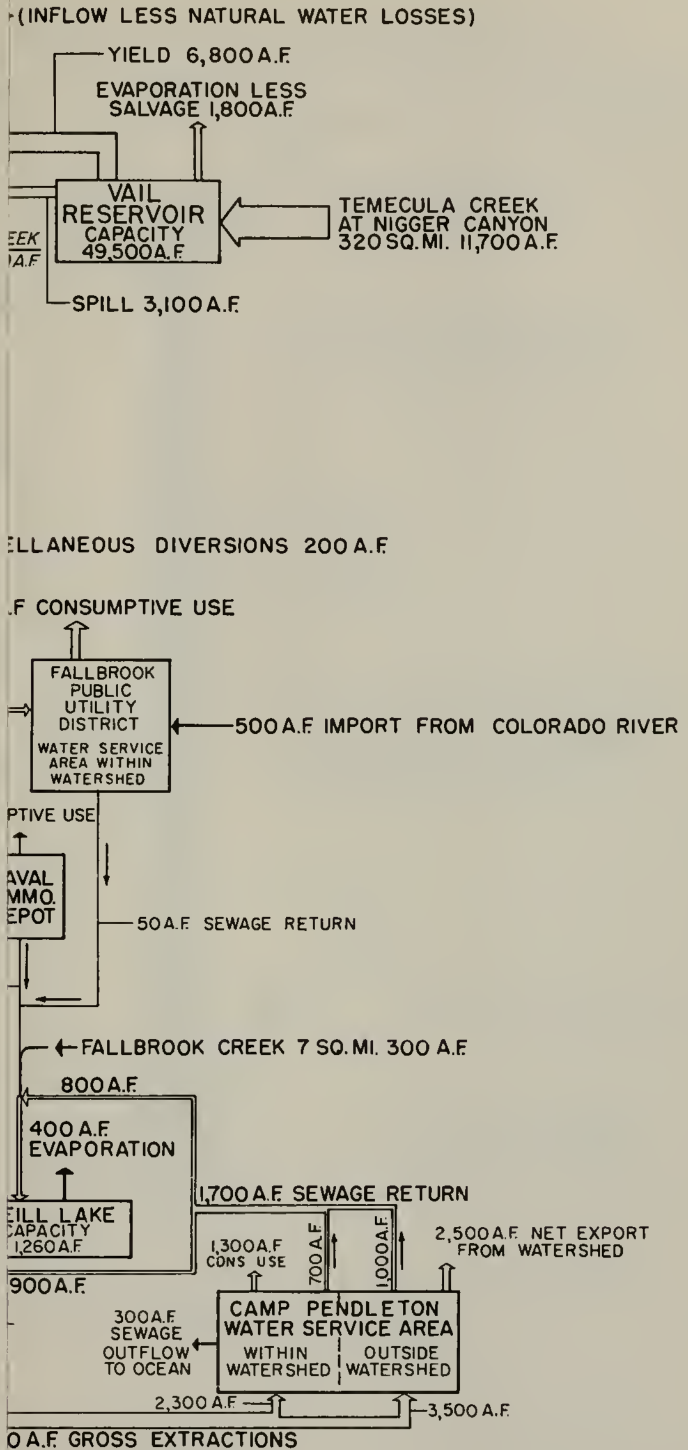
3



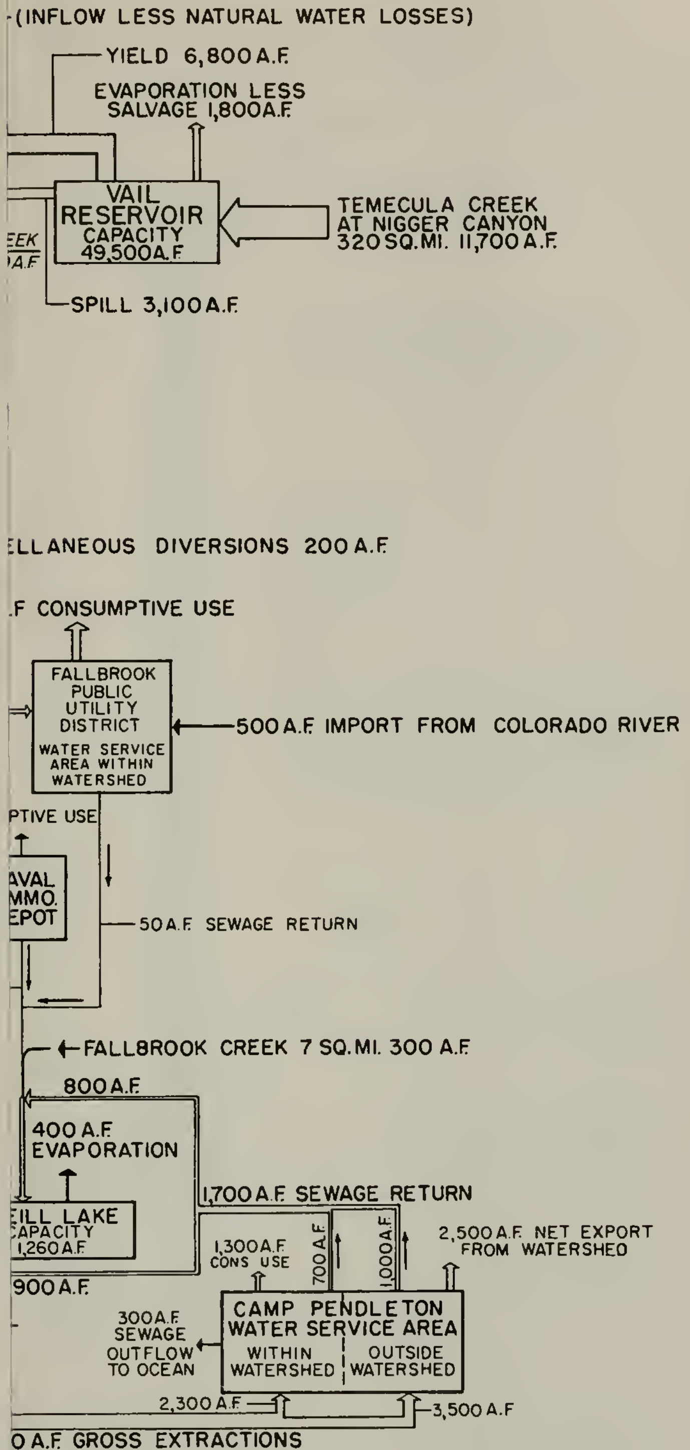
SOIL MOISTURE DEPLETION AND ACCRETION

PLOT NO. 2, IRRIGATED PASTURE, MURRIETA VALLEY

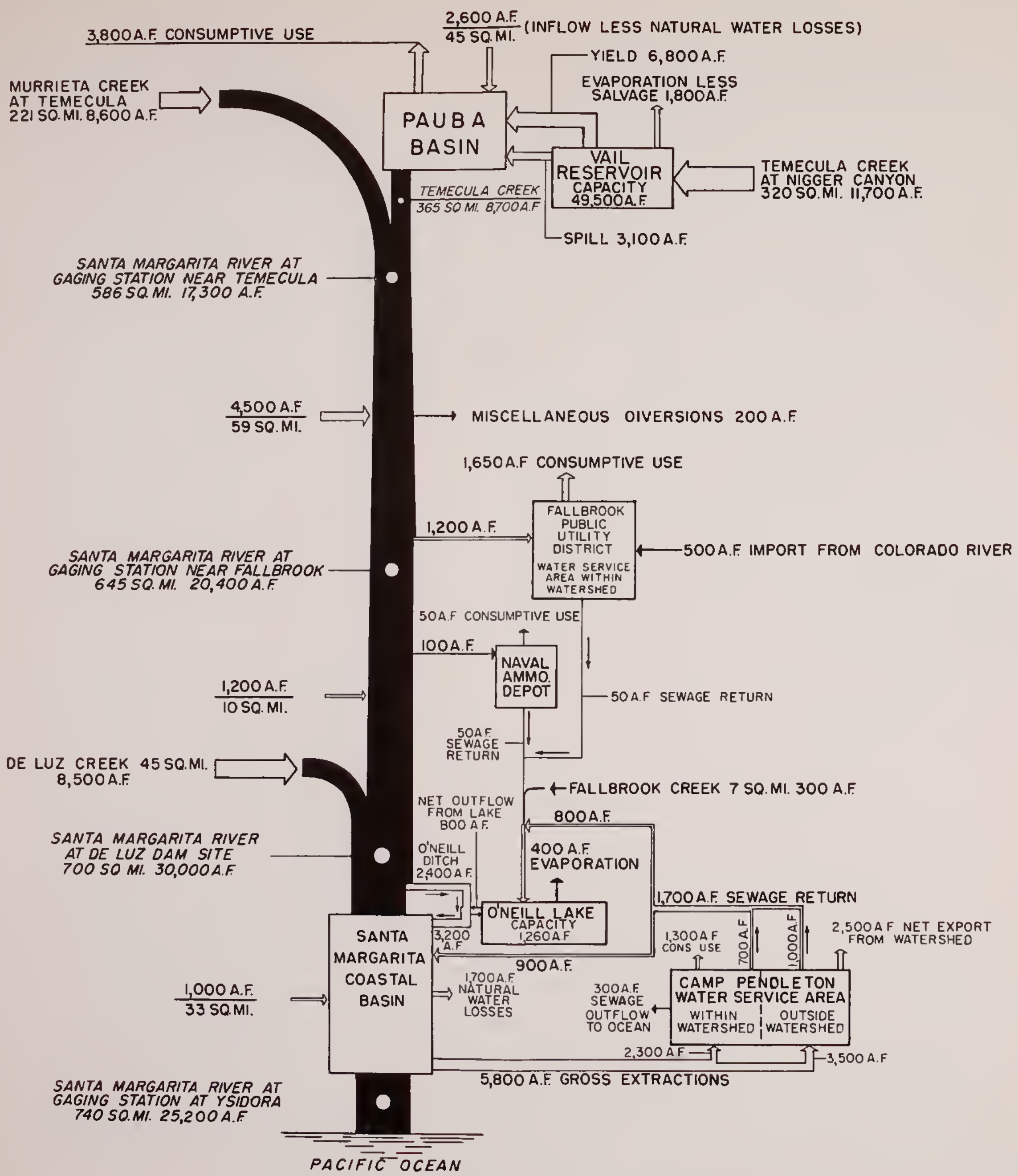
1953



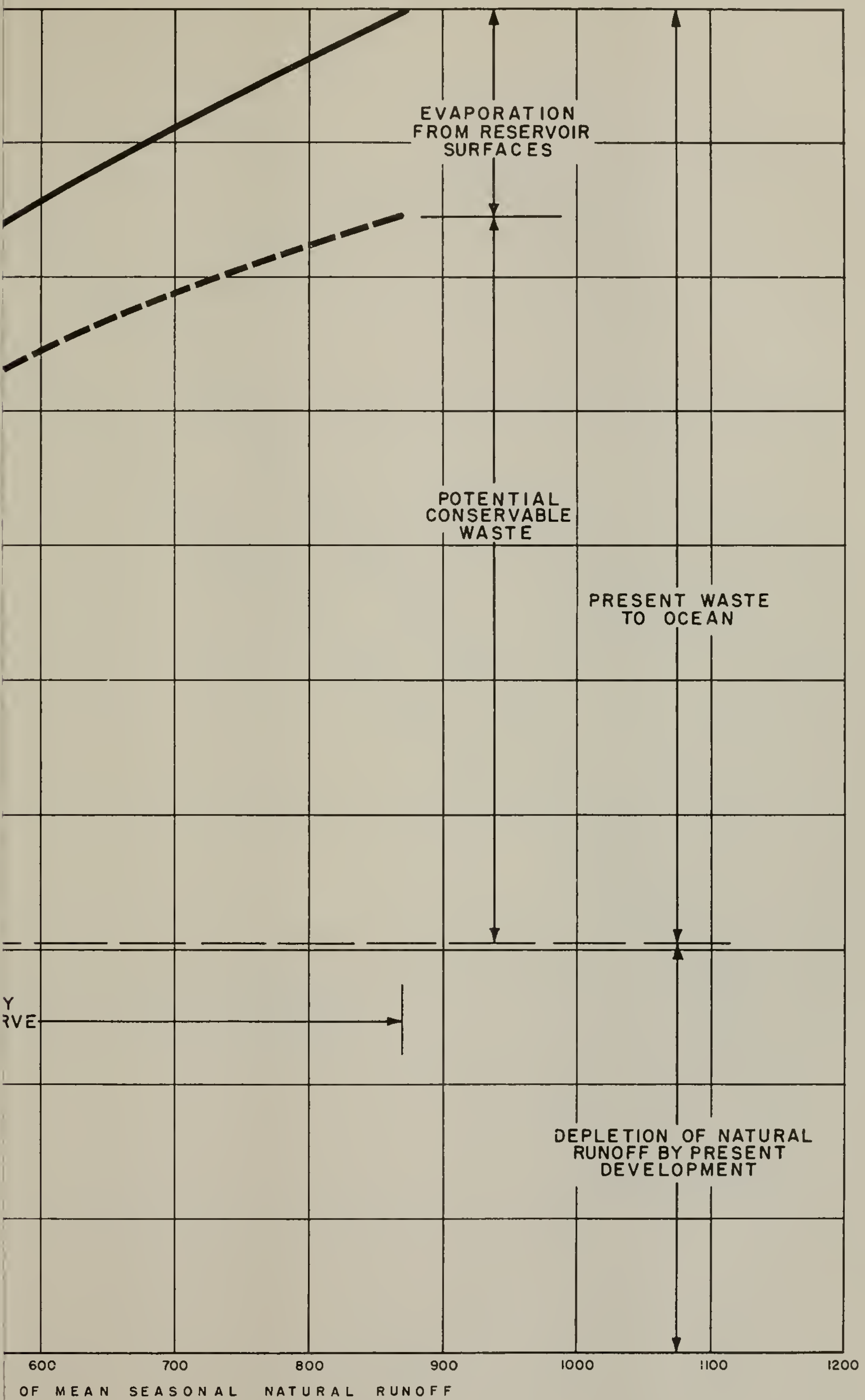
OF MEAN SEASONAL RUNOFF
UNDER PRESENT CONDITIONS
PMENT, 1953



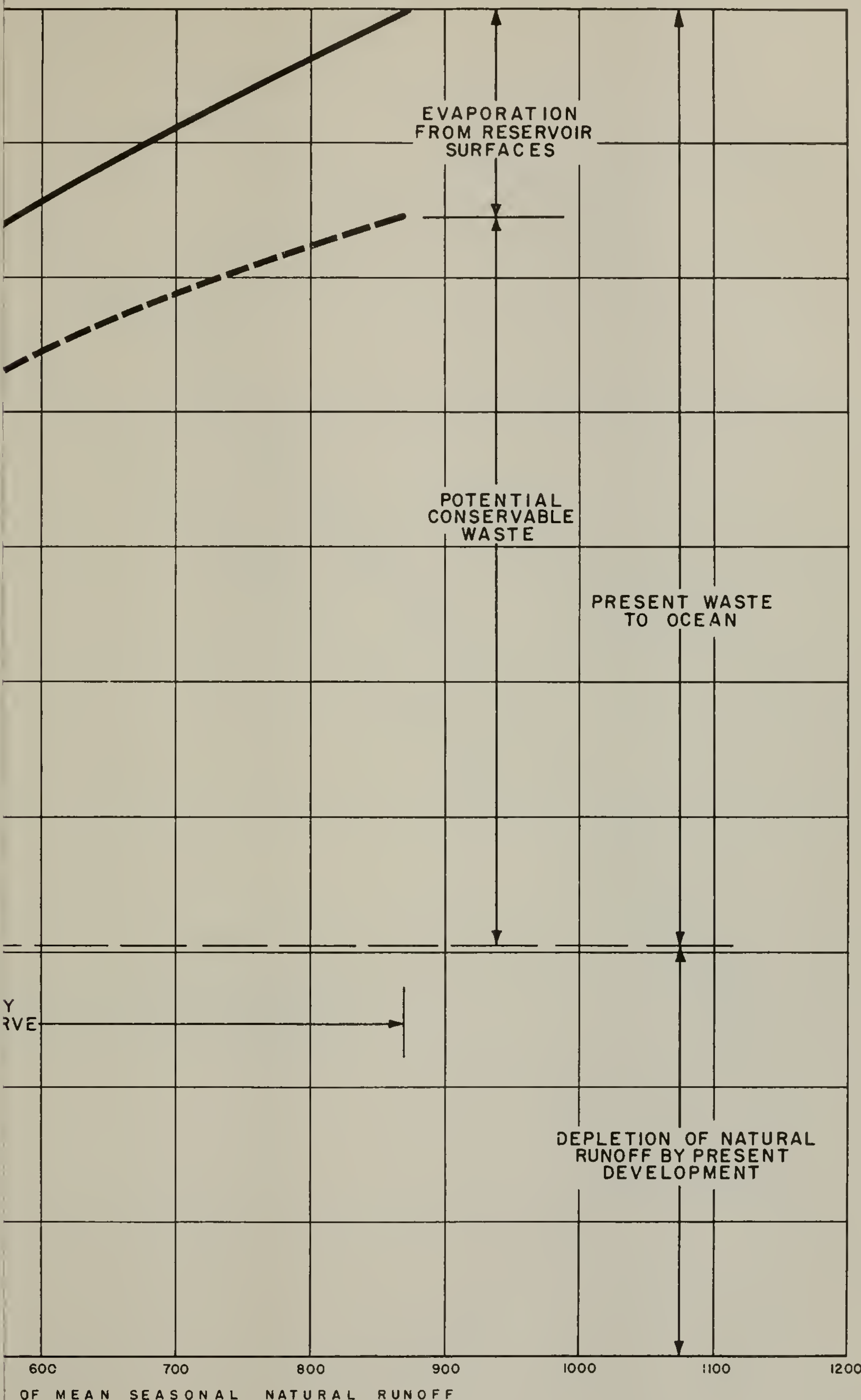
OF MEAN SEASONAL RUNOFF
UNDER PRESENT CONDITIONS
PMENT, 1953



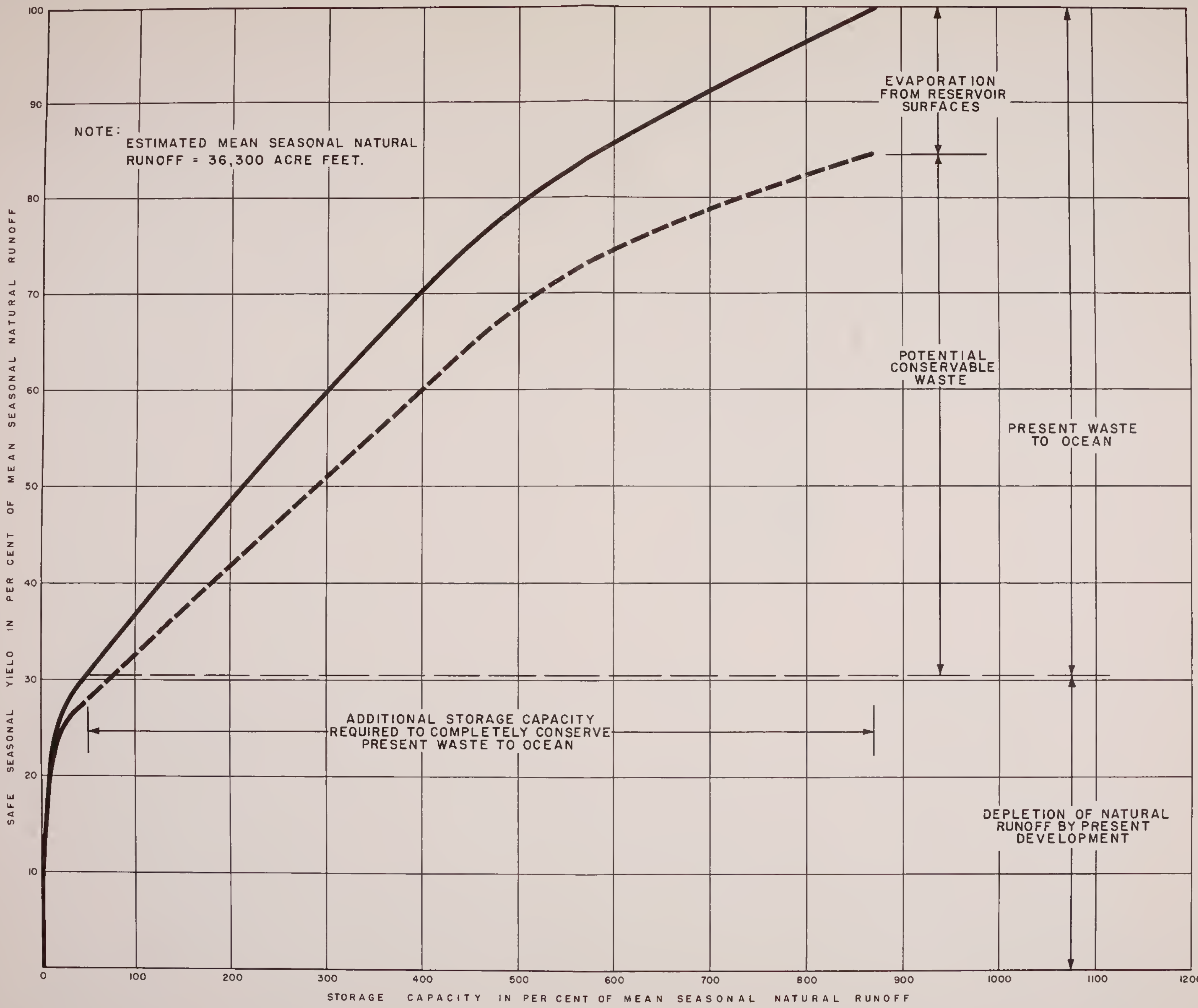
OCCURRENCE AND DISPOSITION OF MEAN SEASONAL RUNOFF IN SANTA MARGARITA RIVER UNDER PRESENT CONDITIONS OF DEVELOPMENT, 1953



R SANTA MARGARITA RIVER AT YSIDORA



R SANTA MARGARITA RIVER AT YSIDORA



STORAGE DEVELOPMENT CURVE FOR SANTA MARGARITA RIVER AT YSIDORA

DIVISION OF WATER RESOURCES

END

TIAL RESERVOIR SITE

IGATED DAM SITE

SED CONDUIT

ING CONDUIT

.ATORY RESERVOIR

NG PLANT

RSHED BOUNDARY

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

EXISTING AND POTENTIAL WATER SUPPLY DEVELOPMENTS

1955

SCALE OF MILES

1 0 1 2 3 4 5

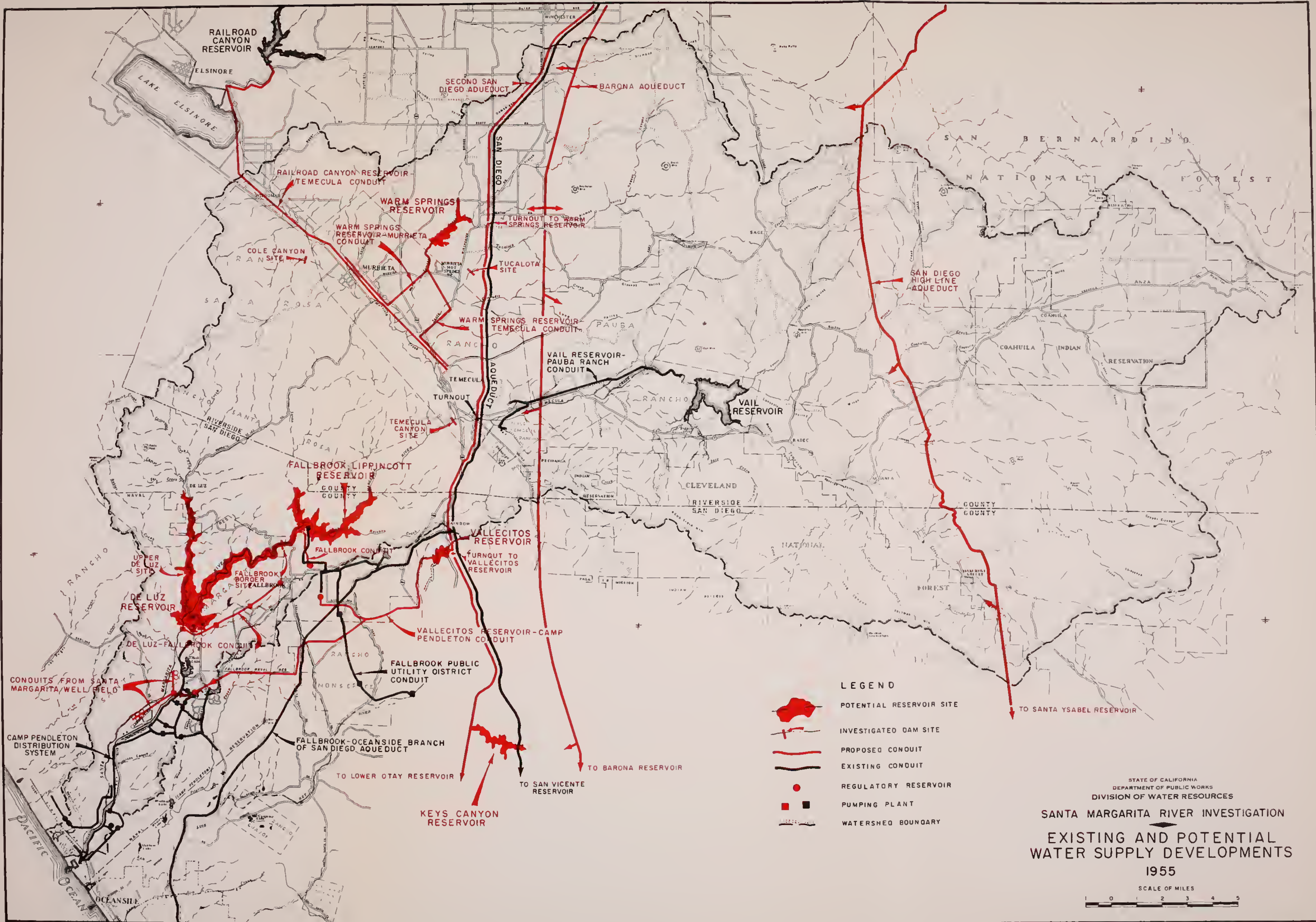
END
TIAL RESERVOIR SITE
IGATED DAM SITE
SED CONDUIT
ING CONDUIT
.ATORY RESERVOIR
NG PLANT
RSHED BOUNDARY

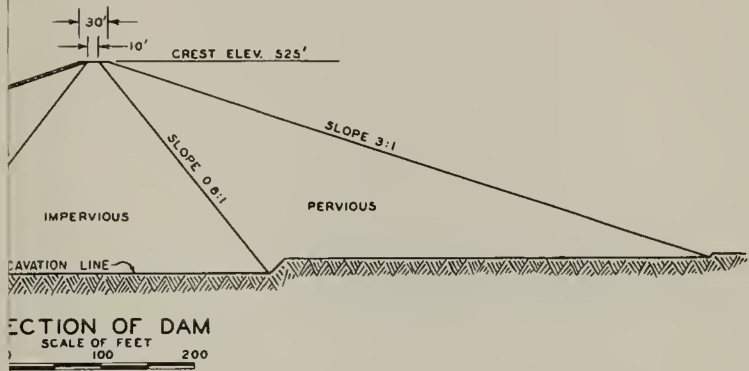
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

EXISTING AND POTENTIAL
WATER SUPPLY DEVELOPMENTS
1955

SCALE OF MILES
1 0 1 2 3 4 5


RAILROAD CANYON RESERVOIR
ELSINORE
LAKE ELSINORE
SECOND SAN DIEGO AQUEDUCT
BARONA AQUEDUCT
SAN BERNARDINO NATIONAL FOREST
RAILROAD CANYON RESERVOIR-TEMECULA CONDUIT
WARM SPRINGS RESERVOIR
TURNOUT TO WARM SPRINGS RESERVOIR
WARM SPRINGS RESERVOIR-MURRIETA CONDUIT
COLE CANYON SITE
MURRIETA
TUCALOTA SITE
SAN DIEGO HIGH LINE AQUEDUCT
ANZA
WARM SPRINGS RESERVOIR-TEMECULA CONDUIT
PAUBA
COAHUILA INDIAN RESERVATION
VAIL RESERVOIR-PAUBA RANCH CONDUIT
TEMECULA
TURNOUT
SAN DIEGO AQUEDUCT
VAIL RESERVOIR
TEMECULA CANYON SITE
RIVERSIDE
SAN DIEGO
FALLBROOK LIPPINCOTT RESERVOIR
COUNTY
COUNTY
CLEVELAND
NATIONAL
FOREST
VALLECITOS RESERVOIR
FALLBROOK CONDUIT
TURNOUT TO VALLECITOS RESERVOIR
UPPER DE LUZ SITE
FALLBROOK BORDER SITE
DE LUZ RESERVOIR
VALLECITOS RESERVOIR-CAMP PENDLETON CONDUIT
DE LUZ-FALLBROOK CONDUIT
FALLBROOK PUBLIC UTILITY DISTRICT CONDUIT
CONDUITS FROM SANTA MARGARITA WELL FIELD
CAMP PENDLETON DISTRIBUTION SYSTEM
FALLBROOK-OCEANSIDE BRANCH OF SAN DIEGO AQUEDUCT
TO LOWER OTAY RESERVOIR
TO SAN VICENTE RESERVOIR
TO BARONA RESERVOIR
TO SANTA YSABEL RESERVOIR
KEYS CANYON RESERVOIR
PACIFIC OCEAN
OCEANSIDE
LEGEND
POTENTIAL RESERVOIR SITE
INVESTIGATED DAM SITE
PROPOSED CONDUIT
EXISTING CONDUIT
REGULATORY RESERVOIR
PUMPING PLANT
WATERSHED BOUNDARY
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
EXISTING AND POTENTIAL WATER SUPPLY DEVELOPMENTS
1955
SCALE OF MILES
0 1 2 3 4 5



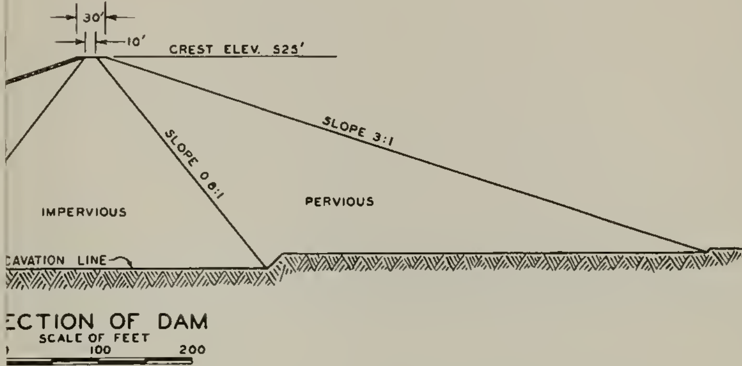
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

FALLBROOK, LIPPINCOTT DAM
ON
SANTA MARGARITA RIVER

RESERVOIR STORAGE CAPACITY OF 65,000 ACRE-FEET

1955



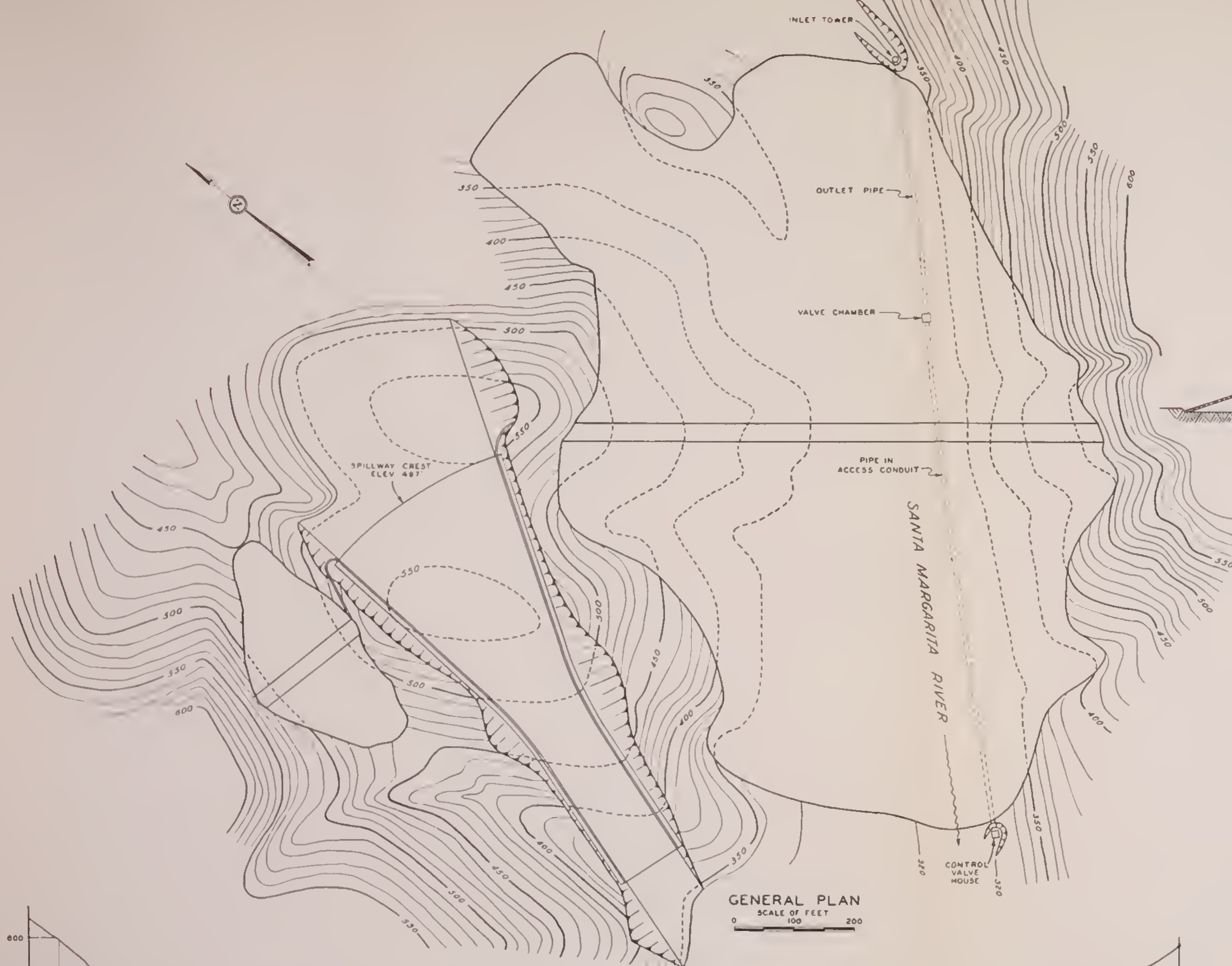
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

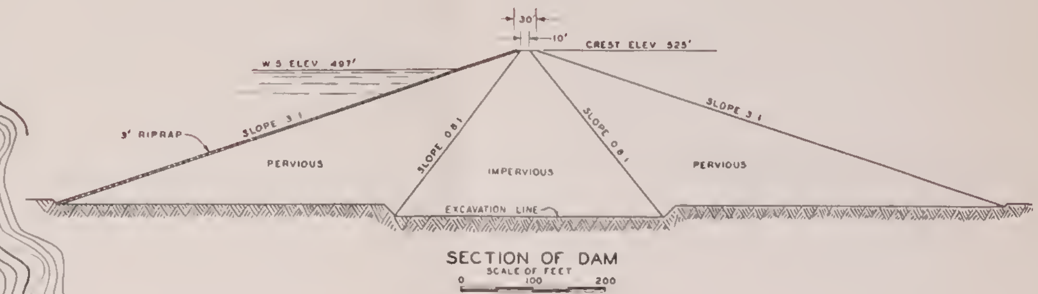
FALLBROOK, LIPPINCOTT DAM
ON
SANTA MARGARITA RIVER

RESERVOIR STORAGE CAPACITY OF 65,000 ACRE-FEET

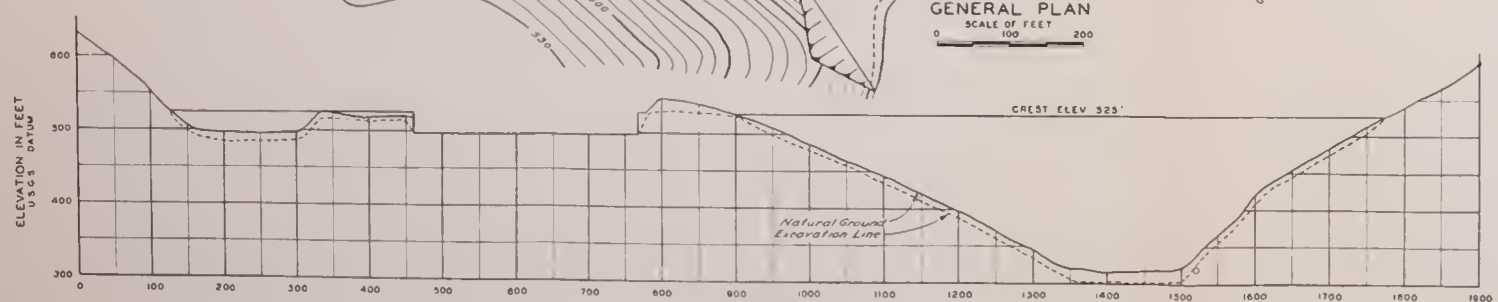
1955



GENERAL PLAN
SCALE OF FEET



SECTION OF DAM
SCALE OF FEET



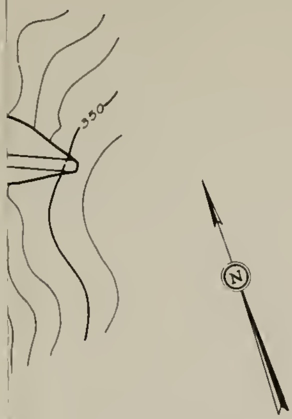
PROFILE OF DAM
LOOKING UPSTREAM

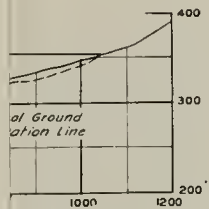
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SANTA MARGARITA RIVER INVESTIGATION

FALLBROOK, LIPPINCOTT DAM
ON
SANTA MARGARITA RIVER

RESERVOIR STORAGE CAPACITY OF 65,000 ACRE-FEET
1955





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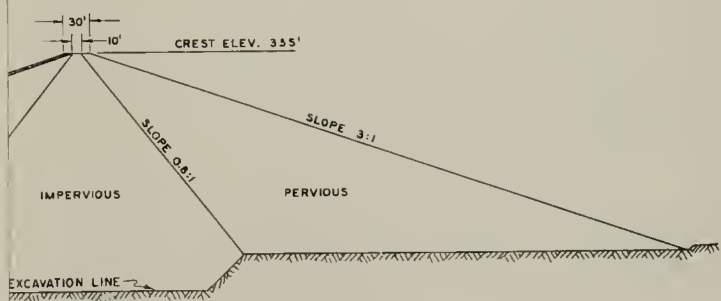


CTION OF DAM

SCALE OF FEET
100 200

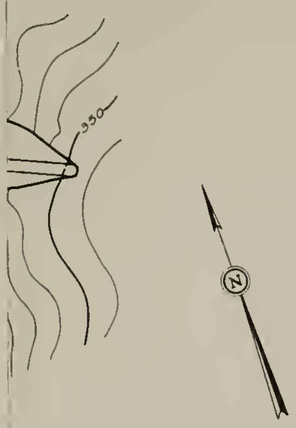
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

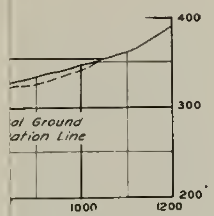
SANTA MARGARITA RIVER INVESTIGATION

DE LUZ DAM
ON
SANTA MARGARITA RIVER

RESERVOIR STORAGE CAPACITY OF 188,000 ACRE-FEET

1955





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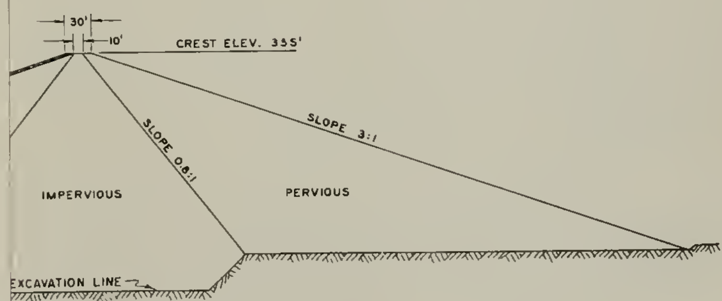


CTION OF DAM

SCALE OF FEET 100 200

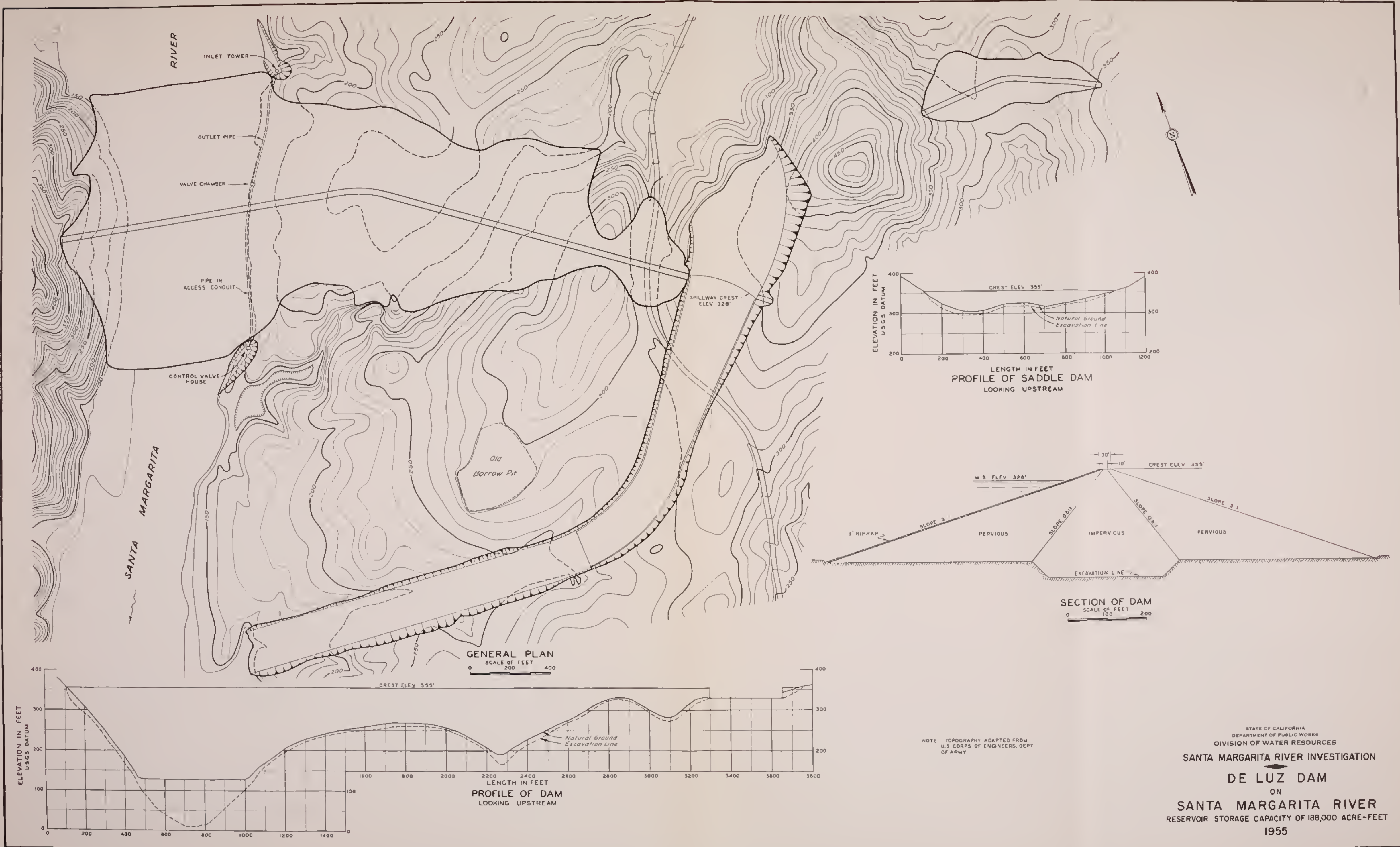
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

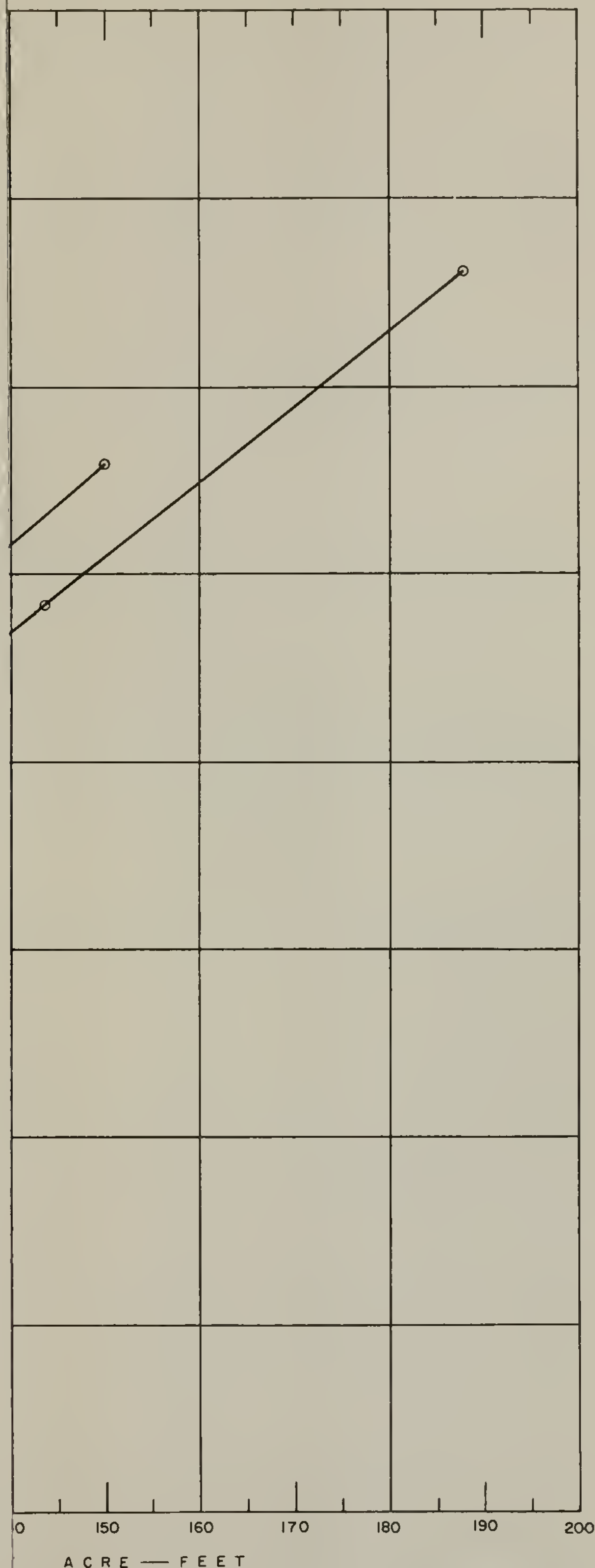
SANTA MARGARITA RIVER INVESTIGATION

DE LUZ DAM
ON
SANTA MARGARITA RIVER

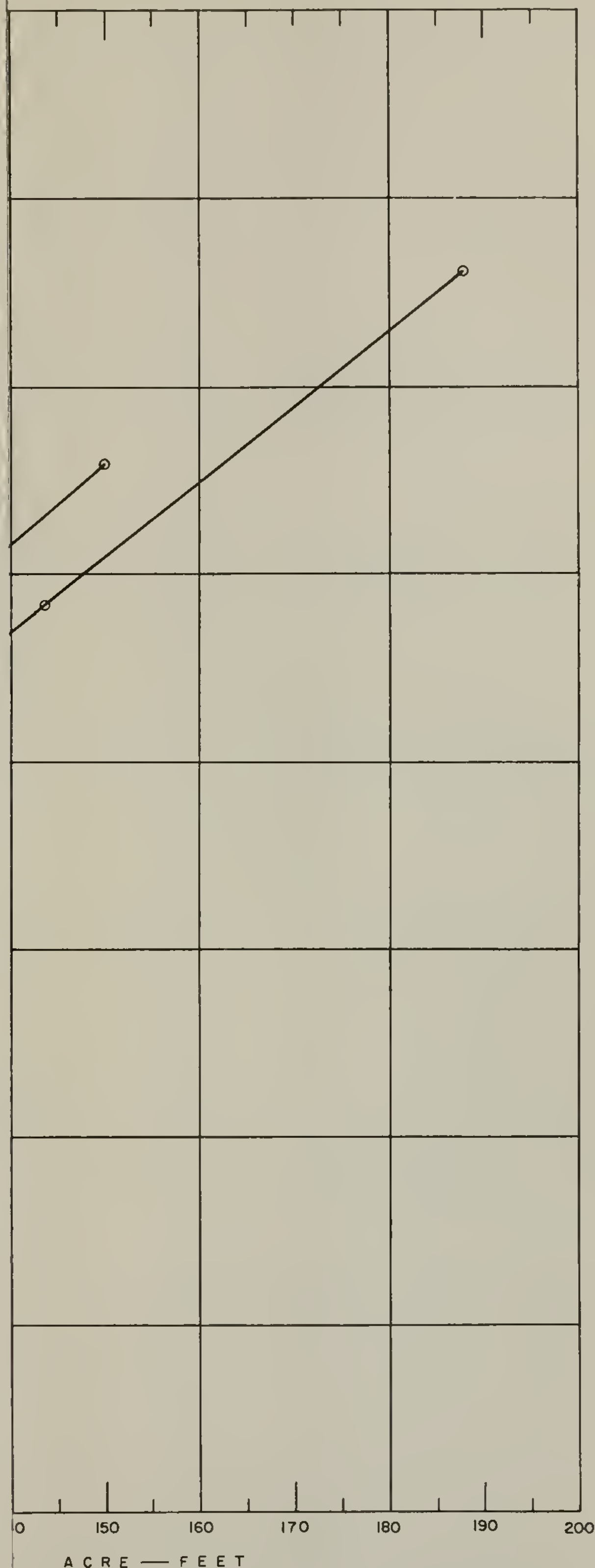
RESERVOIR STORAGE CAPACITY OF 188,000 ACRE-FEET

1955

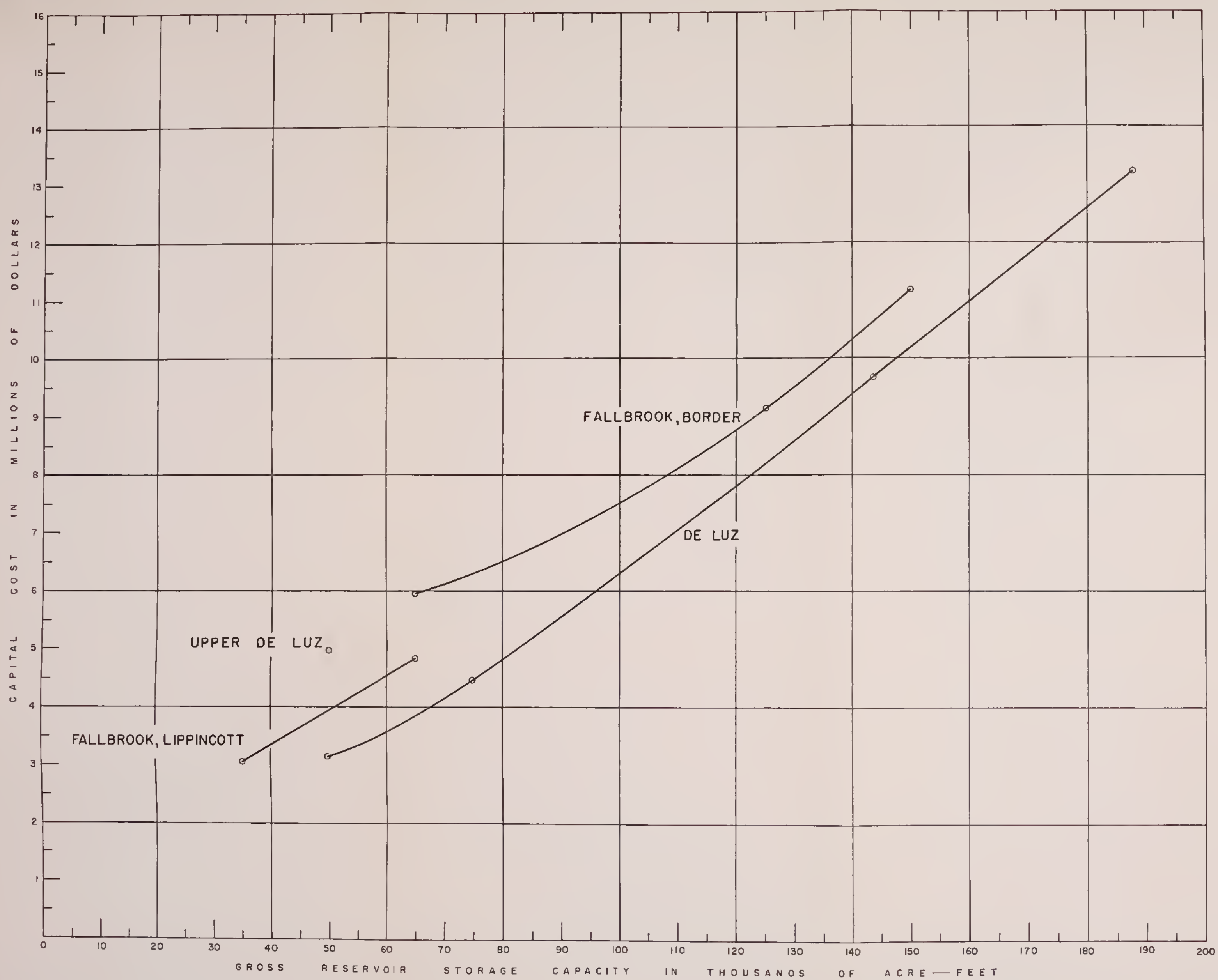

RIVER
INLET TOWER
OUTLET PIPE
VALVE CHAMBER
PIPE IN ACCESS CONDUIT
CONTROL VALVE HOUSE
SANTA MARGARITA
Old Borrow Pit
SPILLWAY CREST ELEV 328'
GENERAL PLAN
SCALE OF FEET
0 200 400
ELEVATION IN FEET USGS DATUM
CREST ELEV 355'
Natural Ground
Excavation Line
LENGTH IN FEET
PROFILE OF SADDLE DAM
LOOKING UPSTREAM
W S ELEV 328'
30'
10'
CREST ELEV 355'
SLOPE 3:1
SLOPE 0.8:1
SLOPE 0.8:1
SLOPE 3:1
3' RIPRAP
PERVIOUS
IMPERVIOUS
PERVIOUS
EXCAVATION LINE
SECTION OF DAM
SCALE OF FEET
0 100 200
PROFILE OF DAM
LOOKING UPSTREAM
NOTE: TOPOGRAPHY ADAPTED FROM U.S. CORPS OF ENGINEERS, DEPT OF ARMY
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES
SANTA MARGARITA RIVER INVESTIGATION
DE LUZ DAM
ON
SANTA MARGARITA RIVER
RESERVOIR STORAGE CAPACITY OF 188,000 ACRE-FEET
1955



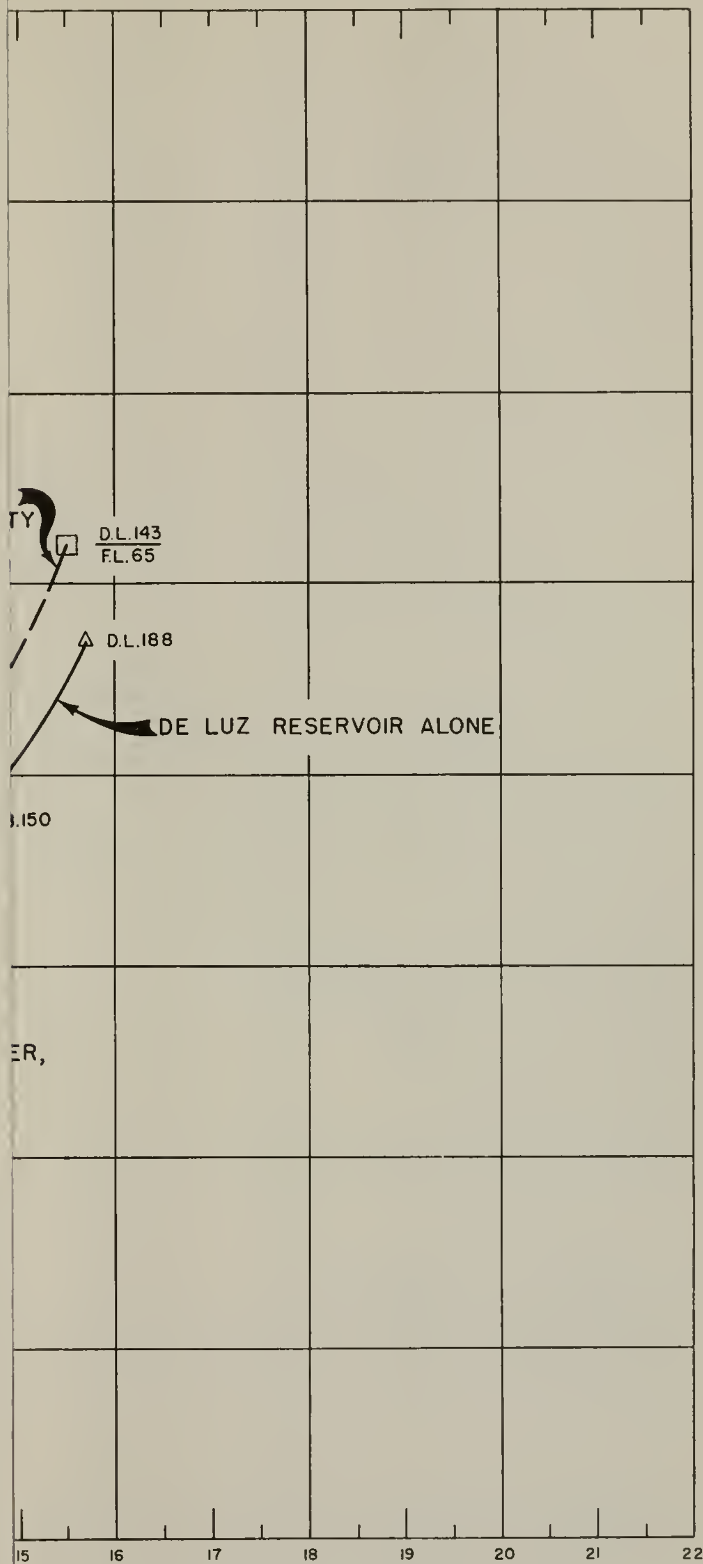
ID CAPITAL COST



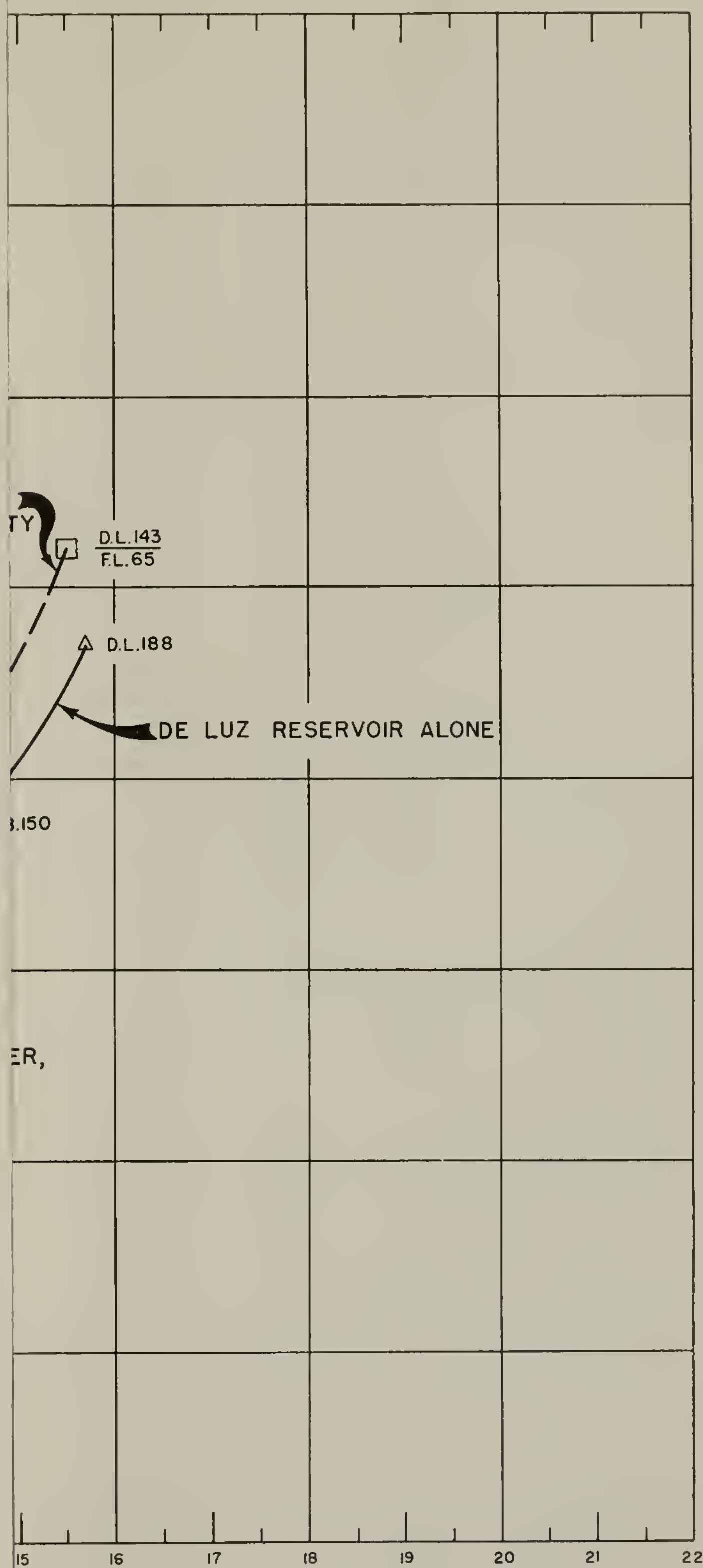
ID CAPITAL COST



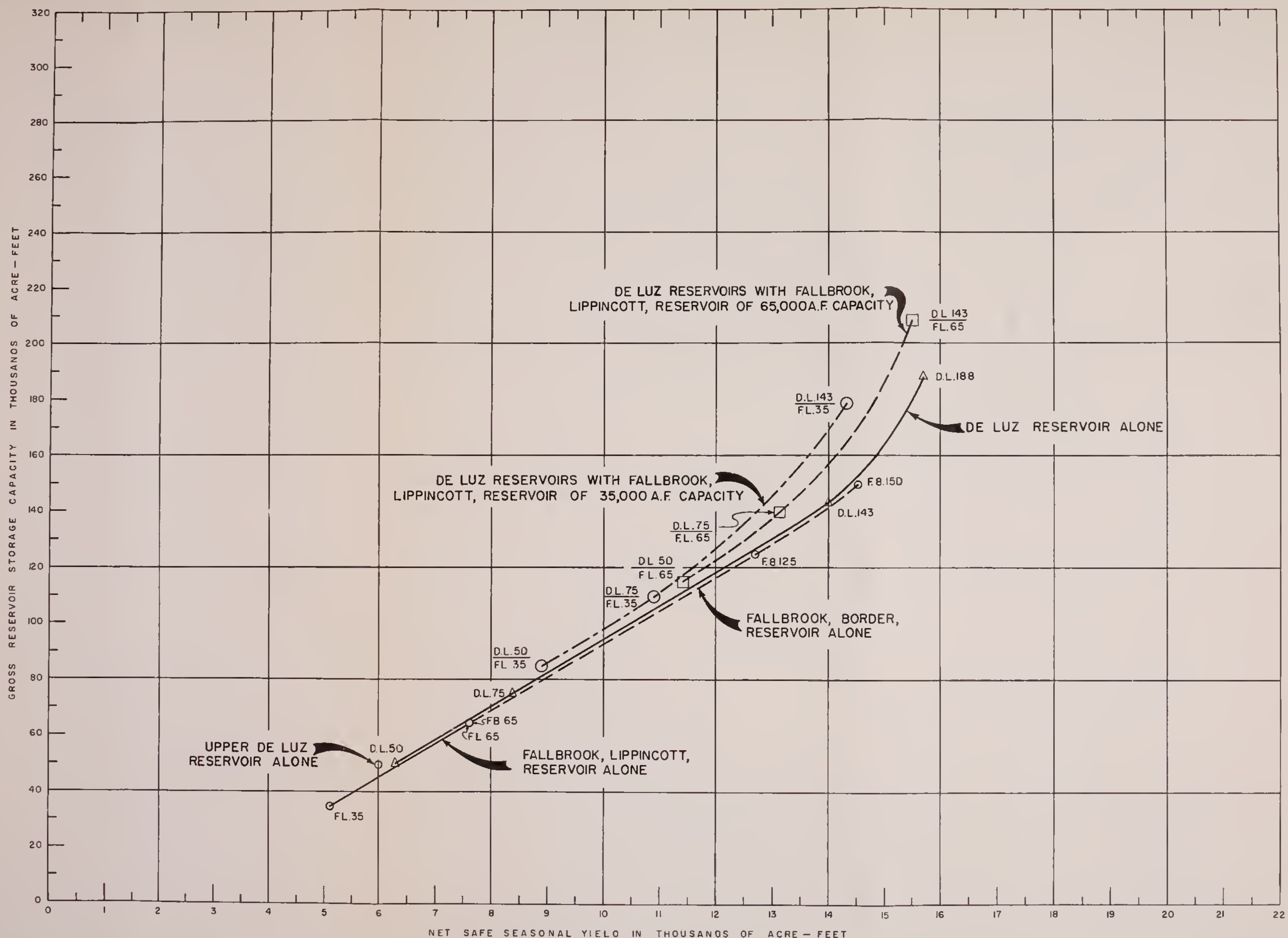
RELATIONSHIP BETWEEN RESERVOIR STORAGE CAPACITY AND CAPITAL COST



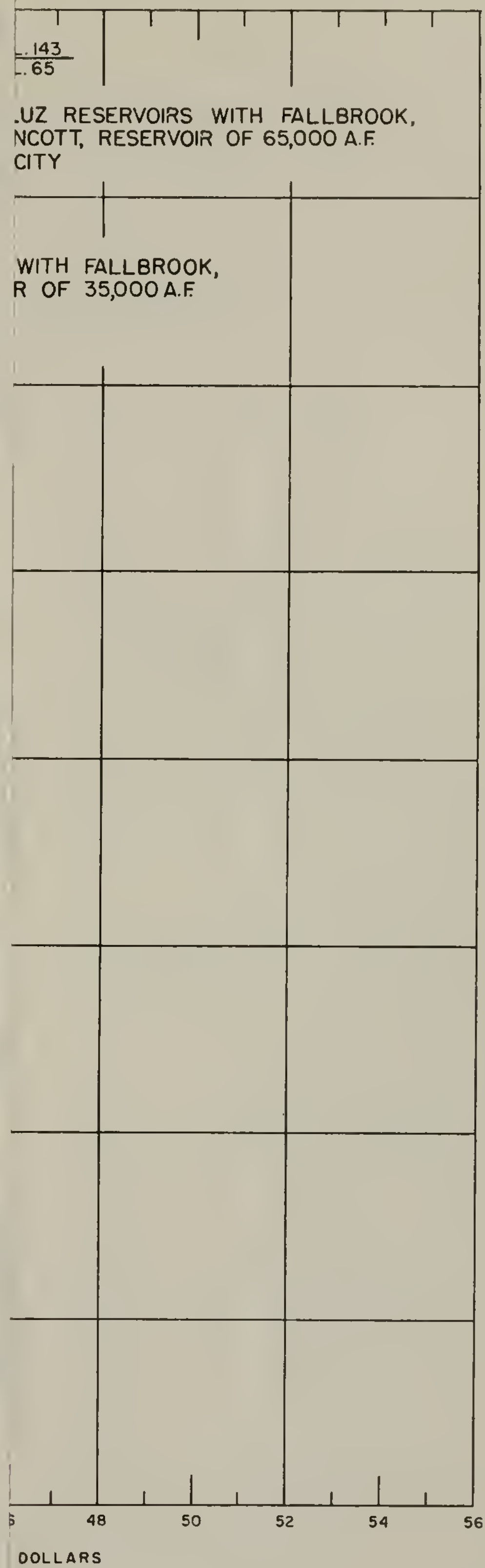
SAFE SEASONAL YIELD



SAFE SEASONAL YIELD

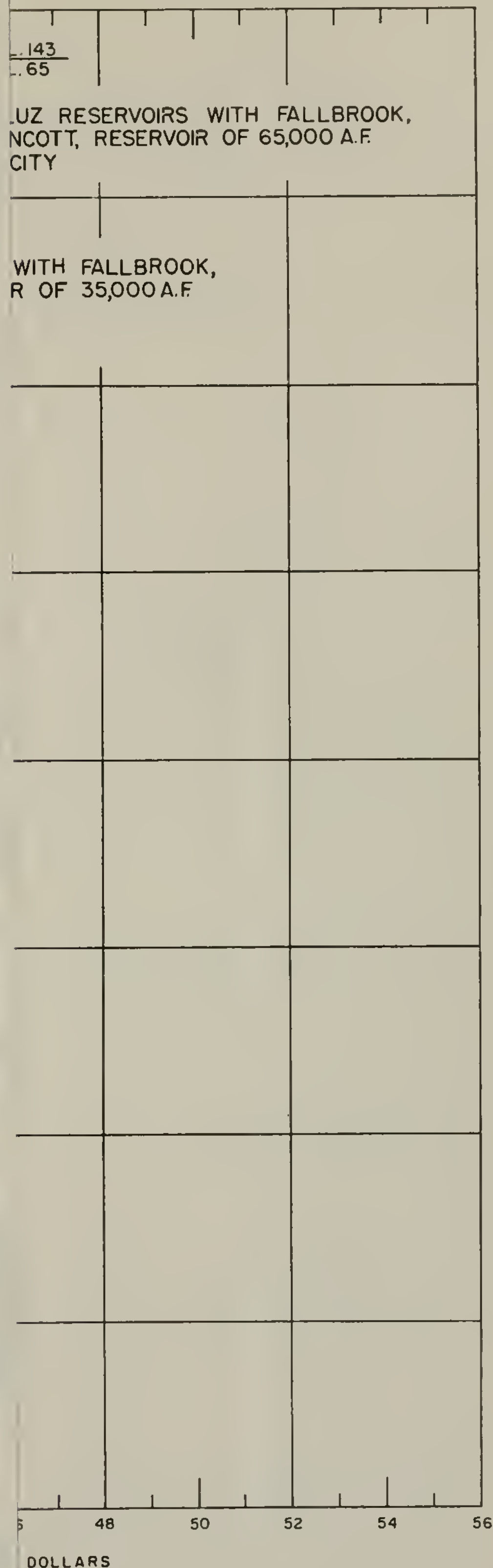


RELATIONSHIP BETWEEN RESERVOIR STORAGE CAPACITY AND NET SAFE SEASONAL YIELD



.143
.65
.UZ RESERVOIRS WITH FALLBROOK,
NCOTT, RESERVOIR OF 65,000 A.F.
CITY
WITH FALLBROOK,
R OF 35,000 A.F.
48
50
52
54
56
DOLLARS

OF


.143
.65
UZ RESERVOIRS WITH FALLBROOK,
NCOTT, RESERVOIR OF 65,000 A.F.
CITY
WITH FALLBROOK,
R OF 35,000 A.F.
48
50
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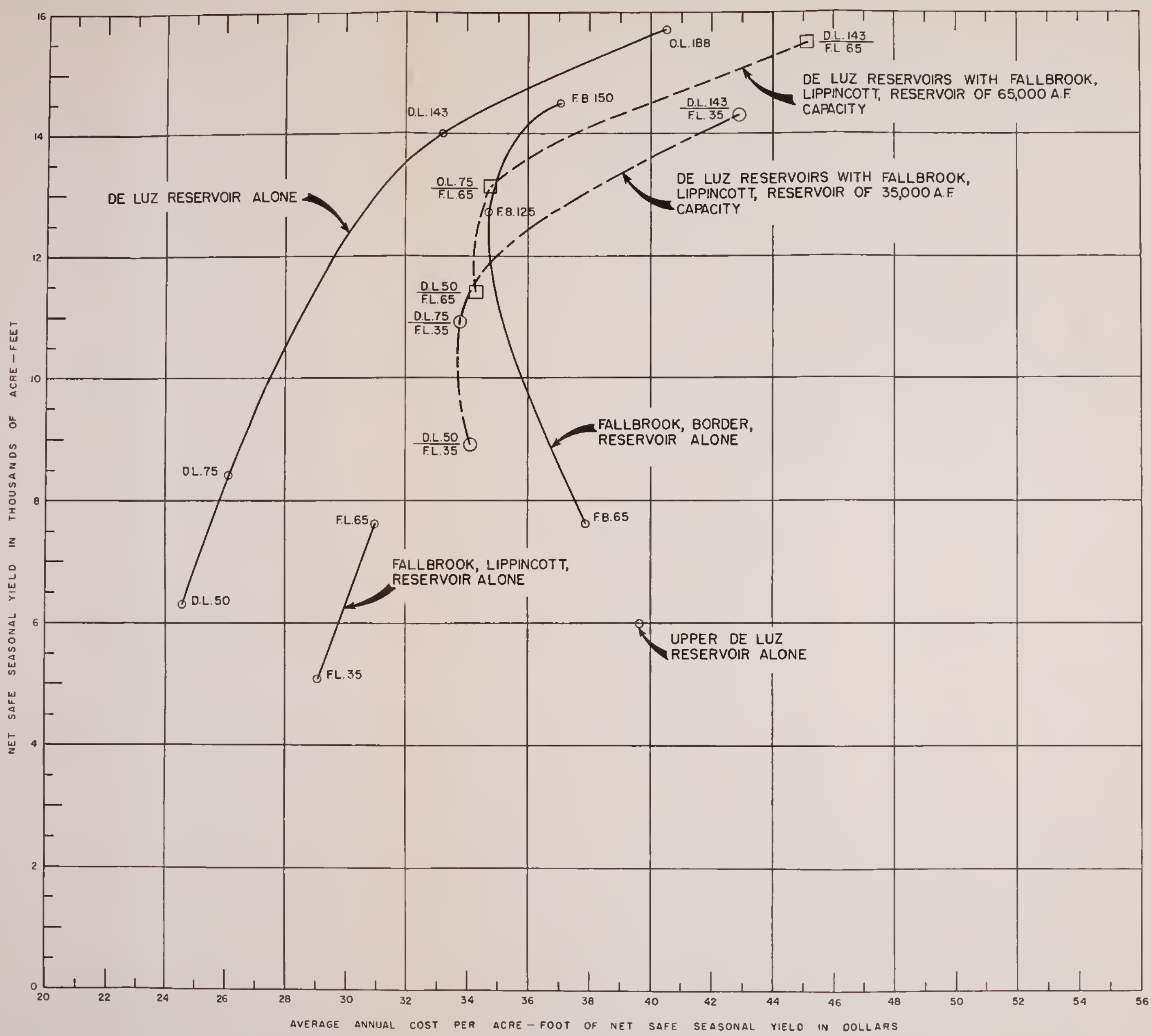
54
56
DOLLARS

OF



RELATIONSHIP BETWEEN NET SAFE SEASONAL YIELD OF RESERVOIRS AND ANNUAL UNIT COST

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

GOODWIN J. KNIGHT, Governor
FRANK B. DURKEE, Director of Public Works
HARVEY O. BANKS, State Engineer

Bulletin No. 57

SANTA MARGARITA RIVER INVESTIGATION

Volume II

APPENDIXES

June, 1956

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

GOODWIN J. KNIGHT, Governor
FRANK B. DURKEE, Director of Public Works
HARVEY O. BANKS, State Engineer

Bulletin No. 57

SANTA MARGARITA RIVER INVESTIGATION

Volume II

APPENDIXES

June, 1956

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APPENDIXES

APPENDIX A

LEGISLATIVE ACT AUTHORIZING INVESTIGATION

APPENDIX A

LEGISLATIVE ACT AUTHORIZING INVESTIGATION

California State Legislature
Chapter 3, Statutes of 1952
"Budget Act of 1952"

Item 262.5---For surveys and investigations of the water resources of the Santa Margarita Watershed including but not limited to hydrography, hydroeconomics, the use and distribution of water for agricultural and other beneficial purposes, including consideration of both surface and underground water conditions, and the availability of natural situations for reservoirs or reservoir systems for gathering and distributing flood or other waters, Division of Water Resources, Department of Public Works. $150,000

APPENDIX B

GEOLOGY

APPENDIX B

TABLE OF CONTENTS

GEOLOGIC AND GROUND WATER FEATURES OF THE SANTA MARGARITA RIVER WATERSHED

TABLES

PLATES

Plates referred to in this appendix are bound in Santa Margarita River Investigation, Volume I, Text and Plates.

1. INTRODUCTION

This appendix presents the results of the geologic investigation of the Santa Margarita River watershed, conducted as a part of the Santa Margarita River Investigation, authorized by the California State Legislature in its Budget Act of 1952. Discussed herein are the geologic features of the watershed, with particular emphasis on the occurrence and movement of ground water, and methods and techniques employed in the geologic investigation.

Acknowledgments

The cooperation extended by the following in providing basic data relating to the geology of the Santa Margarita River watershed is gratefully acknowledged:

United States Geological Survey, Ground Water Branch

United States Navy, Office of Ground Water Resources, United States Marine Corps Barracks, Camp Pendleton

University of California at Los Angeles, Department of Geology

University of Southern California, Department of Geology

Vail Company

Information on subsurface geology and ground water storage capacity was obtained from about 400 logs of wells supplied by a great many well drillers and property owners. The cooperation and assistance of these parties is also acknowledged with thanks.

Related Investigations and Reports

In preparation of this appendix, prior investigations and reports dealing with the Santa Margarita River watershed and areas adjacent thereto were studied. Those reports so employed are listed following, and are referenced in this appendix by numerical designations as shown:

1. Arnold, Ralph. "Topography and Fault System of the Region of the San Jacinto Earthquake". Seismological Society of America Bulletin, Vol. 8, pp. 68-73. 1918.

2. Blackwelder, Eliot. "The Recognition of Fault Scarps". Journal of Geology, Vol. 36, No. 4, pp. 289-312. 1928.

3. California State Department of Public Works, Division of Water Resources, South Coastal Basin Investigation. "Geology and Ground Water Storage Capacity of Valley Fill". Bulletin No 45. 1934.

4. California State Department of Natural Resources, Division of Mines. "Geologic Formations and Economic Development of the Oil and Gas Fields of California". Bulletin No. 118. 1943.

5. California State Water Resources Board. "Santa Ana River Investigation". Bulletin No. 15. 1956

6. Davis, W. M. "The Rifts of Southern California". American Journal of Science, Vol. 213, pp. 57-72. 1927.

7. Dudley, P. H. "Physiographic History of a Portion of the Perris Block, Southern California". Journal of Geology, Vol. 44, pp. 358-378. 1935.

8. Ellis, A. J. and Lee, C. H. "Geology and Ground Waters of the Western Part of San Diego County, California". United States Department of the Interior, Geological Survey, Water Supply Paper No. 446. 1919.

9. Engel, Rene. "Geological Map of the Lake Elsinore Quadrangle, California". California State Department of Natural Resources, Division of Mines. Bulletin No. 146, Plate 1. 1949.

10. Fraser, Donald M. "Geology of San Jacinto Quadrangle South of San Gorgonio Pass, California". California State Department of Natural Resources, Division of Mines. State Mineralogist Report, Vol. 27, pp. 494-540. 1931.

11. Hanna, M. A. "Geology of the La Jolla Quadrangle, California". University of California Publication, Department of Geological Sciences Bulletin, Vol. 16, No. 7, pp. 187-246. 1926.

12. Hanna, M. A. "Geology and Oil Possibilities of Southwestern San Diego County". California State Department of Natural Resources, Division of Mines. State Mineralogist Report, Vol. 35. 1939.

13. Hill, R. T. "The Rifts of Southern California". Seismological Society of America Bulletin. Vol. 10, No. 3, pp. 146-149. 1920.

14. Hurlbut, C. S., Jr. "Dark Inclusions in a Tonalite of Southern California". American Mineralogist, Vol. 20, pp. 609-630. 1935.

15. Jenkins, O. P. "Geologic Map of California". California State Department of Natural Resources, Division of Mines. 1938.

16. Larsen, E. S. "Batholith and Associated Rocks of Corona, Elsinore, and San Luis Rey Quadrangles, Southern California". Geological Society of America. Memoir 29. 1948.

17. Larsen, E. S. "Crystalline Rocks of the Corona, Elsinore, and San Luis Rey Quadrangles, Southern California". California State Department of Natural Resources, Division of Mines. Bulletin 159. 1951.

18. Larsen, E. S. and Keevil, N. B. "Radioactivity of the Rocks of the Batholith of Southern California". Geological Society of America Bulletin. Vol. 58, pp. 483-493. 1947.

19. Mann, J. F. "Late Cenozoic Geology of a Portion of the Elsinore Fault Zone, Southern California". University of Southern California Thesis. 1951.

20. Merriam, R. H. "Ground Water in the Bedrock in Western San Diego County". California State Department of Natural Resources, Division of Mines. Bulletin 159, pp. 117-128. 1951.

21. Miller, F. S. "Petrology of the San Marcos Gabbro, Southern California". Geological Society of America Bulletin. Vol. 48, pp. 1397-1426. 1937.

22. Miller, W. J. "Some Features of Faulting in Southern California". Journal of Geology, Vol. 48, pp. 385-420. 1940.

23. Reed, R. D. "Geology of California". America Association of Petroleum Geologists. 1943.

24. Sampson, R. J. "Mineral Resources of a Portion of the Perris Block, Riverside County, California". California Journal of Mines and Geology, State Mineralogist Report No. 31, pp. 507-521. 1935.

25. Sutherland, J. C. "Geological Investigation of the Clays of Riverside and Orange Counties, Southern California". California State Department of Natural Resources, Division of Mines. State Mineralogist Report, Vol. 31, No. 1, pp. 51-87. 1955.

26. Waring, G. A. "Ground Water in the San Jacinto and Temecula Basins, California". United States Department of the Interior, Geological Survey, Water Supply Paper No. 429. 1919.

27. Woodford, A. O. "The San Onofre Breccia, Its Nature and Origin". University of California Publication, Department of Geological Science Bulletin. Vol. 15, No. 7, pp. 159-280. 1925.

Scope of Geologic Investigation

The objectives of the geologic investigation were to ascertain the water-bearing characteristics of the various rock types found within the Santa Margarita River watershed; to determine the hydrologic significance of the prominent structural features of the area; to determine the mode of occurrence, movement, and ultimate destination of ground water; and to locate and evaluate the characteristics of water-bearing deposits forming the several ground water basins identified in the watershed for the purpose of preparing estimates of the storage capacity thereof.

In order to accomplish the foregoing objectives, the areal geology was mapped, water wells in the area were located, measurements of depth to ground water and mineral analyses of surface and ground water were made and evaluated, all available well logs were collected and analyzed, and pump tests were conducted to determine characteristics of the water-bearing materials. Geologic sections were drawn to show the nature and configuration of the subsurface deposits. In this regard, a peg model was also constructed to assist in the determination of the subsurface geology in a portion of the area. In field mapping, particular care was given to the location of boundaries of water-bearing rocks. The area investigated was confined to the watershed of the Santa Margarita River except in those instances where adjacent areas required investigation in order to properly interpret the geology of the watershed.

The geology of the Santa Margarita River watershed is depicted on areal geology maps, Plates 13A and B.

Since this portion of the Santa Margarita River Investigation was primarily a study of geology as related to water resources and more particularly to the ground water supply, geologic structure of the nonwater-bearing rocks was not intensively investigated. Work in this regard generally extended to field checking of the results of previous investigations; however, those faults and fault zones which appeared to have a direct bearing on the occurrence and movement of ground water were given more thorough study. The discussion of historical geology and of the older nonwater-bearing rocks is of a general nature and is presented in brief in this appendix. However, rocks of Quaternary age, which are the important sources of ground water in the watershed, are described in detail herein.

The results of the geologic investigation of the Santa Margarita River watershed are presented and discussed in the following sections of this appendix:

2. Physiography
3. Geologic Units
4. Structure
5. Geologic History
6. Occurrence of Ground Water
7. Ground Water Basins
8. Procedure for Estimating Underground Storage Capacity

2. PHYSIOGRAPHY

General physiographic features of the Santa Margarita River watershed are shown on physiography maps, Plates 2 A and B. Plate 2 A depicts the coastal portion of the watershed, and Plate 2 B similarly depicts features of the inland area or that portion of the watershed landward from the coastal mountains. The area of investigation lies within the Peninsular Ranges geomorphic province as defined by Jenkins[4]. To the north are the Transverse Ranges, including the San Bernardino and Little San Bernardino Mountains, and to the east is the Colorado Desert. The San Jacinto Mountains lie northeast of the area. Between the San Jacinto and Santa Ana Mountains, which border the area to the west, is the relatively stable, eroded Perris block. The Elsinore Mountains, which lie southwest of Lake Elsinore, the Santa Rosa plateau, and the Palomar block, including Agua Tibia Mountain and Aguanga Mountain, are included in the areas of greater relief and higher elevation, and form the ridge separating the afore-mentioned coastal and inland areas. Large areas of the coastal slopes southwest of the ridge consist of rolling hill lands, with prominent elevated coastal terraces bordering these lands along the coast. Within the Santa Margarita River watershed, these terrace lands are known as Stuart and South Mesas.

All major and several minor topographic features are primarily the result of faulting however; these features have been somewhat modified by erosion. The two important structural features of the Santa Margarita River watershed are the Elsinore and San Jacinto fault zones. All the important faults in the area are associated with these zones and trend in a northwesterly direction. Fault zones have had a marked effect upon drainage and also form boundaries of several ground water basins.

A major physiographic feature of the province is the deep northwesterly trending Elsinore trough, or graben, formed by faults of the Elsinore fault zone. Lake Elsinore occupies the central portion of this trough. The portion of the trough within the Santa Margarita River watershed is referred to herein as the Murrieta graben. The Wildomar fault, Glen Ivy fault, and Willard fault zone are within the larger Elsinore fault zone.

The general physiographic features of the Santa Margarita River watershed and adjacent areas are discussed in this section under the following headings: Perris Block, Palomar Block, Streams, Elsinore Trough, San Jacinto Mountains, Mesa de Burro, and Badlands.

Perris Block

The Perris block, which lies between the San Jacinto fault zone and the Elsinore trough, is a relatively stable eroded surface of crystalline rock cut by interconnected valleys. The most obvious feature of the block which has behaved as a single structural unit, is the remarkably constant elevation of the valley, which has resulted from slow, rather uniform erosion of highland masses and consequent building up of the valley fill. The western and southern rims of the comparatively high-lying Perris block are being slowly eroded eastward by streams which drain into the Elsinore trough. Within the Santa Margarita River watershed, this process is effected by tributaries of Murrieta Creek. The trenching of alluvial deposits has resulted in the formation of terraces near the highland areas.

Many physiographic evidences of faulting are present in the Perris block, the most prominent of which is the scarp of the San Jacinto fault along the northeast boundary (outside the area of this investigation). Other evidences of faulting include fault blocks, truncated spurs, sag ponds, small scarps, and alignment of springs.

The following presents a plausible interpretation of the more recent physiographic history of the Perris block. In the late Pleistocene time active streams cut V-shaped canyons on a surface developed by earlier erosion. Drainage then was probably to the northeast. Movement on the San Jacinto fault zone initiated a rise of the land mass northeast of the fault.

Streams leaving the area to the northeast were able to maintain their positions for a time, aggrading in the canyons to the southwest and downcutting across the rising fault block. This aggradation was the beginning of the process of alluviation of the Perris block which has continued to the present time. Ultimately, the antecedent streams were no longer able to maintain their courses across the fault and the Perris block became a closed basin with interior drainage. This basin continued to fill with detrital material from the surrounding highlands, especially the San Jacinto Mountain block, which was rising with the same movement that blocked the northeast-trending drainage. As the valleys were filled toward their present level, gradients continually became gentler and streams slower moving. At some time in the late stages of the period of filling, water began to spill over the divide to the southwest into the Elsinore trough, and the cutting of Railroad Canyon on the San Jacinto River began.

Palomar Block

The Palomar block is a large mass, or horst, of plutonic igneous and metamorphic rocks which has been elevated between two faults within and parallel to the Elsinore fault zone. The summit of this horst is a surface of high elevation but low relief. Similar erosion surfaces stand at a lower elevation on both flanks of the block, which suggests an uplift in two stages. Although these uplifted areas are now undergoing vigorous downcutting, much of the area of low relief is still apparent.

Elsinore Trough

The Elsinore trough is a complex northwesterly-trending graben bounded on the northeast by the Perris block and on the southwest by the Elsinore Mountains and Santa Rosa plateau. The trough includes the entire valley extending from Corona southeast to beyond Temecula. Lake Elsinore, which occupies the central portion of this trough, is surrounded by fault scarps on all but its southeast side. The scarp of the Glen Ivy fault, a discontinuous line of low hills, bounds the lake on the northeast. On the southwest, the lake is bounded by the Willard fault zone at the base of the Elsinore Mountains, which attain elevations of over 3,500 feet above sea level. There may be no fault immediately northwest of the lake, but between one and two miles farther northwest, a northerly-trending cross fault lies at the base of the mountains. Alluvial debris has accumulated to considerable depth between the Glen Ivy and Wildomar faults, the major inner faults of the Elsinore graben.

The portion of the Elsinore trough previously referred to as the Murrieta graben extends from near the southeastern end of Lake Elsinore southeast into Wolf Valley. It is a narrow depression about 18 miles long, averaging about one mile in width, and is included between the Wildomar fault on the northeast and the Willard fault zone on the southwest. The basement surface in the graben dips southeast, and the thickness of sedimentary fill increases in that direction.

A brief physiographic history of the area follows:

During the period in which the Elsinore trough has been sinking, it has become deeply alluviated by streams draining the surrounding highlands. During this time the region may have been occupied by streams similar to Murrieta Creek. At other times the drainage may have been ponded into lakes similar to the present Lake Elsinore.

Lake Elsinore is only a temporary feature and its destruction may come by lowering of either the northwest or southeast divide by faulting, warping, or headward erosion of Temescal Wash northwest of the Lake, or of Murrieta Creek, or by filling of the Lake with sediment.

San Jacinto Mountains

The San Jacinto Mountains are a recently elevated mass of crystalline rock, the highest point of which is San Jacinto Peak, which rises to a height of 10,831 feet above sea level about 14 miles north of the Santa Margarita River watershed boundary. Elevations generally decrease gradually to the west, moderately to the southwest and south, and abruptly to the north and east. Some old erosion surfaces are preserved at high elevations southeast of San Jacinto Peak. The streams draining the southwest slope of the block generally occupy deep, steep-walled canyons. Gradients of many of these increase with decreasing elevation, indicating very recent strong uplift along the northwesterly trending mountain front faults, including San Jacinto fault, which crosses the extreme northeast portion of the watershed.

Mesa de Burro

Mesa de Burro, the most prominent of several similar features within the Santa Rosa plateau, is located about four miles southwest of Murrieta, and is capped by a series of thin flat-lying flows of basalt. The total thickness of basalt does not exceed 100 feet. The basalt consists of thin regular flows and ends abruptly in steep peripheral cliffs. The thinness and regularity of the flows are indicative of a very fluid magma which enabled it to spread over a large surface area. These flows were once quite extensive, but now only isolated remnants remain.

Badlands

Badland topography is displayed on the prominent northwest-trending ridge near Vail Reservoir, which separates Nigger and Aguanga Valleys on the southwest from Lancaster Valley on the northeast. It is marked by barren, dissected, poorly consolidated sediments. The material comprising the badlands is medium-grained arkosic sediment, rather than silt and clay which are more commonly found in such areas.

Streams

A great deal of the physiographic history of the region can be determined by a study of the present streams. Changing stream gradients are a good indication of tilting and this source of evidence has been used in determining the sequence of events within the investigational area. Stream piracy or capture is a frequent occurrence in fault block regions such as this. The capture of Murrieta and Temecula Creeks by the Santa Margarita River, is an example of this phenomenon. A more detailed account of this capture is described in Section 5, entitled "Geologic History".

Obsequent streams flowing down the northeasterly faces of the Elsinore Mountains and the Santa Rosa plateau have a great slope advantage over the consequent streams and are, thus, eroding more rapidly headward. The divides are moving to the west and as a result the consequent streams will be beheaded. Most of the bedrock canyons are now occupied by subsequent streams which are superposed along fault lines and the formation of almost all these canyons are directly or indirectly the result of superposition. The streams of particular interest in this report are the following: Santa Margarita River, an antecedent stream in the lower reaches and a consquent stream near its headward portion in Temecula Canyon; Temecula Creek which is almost entirely subsequent; and Murrieta Creek, a subsequent stream.

3. GEOLOGIC UNITS

Ground water occurs in several distinct rock types within the investigational area. Almost all of the readily extractable ground water is stored in the larger alluvium filled valleys, which are themselves distinctive in size, shape, depth, and permeability. The material comprising the valley fill is generally unconsolidated to poorly consolidated water-bearing alluvium of variable thickness. The alluvium is composed primarily of continental flood plain and fan deposits, with some interbedded lagunal sediments in the basins which border the coast. Limited quantities of ground water are found in the semiconsolidated Pleistocene sediments, which flank several of the alluviated valleys and form permeable collecting areas for the sediments underlying the valleys. Minor quantities of water are also stored in the fractured and jointed volcanic and crystalline rocks, within fault zones, and in the areas of decomposed granitics.

Forming the relatively impermeable sides and bases of many of the valleys are materials classed herein as non-water-bearing. This group ranges from pre-Cretaceous to Tertiary in age and comprises crystalline, igneous, metamorphic, and volcanic rocks plus impervious or slightly permeable sedimentary formations. Deep strata saturated with saline or connate waters are also included in this category.

Described in this section are the various geologic units found in the Santa Margarita River watershed. Discussion presented hereinafter for each unit is set forth under each broad rock type; sedimentary, igneous and metamorphic. Pertinent data are given for each unit including location, mode of occurrence, description, origin, and water-bearing characteristics. These data are also summarized in Table B-1, "Generalized Stratigraphy of Santa Margarita River Watershed". The locations of geologic units are shown on Plates 13A and B.

TABLE B-1

GENERALIZED STRATIGRAPHY OF SANTA MARGARITA RIVER WATERSHED

Geologic age: System	Geologic age: Series	Geologic unit	Symbol	General character	Water-bearing characteristics
				Sedimentary Rocks	
Quaternary	Recent	Recent alluvium	Qal	Valley and basin fill consisting of boulder beds, gravel, sand, silt, and clay. Includes the present stream channel and beach deposits. Occupies the valley of the older streams and veneers the floors of the valleys of the younger streams. Also occurs in the highland basins.	Principal aquifers in the region. Fine grained deposits usually low in permeability but may contain unconfined water. Coarser grained deposits highly permeable, saturated below water table, and readily permit percolation to water table or underlying deposits. Tapped by many wells. Recharged by percolation of runoff, rainfall, and return irrigation waters.
		Residuum	Qr	The friable, porous, argillaceous material resulting from the disintegration of igneous granitic phases of crystalline complex. Residual or may have been transported a short distance. Localized valley and basin fill.	A locally important source of ground water in the highland areas. Permeable and water-bearing. Permeability largely a function of degree of weathering. Recharge principally by percolation of rainfall and runoff.
	Pleistocene to Recent	Terraces and Older alluvium	Qtoa	Terraces often called older alluvium, name being derived from its topographic position and age. Qtoa regions are presently being eroded and dissected by perennial, and ephemeral streams forming rolling topography; sediments characterized by reddish-brown soils which are similar but more indurated than Qal.	Below the zone of weathering this unit is similar to Qal and may contain strata of unweathered sand and gravel of moderate permeability. Generally Qtoa has a low permeability and wells tapping the formation are limited mostly to domestic use.
	Upper Pleistocene	Undifferentiated Upper Pleistocene sediments	Qps	Includes Temecula arkose, Dripping Springs fanglomerate, and Pauba formation, which are continental deposits of subaerial and lacustrine origin. Consists of unconsolidated to semiconsolidated clays, silts, sands, gravels, conglomerates, and minor marl, caliche, limestone, and tuff beds. Color variable to white, buff, brown, or red. Unconformable relationships with overlying formations and with each other.	Relatively few wells obtain water from the undifferentiated upper Pleistocene sediments probably because of low yield and nonirrigable terrain.
	Pleistocene	Marine deposits	Qm	Marine deposits exposed along coast near mouth of Santa Margarita River. Principally shallow water deposits of gravels, sands, silts, and clays. Chiefly littoral, and estuarine or bay deposits but may include considerable quantities of brackish water sediments.	These deposits are situated above the water table and although no known wells tap them as a source of supply they readily transmit water to underlying materials.
		Marine and terrace deposits	Qtm	Marine and terrace deposits differentiated from Qm by topographic position and peculiar reddish-brown color. Qtm contains a high percentage of clay due to breakdown of original materials.	

GENERALIZED STRATIGRAPHY OF SANTA MARGARITA RIVER WATERSHED
(continued)

Geologic age: System	Geologic age: Series	Geologic unit	Symbol	General character	Water-bearing characteristics
				Sedimentary Rocks (continued)	
	Middle Miocene	San Onofre breccia	Tmso	Comprises beds of well-cemented fragments of pebbles, cobbles, and boulders up to nine feet in diameter. Contains strata of cemented sand, sandy shale, and shale, the finer facies being more prominent near the base. At shallow depths, the unweathered outcrops resemble concrete.	Considered to be impermeable and nonwater-bearing due to its tight cementation.
Tertiary	Eocene	La Jolla	Tolj	Includes three members: Delmar sand, Torrey sand, and Rose Canyon shale. Delmar, lowest member, comprises greenish-gray or reddish sandstone, or sandy shale. Often lenticular and exhibits cross-bedding. Torrey sand comprises white to light gray or brown, massive, clean sand. Rose Canyon shale consists of gray or brown shale, silty mudstones, and minor amounts of conglomerate.	Torrey sand is highly permeable and permits percolation of rainfall and runoff. Generally situated above the water table but readily yields water when saturated. Sandstone phase of the Delmar sand is permeable and water-bearing. Shale members generally low in permeability, but may yield limited amounts of water. Mudstones, conglomerates, and limestones of the Rose Canyon member are relatively impermeable and nonwater-bearing.
	Paleocene	Martinez	Tmz	Martinez beds found underlying the Santa Rosa basalt-Tsrv, which caps Mesa de Burro. The Tmz characterized by arkosic sands and gravels which are well indurated, hard, and ferruginous where baked by overlying basalt.	The stratigraphic position of the Martinez, below the basalt, and its low permeability account for the lack of ground water in this formation. Although the basalt is fractured it appears unlikely that sediments of the Martinez can be recharged by water seeping through the basalt.
				Igneous Rocks	
Quaternary	Pleistocene or Recent	Nigger Canyon volcanics	Qncv	Includes tuffs, agglomerates, dikes, and flows, which outcrop near the mouth of Nigger Canyon. These volcanics were extruded from a series of northeast trending fractures. Bombs of scoriaceous basalt, up to several feet across, are contained in the agglomerate.	The formation is impermeable and nonwater-bearing except along localized fractures and joints.
Tertiary	Pliocene	Santa Rosa basalt	Tsrv	Found capping Mesa de Burro. The volcanics are almost horizontal and rest upon a nearly flat surface of Tertiary sediments (Tmz) or basement rocks. Primarily an olivine basalt, characterized by a reddish-brown color.	The basalt is impervious and nonwater-bearing.

GENERALIZED STRATIGRAPHY OF SANTA MARGARITA RIVER WATERSHED
(continued)

Geologic age: System	Geologic age: Series	Geologic unit	Symbol	General character	Water-bearing characteristics
				Igneous Rocks (continued)	
		Roblar leucogranite	Kr	Shows poor outcrop and the exposures are of a friable, sandy nature. Where it is better exposed, it is characterized by small, angular blocks. Boulders of disintegration are rare. Dikes of the Roblar are found cutting the Woodson Mountain granodiorite. The leucogranite is flesh colored, uniform in character and aplitic in appearance.	Several wells of limited capacity tap the leucogranits as a source of supply. In general, however, this formation is impermeable and nonwater-bearing.
		Woodson Mountain granodiorite	Kwm	Granodiorite outcrops most prominently in the highlands southwest of Murrieta Valley and intrudes the Bonsall tonalites. It is characterized by light-colored outcrops and gneissoid structure. It exhibits coarse texture and contains phenocrysts of quartz.	Although this formation is generally impermeable and nonwater-bearing, it supplies a few small wells which tap fractures of fissures in the rock.
		Domenigoni Valley granodiorite	Kdv	A number of small bodies of granodiorite have been mapped in the Domenigoni Valley area. They range from tonalite to granodiorite and resemble Bonsall tonalite, but are lighter colored and finer grained. The rocks crop out as boulders of disintegration and contain abundant oriented dark inclusions.	The granodiorite is generally impermeable and nonwater-bearing, except along joints and fissures, a few small wells tap this rock for their supplies.
Cretaceous		Miscellaneous granodiorites	Kmg	Small outcrops, poorly developed boulders of disintegration, a light gray color, and medium grain size are characteristics of this unit.	No water is contained in this unit except limited quantities which may be stored in the joints and fissures.
		Bonsall tonalite	Kb	Characterized by the abundance of oriented inclusions and schlieren. Younger than the San Marcos gabbro, as it contains inclusions of the gabbro. Intruded by the Woodson Mountain granodiorite. It is a medium grained rock ranging from light to dark gray depending on the proportion of dark minerals present, hornblende being the most promient.	This formation is generally nonwater-bearing. Locally, however, small wells tap the tonalite as a source of supply. In these cases water is stored along joints and fissures.
		Aguanga tonalite	Kat	A biotite rich quartz diorite having books of mica up to 5 mm. in thickness. The biotite did not oxidize readily and imparted a definite blackish color to soils made up of the disintegrated rock. It is best exposed in the horst north of Aguanga.	Nonwater-bearing
		San Marcos gabbro	Ksm	The largest body of gabbro lies southeast of Lake Elsinore and underlies an area of about 25 square miles. It intrudes the Bedford Canyon formation and rocks of the underlying Santiago Peak volcanics. The rock is quite variable in composition.	Nonwater-bearing

GENERALIZED STRATIGRAPHY OF SANTA MARGARITA RIVER WATERSHED
(continued)

Geologic age: System	Geologic age: Series	Geologic unit	Symbol	General character	Water-bearing characteristics
				Igneous Rocks (continued)	
Jurassic		Santiago Peak volcanics	Jsp	Outcrops extend from an area south of the La Jolla quadrangle northward almost to the Santa Ana River. The volcanics are a series of mildly metamorphosed agglomerates, quartzites, shales, tuffs, shallow intrusives, and flows. The characteristic color is whitish gray to green and the rock is generally hard and resistant.	The volcanics and related intrusives appear locally water-bearing, but at present supply no wells. The permeability and storage capacity are erratic and dependent upon the characteristics of the particular phase rather than on any property as a whole. Water is obtained from joints, fractures, planes of lamination, or the weathered zone.
		Intrusive rocks related to the Santiago Peak volcanics	Jspi	Small bodies of fine-grained granodiorite and related rocks believed to be the same age as the volcanic rocks.	
		Undifferentiated igneous rocks	Ig	Several igneous rock types have been included under the general term, Ig. This unit includes formations which have previously been mapped only in areas outside the Santa Margarita region but which outcrop in the area under investigation. Their individual boundaries were not determined in the present study.	Permeability in unweathered phases governed by joints and fractures. The joints provide channels along which water may move. Faulting increases the permeability by fracturing. The joints and fractures are a source of limited quantities of water to wells in the highland areas, and also provide water to springs. Weathering facilitated by movement of solutions along joints and fractures.
				Metamorphic Rocks	
Triassic		Bedford Canyon	Trbc	A group of quartz-mica schists, slates, quartzites, mildly metamorphosed argillites, and a few thin lenses of limestone. They underlie much of the mountainous area of the watershed	Permeability generally low but weathering, aided by schistose and slatey nature of the rock, creates some storage area. Some windmills and small domestic wells obtain water from weathered phases and from the joints and fissures.
pre-Cretaceous (Paleozoic)		Paleozoic schists and quartzites	P	Rocks of Paleozoic time outcrop in the vicinity of Domenigoni Valley and are probably of carboniferous age. Quartz, mica, and amphibole schists are characteristics of this unit	Permeability and storage capacity erratic and dependent on the particular phase. Slatey cleavage and schistosity aids weathering and some small wells obtain supplies from this weathered portion. Springs fed by water stored in numerous joints, faults, and fissures.
pre-Cretaceous		Undifferentiated metamorphics	Mm	Includes hornfels, schists, gneisses, slates, and quartzites which have not been previously differentiated.	

Sedimentary Rocks

The sedimentary rocks considered in this investigation have been subdivided into two age groups; namely, the Quaternary and the Tertiary systems. Of the entire stratigraphic column, only those sediments of Upper Pleistocene and Recent age within the Quaternary system contain readily exploitable ground water. Sediments of greater age, with exception of some strata-bearing limited quantities of potable water, contain waters of dubious quality or consist of fine-grained clastics of very low specific yield.

Quaternary System

Six sedimentary units of Quaternary age have been mapped during the course of this investigation. These units, which are described hereinafter are designated:

(1) Recent alluvium, Qal; (2) Residuum, Qr (Recent); (3) Terraces and Older alluvium, Qtoa (Pleistocene); (4) Undifferentiated Upper Pleistocene sediments, Qps; (5) Marine deposits, Qm (Pleistocene); and (6) Marine and Terrace deposits, Qtm (Pleistocene).

Recent Alluvium, Qal. Recent alluvium covers almost all of the valley floors in the Santa Margarita region, as shown on the geologic maps. The formation fills the basins to great depths and contains most of the readily extractable ground water. The alluvium comprises a complex of clay, silt, sand, and gravels of all conceivable combinations and gradations. Some of the sands and gravels are fresh and clean, and these are the most prolific water-producing sediments. Others were poorly sorted when laid down and some contain a high percentage of fines. Still others were subjected to long continued weathering before being buried and now contain a high percentage of residual clay. The finer sediments include both silts and clays.

Generally alluvial strata of the same type are not continuous over extensive areas. Instead, the more permeable strata generally occur in stringers and lenses that are largely surrounded by less permeable or impervious materials. Such stringers and lenses were laid down in the channels of the streams which have slowly filled the basins with alluvial material. While the stream channels in existence at any given time were being filled with sands and gravels, the surrounding areas received only fine grained deposits in times of flood, and at other times were subjected to weathering which resulted in an increased percentage of residual clay in the present deposits.

The occurrence of sand and gravel aquifers as stringers and lenses is evidenced by the fact that water-bearing as well as nonwater-bearing horizons, as indicated by logs, cannot commonly be correlated between wells spaced as close together as a few hundred feet. The condition of rapid vertical and lateral gradation is apparent in longitudinal geologic sections K-K' and L-L', Plate 17, through Murrieta and Santa Margarita Valleys.

Principal aquifers in the watershed are found within the alluvial deposits. Sediments in these aquifers are usually neither compact nor cemented and are generally highly permeable, readily permitting percolation of surface water. The fine-grained phases are usually lower in permeability. Generally, however, Recent alluvium may be classed as having moderate to high permeability.

<u>Residuum, Qr</u>. At many places throughout the watershed, the surfaces of the crystalline rocks have been disintegrated or decomposed through weathering. The depth to which such weathering has progressed varies considerably, extending from only a few inches below the surface in many areas to more than 100 feet at points near Fallbrook. Areas of weathered materials are indicated on the areal geology maps, where they are shown as a distinct formational unit designated Residuum, Qr. Only those areas in which depth of weathering appeared to exceed 15 feet are shown on this plate. Where weathering appeared shallower the parent rock formation is indicated. The 15-foot depth criterion was selected for the following reasons: First, it was considered that where weathering extended to a depth of less than 15 feet, the ground water storage capacity of the weathered materials was negligible; second, it was felt that a thickness of at least 15 feet would be required before an appreciable quantity of water could be produced from wells; and third, it was held that the detailed work necessary to map the numerous existing shallow deposits was not warranted. Estimations of depths of weathering was based on information obtained from wells and observations of stream and road cuts.

Residuum is a minor source of ground water throughout the watershed supplying domestic wells in addition to a few small irrigation wells. In the Fallbrook area, however, many wells tap the residuum and it constitutes an important source of domestic and irrigation water. In this case weathering has progressed to a depth which results in a greater storage space.

<u>Terraces and Older Alluvium, Qtoa</u>. Terrace deposits are also called older alluvium, the names having been derived from the topographic position and age of the formation. Much of the area mapped as "Terrace deposits and Older alluvium" in this report also include areas which have previously been mapped by Mann[19] as the Pauba formation and Temecula arkose. Qtoa has been differentiated from Qps, described hereafter, by its topographic expression. The Qtoa has been eroded to a low, rolling topography while the Qps has been largely dissected to such an extent that it forms badlands. These sediments are characterized by reddish-brown soil due to oxidation, and are somewhat more indurated than Recent alluvium. Qtoa also contains a high percentage of residual clay resulting from weathering of the original minerals.

Terraces in the strictest sense are remnants of what was once the valley floor and which have been isolated either by relative uplift of the valley sides, or erosion in the central portions. Continuing erosion has resulted in the removal of all but a few scattered remnants of the original alluvium. During the course of this investigation the terraces were found to be widespread and dissected, and the boundary between older alluvium and terrace deposits was so difficult to distinguish that the general designation Qtoa was used. Wells tapping materials of this unit have low yields and are limited to domestic use.

Undifferentiated Upper Pleistocene Sediments, Qps.

Three formations previously mapped by Mann[19] have been grouped together and are included under the general rock unit Undifferentiated Upper Pleistocene Sediments, Qps. Temecula arkose, Pauba formation, and the Dripping Springs fanglomerate are distinct lithologic units, but for the purpose of simplicity and because their water-bearing characteristics are similar, they have not been differentiated on the geologic maps.

The best exposures of Temecula arkose are found along Highway 71 in the vicinity of Dripping Springs. The arkose was deposited on a surface of fairly low relief, mostly on basement rocks, but to some extent on Tertiary sediments and on the Santa Rosa basalts. The upper contact of the formation is a disconformity since every outcrop indicates the formation has been tilted and eroded. The Temecula arkose consists of pale buff to white arkose beds, buff to brown silts, gray algal limestones, and a few thin beds of rhyolitic tuff.

The name, Pauba formation, has been given to a series of coarse fanglomerates and interbedded sands and silts which are best exposed in the Dripping Springs alcove. Similar beds were mapped by Engel[9] as Fanglomerate and Terrace Deposits, Qf. The Pauba formation was deposited on an irregular topography eroded in the Temecula arkose and is overlain by the Dripping Springs fanglomerate. The Pauba formation comprises beds of arkose, hardpan, and members characterized by boulders and cobbles and its maximum thickness is about 350 feet. It is distinctively pale in color and includes beds of lime-cemented arkose and silicified algal marls.

The Dripping Springs formation comprises beds of fanglomerates which are best exposed in the Dripping Springs alcove, especially in roadcuts along Highway 71. Small outcrops appear in the vicinity of Pechanga Creek and in Nigger Valley. It is similar in most respects to the Pauba formation and nowhere exceeds a thickness of ten feet. A lowering of base-level in the Temecula area caused dissection of the Pauba fans and renewed deposition at lower levels.

A few domestic wells obtain their supply of water from these Pleistocene sediments. The wells of greatest yield, however, are in Recent alluvium, where the effects of faulting have been at a minimum and specific yields are higher.

Marine Deposits, Qm. Marine deposits are exposed along the Pacific coast in the vicinity of the mouth of Santa Margarita River. These sediments are principally shallow water deposits of gravels, sands, silts, and clays. They are probably chiefly littoral and estuarine or bay deposits, but locally include considerable quantities of brackish water sediments.

These deposits are situated above the water table, and although no known wells tap them as a source of supply, they readily transmit water to underlying materials.

Marine and Terrace Deposits, Qtm. The classification Qtm includes terrace deposits and marine sediments which are similar in so many respects that they have been combined into the one general unit. These deposits have been differentiated from the marine sediments, Qm, by their topographic position, peculiar reddish-brown color, resulting from oxidation, and their relatively high residual clay content which has resulted from the breakdown of the original materials.

In the investigated area the terraces are named Stuart and South Mesas. They stand at elevations ranging from 75 to 100 feet above sea level and slope gradually southwesterly toward the ocean. The composition and water-bearing characteristics are similar to the marine sediments.

Tertiary System

The following three sedimentary formations of Tertiary age have been delimited on the geologic maps, and are described hereinafter: (1) San Onofre breccia, Tmso (Middle Miocene); (2) La Jolla, Telj (Eocene); and (3) Martinez, Tmz (Paleocene).

San Onofre Breccia, Tmso (Middle Miocene). This formation described by Woodford[27] comprises beds of well cemented angular fragments of pebbles, cobbles, and boulders up to nine feet in diameter. It contains strata of cemented sand, sandy shale, and shale, of which the finer facies are more prominent near the base. The breccia is well cemented and is considered to be impermeable, the outcrops resemble concrete in appearance.

La Jolla Formation, Telj (Eocene). Marcus Hanna[11] has divided the La Jolla formation into three members: Delmar sand, Torrey sand, and Rose Canyon shale. These members were not mapped separately in this investigation. The lowest member, the Delmar sand, comprises greenish-gray or reddish sandstone or sandy shale. It is often lenticular, may exhibit cross-bedding, and contains poorly preserved marine fossils.

The Torrey sand member of the La Jolla formation rests on the Delmar sand with gradational contact, and it comprises white to light-gray or brown, and rather clean sand. The sands are coarse-grained, and sometimes exhibit a slightly reddish color. Cross-bedding is found locally and the lack of marine fossils suggests a continental origin.

The Rose Canyon shale rests conformably on the Torrey sand. It consists mostly of gray or brown shale, silty mudstones with minor amounts of conglomerate, and a few thin limestone beds.

The Torrey sand is highly permeable and readily permits percolation of rainfall and runoff. It is generally situated above the water table, but yields water where saturated. The / sandy phases of the Del Mar sand are permeable and water-bearing. The shale members are relatively low in permeability but may yield limited amounts of water. The mudstones, shales, conglomerates, and limestones of the Rose Canyon member are relatively impermeable and nonwater-bearing. The sandstones are moderately permeable and may be water-bearing.

Martinez Formation, Tmz (Paleocene). Beds of Martinez age were found underlying the Santa Rosa basalt (Tsrv), which caps Mesa de Burro. Metamorphics of the Bedford Canyon formation are exposed below the Martinez. The latter formation is characterized by arkosic sands and gravels which are well indurated, hard, and reddish colored where baked by the overlying basalt. The Bedford Canyon formation and Santa Rosa basalt are described hereinafter.

Igneous Rocks

Igneous rocks include all the volcanic, hypabyssal, and plutonic types exposed within the Santa Margarita region. They are usually found as bordering highlands and in many cases form the relatively impermeable sides and bottoms of the ground water basins. Almost all of the plutonic rocks are a part of the southern California batholith, a huge complex of igneous rocks which was intruded during the Cretaceous period. It extends southeast from Riverside, California for at least 350 miles and possibly to the tip of Baja California 65 miles further south. Twelve units which are described briefly herein, have been differentiated as follows:

(1) Nigger Canyon volcanics, Qncv (Pleistocene); (2) Santa Rosa basalt, Tsrv (Pliocene); (3) Roblar leucogranite, Kr (Cretaceous); (4) Woodson Mountain granodiorite, Kwm (Cretaceous); (5) Domenigoni Valley granodiorite, Kdv (Cretaceous); (6) Miscellaneous granodiorites, Kmg (Cretaceous); (7) Bonsall tonalite, Kb (Cretaceous); (8) Aguanga tonalite, Kat (Cretaceous); (9) San Marcos gabbro, Ksm (Cretaceous); (10) Santiago Peak volcanics, Jsp (Jurassic); (11) Intrusives related to the Santiago Peak volcanics, Jspi (Jurrasic); and (12) Undifferentiated Igneous Rocks, Ig (pre-Cretaceous).

Nigger Canyon Volcanics, Qncv

The Nigger Canyon volcanics include tuffs, agglomerates, dikes, and flows. They outcrop near the mouth of Nigger Canyon. These volcanics were extruded from a series of northeast trending fractures. Bombs of scoriaceous basalt.

up to several feet across are contained in the agglomerates. The age of the Nigger Canyon formation is Upper Pleistocene. The formation is impermeable and nonwater-bearing except along fractures and joints.

Santa Rosa Basalt, Tsrv

Remnants of a once widespread basalt plateau were found capping Mesa de Burro, and small areas are exposed near Vail Dam and northeast of Murrieta. The volcanics are almost horizontal and rest upon a nearly flat surface of Tertiary sediments or basement rocks. The rock is of Pliocene age and is primarily olivine basalt characterized by a reddish-brown color. It is several tens of feet in thickness, and is impervious and nonwater-bearing.

Roblar Leucogranite, Kr

Roblar leucogranite of Cretaceous age is exposed in the vicinity of De Luz. This formation shows poor outcrops, and the exposures are of a friable sandy nature. It is characterized by small angular blocks but boulders of disintegration are rare. Roblar leucogranite is flesh-colored, uniform in character, and aplitic in appearance. It is sometimes found as dikes cutting the Woodson Mountain granodiorite. Several wells of limited capacity tap fractures in the Roblar leucogranite. In general, however, this formation is impervious and nonwater-bearing.

Woodson Mountain Granodiorite, Kwm

The Woodson Mountain granodiorite of Cretaceous age is exposed most prominently in the highland area southwest of Murrieta Valley. The formation in many cases has intruded the Bonsall tonalite. It is characterized by light-colored outcrops and gneissoid structure. The Woodson Mountain granodiorite is rather coarse-grained, nearly white to buff, and contains phenocrysts of quartz. Although this formation is generally impermeable and nonwater-bearing, limited quantities of water are stored in the fractures and joints.

Domenigoni Valley Granodiorite, Kdv

A number of small bodies of granodiorite of Cretaceous age have previously been mapped in the Domenigoni Valley area. They range from tonalite to granodiorite, and resemble the Bonsall tonalite, but are lighter colored and finer grained. The rocks crop out as boulders of disintegration and contain abundant dark inclusions. The Domenigoni Valley granodiorite is generally impermeable and nonwater-bearing except along joints and fissures. A few small wells tap this rock.

Miscellaneous Granodiorites, Kmg

Small outcrops, boulders of disintegration, light gray color, and medium-grain size are characteristic of this unit which is of Cretaceous age. Its water-bearing properties are identical with the other granodiorites.

Bonsall Tonalite, Kb

Large bodies of Bonsall tonalite are exposed west and south of Mesa de Burro. Prominent characteristics of the tonalite are abundant, oriented inclusions and streaking. It is of Cretaceous age but is younger than the San Marcos gabbro, as it carries abundant inclusions of the gabbro. The Bonsall tonalite is a medium-grained rock ranging from light to dark gray depending on the proportion of dark minerals present, of which hornblende is the most prominent. This formation is generally nonwater-bearing; locally, however, small wells tap it as a source of supply. In these cases water is obtained from joints and fissures.

Aguanga Tonalite, Kat

The best exposures of the Aguanga tonalite are found on the north and south sides of Aguanga Valley and north of Lancaster Valley. The name was given by Mann[19] to a biotite rich quartz diorite of Cretaceous age. The biotite was found in books up to five millimeters in thickness. Although no wells tap this formation limited quantities of water may be found along joints and fractures of the rock.

San Marcos Gabbro, Ksm

Large bodies of San Marcos gabbro are exposed throughout the watershed. It intrudes the Bedford Canyon metamorphics and Santiago Peak volcanics. One of the most noticeable features of the rock is the variation in its physical characteristics.

These variations in most cases represent actual differences in mineral content, grain size, and texture. The San Marcos gabbro appears to be the oldest rock of the Cretaceous batholith. No wells were found tapping this formation.

Santiago Peak Volcanics, Jsp

Outcrops of the Santiago Peak volcanics are widespread in southern California and extend from an area south of the La Jolla quadrangle northward almost to the Santa Ana River. In the Santa Margarita River watershed, however, this formation is limited to areas southwest of Murrieta and west of Fallbrook. This unit, which is of Jurassic age, comprises mildly metamorphosed agglomerates, conglomerates, quartzites, shales, tuffs, shallow intrusives, and flows. The characteristic color of the formation is whitish gray to green and it is generally hard and resistant. The Santiago Peak volcanics have been intruded by the southern California batholith. These volcanics are generally locally water-bearing but no wells in the watershed were found to tap them. Their permeability and storage capacity are erratic and are dependent upon the characteristics of the particular phase rather than any general property of the group as a whole.

Intrusives Related to Santiago Peak Volcanics, Jspi

Small bodies of fine-grained granodiorite and selected rocks believed to be the same age as the Santiago Peak volcanics are shown on the geologic maps. These intrusives form the core of the Santa Margarita Mountains which lie generally west of

Margarita Peak. In the watershed, this unit is exposed west of Fallbrook and in the vicinity of De Luz. The material is quite resistant to erosion and where it is exposed, stands as high ridges with steep slopes. Its water-bearing characteristics are similar to the Santiago Peak volcanics.

Undifferentiated Igneous Rocks, Ig

Several igneous rock types have been included under the general term Ig. This unit includes igneous rocks of types mentioned above and possibly others. The segregation of the various rock types comprising this group was not considered warranted since water-bearing characteristics of the rocks are similar. As previously mentioned, no detailed mapping was performed in this investigation for areas of nonwater-bearing rocks, so the individual types are herein delineated only in areas where previous detailed mapping was available. Rocks in this unit comprise intrusions varying from granites to gabbros, and no age has been assigned to them, although they were probably intruded concurrently with the rocks of the southern California batholith. Although the group, in general, is impermeable and nonwater-bearing, limited quantities of water may be obtained from the fractures and joints in the rock.

Metamorphic Rocks

Three metamorphic units which have been delimited on the geologic maps and described herein are:

(1) Bedford Canyon formation, Trbc (Triassic); (2) Palezoic schists and quartzites, P (Carboniferous);

(3) Undifferentiated metamorphics, Mm (pre-Cretaceous). They are of sedimentary origin and have suffered metamorphism in varying degree.

Bedford Canyon Formation, Trbc

This formation is composed of a group of mildly metamorphosed slates and argillites with some quartzites and very few thin lenses of limestone. It underlies much of the mountainous areas and large bodies are exposed throughout the watershed. The Bedford Canyon formation is of Triassic age and is generally impermeable and nonwater-bearing. Where it is fractured and jointed, the formation supplies small wells of limited capacity.

Paleozoic Schists and Quartzites, P

Rocks of probable Carboniferous age outcrop in the vicinity of Domenigoni Valley. Quartz, mica, and amphibolite schists are characteristic of this unit. A thick series of quartzites outcrops in the vicinity of Diamond and Domenigoni Valleys. Rocks of this unit are impermeable and nonwater-bearing except along joints and fissures.

Undifferentiated Metamorphics, Mm

This unit comprises hornfels, schists, gneisses, slates, and quartzites which have not been previously mapped and which are not segregated in this investigation. Undifferentiated metamorphics are impervious and contain no water except in joints and fissures.

4. STRUCTURE

Subsurface structures which affect the movement of ground waters in the Santa Margarita River watershed are not generally apparent, due mainly to the thick cover of alluvial materials in the basins. The chief structural and physical features in the area trend in a northwesterly direction. The direction of trend has remained approximately the same from pre-Cretaceous time to the present.

Faults are numerous in the area but the magnitude of several of them is unknown, as the majority are masked by the broad alluvial plains. Only those that have a topographic expression or other surficial evidence are noted on the areal geology plates. Fault scarps are the most noticeable surficial evidence of faulting. Almost all the scarps in the area are fault line scarps as opposed to true fault scarps. Although the faces of the scarps have been eroded, the bases in most cases have not been appreciably eroded back from the fault plane. However, along the Willard fault zone adjacent to Murrieta Valley the trace of the fault lies in front of the base of the present scarp.

Evidences of faulting, other than fault line scarps, are sharp V-shaped canyons with streams flowing on rock channels to the fault line, and increasing stream gradients as the fault line is approached from upstream. The location of springs in straight-line series along many of the faults is another means by which the position of the faults has been determined. Spring locations are shown on the Hydrographic Map, Plate 6. Sag ponds, linearities of vegetation, unconformable drainage lines, alignment of saddles, and landslides are still other forms of evidence which were utilized in determining the trace of faults. In areas of crystalline rock, faults were often difficult to locate, since, in many cases, their strikes are parallel to the trend of other structural features.

The most noteworthy faults are described in Table B-2, entitled "Major Faults and Associated Features in Santa Margarita River Watershed and Adjacent Areas". This table gives the location, trend, movement, barrier effect to ground water movement, age, and evidence of faulting. Locations of these faults are shown on the areal geology maps.

TABLE B-2

MAJOR FAULTS AND ASSOCIATED FEATURES IN
SANTA MARGARITA RIVER WATERSHED AND ADJACENT AREAS

Name	Location	Trend	Movement	Barrier effect to ground water movement	Age of faulting	Evidence of faulting
Willard Fault Zone	Northeastern boundary of the Elsinore Mts. and Santa Rosa plateau from Lake Elsinore southeast	N 45° W	Normal; dip 70° +	None apparent	Middle Pleistocene	Fault line scarps, aligned saddles
Wildomar Fault	Bounds Murrieta graben on the northeast and extends southeast into the Wolf Valley area beyond Temecula Creek	N 51°-55° W	Normal, possibly some rotation, dip almost vertical	In Murrieta Basin ground water movement impeded, and a ground water cascade produced. Line of springs at northeast edge of Murrieta Valley is the result	Faulting continues at present	Spring alignment, sag ponds, gouge zones, fault line scarps
Wildomar Horst	Northeast of State Highway 71, between Wildomar and Murrieta	N 51°-55° W	Upthrust block - possibly some rotation	None apparent	Movement has continued to the present	Topographic discontinuity
Murrieta Graben	Extends from a point near Rome Hill (Lake Elsinore Quad) southeast to the Pechanga Indian Reservation	N 51° W	Narrow downdropped block about 18 miles long and one mile in width; portion of Elsinore trough	None apparent	Middle Pleistocene	Faults on either side of trough
Agua Caliente	Bounds the Palomar horst on the northeast	N 47° W	Normal. high angle	None apparent	Middle Pleistocene	Topographic features
Aguanga Fault	Prominent fault scarp south and west of Aguanga	Trend south of Aguanga is N 62° W; to the west, trend is N 44° W	Normal, high angle with dips greater than 80°	None apparent	Middle Pleistocene	Prominent scarp
Lancaster Fault Zone	Lancaster Valley has been eroded along this fault	N 74° W	Normal, may be some rotational	None apparent	Middle Pleistocene	Fault line scarp
Oak Mountain Horst	Several faults bound the Oak Mountain horst on the west and east	Trend is transverse to the regional trend of faulting	Hundreds of feet of throw have been measured on these faults	None apparent	Middle Pleistocene	A horst which cuts across the regional structural features
San Jacinto Fault Zo	Forms the southwest border of the San Jacinto Mountains	Approximately. N 50° W	Movements of various types have been noted along the course of the fault zone. It is predominantly rotational with the upthrown block on the northeast. The throw decreases to the northwest.	None apparent	Pleistocene	Alignment of springs, fault line scarps, fault contacts, topographic evidence

5. GEOLOGIC HISTORY

A generalized geologic history of the watershed region is given herein. Geologic events are presented in chronological order, with the older occurrences presented first.

Pre-Tertiary Time

Before Tertiary time the major geologic event was the emplacement of the southern California batholith[17]. The batholith is related to that of the Sierra Nevada, which is of late Jurassic age, and includes all the plutonic and hypabyssal igneous rocks which were described earlier. The sequence of intrusion was as follows: gabbros, tonalites, granodiorites, and finally the granites.

Tertiary-Quaternary Time

Pre-Pliocene events in the Tertiary period, although important, are not as diagnostic as those which occurred in the Pliocene, Pleistocene, and Recent epochs. A brief summary of the geologic history of the latter periods, as interpreted from physiographic and geologic evidences in the Santa Margarita region, is presented herein:

In Pliocene time the area was principally a broad alluviated surface of comparatively low relief. Although the Perris block was low, the San Jacinto Mountains, a fault block, were beginning to be uplifted. Drainage in the area was to the north or northeast. During the "Plio-Pleistocene" the Santa Rosa basalts were extruded upon this surface of low relief and the Santa Ana Mountains were being uplifted along the Elsinore fault zone. The San Jacinto and Palomar Mountains were also rising at this time.

In early Pleistocene time, drainage was southwesterly across the Perris block and Santa Margarita region. During middle Pleistocene the Pasadenan orogeny occurred, accompanied by uplift and erosion. The San Jacinto, Santa Ana, and Palomar Mountains were uplifted and the Elsinore trough was downfaulted. The Santa Ana River, located northwest of the watershed, developed a subsequent tributary down the Elsinore trough and captured Temecula Creek.

The Upper Pleistocene epoch was characterized by the deposition of the Pauba formation, faulting, and by headward erosion by the Santa Margarita River resulting in the eventual capture of Murrieta and Temecula Creeks and the change of drainage direction to the present southwesterly course through Temecula Canyon. Larsen[17] suggests that the San Luis Rey River similarly may capture in the early geologic future the drainage of Temecula Creek. During Upper Pleistocene time downfaulting of the Elsinore trough continued and Murrieta graben in its present configuration was formed. The Dripping Springs fanglomerates were also deposited during this time. In the late Pleistocene the Nigger Canyon volcanics were emplaced. Deposition of alluvial sediments and movement along older faults has continued to the present.

6. OCCURRENCE OF GROUND WATER

Ground water is exploited to some extent from all the formations occurring within the watershed. The water yielding ability of the formations ranges from high for alluvium to almost negligible for the massive crystalline rocks. On Plates 9A and 9B rocks within the watershed have been mapped according to their abilities to yield water. Three units are delimited on this map; these include materials varying from moderate to high permeability, materials of low permeability, and materials generally impermeable. Areas designated as moderately to highly permeable consist of Recent alluvium, Qal, and constitute the principal sources of ground water in the watershed. Wells tapping these deposits generally have specific capacities, in gallons per minute per foot of drawdown, ranging from 6 to 220. Areas of low permeability comprise terraces and older alluvium, Qtoa; deep residuum, Qr, exposed in the vicinity of Fallbrook; and upper Pleistocene sediments, Qps. Wells in these units supply minor quantities of ground water and generally have specific capacities of less than six. The third group of generally impermeable materials includes igneous rocks, metamorphic rocks, and cemented sediments and rocks. They are practically nonwater-bearing, but yield limited supplies from joints, fractures, and highly weathered zones. Water is occasionally obtained from permeable members within the cemented sediments.

At several places within the watershed, crystalline rock formations have been deeply weathered forming a layer of decomposed material of varying physical characteristics. Such weathered rock has been herein designated residuum. In general, the permeability of residuum is low; however, in some locations it constitutes an important source of water. In the vicinity of Fallbrook an extensive area is underlain by residuum, a part of which presently yields water to wells. The limits of presently productive residuum in the Fallbrook area are delineated on Plate 9A.

Artesian wells are scattered in many localities throughout the watershed. Those of significance, however, are found in Pauba Valley, Santa Gertrudis Valley, and at other locations along the northeast side of the Wildomar fault. The apparent areas of confined waters are delineated on Plates 10B and 11B

Springs exist or have been reported to exist in the past throughout the watershed. The occurrence of springs may be attributed to the discharge of water accumulated in joints or fractures of impervious rocks through openings in the rocks or through the exposed seepage faces of permeable fill material similarly supplied. Flows of ground water which are caused to appear on the surface by the intersection of the planes of the water table and the ground surface or by impervious obstructions are sometimes called springs, although in California such flow is often called rising water. In this report such flows are considered to be rising water except that in cases where the source has been locally considered to be a spring, such designation has been preserved. Locations of most springs which are of local significance, including those used for domestic or stock use and those for which appropriation water rights applications have been filed, are plotted on Plate 6, "Hydrographic Map".

7. GROUND WATER BASINS

Twenty-three ground water basins of signficant size a present development were identified in Santa Margarita River watershed, and are herein described. The boundaries of these basins are delineated on Plates 10 and 11, "Lines of Equal Elevation of Ground Water". Many other ground water bodies exist in the watershed, but they are very small, virtually undeveloped, and insufficient information was available to warrant their designation as separate basins.

Boundaries of basins are generally continuous ridges of basement complex either exposed at the surface or underlying several feet of residual cover. Several boundaries are formed by faults which act as barriers to the movement of subsurface waters. In other cases, alluvial "highs" have formed surface drainage boundaries between basins, and in such situations the surface divides have been utilized in delimiting the basin boundaries.

Materials filling the basins near the coast are chiefly littoral, estuarine, or bay deposits of gravels, sands, silts, and clays. Materials filling the intermontane basins were derived from the surrounding mountains and consist of deposits of unconsolidated clays, sands, and gravels. This detritus varies in thickness from a thin veneer at the outer limits to deposits of considerable, but unknown, thickness in some basin centers.

Directions of ground water movement are indicated by lines of equal elevation of ground water shown on Plates 10A and 10B for spring, 1927, and Plates 11A and 11B for fall, 1953.

In Table B-3, entitled "Ground Water Basin Characteristics", are tabulated the characteristics of all designated basins, including the following pertinent data: general

TABLE B-3

GROUND WATER BASIN CHARACTERISTICS

Ground water	General description	Surface area, in acres	Maximum depth of storage unit, in feet	Relative permeability	Storage capacity basin: Gross storage capacity, in acre-feet	Storage capacity basin: Usable storage capacity, in acre-feet
	Hydrographic Unit No. 1					
Diamond	The basin lies partly within and partly outside of Santa Margarita River watershed. Only the portion within the watershed is considered herein. Mountains of Paleozoic schists and quartzites bound the valley on the north and south. This same formation underlies the valley. Basin fill is composed of Recent alluvium. Spurs of bedrock separate Diamond Valley from Domenigoni Valley to the west. A low alluvial divide separates the part of the valley which lies within the watershed from the part which is outside of the watershed. Wells are supplied by ground water in the alluvium.	2,600	---	High	37,400	26,800[a]
Domenigoni	Bounded on the north and south by hills of Paleozoic schist and quartzite, except for the western section where the bounding hills on the north and south are largely composed of Domenigoni Valley granodiorite. The basin is separated from Menifee Valley to the west by spurs of granodiorite and a low alluvial divide, and from Diamond Valley to the east by spurs of schist and quartzite. Valley fill composed of Recent alluvium, underlain by granodiorite and schist and quartzite. Well information is scanty, but it is probable that most wells are supplied from the alluvium. See detailed description in text.	3,000	146	High	20,900	16,700[a]
French	Bounded on the north and northeast by Paleozoic schist and quartzite and residuals developed upon them, on the south by residuals developed upon Woodson Mountain granodiorite, on the northwest by residuals developed on the San Marcos gabbro, and on the west by thin older alluvial deposits. Basin separated by a low alluvial divide on the east from Los Alamos Valley. Basin fill composed of Recent alluvium and slightly dissected older alluvium underlain by igneous and metamorphic complex. Wells supplied by both Recent and older alluvium, with Recent alluvium yielding largest supplies. Drained by Warm Springs Creek flowing southwesterly into Murrieta Valley.	3,000	199	Moderate	8,280	6,860[a]
Los Alamos	Bounded on the south by residual soils developed upon metamorphic rocks, on the north by San Marcos gabbro, on the east by terraces and older alluvium, on the southwest by residuals developed upon Woodson Mountain granodiorite, on the northwest by the Bedford Canyon formation and by residual soils developed upon it. A low alluvial divide separates this basin from French Valley to the west. The basin fill comprises Recent and slightly dissected older alluvium. Wells obtain supplies from both, but Recent alluvium yields larger amounts. Drained by Tucalota Creek flowing southwest into Santa Gertrudis Valley.	1,700	123	Moderate	10,800	7,520[a]

GROUND WATER BASIN CHARACTERISTICS
(continued)

Ground water	General description	Surface area, in acres	Maximum depth of storage unit, in feet	Relative permeability	Storage capacity basin: Gross storage capacity, in acre-feet	Storage capacity basin: Usable storage capacity, in acre-feet
	Hydrographic Unit No. 1 (continued)					
Murrieta	The basin is a graben lying between the Willard fault zone on the southwest and the Wildomar fault on the northeast. Upthrown side of Willard fault zone forms Santa Rosa Mountains southeast of Murrieta Valley, which are composed of igneous, volcanic, and metamorphic rocks. Basin fill comprises Recent alluvium underlain by older alluvium. Wells supplied by both Recent and older alluvium. Drained by Murrieta Creek, which flows southeasterly through the valley to join Temecula Creek and form Santa Margarita River at Temecula Canyon. See text for detailed description.	4,400	520	Moderate	146,000	136,000[a]
Santa Gertrudis	The basin is surrounded by hills of older alluvium except on the southwest where Santa Gertrudis Valley merges with Murrieta Valley. The Wildomar fault crosses the mouth of the Valley, and, although it is not visible, it is a barrier to ground water movement forming a zone of artesian pressure upstream from the fault. The basin fill is Recent alluvium underlain by older alluvium. Wells are supplied both by Recent and older alluvium. The basin is drained by Santa Gertrudis Creek, which flows southwesterly to Murrieta Creek. In the portion of the basin which overlies the pressure zone, ground water storage was calculated for the upper 50 feet away, storage in the remainder of the basin was calculated to the maximum depth as indicated by well logs.	580	314	High	6,960	6,460[b]
Tucalota	The basin is bounded on the north and south by igneous rocks, and on the east and west by residual soils formed upon igneous rocks. A prominent northwesterly trending fault crosses the lower end of the basin. Basin fill is composed of Recent alluvium underlain by igneous basement rock. Wells are supplied by ground water in the alluvium. The basin is drained by Tucalota Creek, which flows westerly into Los Alamos Valley.	260	22	Moderate	1,390	585[a]
Wildomar	The basin is surrounded by low hills of older alluvium. It is situated at the northwest end of the Murrieta graben with the Wildomar fault to the northeast and the Willard fault zone to the southwest. The basin is composed of Recent alluvium underlain by older alluvium. Wells are supplied by Recent and older alluvium. Drainage from the basin is southeasterly into Murrieta Basin.	590	221	Moderate	15,000	13,500[a]
	Hydrographic Unit No. 2					
Anza	Bounded on the northeast and east by igneous rocks, on west and southwest by low hills of residual material developed by decomposition of underlying igneous rock, and on the north and southeast by areas of older alluvium. Basin fill composed of Recent alluvium underlain by igneous rocks. San Jacinto fault zone forms prominent scarp which bounds Anza Valley on the northeast. Basin drained by Coahuila Creek, which flows southwesterly. Most wells drilled in Recent alluvium. See detailed description in text.	5,700	230	Low	65,000	34,100[a]

GROUND WATER BASIN CHARACTERISTICS
(continued)

Ground water	General description	Surface area, in acres	Maximum depth of storage unit, in feet	Relative permeability	Storage capacity basin: Gross storage capacity, in acre-feet	Storage capacity basin: Usable storage capacity, in acre-feet
	Hydrographic Unit No. 2 (continued)					
Lower Coahuila	Bounded on the east by areas of residual soils developed upon igneous rocks which stand at slightly higher elevations than valley floor on the north by Coahuila Mountain, comprised of metamorphic and igneous rocks, on the west by hills of igneous rock, on the south by rolling hills of older alluvium. Basin fill is composed of Recent alluvium and is underlain by igneous rocks. High water table conditions prevail in the basin. Two wells have a slight artesian flow Basin drained by Coahuila Creek which flows southwest to Temecula Creek.	1,300	40	Low	8,660	2,600[a]
Lower Lancaster	Basin is bounded on the north by Woodson Mountain granodiorite and metamorphic rocks, on the south by undifferentiated upper Pleistocene sediments which have been eroded to a badland topography, on the east by upper Pleistocene sediments and a small horst of granodiorite. Basin fill composed of Recent alluvium, underlain by undifferentiated upper Pleistocene sediments and basement of igneous and metamorphic rocks. Wells supplied by Recent alluvium. Drained by Lancaster Creek flowing westerly into Vail Reservoir.	480	362	Moderate	7,120	5,840[a]
Upper Coahuila	The basin is surrounded by areas of residual soils developed upon igneous rocks. Residual areas slope gently toward the valley floor and probably represent an old erosion surface. Basin fill composed of Recent alluvium underlain by igneous rock. High water table conditions are found in the basin. A large hot spring is located near the edge of the basin. Wells derive water from Recent alluvium. Basin drained by Coahuila Creek, which flows southwesterly into lower Coahuila Valley	710	---	---	4,840	192[a]
Upper Lancaster	The basin has been eroded along Lancaster fault zone. Basin bounded on the north by upper Pleistocene sediments and Aguanga tonalite. Surrounded on other sides by hills of upper Pleistocene sediments, with a small horst of Woodson Mountain granodiorite on the west. Basin fill of Recent alluvium, underlain by older alluvium with basement of igneous rock. Wells supplied by Recent alluvium Basin drained by Lancaster Creek flowing westerly into lower Lancaster Valley.	460	384	Low	5,030	3,060[a]
	Hydrographic Unit 3					
Aguanga	The basin occupies a graben. Bounded on southwest by high ridges of metamorphic rock which form the scarp of Aguanga fault zone, on the north and southeast by hills of upper Pleistocene sediments, and on the east by hills of igneous rock. Drainage is by Temecula Creek. Basin fill is Recent alluvium underlain by undifferentiated upper Pleistocene sediments. All existing wells supplied by ground water in Recent alluvium. See detailed description in text.	1,200	260	Low	40,100	35,200[a]

Ground water	General description	Surface area, in acreas	Maximum depth of storage unit, in feet	Relative permeability	Storage capacity basin: Gross storage capacity, in acre-feet	Storage capacity basin: Usable storage capacity, in acre-feet
	Hydrographic Unit No. 3 (continued)					
Dodge	The basin is located at southeastern edge of the watershed, surrounded on all sides by igneous rocks. The fault-line scarp of the Agua Caliente fault bounds basin on the south-west. Basin fill composed of Recent alluvium which is underlain by igneous rock. Most wells supplied by ground water in alluvium, a few supplied by fractures in bedrock. Drainage is by Temecula Creek, which flows northwesterly into Oakgrove Valley.	1,000	100	---	4,560	3,220[a]
Lower Culp	The basin is bounded on the east, northeast, and west by igneous rock, and on the north-west by hills of upper Pleistocene sediments. Southern boundary formed by the Agua Caliente fault and metamorphic and igneous rocks of the Palomar block. Basin fill composed of Recent alluvium underlain by igneous rock. Most wells obtain water from alluvium, but small supplies are obtained from the bedrock. Basin drained by Temecula Creek which flows northwesterly to Aguanga Valley.	610	80	---	5,550	630[a]
Nigger	The basin is bounded on the north and southwest by upper Pleistocene sediments, and on the south by igneous rock in fault contact with the upper Pleistocene sediments. Basin fill composed of Recent alluvium underlain by undifferentiated upper Pleistocene sedi-ments. Wells supplied by ground water in Recent alluvium. Basin drained by Temecula Creek which flows northwesterly to Vail Reservoir.	310	183	---	8,690	8,100[a]
Oakgrove	The basin is surrounded by igneous rock and bounded on the southwest by scarp of the Agua Caliente fault. Basin fill is composed of Recent alluvium which is underlain by igneous rock. Most of the water is supplied by wells in Recent alluvium, small amounts are obtained from the underlying bedrock. The basin is drained by Temecula Creek.	2,000	170	---	25,200	11,200[a]
Radec	This small basin is bounded on the north, northwest, and northeast by hills of upper Pleistocene sediments, and on the southwest by igneous rock. The basin is filled with Recent alluvium underlain by undifferentiated upper Pleistocene sediments. Wells are supplied by ground water in the Recent alluvium. The basin is drained by Temecula Creek, which flows northwesterly into Nigger Valley.	130	87	---	756	555[a]
	Hydrographic Unit No. 4					
Pauba	The basin occupies a narrow stream valley bordered on the northwest and southeast by low hills of older alluvium, bounded at the upstream end by Bedford Canyon formation, and separated from Pechanga Basin at the downstream end by the Wildomar fault. Basin fill is composed of Recent alluvium and underlain by older alluvium. Pressure aquifers in older alluvium cause flowing artesian wells in a large portion of the basin. Storage capacity is calculated herein for the free ground water zone only. See detailed description in text.	3,000	170	High	52,000	28,600[b]

GROUND WATER BASIN CHARACTERISTICS
(continued)

Ground water	General description	Surface area, in acres	Maximum depth of storage unit, in feet	Relative permeability	Storage capacity basin: Gross storage capacity, in acre-feet	Storage capacity basin: Usable storage capacity, in acre-feet
	Hydrographic Unit No. 4 (continued)					
Pechanga	The basin occupies a downdropped block between the Wildomar fault on the northeast and the Willard fault zone on the southwest. The basin is bounded on the southwest by Woodson Mountain granodiorite, and elsewhere by hills of older alluvium. Basin fill is composed of Recent alluvium underlain by older alluvium. Ground water in the Recent alluvium and in the underlying older alluvial deposits supplies wells. The basin is drained by Pechanga Creek and Temecula Creek.	2,200	500	Low	40,000	28,200[a]
	Hydrographic Unit No. 5					
Rainbow	This basin is located in a shallow valley surrounded by hills of Woodson Mountain granodiorite. Basin fill is Recent alluvium underlain by granodiorite. Both the alluvium and fractured bedrock yield water to wells. Minor amounts of water are supplied by hillside springs in jointed granodiorite. The valley is drained by Rainbow Creek, except for a small segment which lies within San Luis Rey River drainage.	450	22	Moderate	2,000	335[a]
	Hydrographic Unit No. 6					
Santa Margarita Coastal	The basin is bounded on the north by igneous rocks which have residual soils developed upon them, on the east and west by sediments of the La Jolla formation, and on the south by San Onofre breccia. Boundary rocks are largely nonwater-bearing. Basin fill is Recent alluvium. The basin is constricted at two points, forming three interconnected sub-basins named, in downstream order: Upper, Chappo, and Ysidora sub-basins. See detailed description in text.					
Upper Sub-basin		860	145	High	13,600	9,200[c]
Chappo Sub-basin		2,240	185	High	36,000	13,600[c]
Ysidora Sub-basin		1,100	197	High	12,000	1,200[c]
TOTALS		4,200			61,600	24,000[c]

a. Usable storage capacity calculated between historic high water table and a surface 25 feet above base of Recent alluvium.
b. Storage capacity calculated in free ground water zone only.
c. Storage capacity calculated in the interval of 10 feet below ground surface and mean sea level but not more than 100 feet below ground surface.

description, surface area, relative permeability and storage capacity data. Basins are listed in the table alphabetically within each of the six hydrographic units delineated on the hydrographic map, Plate 6. Aguanga, Anza, Domenigoni, Murrieta, Pauba, and Santa Margarita Coastal Basins are described in additional detail in the following paragraphs:

Aguanga Basin

Aguanga Basin is a rectangularly shaped, northwesterly trending, structural feature, approximately 3.8 miles in length, with an average width of about one mile. The basin surface covers an area of about 1,200 acres, which is drained by Temecula Creek. In general, the basin floor slopes from southeast to northwest, surface elevation being about 2,200 feet at the eastern extremity of the basin, and decreasing to about 1,800 feet near the westerly end.

Aguanga Valley is one of several alluviated valleys along upper Temecula Creek bounded in part by fault line scarps and separated by bedrock canyons. Aguanga Valley and Radec and Nigger Valleys downstream show as en echelon arrangement typical of valleys occupying a series of tilted blocks between parallel faults.

The most impressive fault zone in this locality, the Aguanga zone, forms the southwest boundary of Aguanga Valley. In less spectacular form it continues to the southeast as the Agua Caliente fault and forms the northeast boundary of the Palomar block. Southeast of Aguanga the main fault trends

about N 62° W, but further west it joins a persistent fault trending approximately N 44° W. Exposures of some of the fault surfaces of this zone, directly south of Aguanga, show northeast dips of more than 80 degrees.

The northern boundary of the basin is formed by a ridge of undifferentiated Pleistocene deposits (Qps) which has been eroded to a badland type of topography. The ridge is asymmetric, especially in its eastern part. This feature is shown on geologic section E-E', through Aguanga Valley, which is presented on Plate 15. Further west the ridge becomes a cuesta. A small horst of Aguanga tonalite forms a ridge of crystalline rock within the badlands near the north side of Aguanga Valley.

Surface flow is intermittent in the heavily alluviated central portion of the valley. Perennial flow in Temecula Creek occurs, however, at both the upstream and downstream extremities of the valley where the alluvium is thin and bedrock is near the surface.

All the wells draw water from the alluvium which is recharged by percolation of precipitation on the valley floor, runoff from the adjoining slopes, and inflow from Temecula and other tributary creeks.

Six active water wells were located in Aguanga Basin, including two irrigation wells. A pump test on one of the irrigation wells showed a yield of 180 gallons per minute with a drawdown of 30 feet.

Anza Basin

Anza Basin is located in the irregularly-shaped erosional Anza Valley situated in the northeasterly portion of the watershed. In general, the valley floor slopes toward the southwest, and elevations range from about 4,400 feet above sea level at the northern extremity of the valley to about 3,800 feet at the outlet. The valley is drained by Coahuila Creek, which flows in a general southwesterly direction.

Mountains composed chiefly of igneous rock, border the basin on the northeast and east. The basin is bounded on the southwest and west by long gentle slopes of residuum which were formed by the decomposition of the underlying igneous rocks. The northern extremity of the basin is bounded by low hills of older alluvium. On the southeast, Anza Valley is separated from Terwilliger Valley by a narrow saddle filled to shallow depth with alluvial materials. Terwilliger Valley drains to the Colorado Desert and is outside of the Santa Margarita River watershed. Geologic features of the valley are depicted on geologic section C-C' Plate 14.

Ground water in Anza Basin occurs in Recent alluvial deposits consisting of gravels and sands outwashed from the slopes of the mountains along the north side of the basin.

The ground water basin is recharged by percolation of precipitation on the valley floor and runoff from the surrounding slopes. Recharge from the latter source is limited by the small drainage area tributary to the basin.

Direction of ground water movement is shown by the ground water contours on Plate 11B. In general, flow is toward the south converging on Coahuila Creek at the southwestern corner of the Basin. An unnamed fault trending northwest to southeast through the westerly portion of the basin apparently forms a partial barrier to ground water movement as indicated on the Plate.

There are a total of about forty active wells located within the basin. Most of these are concentrated within the central and southwestern portions of the basin, and most are equipped with windmills. Many are small producers with discharge rates of but a few gallons per minute, but others have been tested at rates varying from a few gallons per minute to 550 gallons per minute. One large irrigation well drilled adjacent to the basin in 1954, produces about 600 gallons per minute. This well produced about 1,000 gallons per minute under test at the time of drilling. This well is unusual in that it was drilled in crystalline rocks which are generally nonwater-bearing. The well is believed to penetrate fractures or a fault from which its source of water is derived.

Domenigoni Basin

Domenigoni Basin is an irregularly shaped southwesterly trending valley, which is approximately four miles in length and averages about one mile in width. It is an erosional feature, covering an area of approximately 3,000 acres situated about two and one-half miles south of the town of Winchester. In general, the valley floor slopes toward the southwest, with surface elevations varying from 1,530 feet at the northeast extremity of the valley, to about 1,440 feet at the southwest edge.

The basin is composed of Recent alluvium. It is flanked on the north and south by hills of Paleozoic schist and quartzite, except for the western section where the bordering hills on the north and south are largely composed of Cretaceous Domenigoni Valley granodiorites. The basement complex forming the floor of the valley comprises granodiorite, schist, and quartzite. Spurs of granodiorite and a low alluvial divide separate Domenigoni Valley from Menefee Valley to the west. A constriction in the bordering highlands separates Domenigoni Basin from Diamond Basin to the east. Geologic Section B-B' on Plate 14 depicts geologic characteristics of Domenigoni Valley.

Wells in the basin obtain their supplies of ground water from the alluvial fill. Some wells penetrate the underlying basement rocks for short distances, but it is not likely that any significant yields are obtained from the bedrock. Wells are recharged by precipitation upon the valley floor and percolation of runoff from the surrounding slopes.

Information on the characteristics of water wells in Domenigoni Valley is very scanty, but records available show that the maximum depth of wells is about 150 feet. Yields in the range of 500 to 1,000 gallons per minute have been obtained with specific capacities of about 30 to 50.

The direction of ground water movement is depicted by contours on Plate 11B. In general the flow is westerly conforming with the slope of the valley floor.

Murrieta Basin

This basin lies within Murrieta graben, and, as herein designated, includes a section of the graben approximately eight miles in length extending from a point 3.7 miles northwest of Murrieta to a point one mile southeast of Temecula. The basin surface, which trends in a northwesterly direction, covers an area of about 4,400 acres and reaches its greatest width of about 1.3 miles in the vicinity of Murrieta. It is drained by Murrieta Creek, which flows to the southeast joining Temecula Creek to form the Santa Margarita River near Temecula. Principal tributaries of Murrieta Creek are Warm Springs and Santa Gertrudis Creeks which enter the valley from the northeast, and Cole Canyon Creek, which flows into the valley from the southwest.

The basin, which is filled chiefly with Recent alluvium, is adjointed by areas of older alluvium on the northeast and southwest. Older alluvium is also found underlying the Recent sediments. Murrieta Basin is separated from Wildomar Basin to the northwest by a constriction in the bordering hills of older alluvium. It is separated from Santa Gertrudis Basin by the Wildomar fault.

Murrieta graben is bounded on the northeast by the Wildomar fault and on the southwest by the Willard fault zone, both of which are apparently high angle normal faults. Present features of Murrieta graben were formed at about the end of Pleistocene time. However, the major vertical movements took place in middle Pleistocene time probably during the Pasadenan orogeny. Faulting, especially along the Wildomar fault, has continued to the present.

The Willard fault zone, named by Engel[9], marks the northeast boundary of the Elsinore Mountains and Santa Rosa plateau. Although shown as a single fault, its extension into the Murrieta region appears as a zone of faulting. The Willard fault zone trends about N 45° W and is one of the most persistent zones of the Elsinore fault system.

The Wildomar fault was also named by Engel[9]. It extends southeast beyond Murrieta Basin into Wolf Valley. Gouge zones on this fault are nearly vertical.

In the Vernard oil test well (7S/3W-21H1), basalt, which was extruded in late Pliocene time, was encountered at a depth of about 2,450 feet or 1,350 feet below sea level. This basalt has been correlated by Mann[19] with the Santa Rosa basalt which caps Mesa de Burro southeast of Murrieta at an elevation of 1,950 feet. The relative vertical displacement of the basalt between the two points described is therefore 3,300 feet. Geologic features of Murrieta Valley are depicted on geologic sections A-A', J-J', and K-K' on Plates 14, 16, and 17, respectively.

As previously indicated in the discussion of geologic history, stream piracy has been a significant process in this area. After the Murrieta graben was formed, the Santa Ana River developed a subsequent tributary down the Elsinore trough and captured the San Jacinto River and Temecula Creek. Later, the ancestral Santa Margarita eroding headward at Temecula Canyon, captured Temecula Creek and reversed the direction of drainage down Murrieta graben, forming a prominent elbow of capture near Temecula Canyon.

Ground water occurs within both the Recent and older alluvial deposits. Wells 120 feet deep or less draw from the Recent deposits. Those of greater depth may be supplied from both Recent and older alluvium.

About 110 active wells were located during the field canvass of the basin. These wells vary in depth from about 25 to about 450 feet. Twenty-three of these are irrigation wells with capacities ranging from about 100 to 450 gallons per minute; whereas the remainder are wells of small yield utilized chiefly for domestic or stockwatering purposes. Specific capacities range from one to about forty, the average value being approximately nine.

Direction of ground water movement is depicted by contours on Plate 11B. In general, the direction of subsurface flow conforms roughly with that of surface runoff, converging toward Murrieta Creek from the north and south and thence moving eastward toward Temecula Canyon. Ground water in the older alluvium to the northeast of the basin moves in a southwesterly direction toward the basin. This flow is impeded by the Wildomar fault which acts as a ground water barrier near the easterly end of the basin. At Santa Gertrudis Creek, ground water impounded behind this fault rises to the surface and flows from several springs. The alignment of these springs clearly marks the surface trace of the Wildomar fault, which is made even more conspicuous by the presence of clumps of native phreatophytes which thrive along the northerly edge of the fault where depth to ground water is shallow.

Pauba Basin

West of Vail Reservoir, Temecula Creek emerges from the rock walls of Nigger Canyon into a region underlain by poorly consolidated older alluvium. Commencing at this transition the stream has cut a broad flood plain into the older alluvium which extends southwesterly to the Murrieta graben. This flood plain, approximately three quarters of a mile in width, six and one-half miles in length, and having an area of about 3,000 acres, constitutes Pauba ground water basin. The basis is bounded on the east by impervious igneous and metamorphic rocks, on the northwest and southeast by older alluvium, and on the southwest by the Wildomar fault.

The floor of the basin comprises alluvial gravel, sand, and clay deposited in Recent geologic time. The depth of this material, as estimated from the logs of wells, averages about 170 feet. Elevations range from 1,020 feet at Wildomar fault to 1,300 feet at the mouth of Nigger Canyon.

The Recent alluvium is underlain by older alluvium consisting of gravels, sands, and clays generally more consolidated than the Recent materials and consequently less permeable. The thickness of older alluvium increases in a southwesterly direction being 510 feet at well 8S/2W-12H1 near the head of the basin and in excess of 2,471 feet at well 8S/2W-17M1 near the west end of Pauba Valley at which point it was not encountered during drilling of the well. These features are shown on geologic sections G-G' and H-H', Plate 16.

Crystalline igneous and metamorphic rocks lie subjacent to the sedimentary formations in and adjacent to Pauba Basin. These rocks are massive where exposed in neighboring highland areas and are therefore presumed to constitute an impermeable basement where they underlie the basin.

Ground water occurs in both the Recent and older alluvium. In the Recent deposits, it occurs as free ground water; whereas in the older alluvium it is confined. The area of confined water is limited to the westerly two-thirds of the basin as indicated on Plates 10B and 11B. In this area the older alluvium consists of an upper confining bed comprising clay and sandy clay with small lenses of sand and gravel, which is underlain by a more permeable zone from which the confined water is obtained. At the present time there are five flowing wells in this area. These wells are 8S/2W-15C1, 16A1, 16G1, 17G1, and 17M1. Well 8S/2W-12H1 evidentally obtains water from the confined zone since it flows intermittently. Although there is a paucity of well logs in the easterly third of the basin, the data available suggest that the area serves as a forebay recharged by percolation from Temecula Creek and through which the pressure aquifers are supplied.

The Wildomar fault, which forms the southwestern boundary of the basin, is a high angle normal fault. Deep wells drilled on the northeast side of this fault yield flowing water; whereas on the southwest side no successful wells are in existence. This observation suggests that the fault forms a ground water barrier which prevents appreciable recharge of the deep sediments situated on its downstream side. On the other hand the fault appears to have no appreciable effect on underflow through the shallower Recent alluvium. Flow in Temecula Creek progressively increases with distance downstream. This increase in flow has been observed to continue for considerable distance downstream from the fault indicating that underflow must be crossing the fault in the Recent alluvium and rising in the stream bed on the downstream side.

Ground water moves in a southwesterly direction through

Pauba Basin. Directions of flow in the shallow, free ground water zone and in the deeper zone of confined ground water are depicted by separate sets of ground water contours on Plates 10B and 11B.

The older alluvium which flanks Pauba Basin on the northwest and southeast consists of interfingering lenses of sediments. Some of these lenses are known to be moderately permeable since they supply deep windmill wells located in the hills on either side of the basin. In effect these lenses constitute conduits through which ground water may either escape from or enter the basin depending upon the direction of the ground water slope existing at any particular time. Because of the irregular shape of these lenses, their heterogeneous composition, and unknown areal extent, the evaluation of the leakage through them becomes a complex problem. No evaluation was made of such flow in this investigation.

Fifteen active wells have been located within the basin. Nine of these are large irrigation wells, of which two are artesian. Pump tests showed that well 8S/2W-11J4 yielded 1,025 gallons per minute and well 8S/2W-20C1 yielded 1,750 gallons per minute with a specific capacity of 70.

The Pauba Valley artesian wells were reported by Waring[26] to have flowed at a rate of about 200 gallons per minute in 1915. One of the wells, 8S/2W-15C1, flowed at the rate of 210 gallons per minute in January, 1951. Artesian well 8S/2W-17M1, adjacent to the Pauba Basin boundary, produced a maximum stabilized discharge of 2,326 gallons per minute during pump tests of August 3 through 6, 1951. Prior to the pump test, the artesian flow stabilized at about 400 gallons per minute. Four days after the pump tests, the well flow stabilized at about 250 gallons per minute.

Santa Margarita Coastal Basin

The San Margarita Coastal Basin underlies the irregularly-shaped flood plain of the Santa Margarita River in the coastal portion of the watershed. The basin surface covers an area of about 4,200 acres, and in general slopes southwesterly, surface elevation ranging from about 140 feet at the upper end to about 10 feet at the lower.

The basin is bounded on the north by hills of igneous rocks, which have residual soils developed upon them, on the east and west by sediments of the La Jolla formation, and on the south by San Onofre breccia. The boundary rocks are largely non-water-bearing.

The basin is constricted at two places, as shown by the delineation of the basin boundary on Plate 10A. For convenience in estimating storage capacity, the basin was considered as divided into three interconnected sub-basins, named Upper, Chappo, and Ysidora, respectively. A third constriction, known as Ysidora Narrows, is located at the downstream extremity of Ysidora Sub-basin and defines the downstream basin boundary. The stream bed again widens downstream from the narrows to form a broad alluvial flat, but this is not considered as part of the ground water basin since the saline character of the ground water contained therein prevents its use for domestic or irrigation purposes.

The three sub-basins are filled with alluvium varying in maximum depth from about 140 feet in Upper Sub-basin to about 200 feet in Ysidora Sub-basin. Materials underlying Upper and Chappo sub-basins consist of stringers and lenses of unconsolidated clay, silt, sand, gravel, and cobbles. Ysidora Sub-basin includes two lithologic units: a lower permeable member, and an overlying less permeable member. These features are illustrated on geologic cross section L-L', Plate 17. The permeability of the sediments which flank the basin on either side is variable, although generally much less than that of the alluvium. Surface outcrops of these formations consist chiefly of fine sediments, largely marine sands, shale, and clay. Logs of water wells show that the formations subjacent to the basin consist of similar materials. These formations do not appear to be completely impermeable, however, movement of ground water through them is undoubtedly quite slow.

The following are results of available pump tests made on wells in the basin:

Santa Margarita Coastal Basin
Water Well Yields

Sub-basin	Number of wells tested	Average yield of wells in gpm	Specific capacity
Upper	2	200-350	3.8-7
	1	1,980	220
Chappo	4	600-900	19-50
	2	1,600	97-121
	1	1,300	31
Ysidora	7	1,800	100

Direction of movement of ground water is indicated by ground water contours on Plates 10 A and 11 A.

8. PROCEDURE FOR ESTIMATING GROUND WATER STORAGE CAPACITY

Estimates of storage capacity were derived for each of the designated ground water basins within the watershed. Results are set forth in Table B-3. The method of compiling these estimates is discussed briefly in the following paragraphs.

In general, the procedure adopted followed that prescribed by the Division of Water Resources in its South Coastal Basin Investigation[3]. Briefly, this method entailed estimating the volumes of various sedimentary types such as sand, gravel, clay, etc., occurring within appropriate depth intervals in each basin, multiplying each of these volumes by an appropriate weighted specific yield factor to obtain the volume of extractable water contained in each interval and finally summing the capacities of each interval to obtain the total storage capacity of the basin. Specific yield is defined herein as the volume of extractable ground water obtained from a unit volume of material expressed as a percentage of the volume of the material.

The logs of water wells provided the information upon which the storage capacity estimates were based. Clay, sand, and gravel and numerous gradations between these types were recognized on most logs. Some logs reported as many as 20 different types of material. In order to estimate the storage capacities of individual sedimentary types, it was first necessary to assign a specific yield value to each type appearing on the logs. The values assigned are those set forth in Table B-4 and were derived largely from laboratory determinations made at the time of the South Coastal Basin Investigation[3].

Estimates of the storage capacities of ground water basins are necessarily approximate because of inherent difficulties in extending data from relatively few wells to apply to entire basins. The results, however, are believed to be useful and to reasonably represent the physical situation under the stated assumptions.

TABLE B-4

ASSIGNED SPECIFIC YIELD VALUES

Type	Description of material		Specific yield value assigned
Clay	Carbonaceous-silt Decomposed granite Hill formation	Hard pan Adobe	1
Soil	Loam Lake bed		4
Clay-sand	Sand and clay Muck Sea mud and packed sand Silty clay Clay with lime rocks	Cement Sandy clay Cemented sediment	5
Silt	Sandy soil		10
Sand	Fine sand	Coarse sand Quicksand	28
Tight Sand	Sandy-soil Silty-sand Unsorted angular sand Sand with trace of clay Sand and mud	Cemented sand Dirty sand	16
Gravel	Gravel and sand Boulders Cobbles and sand Fill		22
Tight Gravel	Cemented gravel Gravel with clay layers Dirty gravel	Sandy clay with gravel Packed sand with rocks	15
Gravel Clay	Conglomerate (partially cemented) Clay and boulders		7

APPENDIX C

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Soil and Water Conservation Research Branch
Western Soil and Water Management Section

CONSUMPTIVE USE OF WATER IN THE SANTA MARGARITA RIVER BASIN, CALIFORNIA

(A report based on data collected under a cooperative agreement between the United States Department of Agriculture and the State Engineer of California, Division of Water Resources, Department of Public Works)

Los Angeles, California
December, 1954

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FOREWORD

This study was initiated at the request of the State Engineer of California and has been conducted under a cooperative agreement between the Soil Conservation Service, United States Department of Agriculture, and the Division of Water Resources, Department of Public Works, State of California.

On August 1, 1952, a joint working plan was completed by members of the staffs of the Division of Irrigation Engineering and Water Conservation of the Soil Conservation Service and of the State Engineer of California. The objectives set forth in the plan were as follows: (1) To determine the consumptive use of water by agricultural crops, native vegetation and other water-consuming areas and (2) To obtain information on farm irrigation use.

The results of the cooperative studies made under this agreement during the years 1952 and 1953 were presented in a provisional report entitled "Irrigation and Consumptive Use of Water Investigations in the Santa Margarita River Basin, Riverside and San Diego Counties, California" by William W. Donnan and G. Marvin Litz.

After reviewing this report, the State Engineer requested that it be condensed. The following report entitled "Consumptive Use of Water in the Santa Margarita River Basin, California" by Harry F. Blaney and Gilbert L. Corey, is a revision of the previous provisional report.

Harry F. Blaney
State Research Supervisor

LIST OF TABLES

APPENDIX

APPENDIX
(continued)

ACKNOWLEDGMENTS

Much of the field work connected with this investigation was carried on by the Santa Margarita staff of the California State Division of Water Resources, consisting of Leland Illingworth, Keith Tranbarger, James Jackson, Paul Erb, and Joseph Leitzinger.

Acknowledgment is made of the valuable assistance rendered by V. S. Aronovici, Soil Scientist of the Agricultural Research Service, United States Department of Agriculture, on the soils and laboratory phases of the investigation.

Aerial photographs and other data furnished by Earl Shade, Work Unit Conservationist of the Soil Conservation Service, is hereby acknowledged.

Evaporation and other climatological data furnished by the Ground Water Resources office of the Camp Pendleton Marine Base and the Metropolitan Water District of Southern California are hereby acknowledged.

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CONSUMPTIVE USE OF WATER IN THE SANTA MARGARITA RIVER BASIN, CALIFORNIA[1]

INTRODUCTION

This report is a contribution to an investigation initiated by the State Engineer of the Division of Water Resources, Department of Public Works, involving an inventory of the water supply of the Santa Margarita River watershed in Riverside and San Diego Counties, California.

Because of experience accumulated by the Division of Irrigation Engineering and Water Conservation of the Soil Conservation Service[2], United States Department of Agriculture, along similar lines in other regions (1, 2)[3], its entry into the investigation was brought about under provisions of a formal agreement of long standing between the two agencies. Under this agreement, the Division of Irrigation Engineering and Water Conservation undertook to determine rates of consumptive use of water by agricultural crops and native vegetation and other factors needed to determine ultimate water requirements and safe yield of the basin.

1/ A revision of provisional report entitled, "Irrigation and Consumptive Use of Water Investigations in the Santa Margarita River Basin, Riverside and San Diego Counties, California", (April, 1954) by William W. Donnan, Drainage Engineer, and G. Marvin Litz, Associate Irrigation Engineer; prepared by Harry F. Blaney and Gilbert L. Corey, Irrigation Engineers; Western Soil and Water Management Section, Soil and Water Conservation Research Branch, Agricultural Research Service, U.S. Department of Agriculture, Los Angeles, California, December, 1954.

2/ On January 1, 1954, the activities of this division were transferred to Western Soil and Water Management Section, Soil and Water Conservation Research Branch, Agricultural Research Service, U. S. Department of Agriculture.

3/ Numbers underscored in parentheses refer to LITERATURE CITED at end of report.

Prior to the present investigation, informal cooperation on the installation and operation of evaporation stations had been started at the request of the Marine Corps of the United States Navy, Camp Pendleton Marine Base. Equipment was loaned and assistance rendered in establishing two evaporation stations in the basin. These stations were located at O'Neill Lake on the Camp Pendleton Marine Base, and Vail Reservoir on the Pauba Ranch.

In the fall of 1952, a reconnaissance field trip was made of the Upper Santa Margarita River watershed for the purpose of locating sites for three additional evaporation stations in cooperation with the Los Angeles office of the State Engineer. Sites were selected and stations were established at Anza, Murrieta, and Oakgrove Valley.

Observations at these three stations on evaporation, precipitation, temperature, and wind movement were begun in February, 1953. These data, together with data collected from stations at Vail Reservoir and O'Neill Lake, have been used in this report in connection with determining evapo-transpiration rates and coefficients for the consumptive-use formula.

In March, 1953, a program of soil moisture sampling was started on a series of representative plots in the irrigated area of the basin. A soil moisture field laboratory was established in Murrieta and equipment to carry on the field work was assembled. The purpose of this program was to make field measurements of consumptive use of water by various irrigated crops in the basin. At the same time, a 1.3-mile section of Temecula Creek was chosen as the site for a study of consumptive use of water by riparian native vegetation during the summer months.

Most of the field observation connected with these studies were made by engineers of the staff of the State Division of Water Resources at Murrieta. Some of the laboratory analyses of soils, such as volume weights, were made in the Division of Irrigation Engineering and Water Conservation laboratory at Pomona, California.

At various times throughout the summer irrigation season, checks and analyses were made of irrigation practices, duty of water, and efficiency of irrigation on various plots. In November, 1953, the soil moisture sampling of the irrigated plots was completed. This report presents an analysis of the above data, together with estimates of the unit values of evaporation and consumptive use of water in the various sub-basins.

DESCRIPTION OF THE AREA

The Santa Margarita River Basin is located in Riverside and San Diego Counties. Figure 1[1/] is a map of the watershed. This

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[1/] **Figure 1 not reproduced; see Plates 21A and B, Diversion Systems and Irrigated and Irrigable Lands, bound in Santa Margarita River Investigation, Volume I, for location of climatological stations, and consumptive use study plots. Sub-basins are located on plates in accordance with the following tabulation:**

Subdivisions of Santa Margarita River Watershed

Appendix C Area	Designation on Plates 21A and B	
	Area	Hydrographic unit
Upper Sub-basin (Anza)	Inland	Portions of Nos. 2 and 3 above elevation 3,000 feet
Intermediate Sub-basin (Murrieta-Temecula)	Inland	Nos. 1 and 4 and portions of Nos. 2 and 3 below elevation 3,000 feet.
Lower Sub-basin	Coastal	Nos. 5 and 6.

Note: Areas in Hydrographic Units Nos. 2 and 3 having elevations above 3,000 feet are roughly those in Range 2 East and easterly and all those within San Diego County, except portions of Oakgrove Valley and areas downstream therefrom, along Temecula Creek.

watershed covers an area of about 740 square miles and is divided into upper, intermediate, and lower sub-basins by topographic and climatic features. The upper sub-basin is considered to be that portion of the watershed inland from the coastal mountains which is 3,000 feet above sea level or higher. Temecula Creek, Coahuila Creek, and Wilson Creek have their origin in the Palomar, Warner, and Coahuila Mountains, and drain the upper sub-basin, a region of high mountain valleys separated by rocky granitic ridges and low hills. The intermediate sub-basin comprises the remainder of the inland area. It is drained by lower Temecula Creek and Murrieta Creek and its tributaries, Warm Springs and Santa Gertrudis Creeks, which drain the Murrieta Valley and adjacent extensive area of low hills. The intermediate sub-basin ranges in elevation from about 1,000 to 3,000 feet above sea level. The Santa Margarita River proper is formed at the junction of Temecula and Murrieta Creeks. The river enters Temecula Canyon and flows down a precipitous gorge to the long narrow valley of the lower sub-basin. Much of the lower sub-basin, or coastal area, is in the Camp Pendleton Marine Base. The Santa Margarita River flows into the Pacific Ocean about five miles north of the City of Oceanside, California. The basin contains portions of the Elsinore-Murrieta-Anza, Upper San Luis Rey, and San Jacinto Soil Conservation Districts.

Soils

The soils of this watershed are predominantly derived from acid igneous granodiorites. Variations in physiography and relief have produced a wide range in soil profile characteristics. Soils of this watershed have been mapped by the United States

Department of Agriculture, Bureau of Soils (8,11). At the present time, parts of this watershed are being surveyed in detail by the Soil Conservation Service.

From a soils standpoint, the area may also be divided roughly into three regions:

First, the coastal region consisting of coastal terrace soils of relatively poor quality, having moderately to strongly developed clay subsoil. Where the river and tributary streams have cut down into the terraces, recent alluvial soils of the Hanford series are found. Some sandy soils formed on old shore lines are found directly east from the coast line.

Second, the residual soils found on the rolling-to-mountainous lands. Here the productive Vista and Fallbrook series are formed directly on deeply weathered granodiorites. These soils are intensively cultivated on the gentler slopes, and where water is available.

Third, the interior valleys and plains. This zone is quite variable. In the vicinity of Temecula, very old terrace soils having moderately to strongly developed clay subsoils and hardpan, including the Ramona, Placentia, and Monserate series. There are minor areas of so-called badlands in the Vail Lake region. In the vicinity of Anza, a soil classified as Calvista is now being mapped. This soil is similar to the Vista series, but reflects the lower rainfall of the interior valleys.

Land Use

The present land use of the Santa Margarita River

Basin is typical of the coastal and inland valleys of the Southern California region. A major portion of the lower sub-basin is occupied by the Camp Pendleton Marine Base. Some of these lands are leased to private operators for truck and citrus production. The area around Fallbrook contains extensive acreages devoted to avocado and subtropical fruits. In the intermediate subbasin a large portion of Temecula Creek Valley is occupied by the Pauba Ranch of the Vail Estate and most of the irrigated area is devoted to alfalfa and forage crops. Murrieta Creek watershed contains the largest area of small irrigated ranches devoted primarily to alfalfa, irrigated pasture, truck and deciduous fruits. The balance of the basin, aggregating nearly two-fifths of the watershed area, consists of brush and woodland range, dry-farmed grain, and in the valley bottom lands small fertile areas of irrigated crops, mostly alfalfa, irrigated pasture, and some seed crops.

The State Division of Water Resources is completing a land use survey of the Santa Margarita River watershed for inclusion in its overall report of the basin.

Climate

The climate of the Santa Margarita Watershed is characterized by warm, dry summers and cool, rainy winters. The area immediately adjacent to the ocean is visited by heavy summer fogs which contribute to the humidity and aid in the production of some crops.

Temperature and Precipitation

The upper basin averages two to five degrees warmer than the lower basin during the summer months and five to ten degrees cooler during the winter months. The prevailing wind is from the west. However, occasionally, hot, dry winds sweep in from the eastern desert areas and affect the temperatures of the upper and intermediate areas.

Most of the rainfall comes during December, January, February, and March. The total precipitation gradually increases with increased elevation to the east. Along the coast, the average annual precipitation is about 12 inches; at Fallbrook, elevation 750 feet, the average is about 17 inches; while in the upper sub-basin mountain area the annual average aggregates 25 to 30 inches. In most of the interior valleys the rainfall averages from 14 to 16 inches on the valley floor.

Long-term temperature and precipitation records are available from the published data of the United States Weather Bureau for the following observation stations:

Escondido Church Ranch: Elevation 715 feet, frost-free period March 9 to November 25, with a 36-year record representing the approximate long-term mean temperature of the lower sub-basin and coastal areas.

Elsinore: Elevation 1,300 feet, frost-free period March 12 to November 20, with a 54-year record representing the approximate long-term mean temperature of the Murrieta Valley, Temecula Valley, and Pauba Valley areas of the intermediate sub-basin.

Warner Springs Ranch: Elevation 3,180 feet, frost-free period April 29 to October 29, with a 47-year record representing the approximate long-term mean temperature of the higher elevation and mountain areas of the upper sub-basin.

A summary of these records appears in Table C-1.

Table C-1 Long-term mean monthly temperature and precipitation records at Escondido Church Ranch, Elsinore, and Warner Springs Weather Bureau Stations.

Month	Escondido Church Ranch 1/		Elsinore 2/		Warner Springs 3/	
	Mean temperature	Mean precipitation	Mean temperature	Mean precipitation	Mean temperature	Mean precipitation
	°F	Inches	°F	Inches	°F	Inches
January	51.0	3.43	50.2	2.71	46.5	3.20
February	52.6	3.54	52.5	2.88	47.8	3.43
March	55.2	2.77	55.6	2.42	50.4	2.62
April	58.3	.80	60.0	.80	53.9	1.30
May	62.6	.60	65.3	.31	58.6	.52
June	67.2	.09	71.8	.03	65.9	.07
July	71.9	.03	78.5	.06	73.9	.52
August	72.2	.13	78.2	.15	73.4	.95
September	69.0	.16	73.6	.27	68.6	.43
October	63.1	.79	65.7	.64	60.9	.86
November	57.3	1.15	57.7	.83	53.8	1.08
December	52.2	2.83	51.8	2.45	48.1	3.26
Annual	61.0	16.32	63.4	13.55	58.5	18.24

1/ Means based on a 36-year record.

2/ Means based on a 55-year record.

3/ Means based on a 46-year record.

EVAPORATION STUDIES

The only reliable long-term evaporation records for adjacent areas, continuous up to the present date, are those for San Jacinto and Chula Vista. Additional fragmentary records covering shorter periods are available for Lake Elsinore and Lake Henshaw.

New Evaporation Stations

In order to provide additional meteorological data for the Santa Margarita River Basin, a number of additional observation stations have been established in the area.

In 1952, equipment was loaned and assistance rendered to the Marine Corps, U. S. Navy, to establish evaporation stations at O'Neill Lake at Camp Pendleton and the Vail Reservoir on the Pauba Ranch. A standard Weather Bureau Class A evaporation station was established at each site. Observations were made by personnel at the Marine Base.

In the winter of 1952-53, sites were chosen for three more evaporation stations in the intermediate and upper sub-basins. The location of these three stations were as follows:

1. Anza Station, located in the crossroads settlement of Anza to represent evaporation and climatic conditions in the high mountain valley areas of the watershed.

2. Oakgrove Station, located at the Oakgrove Forest Fire Guard Station, to represent the evaporation and climatic conditions in the mountain watershed areas.

3. Murrieta Station, located on the southeast edge of Murrieta to represent the evaporation and climatic conditions in

the major irrigated region of the watershed area.

The meteorological observations at all these stations are summarized in Tables C-2, C-3, and C-4.

FIELD CONSUMPTIVE USE STUDIES

Various methods have been used to determine the amount of water consumed by agricultural crops and native vegetation in a specific basin or watershed. Actual measurements can be made using field plots in the area being investigated, or measurements made in other areas can be transferred to a given area by a method developed by Blaney and Criddle (3). For this investigation, it was felt advisable to make plot studies on some of the most predominant irrigated crop types and to augment these actual measurements by translocation of measured data from adjacent areas.

Table C-2 Mean monthly temperatures at Evaporation Stations in Santa Margarita River Basin, California.

Month	Location of station										
	Anza		Oakgrove		Murrieta		Vail Lake			Lake O'Neill	
	Mean temperature		Mean temperature		Mean temperature		Mean temperature	Mean temperature		Mean temperature	
	1953	1954	1953	1954	1953	1954	1952	1953	1954	1953	1954
January	--	44	--	50	53.0 1/	50	--	--	52	--	51
February	44.5	52	42.5	56	53.0 1/	57	--	--	58	--	59
March	47.0	45	50.0	50	54.0 1/	53	--	57.0	52	57.0	53
April	48.5	56	52.0	60	54.5	60	56.0	57.0	60	61.0	57
May	50.5	60	56.0	63	58.5	64	66.0	61.0	64	61.0	60
June	62.0	--	66.0	--	65.5	68 2/	63.0	73.0	67	68.0	63
July	77.0	--	79.0	--	75.5	79 2/	74.0	79.0	79	74.0	72
August	71.5	--	74.0	--	73.0	72 2/	76.0	77.0	72	72.0	69
September	69.5	--	72.0	--	70.5	71 2/	74.0	75.0	74	71.0	67
October	58.5	--	62.5	--	65.0	64 2/	--	67.0	65	69.0	61
November	53.0	--	57.5	--	58.5	59 2/	--	60.0	58	64.0	60
December	46.5	--	52.0	--	51.0	51 2/	--	56.0	53	54.0	55

1/ Estimated from Elsinore Station.

2/ From U.S.D.A., Soil Conservation Service, Murrieta, California.

Table C-3 Monthly precipitation at Evaporation Stations in Santa Margarita River Basin, California

Month	Anza		Oakgrove		Murrieta		Vail Lake			Lake O'Neill	
	Inches		Inches		Inches		Inches	Inches		Inches	
	1953	1954	1953	1954	1953	1954	1952	1953	1954	1953	1954
January	--	4.08	--	5.59	0.82	5.77	--	0.55	3.70	--	4.25
February	0.62	1.72	0.82	2.78	0.52	2.80	--	0.45	1.66	--	1.84
March	1.18	4.03	1.53	5.36	1.12	4.05	--	1.17	5.04	0.21	3.47
April	1.40	0.09	1.03	0.00	0.74	0.08	2.16	0.24	T	0.59	0.14
May	0.17	0.11[1]	0.02	0.00	0.01	0.00	0.00	0.04	0.01	0.21	0.00
June	0.00	0.00[1]	0.00	0.02	0.00	T[2]	0.00	0.00	0.00	0.00	0.06
July	0.00	--	1.37	--	T	0.00[2]	0.09	T	0.16	0.00	0.37
August	0.00	--	0.00	--	0.00	0[2]	T	0.00	0.00	0.00	T
September	0.00	--	0.00	--	0.00	0[2]	1.30	0.00	0.09	0.00	0.00
October	0.40	--	0.52	--	0.21	0[2]	0.00	0.67	T	0.16	T
November	0.45	--	0.56	--	0.69	2.45[2]	3.08	0.44	1.33	0.64	1.25
December	0.39	--	0.03	--	0.10	0.93[2]	2.51	0.03	0.71	0.14	0.78

1/ Partly estimated.

2/ From U.S.D.A., Soil Conservation Service, Murrieta, California.

Table C-4 Monthly evaporation from Weather Bureau pans in Santa Margarita River Basin, California

Month	Anza		Oakgrove		Murrieta		Vail Lake			Lake O'Neill	
	Inches		Inches		Inches		Inches	Inches		Inches	
	1953	1954	1953	1954	1953	1954	1952	1953	1954	1953	1954
January	--	3.35 1/	--	--	2.34 1/	2.74 1/	--	3.75 1/	2.52	--	2.21
February	3.80	5.74	3.43 1/	4.39 1/	3.10	3.61	--	--	4.82	--	4.57
March	5.23	4.64	4.49	4.38 1/	4.64	3.30	--	6.37	3.43 1/	4.65	3.93 1/
April	5.15	7.09	4.11	5 57	5.36	5.39	5 67	5.45	6.48	4.91	4.75
May	7.71	8.25 1/	7.57 1/	7.95 1/	8.42	7.18 1/	9.17	8.48	7.98	7.60	6.09
June	9.76	--	9.12	--	9.82	7.53 2/	8.94	10.10	9.34	6.59	7.86
July	11.68	--	11.27	--	11.64	9.16 2/	11.41	12.95	11.05	8.66	8.24
August	12.13	--	10.81	--	10.41	6.67 2/	11.92	11.56	9.56	8.49	8.07
September	9.93	--	8.88	--	8.52	7.71 2/	8.54	9.52	7.98	5.41	6.60
October	7.81	--	6.27 1/	--	6.61	4.91 2/	7.00	6.63	6.67	6.08	5.16
November	4.72	--	4.05 1/	--	4.04	3.01 2/	4.22 1/	4.35	4.03	3.58	3.80
December	5.45	--	4.24	--	4.33	2.24 2/	2.65	4.34	3.50	4.27	2.92

1/ Partly estimated.

2/ From U.S.D.A., Soil Conservation Service, Murrieta, California.

Irrigated Crops

In the spring of 1953, a soil moisture field laboratory was established at Murrieta. Sites were selected for making plot studies of consumptive use of various crops. Figure 1[1] shows the location of the various plots. The following tabulation gives a general description of the plots selected:

Plot No.	Location 2/	Owner	Nearest town	Crop	Method of irrigation
1	T9S-R3W-19C	Anderson	Fallbrook	Avocados	Sprinkler
2	T7S-R4W- 1E	Freeman	Wildomar	Irrig. pasture	Sprinkler
3	T7S-R4W- 1M	Freeman	Wildomar	Alfalfa	Sprinkler
4	T7S-R3W- 7R	Morrow	Murrieta	Romaine	Furrow
5	T7S-R3W-18A	Morrow	Murrieta	Lettuce	Furrow
6	T7S-R3W-17D	Morrow	Murrieta	Melons	Furrow
7	T8S-R2W-18Q	Pauba Ranch	Temecula	Peaches	Furrow
8	T8S-R2W-20K	Pauba Ranch	Temecula	Carrots	Furrow
9	T8S-R2W-11M	Pauba Ranch	Temecula	Alfalfa	Border check
10	T7S-R1E- 7D	Tucalota Ranch	Sage	Irrig. pasture	Sprinkler
11	T8S-R1E-33F	Trunnell	Aguanga	Alfalfa	Sprinkler
12	T7S-R3E-20J	Pursche	Anza	Irrig. pasture	Border check
13	T7S-R3E-21G	Westphalen	Anza	Seed alfalfa	Sprinkler

2/Refers to township, range, section, and nearest 40 acres within the section.

Auger borings were made on each plot to determine depth of soil and at the same time in-place soil samples were extracted. These samples were analyzed in the Pomona laboratory by V. S. Aronovici for volume weight, field capacity, wilting point, and other characteristics of the soils. The in-place soil samples were obtained by using a Pomona-type coring device. The results of the volume weight measurements on the various plots are summarized in the following tabulation:

1/Figure 1 not reproduced; see Plates 21A and B, "Location of Diversions and Irrigated and Irrigable Lands" for location of consumptive use study plots.

Soil depth	Plot 1/ 1	2	3	5	6	8	9	10	11	12	13
Feet											
0-1	1.60	1.40	1.70	1.50	1.55	1.65	1.55	1.35	1.50	1.65	1.55
1-2	1.55	1.40	1.45	1.40	1.65	1.35	1.50	1.60	1.20	1.75	1.45
2-3	1.55	1.40	1.45	1.55	1.65	1.35	1.50	1.40	1.20	1.75	1.50
3-4	1.55	1.40	1.45	1.55	1.65	1.35	1.45	1.20	1.20	1.75	1.55
4-5	1.55	1.40	--	--	1.65	--	1.40	1.20	1.20	1.75	1.35
5-6	1.55	1.40	--	--	1.65	--	1.40	1.20	1.20	1.75	1.35

1/ Plots 4 and 7 were abandoned.

The periodic soil sampling for moisture depletion on the plots was accomplished by means of a modified Veihmeyer soil tube. Each plot was sampled to a depth of six feet in replicate. The replication was determined by the crop type and method of irrigation. On some plots, only four sampling holes were used while on other plots as many as nine holes were employed to obtain a representative sample of soil. On several plots, decomposed granite was encountered at four-foot depth and the sampling program was carried on only to that depth.

The soils were extracted in one-foot increments, placed in airtight soil cans, and brought to the laboratory for weighing. After weighing, the soils were placed in an oven and the moisture was driven off. Then the soils were reweighed and the percentage of moisture present was computed.

The percentage of soil moisture in the sample, on a dry-weight basis, was converted to inches of water by the formula:

$$I = \frac{Pw \times Vw \times D}{100}$$

Where I = Inches of water per unit depth of soil
Pw = Per cent soil moisture on a dry-weight basis
Vw = Volume weight of the soil
D = Depth in inches

Soil samples were obtained immediately prior to irrigation and as soon as practicable after irrigation. The differential between the post-irrigation soil moisture content and the next succeeding pre-irrigation soil moisture content represented the quantity of water depleted from the soil by the growing vegetation.

The field work on these plot studies was carried on by the State Division of Water Resources staff in Murrieta. Observations on plots 4 and 7 were discontinued early in the season because the owners stopped irrigating these plots. At the other 11 sites, the sampling program was carried through to completion in November, 1953, but late analysis indicated that conditions at plot 10 were not representative.

Results

The procedure for summarizing the data on these plots followed the general pattern used by the Division of Irrigation Engineering and Water Conservation in prior consumptive use investigations (2,5). On an individual plot, a composite was made of the soil moisture in one-foot increments and the loss of moisture (consumptive use) over the period between samplings was determined by taking into account root zone depth of the crop.

In some instances, it was apparent from the analysis of data that antecedent gravitational movement of soil moisture occurred in the fifth or sixth foot of the soil profile between samplings. Where this occurred, the gain or loss was deleted from both the pre-irrigation and post-irrigation sampling composites in order to reflect a more normal increment of consumptive use for the period. The controlling factor in making this adjustment was the mean daily rate of consumptive use which was obtained by dividing the total for the period by the number of days between sampling periods.

For the short periods before, during, and after irrigation when no measurements of moisture depletion were available, estimates were also dictated by the daily measured amounts preceding and following the water application period. Table C-5 is a summary of the consumptive use rates and coefficients (K), of the Blaney-Criddle formula, as measured on the plots. Appendix tables C-11 through C-20 give the individual data from each plot.

Riparian Vegetation

Due to the existence of an extremely favorable site on which to make observations, a field investigation was carried on to measure use of water by riparian vegetation in the upper sub-basin. Temecula Creek, above the Vail Reservoir, appears as rising water at the lower ends of a succession of small interior valleys separated by narrow confined rocky canyons. At a point near the end of lower Culp Valley, water rises to the surface and enters a narrow rock-walled canyon. Continuous flow at this point ranges from one cubic foot per second in the spring to 0.5 cubic foot per second in the late summer and early fall. The stream flows through this narrow section for approximately 1.3 miles before it is diverted for irrigation[1] at

[1] Diversion T8S/R1E-35M on Plate 21B.

Table C-5 Summary of consumptive use rates and coefficients (K) as measured on the field plots.

Crop	Location	Months inclusive	Consumptive Use (U) Inches	Coefficient (K)[1]
Avocados	Fallbrook	Apr.-Oct.	24.09	0.56
Alfalfa	Murrieta	Apr.-Oct.	27.44[2]	--
Irrig. pasture	Murrieta	Apr.-Oct.	35.89	0.85
Lettuce	Murrieta	Mar.-June	12.22	0.58
Melons	Murrieta	June-Sept.	18.10	0.68
Carrots	Temecula	May -Aug.	15.36	0.68
Alfalfa	Temecula	Apr.-Sept.	34.90	0.83
Alfalfa	Aguanga	Apr.-Oct.	35.80	0.85
Irrig. pasture	Anza	Apr.-Oct.	37.43	0.94
Alfalfa (seed)	Anza	Apr.-June	12.97	0.86[3]

1/ $K = \frac{U}{F} = \frac{\text{Consumptive use}}{\text{Consumptive use factor}}$ in the Blaney-Criddle formula $U = KF$

2/ Alfalfa had only a four-foot root zone due to barrier; therefore, the use was less than would be expected under normal conditions.

3/ Coefficient would be smaller if entire season for seed crop is considered.

the upper end of Aguanga Valley. In January, 1951, the State Division of Water Resources established a gaging station at the head of this reach upstream from Aguanga Valley. This station, located on Temecula Creek near Thurber Ranch, consists of a two-foot rectangular, sharp-crested weir placed on bedrock and equipped with a continuous flow, water stage recorder.

In the spring of 1953, a six-inch galvanized iron Parshall flume was installed on a bedrock site near the lower end of this canyon, immediately above the diversion, the purpose being to measure both inflow and outflow through the 1.3-mile section of the canyon and thus determine the stream depletion in the canyon. A float-operated water stage recorder was installed to gage flow through the flume and measurements were started in May, 1953. Figure 1 shows the location of this study.[1/]

The canyon floor of this reach of stream averaged from 35 to 100 feet in width. The watercourse consisted of a succession of rapids, falls, and pools, separated by long reaches of meander flow. There was a drop of about 240 feet in the 1.3-mile reach. Soils in the canyon consisted for the most part of sands, gravels, and boulder outcrops. There were no small side canyons and no evidence of inflow from the rock-walled sides throughout the reach of the measurements. Vegetation on the canyon floor consisted of native grass, weeds, and brush, together with willows, cottonwoods, and oak trees. The pools below the various falls

1/ Figure 1 not reproduced; see Plate 6, Hydrographic Map, for location of gaging station on Temecula Creek near Thurber Ranch (Temecula Creek near Aguanga) at stream mile 52.4 immediately above study site, which extends from stream mile 51.1 to stream mile 52.4.

were bordered by tules and sedges and the entire watercourse supports a dense growth of watercress. The canyon floor on which riparian vegetation was growing was estimated to aggregate 8.57 acres. The vegetation, while classed as dense, where it occurred was interspersed with sandbars and rocky outcrops. Thus, for the purpose of comparison it was classed as medium dense vegetation for this investigation.

Results

The daily measurement of use of water by the vegetation along the creek was determined by comparing the flow at the two measuring points. The daily rate of consumptive use varied from an average low of about 0.10 inch per day in May, to a high of over 0.50 inch per day during August. The following tabulation is a summary of the consumptive use by riparian vegetation on Temecula Creek:

Month	Inches
May (18-31)	2.40
June	4.59
July	10.16
August	13.37
September	5.33
October (1-17; 28-31)	2.12
Total for period	37.97

CALCULATED CONSUMPTIVE USE

Consumptive use of water includes all transpiration and evaporation losses from lands on which there is growth of vegetation of any kind, whether agricultural crops or native vegetation, plus evaporation from bare land and water surfaces(3).

The processes of evaporation from a free-water surface and plant transpiration are similar in that each is influenced by climatic conditions. The quantity of water transpired by plants depends on the amount of water at their disposal as well as on temperature and dryness of the air, sunlight, wind movement, and length of growing season (3).

Irrigated Crops

In order to secure optimum, long-term, mean values of consumptive use on the various land use classification, empirical techniques were utilized. These techniques have been used in similar cooperative investigations (7,9). On those crop types where plot studies were carried out, a comparison was made between the measured consumptive use for the 1953 season and consumptive use in other areas and the data modified to reflect long-range climatic conditions. On those crop types not studied by means of plots, consumptive use data were derived from investigations in other areas and translocated to the Santa Margarita Basin. This transfer was accomplished by comparing climatological data in the area under study. This widely used technique was first developed by Blaney and Morin (4) and later perfected by Blaney and Criddle (3). The Blaney-Criddle method employed the following relationships:

Where U = Consumptive use for period in inches

K = Empirical coefficient (growing period or irrigation season)

t = Mean monthly temperature in degrees Fahrenheit

p = Monthly per cent of daytime hours of the year

$f = \frac{t \times p}{100}$ = Monthly consumptive use factor

F = Sum of monthly consumptive use factors for the period

Thus when computing coefficient (K) for a crop at the location of measured consumptive use, the formula is as follows: $K = \frac{U}{F}$; and to establish consumptive use values for a new area, the formula is: $U = KF$ = Consumptive use, inches.

In order to reflect differences in temperature, rainfall, and frost-free period or growing season for the three hydrographic units of the Santa Margarita Basin, the three representative long-term records were used as follows: Escondido Church Ranch observations to reflect long-term climatic conditions in the lower sub-basin; Elsinore observations to reflect the long-term climatic conditions of the intermediate sub-basin (Murrieta-Temecula area); and Warner Springs observations to reflect the long-term climatic conditions of the upper sub-basin (Anza area).

The (K) values chosen for calculating the consumptive use were taken from values found in the field study (Table C-5) where possible. For crops not studied in the field trials (K) values were taken from values found in other areas (3).

Since the values found in the field plots apply only to the particular year and location of study, it was necessary to modify the values somewhat in order to apply to large areas and long-term means. As an example, the coefficient (K) for alfalfa as found at Temecula and Aguanga was approximately 0.85. However, observations on consumptive use of alfalfa in coastal regions where summer fogs prevail indicate that this value should be lowered. Therefore, a coefficient (K) of 0.75 was used for the lower sub-basin. In the upper sub-basin while the actual growing season is approximately seven months, April through October, the frost-free period ranges from April 29 to October 29 (29-year record at Warner Springs). Thus the coefficient (K) of 0.85 was modified to the value 0.80 for the upper sub-basin (Anza area). In the intermediate sub-basin (Murrieta-Temecula area), the observed (K) of 0.85 was used.

Tables C-6, C-7, and C-8 summarize the calculations of consumptive use on irrigated crops in the Santa Margarita watershed.

Dry-Farmed Crops

Consumptive use of water by dry-farmed crops is controlled by the climatic conditions and the water storage capacity in the root zone of the soil. A wet, rainy winter and spring season will provide ample moisture conditions and reflect a high consumptive use by vegetation. On the other hand, a dry winter and spring will reflect a low consumptive use.

Since seasonal rainfall has such a marked influence on the consumptive use, it is difficult to carry on soil moisture plot studies for only one season which would represent long-range conditions. Therefore, the average unit values of consumptive use for the nonirrigated land use classes have been derived by translocation of reliable measurements made elsewhere. The dry-farmed crops of the Santa Margarita Basin are beans and grain-hay.

Beans

The production of dry-farmed beans in the Santa Margarita watershed is dependent upon moisture stored in the root zone for growth and maturity. Since beans are susceptible to frost and require warm temperatures to attain optimum growth, they are

Table C-6 Long-term mean unit values of consumptive use of water by irrigated crops in the Coastal area[1] of the Santa Margarita watershed, California

Crop	Period	Consumptive use: Coefficient (K)	Factor (F)	Unit value (U) Inches	Feet	Basis for making estimates
Alfalfa	Apr. -Oct.	0.75	42.20	31.65		Coefficient (K) from Santa Margarita plots. Winter period estimate based on evaporation from mean rainfall plus transpiration
	Nov. -Mar.			8.50		
				40.15	3.34	
Irrigated pasture	Apr. -Oct.	.75	42.20	31.65		Coefficient (K) from Santa Margarita plots. Winter period estimate based on evaporation from mean rainfall plus transpiration
	Nov. -Mar.			8.50		
				40.15	3.34	
Citrus	Apr. -Oct.	.45	42.20	18.99		Coefficient (K) from 1940 San Fernando plots. Winter period estimate based on evaporation from mean rainfall
	Nov. -Mar.			8.00		
				26.99	2.25	
Truck	May -Aug.	.60	26.33	15.80		Coefficient (K) from Santa Margarita plots. Winter period estimate based on evaporation from mean rainfall
	Sept.-Apr.			8.75		
				24.55	2.04	
Avocados	Apr. -Oct.	.50	42.20	21.10		Coefficient (K) from Santa Margarita plots. Winter period estimate based on evaporation from mean rainfall
	Nov. -Mar.			8.00		
				29.10	2.42	
Beans	May -Aug.	.60	26.33	15.80		Coefficient (K) from 1930 Davis plots. Winter period estimate based on evaporation from mean rainfall
	Sept.-Apr.			8.75		
				24.55	2.04	
Grain	Mar. -May	.70	15.79	11.05		Coefficient (K) from SCS-TP-96 modified by observational studies. Winter period estimate based on evaporation from mean rainfall
	June -Feb.			6.70		
				17.75	1.48	

U = KF

1/ Hydrographic unit Nos. 5 and 6.

Table C-7 Long-term mean unit values of consumptive use of water by irrigated crops in the Murrieta and Temecula areas[1/] of the Santa Margarita watershed, California

Crop	Period	Consumptive use: Coefficient (K)	Factor (F)	Unit value (U) Inches	Unit value (U) Feet	Basis for making estimates
Alfalfa	Apr. -Oct.	0.85	44.96	38.22		Coefficient (K) from Santa Margarita plots.
	Nov. -Mar.			8.50		Winter period estimate based on evaporation from mean rainfall plus transpiration
				46.72	3.89	
Irrigated pasture	Apr. -Oct.	.85	44.96	38.22		Coefficient (K) from Santa Margarita plots.
	Nov. -Mar.			8.50		Winter period estimate based on evaporation from mean rainfall plus transpiration
				46.72	3.89	
Citrus	Apr. -Oct.	.45	44.96	20.23		Coefficient (K) from 1940 San Fernando plots.
	Nov. -Mar.			8.00		Winter period estimate based on evaporation from mean rainfall
				28.23	2.35	
Avocados	Apr. -Oct.	.50	44.96	22.48		Coefficient (K) from Santa Margarita plots.
	Nov. -Mar.			8.00		Winter period estimate based on evaporation from mean rainfall
				30.48	2.54	
Truck	May -Aug.	.60	28.35	17.01		Coefficient (K) from Santa Margarita plots.
	Sept.-Apr.			8.54		Winter period estimate based on evaporation from mean rainfall
				25.55	2.13	
Beans	May -Aug.	.60	28.35	17.01		Coefficient (K) from 1930 Davis plots.
	Sept.-Apr.			8.54		Winter period estimate based on evaporation from mean rainfall
				25.55	2.13	
Deciduous	Apr. -Oct.	.65	44.96	29.22		Coefficient (K) from SCS-TP 96
	Nov. -Mar.			6.83		Modified by Hemet and Beaumont studies. Winter period estimate based on evaporation
				36.05	3.00	from mean rainfall
Grain	Mar. -May	.70	16.26	11.38		Coefficient (K) from SCS-TP 96
	June -Feb.			6.48		Winter period estimate based on evaporation from mean rainfall
				17.86	1.49	

U = KF

1/ Hydrographic Unit Nos. 1 and 4, and area below elevation 3,000 feet in Hydrographic Unit Nos. 2 and 3.

Table C-8 Long-term mean unit values of consumptive use of water by irrigated crops in the Anza area[1] of the Santa Margarita watershed, California

Crop	Period	Consumptive use: Coefficient (K)	Factor (F)	Unit value (U) Inches	Unit value (U) Feet	Basis for making estimates
Alfalfa	Apr. -Oct.	0.80	41.43	33.14		Coefficient (K) from Santa Margarita plots.
	Nov. -Mar.			8.00		Winter period estimate based on evaporation from mean rainfall plus transpiration
				41.14	3.43	
Irrigated pasture	Apr. -Oct.	.80	41.43	33.14		Coefficient (K) from Santa Margarita plots.
	Nov. -Mar.			8.00		Winter period estimate based on evaporation from mean rainfall plus transpiration
				41.14	3.43	
Truck	May -Aug.	.60	26.16	15.70		Coefficient (K) from 1930 Davis plots.
	Sept.-Apr.			9.29		Winter period estimate based on evaporation from mean rainfall
				24.99	2.08	
Grain	Apr. -June	.70	16.77	11.74		Coefficient (K) from SCS-TP-96. Winter
	July -Mar.			9.76		period estimate based on evaporation from mean rainfall
				21.50	1.79	
Alfalfa seed	Apr. -Oct.	.60	41.43	24.86		Coefficient (K) from Santa Margarita plots and Tehachapi observations.
	Nov. -Mar.			7.00		Winter period estimate based on evaporation from mean
				31.86	2.66	rainfall
Deciduous	May -Oct.	.65	36.70	23.85		Coefficient (K) from SCS-TP-96 and Hemot
	Nov. -Apr.			8.00		and Beaumont studies. Winter period estimate based on evaporation from mean rainfall
				31.85	2.65	

U = KF

1/ Areas above elevation 3,000 feet in Hydrographic Unit Nos. 2 and 3.

usually planted late in April and are harvested in August. The rainfall during this period provides only a small amount of soil moisture. Most of the moisture used by the plants has been stored in the root zone from winter precipitation. Summer fogs are a great aid to the production of beans since they inhibit transpiration and are thought to provide some plant moisture. Beans are usually planted on the heavier soils having a high moisture storage capacity.

Since the moisture use by dry-farmed beans is controlled primarily by the water-holding capacity of the soils, the estimates of consumptive use have been based on that factor. It has been estimated that on those soils where dry-farmed beans can be grown profitably, the available moisture in the root zone would be about six inches. This estimate has been substantiated by fall moisture deficiency observations on dry-farmed bean fields (5). Added to this would be a growing season average annual precipitation (May through August) of one inch, for a total growing season consumptive use of seven inches. In addition, there would be a nongrowing season evaporation and/or growth of winter period weed or cover crops of about eight inches (depending on the rainfall) making a total annual consumptive use of 15 inches.

In the immediate vicinity of the Pacific Ocean, the average annual rainfall does not aggregate 15 inches, yet dry-farmed beans thrive because of heavy summer fogs. Also over a period of years, there would be many years when the annual rainfall would be less than the estimated unit annual consumptive use of 15 inches Therefore, it was felt advisable to adjust the consumptive use estimate to the following amount: 15 inches or 95 per cent of the rainfall, whichever is less. This would take care of the low rainfall coastal areas and would also provide an estimate to use on any given low rainfall year.

Grain-hay

The grain-hay produced on nonirrigated rolling hill areas of the watershed is usually planted late in the fall. This crop germinates when sufficient rain has fallen but does not attain full growth until the frost-free period begins. Plot studies on annual grass and weed areas in the Santa Ana River Basin (2) and other studies made by the Division of Irrigation Engineering and Water Conservation indicate that the coefficient (K) of consumptive use for grain-hay is 0.50 for the growing season, January through May. When this coefficient is applied to the long period climatic conditions for the various sub-basins of the Santa Margarita watershed, it is found that the consumptive use by grain-hay will vary between 10.2 and 11.2 inches for the growing period. Added to this would be evaporation from rainfall during the summer and early fall months, or an aggregate total of 14.00 inches of annual consumptive use. A study of the long-term mean isohyetal of rainfall on the Santa Margarita watershed reveals that the precipitation ranges from about 13 to 16 inches in most of the grain-hay producing areas. Consumptive use on dry-farmed grain-hay would vary for each individual year depending on the rainfall. It is assumed, therefore, that the unit value of consumptive use would be 14 inches or 95 per cent of the rainfall, whichever is less.

Native Vegetation

Consumptive use by native vegetation is controlled by climatic conditions and the water-storage capacity of the root zone in the soil. In addition to these factors, there are certain areas where excessive amounts of soil moisture are available at all times - along creek channels, around ponds and marshes, and in seep areas. At these locations, riparian or water-loving plants thrive and the evapo-transpiration of water is relatively high. The three types of native vegetation are: grass and brush, brush and trees, and riparian vegetation.

Grass and Brush

This type of vegetation consists mostly of annual grasses, weeds, and brush. While the growing period and dormant period compare favorably with that of dry-farmed grain-hay, the presence of deep-rooted, perennial brush and weeds indicates that a slightly higher consumptive use may be apparent. This factor was revealed in plot studies described in the Santa Ana River investigations (2), and in observations on fall deficiency of grain-hay and grass-brush plots (6). The coefficient (K) for brush and weeds was found to be about 0.58 which when applied to the long-term mean growing season consumptive use factor for the watershed indicates a consumptive use of 11 to 12 inches. By adding evaporation from rainfall during the nongrowing season, it is found that the mean annual consumptive use of native pasture (grass and brush) aggregates about 16 inches. Here again, the long-term mean rainfall for some areas in the watershed, or rainfall for any one year, may exceed or be less than 16 inches. Thus, it is recommended that the mean annual consumptive use of native pasture

(grass and brush) be taken as 16 inches or 95 per cent of the rainfall, whichever is less.

Brush and Trees

The areas in the Santa Margarita watershed where brush and trees occur are confined primarily to the north and northeast exposures of the higher elevation mountain areas. These areas receive an average annual rainfall of at least 18 inches, and on the higher elevations up to 25 and 30 inches (Mount Palomar). It has been found by Troxell (12) that mean seasonal water losses (consumptive use) for various watersheds in western Riverside County varies with altitude and with the absorptive and retentive characteristics of the watersheds being investigated. Using data developed by Troxell, a calculation has been made of the estimated average annual consumptive use of water by brush and trees in the various higher elevation areas of the Santa Margarita Basin. Table C-9 is a summary of these calculations.

The rates of consumptive use shown in Table C-9 for the higher elevations, especially Palomar Mountain slopes and the Western Coastal Ridge slopes of the lower basin, are somewhat higher than estimates made for other areas in the south coastal region. It should be noted, however, that these areas are highly absorptive and retentive, creating an excellent reservoir for soil moisture storage. Also, these areas receive measurable amounts of summer precipitation. The 10-year record at Palomar Observatory (1943-1953) reveals an April-to-October rainfall of 3.87 inches,

Table C-9 Estimated long-term mean annual rainfall and rates of consumptive use by brush and trees, Santa Margarita River Basin, California[1]

Altitude	Lower basin, Brush and tree area		Hill and mesa area north of Temecula Creek		Palomar Mountain slopes	
	Rainfall[2]	Consumptive use	Rainfall[2]	Consumptive use	Rainfall[2]	Consumptive use
	Inches	Inches	Inches	Inches	Inches	Inches
1,000	18.0	17.0				
2,000	24.0	21.5	14.0	13.5	16.0	15.5
3,000	28.0	24.0	16.0	15.3	20.0	18.5
4,000			20.0	18.0	27.0	23.0
5,000			25.0	20.0	29.0	23.5
6,000					30.0	24.0

1/ Based on "Hydrology of Western Riverside County" by H. C. Troxell.

2/ Estimated rainfall based on isohyetal maps.

which would augment the consumptive use of moisture stored in the root zone.

Riparian Vegetation

The data found in the field study on Temecula Creek were compared with temperatures, per cent of daytime hours, and evaporation as recorded at the Oakgrove Observation Station, five miles upstream from the canyon test plot. The comparatively low measured consumptive use for June can be traced to cold nighttime temperatures and frost on May 28 which set back the growth of native vegetation during the early summer.

Due to the fact that there was such a wide variation in types of vegetation depleting the stream flow on this study, it was difficult to establish consumptive use coefficients from the measured data. However, these data together with data from other investigations in the adjacent San Luis Rey Bonsal Basin (10) and in Coldwater Canyon (6) were used to estimate long-period unit values. Table 10 is a summary of the above data together with the estimated long-term rates of consumptive use of riparian vegetation for the Santa Margarita watershed.

Table C-10 Measured and estimated monthly rates of consumptive use of water by riparian vegetation in southern California

Month	Measured consumptive use				Temecula Creek canyon section	
	Coldwater Canyon[1] Bulletin No. 44		Bonsal Basin tanks[2]		Measured consumptive use, 1953	Estimated long-term mean consumptive use[6]
	Upper section	Lower section	Dense trees and grass, four-foot water table	Tules		
	Inches	Inches	Inches	Inches	Inches	Inches
January			1.53	1.82		1.5
February			1.89	1.90		1.5
March			3.21	3.09		1.5
April			5.49	4.56		3.0
May			7.59	7.07	[3]2.40	5.0
June			8.09	7.46	4.59	7.0
July	10.23	13.02	10.27	8.70	10.16	10.0
August	10.85	13.64	9.65	7.76	13.37	12.0
September	9.00	11.10	7.91	6.41	[4]5.33	7.0
October	8.99	8.06	3.65	5.07	[5]2.12	4.0
November			2.00	3.18		2.0
December			1.24	1.92		1.5
Annual			62.51	58.94		56.0

1/ Dense trees and grass.

2/ Taken from "Utilization of the Waters of the San Luis Rey Valley, San Diego County, California" by D. C. Muckel and Harry F. Blaney (10).

3/ May 18-31 only.

4/ Part of measurement lost.

5/ October 1-17 and 28-31 only.

6/ Estimated long-term mean values of monthly consumptive use to be applied to riparian vegetation areas in the Santa Margarita Basin.

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APPENDIX

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Table C-11 Measured and estimated rates of consumptive use of water by avocados in the Fallbrook area, California, for the period April 1 to October 31, 1953

Period	Days	Measured C.U.	Rate per day	Estimated rate C.U. after irrigation: 1st day	2nd day	3rd day	Total amount	Consumptive use by months: Month	C.U.
		Inches	Inches	Inches	Inches	Inches	Inches		Inches
Irrig. 3/25 to 3/27	2			0.20	0.15	--	0.35		
3/27 to 4/13	17	1.32	0.078				1.32		
4/13 to 4/15	2		.078				.16	April	2.46
Irrig. 4/15 to 4/17	2			.20	.15	--	.35		
4/17 to 5/14	27	1.94	.072				1.94		
5/14 to 5/16	2		.072				.14	May	3.06
Irrig. 5/16 to 5/18	2			.20	.15	--	.35		
5/18 to 6/9	22	2.57	.117				2.57		
Irrig. 6/9 to 6/11	2			.20	.15	--	.35	June	3.79
6/11 to 6/29	18	2.16	.120				2.16		
Irrig. 6/29 to 7/1	2			.20	.15	--	.35		
7/1 to 7/17	16	2.89	.181				2.98		
7/17 to 7/19	2		.181				.36	July	5.81
Irrig. 7/19 to 7/21	2			.25	.20	--	.45		
7/21 to 8/10	20	3.69	.184				3.69		
Irrig. 8/10 to 8/13	3			.25	.20	0.20	.65	Aug.	4.10
8/13 to 8/27	14	1.03	.074				1.03		
Irrig. 8/27 to 8/31	4			.25	.20	.15 .15	.75		
8/31 to 9/15	15	1.47	.098				1.47		
Irrig. 9/15 to 9/17	2			.20	.15	--	.35	Sept.	3.35
9/17 to 10/6	19	2.08	.109				2.08		
10/6 to 10/7	1		.109				.11		
Irrig. 10/7 to 10/9	2			.20	.15	--	.35	Oct.	1.52
10/9 to 10/30	21	.19	.009				.19		
10/30 to 11/1	2			.20	.15		.35		
TOTAL	--	--	--	--	--	--	24.85	--	24.09

Table C-12 Measured and estimated rates of consumptive use of water by alfalfa in Murrieta area, California, for the period April 1 to October 31, 1953

	Period	Days	Measured C.U.	Rate per day	Estimated rate C.U. after irrigation: 1st day	2nd day	3rd day	Total amount	Consumptive use by months: Month	C.U.
			Inches	Inches	Inches	Inches	Inches	Inches		Inches
	4/1 to 5/5	34	1/2.91	0.083				2.91	April	2.49
Irrig.	5/5 to 5/8	3			0.25	0.20	0.15	.60		
	5/8 to 6/22	45		.10				4.50	May	3.33
	6/22 to 6/23	1		.10				.10		
Irrig.	6/23 to 6/25	2			.25	.20		.45	June	3.43
	6/25 to 7/20	25	3.24	.130				3.24		
	7/20 to 7/21	1		.13				.13	July	4.92
Irrig.	7/21 to 7/23	2			.30	.25		.55		
	7/23 to 7/27	4		.16				.64		
Irrig.	7/27 to 7/30	3			.30	.25	.20	.75		
	7/30 to 8/21	22	4.25	.193				4.25	Aug.	6.07
	8/21 to 8/25	4		.19				.76		
Irrig.	8/25 to 8/27	2			.30	.25		.55		
	8/27 to 9/10	14	2.51	.179				2.51		
	9/10 to 9/11	1		.17				.17	Sept.	4.18
Irrig.	9/11 to 9/14	3			.30	.25	.20	.75		
	9/14 to 10/19	35	3.40	.097				3.40		
	10/19 to 10/24	5		.10				.50	Oct.	3.02
Irrig.	10/24 to 10/28	4			.20	.15	.10	.55		
	10/28 to 11/27	30	1/1.69	.056				1.69		
TOTAL		240	--	--	--	--	--	29.00	--	2/27.44

1/ Includes rain.

2/ Use is low because alfalfa only had a four-foot root zone.

Table C-13 Measured and estimated rates of consumptive use of water by irrigated pasture in the Murrieta area, California, for the period April 1 to October 31, 1953

	Period	Days	Measured C.U.	Rate per day	Estimated rate C.U. after irrigation: 1st day	2nd day	3rd day	Total amount	Consumptive use by months: Month	C.U.
			Inches	Inches	Inches	Inches	Inches	Inches		Inches
	4/1 to 4/17	16		0.10				1.60		
Irrig.	4/17 to 4/20	3			0.25	0.20	0.15	.60	April	4.00
	4/20 to 5/11	21	3.43 1/	.163				3.43		
	5/11 to 5/13	2		.10				.20		
Irrig.	5/13 to 5/15	2			.25	.20		.45	May	5.10
	5/15 to 6/3	19	3.15	.166				3.15		
	6/3 to 6/7	4		.166				.66		
Irrig.	6/7 to 6/10	3			.30	.25	.20	.75	June	5.33
	6/10 to 7/3	23	3.93	.171				3.93		
	7/3 to 7/10	7		.171				1.20		
Irrig.	7/10 to 7/13	3			.30	.25	.20	.75	July	5.69
	7/13 to 7/30	17		.20				3.40		
Irrig.	7/30 to 8/3	4			.30	.25	.20	.95		
	8/3 to 8/14	11	1.87	.17				1.86		
	8/14 to 8/17	3		.17				.51	Aug.	5.65
Irrig.	8/17 to 8/20	3			.30	.25	.20	.75		
	8/20 to 9/4	15	1.98	.132				1.98		
	9/4 to 9/8	4		.13				.52		
Irrig.	9/8 to 9/11	3			.35	.30	.25	.90	Sept.	6.50
	9/11 to 9/23	12	2.97	.246				2.96		
Irrig.	9/23 to 9/25	2			.35	.30		.65		
	9/25 to 9/28	3		.25				.75		
	9/28 to 10/9	11	1.16	.106				1.16		
	10/9 to 10/14	5	.10					.50		
Irrig.	10/14 to 10/16	2			.25	.20		.45	Oct.	3.62
	10/16 to 10/19	3		.15				.45		
	10/19 to 11/9	21	2.41 1/	.115				2.41		
TOTAL		222	--	--	--	--	--	36.92	--	35.89

1/ Includes rain.

Table C-14 Estimated rates of consumptive use of water by lettuce in Murrieta area, California, for the period March 30 to May 26, 1953

Period		Days	Rate per day[1]	Total amount	Consumptive use by months: Month	C.U.
			Inches	Inches		Inches
Irrig.	3/30 to 4/1	2		0.35		
	4/1 to 4/11	10	0.10	1.00	March	2.00[2]
Irrig.	4/11 to 4/13	2		.35		
	4/13 to 4/18	5	.15	.75		
Irrig.	4/18 to 4/20	2		.45		
	4/20 to 4/27	7	.16	1.12	April	5.07
Irrig.	4/27 to 4/29	2		.45		
	4/29 to 5/4	5	.20	1.00		
Irrig.	5/4 to 5/6	2		.45	May	4.15
	5/6 to 5/9	3	.20	.60		
Irrig.	5/9 to 5/11	2		.45		
	5/11 to 5/26	15	.15	2.25	June	1.00[2]
TOTAL		57	--	9.22	--	12.22

1/ Consumptive use rate-per-day estimate based on periodic soil sampling for moisture content, depth of root zone, and rate of moisture depletion.

2/ Estimate based on observations in other areas of southern California.

Table C-15 Estimated rates of consumptive use of water by melons in Murrieta area, California, for the period May 26 to September 22, 1953

	Period	Days	Rate per day 1/	Total amount	Consumptive use by months: Month	C.U.
			Inches	Inches		Inches
Irrig.	5/24 to 5/26	2		0.35		
	5/26 to 6/12	16	0.05	.80		
Irrig.	6/12 to 6/15	3		.50	June	3.10
	6/15 to 6/30	15	.12	1.80		
Irrig.	6/30 to 7/2	2		.40		
	7/2 to 7/17	15	.15	2.25	July	4.85
Irrig.	7/17 to 7/19	2		.45		
	7/19 to 7/24	5	.15	.75		
Irrig.	7/24 to 7/26	2		.45	August	5.25
	7/26 to 8/10	15	.15	2.25		
Irrig.	8/10 to 8/12	2		.45		
	8/12 to 8/17	5	.15	.75		
Irrig.	8/17 to 8/19	2		.45		
	8/19 to 8/23	4	.15	.60		
Irrig.	8/23 to 8/25	2		.45		
	8/25 to 8/30	5	.15	.75		
Irrig.	8/30 to 9/1	2		.45	September	4.80
	9/1 to 9/8	7	.15	1.05		
Irrig.	9/8 to 9/10	2		.45		
	9/10 to 9/22	12	.15	1.80		
TOTAL		121		17.20		18.10

1/ Consumptive use rate-per-day estimate based on periodic soil sampling for moisture content, depth of root zone, and rate of moisture depletion.

Table C-16 Measured rates of consumptive use of water by carrots in Temecula area, California, for the period April 1 to September 30, 1953

	Period	Days	Measured C.U.	Rate per day	Estimated rate C.U. after irrigation: 1st day	2nd day	3rd day	Total amount	Consumptive use by months: Month	C.U.
			Inches	Inches	Inches	Inches	Inches	Inches		Inches
	5/11 to 5/15	4		0.05				0.20	May	
Irrig.	5/15 to 5/18	3			0.25	0.15	0.10	.50	(12-31)	
	5/18 to 5/28	10	0.83	.08				.83		2.03
	5/28 to 5/31	3		.08				.24		
Irrig.	5/31 to 6/2	2			.25	.20		.45		
	6/2 to 6/10	8	1.01	.12				1.01	June	
	6/10 to 6/12	2		.12				.24		
Irrig.	6/12 to 6/15	3			.25	.20	.15	.60		4.38
	6/15 to 6/19	4		.12				.48		
Irrig.	6/19 to 6/21	2			.25	.20		.45		
	6/21 to 7/8	17	2.38	.14				2.38		
	7/8 to 7/10	2		.14				.28	July	
Irrig.	7/10 to 7/13	3			.25	.20	.15	.60		
	7/13 to 7/22	9	1.26	.14				1.26		4.58
	7/22 to 7/24	2		.14				.28		
Irrig.	7/24 to 7/27	3			.25	.20	.15	.60		
	7/27 to 8/10	14	2.12	.15				2.12	Aug.	
Irrig.	8/10 to 8/12	2			.25	.20		.45	(1-24)	4.37
	8/12 to 8/24	12	1.82	.15				1.82		
TOTAL		105	--	--	--	--	--	14.79	--	15.36

Table C-17 Measured and estimated rates of consumptive use of water by alfalfa in Temecula area, California, for the period April 1 to September 30, 1953

	Period	Days	Measured C.U.	Rate per day	Estimated rate C.U. after irrigation 1st day	2nd day	3rd day	Total amount	Consumptive use by months Month	C.U.
			Inches	Inches	Inches	Inches	Inches	Inches		Inches
	4/1 to 5/9	38		0.16				6.08	April	4.80
Irrig.	5/9 to 5/11	2			0.35	0.35		.70		
	5/11 to 5/26	15	5.52 1/	.37				5.52	May	9.20
Irrig.	5/26 to 5/29	3			.35	.30	0.30	.95		
	5/29 to 7/3	35	9.44	.27				9.44	June	8.10
	7/3 to 7/7	4		.25				1.00		
Irrig.	7/7 to 7/9	2			.30	.25		.55	July	5.45
	7/9 to 7/22	13	3.11	.24				3.11		
	7/22 to 7/30	8	.23	.029				.23		
	7/30 to 8/1	2		.029				.06		
Irrig.	8/1 to 8/5	4			.25	.20	.15	.75	Aug.	2.40
	8/5 to 8/28	23	.84 2/	.037				.84		
Irrig.	8/28 to 9/1	4			.25	.20	.15	.75		
	9/1 to 10/2	31	.95 2/	.03				.95	Sept.	1.05
	10/2 to 10/3	1		.03				.03		
Irrig.	10/3 to 10/5	2			.20	.15		.35		
	10/5 to 10/7	2		.15				.30	Oct.	3.90
	10/7 to 12/7	62	8.26 1/	.133				8.26		
TOTAL		251	--	--	--	--	--	39.87	--	34.90

1/ Includes rain.

2/ Suspect presence of high ground water table causing little or no depletion of moisture.

Table C-18 Measured and estimated rates of consumptive use of water by alfalfa in Aguanga area, California, for the period April 1 to October 31, 1953

	Period	Days	Measured C.U.	Rate per day	Estimated rate C.U. after irrigation: 1st day	2nd day	3rd day	Total amount	Consumptive use by months: Month	C.U.
			Inches	Inches	Inches	Inches	Inches	Inches		Inches
	4/1 to 4/4	3		0.10				0.30		
Irrig.	4/4 to 4/6	2			0.25	0.20		.45		
	4/6 to 4/18	12		.15				1.80	April	5.42
Irrig.	4/18 to 4/22	4			.30	.25	0.20	.95		
	4/22 to 5/15	23	4.89 1/	.213				4.89		
	5/15 to 5/18	3		.20				.60	May	5.21
Irrig.	5/18 to 5/20	2			.30	.25		.55		
	5/20 to 6/5	16	1.45 1/	.089				1.45		
	6/5 to 6/7	2		.10				.20		
Irrig.	6/7 to 6/9	2			.30	.25		.55	June	4.33
	6/9 to 6/23	14	2.10	.150				2.10		
	6/23 to 6/25	2		.15				.30		
Irrig.	6/25 to 6/26	1			.30			.30		
	6/26 to 7/14	18	1.85	.103				1.85		
Irrig.	7/14 to 7/16	2			.30	.25		.55	July	5.63
	7/16 to 7/24	8		.25				2.00		
	7/24 to 7/30	6		.20				1.20		
Irrig.	7/30 to 8/3	4			.30	.25	.20	.95		
	8/3 to 8/20	17	3.44	.202				3.44	Aug.	6.74
	8/20 to 8/24	4		.15				.60		
Irrig.	8/24 to 8/25	1			.30			.30		
	8/25 to 9/16	22	6.29	.286				6.29	Sept.	5.98
Irrig.	9/16 to 9/18	2			.30	.25		.55		
	9/18 to 10/29	41	3.63 1/	.088				3.63	Oct.	2.49
TOTAL		211	--	--	--	--	--	35.80	--	35.80

1/ Includes rain.

Table C-19 Measured and estimated rates of consumptive use of water by irrigated pasture in the Anza area, California, for the period April 1 to October 31, 1953

	Period	Days	Measured C.U.	Rate per day	Estimated rate C.U. after irrigation: 1st day	2nd day	3rd day	Total amount	Consumptive use by months: Month	C.U.
			Inches	Inches	Inches	Inches	Inches	Inches		Inches
	4/1 to 4/5	4		0.10				0.40		
Irrig.	4/5 to 4/9	4			0.25	0.20	0.15	.75	April	3.88
	4/9 to 5/7	28	3.47	.134				3.47		
	5/7 to 5/24	17		.15				2.55	May	4.36
Irrig.	5/24 to 5/28	4			.25	.20	.15	.75		
	5/28 to 6/18	21	1.74	.083				1.74		
	6/18 to 6/20	2		.08				.16	June	4.94
Irrig.	6/20 to 6/23	3			.35	.30	.30	.95		
	6/23 to 7/8	15	4.55	.303				4.55		
Irrig.	7/8 to 7/10	2			.25	.20		.45		
	7/10 to 7/21	11	.92	.084				.92	July	6.72
	7/21 to 7/22	1		.08				.08		
Irrig.	7/22 to 7/24	2			.35	.30		.65		
	7/24 to 8/6	13	4.04	.311				4.04		
Irrig.	8/6 to 8/10	4			.25	.20	.15	.75		
	8/10 to 8/16	6		.10				.60	August	7.75
Irrig.	8/16 to 8/19	3			.35	.30	.25	.90		
	8/19 to 8/24	5		.20				1.00		
Irrig.	8/24 to 8/26	2			.35	.30		.65		
	8/26 to 9/10	15	5.75	.383				5.75		
	9/10 to 9/13	3		.05				.15	September	7.28
Irrig.	9/13 to 9/16	3			.25	.20	.20	.65		
	9/16 to 9/23	7	1.96	.280				1.96		
	9/23 to 9/25	2		.20				.40	October	2.50
Irrig.	9/25 to 9/29	4			.20	.15	.10	.55		
	9/29 to 12/9	71	4.50	.065				4.50		
TOTAL		252	--	--	--	--	--	39.32	--	37.43

Table C-20 Measured and estimated rates of consumptive use of water by alfalfa grown for seed in Anza area, California, for the period April 1 to June 30, 1953

	Period	Days	Rate per day	Total amount	Consumptive use by months: Month	C.U.
			Inches	Inches		Inches
	4/1 to 4/10	9	0.08	0.72	April	2.86
Irrig.	4/10 to 4/13	3		.45		
	4/13 to 5/19	36	.092	3.39	May	3.80
Irrig.	5/19 to 5/21	2		.45		
	5/21 to 6/3	13	.15	1.95		
Irrig.	6/3 to 6/5	2		.55		
	6/5 to 7/10	35	.21	7.36	June	6.31
	7/10 to 10/1	1/				
TOTAL		100	--	14.87	--	12.97

1/ No measured use.

APPENDIX D

PRECIPITATION RECORDS

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PRECIPITATION RECORDS

APPENDIX D

TABLE D-1

MONTHLY PRECIPITATION RECORDS AT STATIONS ESTABLISHED BY
DIVISION OF WATER RESOURCES IN SANTA MARGARITA RIVER WATERSHED,
NOT PREVIOUSLY PUBLISHED

In Inches

HYDROGRAPHIC UNIT NO. 1

Los Alamos Valley - Location No. 7S/2W-12A

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1952-53	--	--	--	--	--	--	0.78	0.36	1.04	0.41	0	0	Inc.
54	0	0	0	0.30	0.78[b]	0.05	5.70[a]	1.74	4.19[b]	0	0[a]	0[a]	12.76[b]

Murrieta - Location No. 7S/3W-16N

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1952-53	0[a]	0[a]	0.75	T	2.68	3.97	0.82	0.52	1.12	0.74	0.01	0	10.61[b]
54	0	0	0	0.21	0.69	0.10	5.77	2.80	4.05	0.08	T[a]	0[a]	13.70[b]

HYDROGRAPHIC UNIT NO. 2

Anza (Fire Station) - Location No. 7S/3E-21B

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1947-48									1.79	0.23	0	0.16	Inc.
49	0.25	0	0	1.17	0	1.75	--	1.24	1.80	0	0.14	0	Inc.
1949-50	0	T	0.03	0.20[a]	0.95	1.42	2.11	1.11	1.32	0.82	0.30	0	8.26[b]
51	0.35	0.17	0.20	T	0.83	0.07	1.71	0.58	0.33	2.85	0.20	0	7.29
52	2.69	0.36	0.16	0.71	0.83	--	3.88	0.33	4.35	1.86	0	0	Inc.
53	0.35	0	1.15	0	3.37	2.79[a]	0.70[a]	0.62	1.18	1.40	0.17	0	11.73[b]
54	0	0	0	0.40	0.45	0.39	4.08	1.72	4.03	0.09	0.11[a]	0[a]	11.27[b]

Note: This record includes precipitation through January, 1953, for an adjacent station, previously published by U.S.W.B.

Wilson Creek - Location No. 7S/1E-24G

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1952-53	--	--	--	2.25	3.18	3.89	0.67	0.75	1.16[b]	0.95	0	0	Inc.
54	0	0.76	0	0.36	0.68	0.07	3.67	1.62[a]	4.78[a]	0.04	--	--	Inc.

a. Estimated.
b. Partially estimated.

TABLE D-2

MONTHLY PRECIPITATION RECORDS OF 10 YEARS OR LONGER
AT STATIONS IN SANTA MARGARITA RIVER WATERSHED

In Inches

HYDROGRAPHIC UNIT NO. 1

Greenwood (Los Alamos Valley) - Location No. 7S/2W-15C

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1912-13	0	0	0	0.24	0.33	0	1.76	3.54	0.50	0.13	0.11	0.04	6.64
14	0	0	0	0	1.59	0.59	5.92	5.13	1.06	0.80	0	0	15.09
1917-18	0	0	0	0	0.20	0	0.95	2.76	7.59	0	0.25	0.12	11.87
19	0	0.29	0.06	0.80	0.85	1.09	0.05	1.88	2.80	0.37	0.29	0	8.48
1919-20	0	0	0.08	0.59	0.69	0.93	0.63	4.00	3.60	0.32	0.45	0	11.29
21	0.05	0.02	0	0.69	0.77	0.45	2.48	0.49	3.03	0.12	2.46	0	10.56
22	0.08	0.19	0.16	1.39	0.24	11.74	4.71	3.05	1.95	0.21	0.56	0	24.28
23	0.04	0	0	0.25	1.54	2.18	2.04	1.10	0.56	0.98	0.01	0	8.70
24	0	0	1.05	0.19	0.38	1.53	0.35	0	5.31	1.44	0	0	10.25
1924-25	0	0	0	0.10	0.19	1.91	0.18	0.28	1.64	2.00	0.11	0.29	6.70
26	0	0	0	2.54	0.59	0.97	0.14	3.77	0.52	6.98	0.04	0	15.55

Sage - Location No. 7S/1W-12A

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1938-39	(July through December 6.09)						3.27	2.10	2.09	0.20	0	0	13.75
1939-40	0	0	2.56	0.07	1.60	0.57	4.82	3.10	1.88	1.18	0	0	15.78
41	0	0	0	1.59	1.00	5.70	1.75	6.41	6.61	4.93	0.14	0	28.13
42	0.94	1.17	0.21	2.01	2.07	3.63	1.13	2.45	2.58	1.51	0	0	17.70
43	0	0	0	0.33	0.27	1.27	7.29	2.50	4.76	1.23	0	0	17.65
44	0	0	0	0.64	0	4.98	0.43	5.22	1.67	1.20	0	0	14.14
1944-45	0	0	0	0	4.95	0.58	0.54	2.59	4.62	0.71	0	0	13.99
46	0	2.11	2.27	0	0	4.49	0.64	0.94	2.05	0.58	0.29	0	13.37
47	0.24	0.02	0.59	0.80	4.58	2.32	0.85	0.73	1.60	0.19	0.89	0	12.81
48	0	0.16	0.58	0.52	0.85	2.64	0.26	3.28	1.63	0.41	0	0.68	11.01
49	0	0	0	0.97	0	3.44	3.85	1.75	1.85	0.06	0.73	0	12.65
1949-50	0	0	0	0.34	1.45	1.10	1.60	1.47	1.07	1.17	0.64	0.06	8.90
51	0	0	0	0.06	1.77	0	2.00	0.90	0.44	1.79	0.31	0	7.27
52	0.13	0.36	0.16	0.73	0.95	6.72	4.28	0.49	6.68	2.08	0	0	22.58
53	0	0	1.40	0	2.94	3.42	0.84	0.45	1.39	0.92	0.12	T	11.48
54	0	0.09	0	0.45	0.78	0.06	4.35	2.00	4.84	--	--	--	Inc.

Temecula - Location No. 8S/3W-12M

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1901-02	0	0	0	0.65	0.35	0	2.74	2.30	2.66	0.63	0	0	9.33
03	0.30	0	0	0	2.53	3.35	2.10	2.60	(9.59)		0	0	20.47
04	0	0	0	0	0	0	0.27	1.80	3.38	0.42	0	0	5.87
1904-05	0	0	0	0.45	0	1.00	4.74	8.58	6.06	0	1.50	0	22.33
06	0	0	0	0	5.10	0.60	1.98	1.33	13.04	1.40	0.50	0	23.95
07	0	0	0	0	2.40	5.57	6.20	2.84	4.60	0	0	0	21.61
08	0	0	0	2.15	0	0.18	5.20	3.40	1.13	0.67	0	0	12.73
09	0.50	0.95	0.50	0	0.20	1.40	7.13	4.60	3.00	0	0	0	18.28
1909-10	0	0	0	0	2.28	6.19	4.35	0.20	2.00	0	0	0	15.02
11	0	0	0	0.60	0	0	6.50	4.73	2.00	0.33	0	0	14.16
12	0	0	0	0	0	0.60	0.80	0	8.93	3.52	1.40	0	15.25
13	0	0.25	0	0.95	0.25	0	2.35	5.20	0.85	0	0	0	9.85
14	0	0	0	0	2.10	1.25	7.65	6.00	1.30	1.10	0	0.19	19.59
1914-15	0.10	0	0	0	0.65	3.67	8.62	7.35	0.50	2.90	0.70	0	24.49
16	0	0	0	0	0.50	3.80	19.16	1.03	0.75	0.20	0.10	0	25.54
17	0	0	0.75	0.45	0	2.28	3.40	2.90	0.20	1.90	0.35	0	12.23
18	0	0	0	0	0.30	0	1.37	0.40	8.23	0	0	0	10.30
19	0	0	0	0.95	1.44	1.22	(2.80)		1.95	0.28	0	0	8.64
1919-20	0	0	0	0.77	1.00	1.52	0.42	5.26	5.54	0.49	0	0	15.00

MONTHLY PRECIPITATION RECORDS OF 10 YEARS OR LONGER
AT STATIONS IN SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

HYDROGRAPHIC UNIT NO. 1 (continued)

Wildomar - Location No. 6S/4W-34J

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1914-15	0	0	0	0.53	0.59	3.34	8.16	4.35	2.41	1.77	1.50	0	22.65
16	0	0	0	0	0.46	2.43	15.79	0.56	1.28	0.24	0	0	20.76
17	0	0	0.30	1.67	0	2.87	3.70	2.77	0.36	0.89	0	0	12.56
18	0	0	0	0	0.15	0	1.61	3.20	5.72	0	0.16	0	10.84
19	0	0	0.10	0.53	0.80	0.80	0.77	1.57	1.72	0.17	0.41	0	6.87
1919-20	0	0	0.33	0.60	0.57	1.24	0.75	4.41	3.73	0.16	0.30	0	12.09
21	0	0	0	0.90	0.44	0.56	2.97	0.34	1.82	0.11	2.06	0	9.20
22	0	0	0.90	0	0	13.46	7.33	3.54	2.50	0.60	0.46	0	28.79
23	0	0	0	0.06	2.00	1.94	1.75	1.11	0.35	0.86	0	0	8.07
24	0	0	0.30	0.53	0.40	0.82	0.24	0	4.24	1.14	0	0	7.67
1924-25	0	0	0	0.13	0.53	2.34	0.20	0.28	2.00	1.81	0.17	0	7.46
26	0	0	0	2.17	0.42	0.59	0	3.07	0.10	8.49	0	0	14.84
27	0	0	0	T	1.44	4.20	0.52	11.98	1.87	0.87	0.11	0	20.99
28	0	0	0	0.72	2.10	3.28	0.14	2.23	0.84	0.14	0	0	9.45
29	0	0	0	1.85	0	1.75	1.87	0.76	0.87	1.24	0	0	8.34
1929-30													16.49
31													12.17
32													18.54
33													11.60
34													6.74
1934-35													19.12
36													11.19
37													24.84
38													19.97
39													16.19
1939-40													15.14
41					(Seasonal totals only, 1929 through 1952)								27.52
42													9.85
43													19.26
44													14.54
1944-45													12.91
46													11.47
47													8.32
48													7.34
49													7.78
1949-50													6.34
51													4.44
52													20.28

Wildomar (Near) - Location No. 6S/4W-35C

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1929-30	0	0	0.95	0	0	0	6.87	0.45	4.19	1.84	2.19	0	16.49
31	0	0	0	0.40	1.34	0	2.44	5.58	0.12	1.89	0.40	0	12.17
32	0	0.13	0	0.34	2.16	4.51	1.33	9.77	0	0	0.30	0	18.54
33	0	0	0	1.54	0	2.39	7.00	0	0	0.50	0.17	0	11.60
34	0	0	0	0.15	0.10	3.42	0.95	2.00	0	0	0	0.12	6.74
1934-35	0	0.02	0	2.16	1.46	4.29	3.62	3.48	2.84	1.03	0.22	0	19.12
36	0	0.55	0	0	1.00	0.52	0.29	6.39	1.86	0.58	0	0	11.19
37	0	0	0	3.37	0.13	7.87	1.67	5.26	6.54	0	0	0	24.84
38	0	0	0	0	0	1.20	2.04	6.39	9.67	0.67	0	0	19.97
39	0	0	0.15	0	0	9.12	2.01	2.02	1.04	1.85	0	0	16.19
1939-40	0	0	3.86	0.64	0.65	0.40	3.43	4.31	0	1.85	0	0	15.14
41	0	0	0	0.93	0	7.14	0.42	7.05	7.81	3.27	0.90	0	27.52
42	0	0	0	2.50	0.80	2.48	0.40	1.00	0.97	1.70	0	0	9.85
43	0	0	0	0	0.12	0.72	11.19	3.44	3.11	0.68	0	0	19.26
44	0	0	1.02	0.01	0	6.46	0.27	5.26	0.93	0.59	0	0	14.54
1944-45	0	0	0	0	5.73	1.12	0.22	1.74	4.10	0	0	0	12.91
46	0	1.55	0	0.15	0.20	3.05	0.50	0.95	4.69	0.38	0	0	11.47
47	0	0	0	0.37	5.26	1.47	0.14	0.13	0.76	0	0.19	0	8.32
48	0	0	0	0	0	2.96	0	2.38	1.05	0.95	0	0	7.34
49	0	0	0	0.43	0	2.11	2.91	1.06	0.97	0	0.30	0	7.78
1949-50	0	0	0	0.28	1.10	1.20	1.79	0.73	0.68	0.56	0	0	6.34
51	0	0	0	0	0.67	0	1.24	0.64	0.68	1.04	0.17	0	4.44
52	0	0.47	0.29	0.35	0.63	4.48	5.78	0.23	6.48	1.57	0	0	20.28
53	0	0	0.33	0	3.24	3.19	0.76	0.58	0.77	0.30	0	0	9.17
54	0	0	0	0.25	0.70	0.08	5.82	1.78	3.45	0[a]	0[a]	0[a]	12.08[b]

MONTHLY PRECIPITATION RECORDS OF 10 YEARS OR LONGER
AT STATIONS IN SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

HYDROGRAPHIC UNIT NO. 3

Oakgrove - Location No. 9S/2E-17R

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1910-11	0.80	0.06	0.34	0.97	1.51	0.19	5.95	3.96	1.74	0.55	0	0	16.07
12	0.44	0	0.94	0.49	0.02	1.17	0.18	0.08	9.53	3.76	1.20	0.24	19.05
13	0.33	0.29	0	0.99	0.49	0	2.41	4.39	4.72[a]	0.19	0.10	0[a]	13.91[b]
14	0.25[a]	1.70[a]	0.10[a]	0.10[a]	2.00[a]	0.70[a]	7.29	6.02	1.69	1.28	0.10[a]	0.15[a]	21.38[b]
1914-15	0[a]	0[a]	0.20[a]	0.60[a]	1.00[a]	3.24	8.13	6.70	2.32	2.28	2.12	0	26.59[b]
16	0	0.35	0.05	0	0.80	2.04	22.05	0.60	1.64	0.05	0.06	0	27.64
17	0.18	1.09	0.06	1.38	T	3.45	3.63	2.85	0.13	2.63	0.06	0	15.46
18	1.14	T	0.51	0	0.34	0	1.14	2.40[a]	6.90[a]	0[a]	0.30[a]	0.32	13.05[b]
19	T	0.65	0	1.06	1.46	1.64	1.00	2.79	2.22	0.28	0.45	0	11.54
1919-20	0.92	0.30	0.18	0.87	1.50	0.92	0.70[a]	4.18	6.39	0.15	0.26	0	16.37[b]
21	0	0.35	0	0.18	0.08	0.60[a]	4.54	1.00[a]	1.60[a]	0.28[a]	2.00[a]	0[a]	10.63[c]
1938-39	0.78	0.47	0	0.08	0	5.60	2.35	3.20	1.27	1.10[a]	0.05[a]	0	14.90[b]
40	0	0	4.98	0	1.75	0.55[a]	4.00[a]	4.30[a]	1.70[a]	1.60[a]	0[a]	0	18.88[b]
41	0	0	0	0.52	0.83	10.30	1.77	5.37	6.16	4.23	0.43	0	29.61
42	0	0.83	0.11	2.60	2.89	2.32	0.25	3.72	2.24[b]	1.80[b]	0	0	16.76
1947-48	0	0.16	0.06	0.30	0.06	3.60	0.04	3.07	1.93	0.40	0.07	0.30	9.99
49	0.06	0	0	1.59	0	3.56	6.51	1.32	1.28	0.14	0.27	0	14.73
1952-53	--	--	--	--	--	--	--	0.82	1.53	1.03	0.02	0	Inc.
54	1.37	0	0	0.52	0.56	0.03	5.59	2.79	5.36	0	T	0.02	16.23

Pauba Ranch (Station E) - Location No. 8S/1W-14D

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1920-21	1.11	0	0	0.86	0.30	0.35	2.53	0	1.01	0.06	1.71	0	7.93
22	0	0.56	0.95	0.20	0.08	5.89	1.39	3.21	1.73[a]	0.16[a]	0.72[a]	0[a]	14.89[b]
23	0.07[a]	0	0	0.37	1.45	1.58	2.35	1.33	0.80	1.80	0	0	9.75[b]
24	0	0[a]	0[a]	0.51[a]	0.11[a]	1.70	0.16	0	4.97	1.55	0	0	9.00[b]
1924-25	0	0	0	0.15	0.31	2.09	0.14	0.04	1.76	2.74	0	0.12	7.35
26	0	0.36	0	4.32	0.58	0.45	0.05	3.02	0.51	7.70	0.40	0	17.39
27	0	0.03	0	0	0.64	2.34	2.08	9.25	0.98	0.99	0	0	16.31
28	0	0	0	1.83	0	2.21	0.73	2.46	0.60[a]	0.41	0.20[a]	0	8.44[b]
29	0	0	0	0.95	0.50	1.28	1.48	1.43	1.99	1.25	0	0	8.88
1929-30	0	1.50[a]	0.90[a]	0	0	0	5.46	0.90[a]	2.35	0.39	3.26	0	14.76[b]
31	0	0	0	0.13	1.53	0	0.93	3.70	0	1.25	0.99	0	8.53
32	0	0.21	0.11	0.95	2.05	4.48	1.20	8.68	0.15	0.73	0.04	0	18.60
33	0	0	0	1.84	T	3.05	3.85	0	0	1.25	0.62	0.02	10.63
34	0	0	0	0	0.13	1.64	0.40	1.26	0.20	0	0	0.10	3.73
1934-35	0	0.09	0.14	1.28	0.91	1.80	2.80	2.20	1.29	0.96	0	0	11.47
36	0	0.86	0.25	0	0.64	0.42	0.70	4.72	1.40	0.90	0	0	9.89
37	0	0.55	0.10	3.52	0.02	6.66	1.41	4.05	4.30	0.44	0.15	0	21.20
38	0	0	0	0	0	1.70	1.81	4.23	8.95	0.51	0.44	0	17.64
39	0.02	0.40	0	0.03	0.04	5.91	2.28	1.77	1.33	0.63	0.03	0	12.44
1939-40	0	0	2.45	0.08	0.97	0.57	1.98	2.61	0.18	2.32	0	0	11.16
41	0	0	0.05	2.14	0.35	5.80	1.04	3.93	5.82	4.95	0.50	0	24.58
42	0.10	0.40	0.26	2.25	1.84	3.67	0.28	1.25	1.81	1.52	0	0	13.39
43	T	0.25	0	0.17	0.15	0.98	6.63	1.79	2.99	1.05	0	0	13.91
44	0	0	0.02	0.43	T	3.80	0.50	4.61	1.51	1.27	0.06	T	12.20
1944-45	0	0	0	0.03	4.65	0.50	0.13	1.72	2.67	0.28	0	0	9.98
46	0	1.65	0.37	0.04	0.27	3.05	0.16	1.08	2.49	0.29	0	0	9.40
47	0.17	0.50	0.57	0.46	2.99	1.11	0.47	0.15	1.12	0.19	0.29	0	8.03
48	0	0.08	T	0.30	0.37	1.86	0.01	2.36	0.86	0.18	T	0.59	6.61
49	0	0	0	0.83	0.02	2.69	2.85	0.82	1.30	0	0.20	0	8.71
1949-50	0	0	0	0.19	1.09	0.94	1.39	0.72	0.81	0.98	0.16	0	6.28
51	0	0	0	0	0.63	0	1.38	0.94	0.64	1.11	0.21	0	4.81
52	0.01	0.20	0.26	0.92	0.64	4.98	4.61	1.71	5.12	1.00	0.84	0	20.29
53	T	0	1.55	0	3.35	2.95	0.41	0.42	1.22	0.61	0.01	T	10.52
54	T	T	0	0.72	0.42	0.03	3.77	1.50	4.81	T	0	T	11.25

MONTHLY PRECIPITATION RECORDS OF 10 YEARS OR LONGER
AT STATIONS IN SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

HYDROGRAPHIC UNIT NO. 4

Pauba Ranch (Station C) - Location No. 8S/2W-16M

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1920-21	0	0	0	1.16	0.92	0.63	3.82	0.25	2.24	0.16	2.81	0	11.99
22	0	0.33	1.21	0.29	0.15	11.42	5.15	3.85	2.20	0.20	0.91	T	25.71
23	0.09	0	0	0.32	1.73	3.06	2.17	1.92	0.44	1.10	0	0	10.75
24	0	0	0	0.65	0.14	2.00	0.23	0	6.09	2.40	0	0	11.51
1924-25	0	0	0	0.04	0.50	2.76	0.13	0.34	1.82	1.87	0.01	1.13	8.60
26	0.10	0	0	3.28	1.29	0.98	0.07	4.23	0.45	9.25	0	0	19.65
27	0	0	0	0	1.06	3.51	0.56	15.32	2.49	0.62	0.15	0	23.70
28	0	0	0	1.67	0.79	2.82	0.74	2.24	1.16	0	0.12	0	9.54
29	0	0.01	0	1.01	0.69	2.78	2.69	1.33	1.66	1.16	0	0	11.33
1929-30	0	0	0.79	0	0	0	8.02	0.81	4.49	0.16	4.20	0	18.46
31	0	0.25	0	0.36	2.75	0	1.49	5.36	0.13	2.22	0.60	0	13.16
32	0	0.41	0.09	0.67	2.95	5.44	1.45	10.79	0.20	0.58	0	0	22.58
33	0	0	0	1.67	0	3.04	5.80	0.04	0	1.41	0.34	0	12.30
34	0	0	0	0.12	0.13	3.30	1.22	1.86	0.14	0	0	0.40	7.17
1934-35	0	0.08	0	2.35	1.30	3.61	3.16	3.19	2.92	1.19	0.13	0	17.93
36	0	0.12	0.03	0	0.73	0.69	0.32	7.52	1.70	0.94	0	0	12.05
37	0.28	0.16	0	4.03	0.69	8.04	2.73	6.80	7.09	0.55	0	0	30.37
38	0	0	0	0	0	1.69	1.97	6.28	10.04	1.24	0.17	0	21.59
39	0	0	0	0.29	0.02	6.72	2.64	2.19	1.68	0.62	0.03	0	14.19
1939-40	0	0	3.79	0.16	1.08	0.51	3.93	4.14	0.16	3.19	0	0	16.96
41	0	0	0.10	1.59	0.48	6.88	1.16	4.94	7.80	4.62	0.61	0	28.18
42	0	0.25	0.14	2.58	1.65	4.02	0.70	2.19	1.73	2.17	0	0	15.43
43	0	0	0	0	0	1.12	10.70	3.15	2.20	0.73	0	0	17.90
44	0	0	0.01	0.44	0	6.26	0.77	5.91	1.04	0.40	0	0.05	14.88
1944-45	0	0	0	0	5.90[a]	0.63[a]	0.16[a]	2.18[a]	3.39[a]	0.36[a]	0[a]	0[a]	12.62[b]
46	0[a]	2.09[a]	0.47[a]	0.05[a]	0.34[a]	3.87[a]	0.20[a]	1.37[a]	3.16[a]	0.37[a]	0[a]	0[a]	11.92[a]
47	0.20[a]	0.50[a]	0.50[a]	0.22	4.09	2.50	0.55	0.60	0.96	0	0	0	10.12[b]
48	0	0	0	0	0	2.70	0	2.00	1.32	0.84	0	0.45	7.31
49	0	0	0	0.83	0	3.13	4.78	1.64	1.04	0	0.40	0	11.82
1949-50	0	0	0	0	1.55	1.22	2.23	0.86	1.00	0.81	0.38	0	8.05
51	0	0	0	0	1.34	0	2.04	0.81	0.88	1.70	0.33	0	7.10
52	0	0.54	0	0.79	1.16	3.40	7.82	0.53	5.57	2.01	0	0	21.82
53	0	0	0	0	2.41	3.85	1.28	0.75	1.00	0.29	0	0	9.58
54	0	0	0	0.42	0.45	0	4.19	1.82	5.24	0	0	0	12.12

HYDROGRAPHIC UNIT NO. 5

De Luz - Location No. 8S/4W-29H

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1902-03	0	0	0	1.75	3.00	3.75	2.25	3.50	7.00	2.50	0.06	0	23.81
04	0	0	0	0	0	0	1.12	1.50	5.25	0.50	0	0	8.37
1904-05	0	0	0	0.25	0	1.25	5.25	10.25	2.00	0	0.75	0	19.75
06	0	0	0	0	5.00	0.12	4.00	2.00	13.50	0.60	0.50	0	25.72
07	0	0	0.12	0	2.75	6.75	9.50	2.00	4.50	0.12	0.06	0	25.80
08	0	0	0	3.00	1.00	1.36	6.75	4.50	1.37	0.50	0.50	0	18.98
09	0	0	0.50	0.50	1.25	1.50	12.25	5.25	2.12	0	0	0.13	23.50
1909-10	0	0	0	0	1.75	6.65	4.70	0.06	2.50	0.25	0	0.01	15.92
11	0.02	0	0	0.25	0.56	0.06	6.12	4.00	1.12	0.25	0.01	0	12.39
12	0	0	0.12	0.12	0.12	0.69	0.25	0	8.50	1.37	0.25	0	11.42
13	0	0	0	0.87	0.56	0.25	3.25	5.13	0.63	0.07	0.13	0.50	11.39
14	0	0	0	0	3.75	2.50	9.35	9.00	0.75	0.75	0.13	0.07	26.30
1914-15	0	0	0	0.37	1.10	3.00	9.75	5.25	0.75	1.50	1.00	0	22.72
16	0	0	0.25	0	0.75	3.75	29.25	2.00	1.00	0	0	0	37.00
17	0	0	0.50	0.90	0.25	1.50	3.50	5.25	0.13	2.14	0.27	0	14.44
18	0	0	0	0	0.50	0	3.00	4.25	7.12	0.01	0.01	0	14.89
19	0	0.75	0	1.12	1.28	1.00	1.50	1.32	2.06	0.25	0	0	9.28
1919-20	0	0	0.50	1.37	0.63	1.81	0.50	5.00	8.88	0.63	0.13	0	19.45
21	0	0	0	2.00	1.00	0.56	4.65	0.60	2.00	0	4.25	0	15.06
22	0.07	0	1.50	0.08	0	20.00	8.00	5.75	3.45	0.68	1.04	0	40.57
23	0	0	0	0.50	2.38	4.38	2.62	1.60	0	1.50	0	0	12.98
24	0	0	0	0.25	1.00	1.63	1.25	0	4.30	1.75	0	0	10.18
1924-25	0	0	0	0.13	0.81	3.62	0.31	0.40	1.93	2.50	0	1.25	10.95
26	0	0	0	3.25	1.00	3.31	1.50	6.38	0	8.75	0	0	24.69
27	0	0	0.12	0.13	2.50	3.13	2.00	21.00	3.37	0.94	0.06	0	33.25
28	0	0	0	3.75	2.08	4.08	0.50	1.81	2.18	0.06	0	0.12	14.58
29	0	0	0	0.62	1.00	3.75	2.50	2.62	2.36	1.61	0	0	14.66

MONTHLY PRECIPITATION RECORDS OF 10 YEARS OR LONGER
AT STATIONS IN SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

HYDROGRAPHIC UNIT NO. 5 (continued)

De Luz - Location No. 8S/4W-29H (continued)

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1929-30	0	0	0.50	0	0	0	9.25	1.00	4.50	2.50	2.37	0	20.12
31	0	0	0	0.31	1.98	0	1.93	5.60	0	2.75	0.50	0	13.07
32	0	0.12	0	1.13	3.25	7.87	1.00	7.13	0	0.48	0	0	20.98
33	0	0	0	1.50	0	1.31	7.25	0.12	0	0.43	0.18	0	10.79
34	0	0	0	0.25	0	9.62	3.00	3.14	0.25	0	0	0.50	16.76
1934-35	0	0	0	1.50	2.07	5.86	4.58	3.96	4.60	2.75	0.25	0	25.57
36	0	0	0	0.25	1.00	0.50	0	13.25	2.96	1.13	0	0	19.09
37	0	0	0	5.81	0	10.37	3.13	10.87	7.37	0.50	0.38	0	38.43
38	0	0	0	0	0	3.25	2.86	12.69	14.22	1.37	0.31	0.06	34.76
39	0	0	0.25	0.25	0.06	10.75	4.12	2.74	1.86	0.43	0	0	20.46
1939-40	0	0	6.25	0.50	0.37	0.50	5.94	7.45	1.00	2.21	0	0	24.22
1945-46	0	0	0	0	0	6.71	0.28	0.90	4.74	0.83	0	0	13.46
47	0	0	0	1.13	7.99	3.01	0.79	0.85	1.12	0.35	0	0	15.24
1953-54	0	0	0	0.40	0.69	1.36	9.07	4.75	5.56	0.20	0	0	22.03

Santa Rosa Ranch, 81 - Location No. 8S/3W-7M2

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1943-44	0	0	0	0	0.49	8.05	1.28	7.10	0	1.03	0	1.36	19.31
1944-45	0	0	0	0	8.72	0	0	4.50	3.04	3.02	0	0.27	19.55
46	0	0	1.20	0	0.16	5.97	0	0	2.98	4.38	0	0	14.69
47	0	0	0	0.81	7.76	3.07	0	0.65	0	1.81	0.54	0	14.64
48	0	0	0	0.28	0	1.42	1.43	1.96	2.58	0	0	1.62	9.29
49	0	0	0	0.51	0	1.10	7.20	0	3.36	0	0	0.86	13.03
1949-50	0	0	0	0	1.70	2.23	2.00	0	0	3.70	0.93	0	10.56
51	0	0	0	0	1.53	0	2.42	0.86	0.92	0	0	0.11	7.85
52	0	0	0.70	0	2.15	2.63	13.10	0	8.59	2.04	0.57	0	29.78
53	0	0	0	0	3.95	4.94	0	0	0	0	3.98	0	12.87

Santa Rosa Ranch (Ranch House) - Location No. 7S/4W-35Q

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1922-23	0	0	0	0	0	6.36	3.66	1.55	0.65	0	0	0	12.22
24	0	0	0	0.35	1.86	2.12	0.73	0	6.69	2.81	0	0	14.56
1924-25	0	0	0.20	0.55	1.60	4.21	0.66	1.59	2.68	3.20	0.67	1.64	17.00
26	0	0	0	2.83	0.97	3.09	1.88	6.84	0	11.35	0	0	26.96
27	0	0	0	0	3.00	4.74	1.49	24.93	4.09	1.16	0.50	0	39.91
28	0.16	0	0	1.33	4.07	4.66	0.82	2.60	3.12	0	0.23	0	16.99
29	0	0	0	0.71	1.60	4.29	3.51	3.82	2.99	2.28	0	0	19.20
1929-30	0	0	1.00	0	0	0	10.16	1.38	6.32	0	5.22	0	24.08
31	0	0	0	0.60	3.55	0	3.08	6.30	0.42	1.45	0.97	0	16.37
32	0	0.39	0.09	0.99	4.18	9.64	1.57	11.88	0	1.33	0	0.19	30.26
33	0	0	0	2.15	0	4.17	9.55	0.19	0.19	1.45	0.53	0.12	18.35
34	0	0.08	0	0.40	0.24	7.77	4.83	3.78	0.65	0	0	1.31	19.06
1934-35	0	0	0.36	2.94	2.13	6.37	4.78	4.56	5.69	3.20	0	0	30.03
36	0	0	0	0	1.30	0.84	0	15.17	2.86	0.90	0	0	21.07
37	0	0	0	5.18	0.30	11.07	3.91	12.55	9.37	0.72	0	0	43.10
38	0	0	0	0	0	4.02	3.00	16.48	15.28	1.73	0.87	0.25	41.63
39	0	0	0	0.27	0.22	9.90	4.22	3.14	2.78	1.19	0	0	21.72
1939-40	0	0	7.89	0.82	0.80	0.56	8.82	7.05	0.40	3.64	0	0	29.98
41	0	0	0	1.61	0.80	11.13	2.89	9.70	8.35	6.09	1.87	0	42.44
1948-49	0[a]	0[a]	0[a]	0.50	0	3.63	5.44	2.46	1.86	0	1.15	0	15.04[b]
1949-50	0	0	0	0	1.75	3.00	4.38	1.73	1.47	0.88	0.31	0	13.52
51	0	0	0	0	1.45	1.57	2.99	1.09	1.15	0	0	0	8.25
52	0	0.09	0.02	0.08	1.05	7.66	11.86	0.05	9.05	3.30	0	0	33.16
53	0	0	0.42	0	4.83	5.19	3.01	0	2.36	1.42	0.02	0	17.25
54	0	0	0	0.06	0.20	0.03	11.29	4.76	5.20	1.00	0	0	22.54

MONTHLY PRECIPITATION RECORDS OF 10 YEARS OR LONGER
AT STATIONS IN SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

HYDROGRAPHIC UNIT NO. 6

Fallbrook (No. 6) - Location No. 9S/4W-24B

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1911-12	0	0	0.15	0.10	0.14	1.08	0.49	0	8.31	2.89	0.90	0.07	14.13
13	T	T	0	0.85	1.11	0	1.92	4.26	0.57	0.29	T	0.31	9.31
14	0.09	T	T	0.15	2.59	1.48	9.75	4.88	0.98	1.34	0.11	0.38	21.75
1914-15	0.07	T	T	0.89	1.25	3.57	7.84	7.53	0.59	3.73	1.71	0	27.18
16	0	0.29	0.04	0	0.48	3.73	18.97	2.39	1.41	0	0.18	0	27.49
17	0	0.07	0.57	1.52	0.33	3.15	4.25	3.44	0.63	2.45	0.90	0	17.31
18	0	T	T	0.07	0.46	0	2.63	3.67	8.81	0.10	0.18	T	15.92
19	0.18	T	T	0.69	2.11	1.10	0.63	3.01	2.47	0.52	0.13	0	10.84
1919-20	0	0	0.82	0.96	0.85	1.68	0.60	3.17	5.11	0.79	0.38	0	14.36
21	0	T	0.06	1.05	1.05	1.15	4.52	0.68	2.56	0.11	3.41	0	14.59
22	0.12	0.17	1.31	0.75	0	13.52	4.75	4.05	2.67	0.39	0.90	0	28.63
23	T	T	0	0.23	1.94	3.58	2.34	2.17	0.65	1.54	T	0	12.45
24	T	0	0.11	0.60	0.09	1.89	1.43	0	4.93	1.49	0.03	0	10.77
1924-25	0	T	0.03	0.47	0.88	3.33	0.29	0.98	1.81	1.85	0.26	0.55	10.45
26	0	0	T	3.04	0.75	1.39	1.04	4.22	0.09	8.65	0.03	0.05	19.26

Santa Margarita Ranch - Location No. 10S/4W-18F

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal total
1913-14	0	0	0	0.04	1.82	0.70	2.03	3.74	0.80	1.00	0.16	0	10.29
1914-15	0	0	0	0	1.55	2.92	6.82	6.51	1.10	0	0	0	18.90
16	0	0	0	0	0	3.56	13.08	0.54	1.12	0	0	0	18.30
17	0	0	1.32	0	0	2.79	3.16	3.49	0.38	1.83	0.34	0	13.31
18	0[a]	0[a]	0[a]	0[a]	0.35[a]	0[a]	2.40	2.94	6.48	0.10[a]	0.25[a]	0[a]	12.52[b]
19	0.20[a]	0.10[a]	0.20[a]	0.50[a]	1.91	1.11	1.06	1.87	2.22	0.42	0	0	9.59[b]
1919-20	0	0	0.69	1.00	0.39	1.74	0.46	2.25	3.01	0.62	0.60	0	10.76
21	0	0	0	1.07	0.63	0.75	3.74	0.73	2.08	0.05	2.63	0.08	11.76
22	0	0.23	0.24	1.03	0.14	9.91	3.98	3.07	2.02	0.31	0.34	0.14	21.41
23	0	0	0	0.18	0.97	2.48	1.77	2.15	0.60	1.86	0	0	10.07
24	0.08	0	0	0.62	0.79	1.38	0.48	0	3.97	0.92	0	0	8.24
1924-25	0	0	0	0.55	0.55	2.25	0.17	0.55	1.55	1.66	0.26	0.30	7.84
26	0	0	0	2.74	0.64	0.89	0.37	4.70	0.14	8.66	0	0	18.14
27	0	0	0	0.13	1.84	3.18	0.68	10.14	3.64	0.44	0.30	0	20.35
28	0.09	0	0	0.82	3.33	4.17	0.62	1.23	1.50	0.12	0.09	0	11.97
29	0	0	0	0.43	0.72	2.72	1.66	1.18	1.48	1.02	0	0	9.21
1929-30	0	0	0.41	0.07	0	0	5.85	0.99	3.27	0.27	3.61	0	14.47
31	0	0	0	0.45	2.31	0	2.89	4.95	0	2.11	0.89	0	13.60
32	0	0.44	0	0.90	2.61	6.07	1.48	5.69	0.27	0.84	T	0.06	18.36
33	0	0	0	1.83	0	2.45	6.03	0.07	0.19	0.68	0.48	0.06	11.79
34	T	T	0	0.39	0.27	3.49	0.77	1.82	1.17	0.04	0	1.05	9.00
1934-35	0	0.07	0.25	0.56	2.46	3.48	3.63	4.18	2.72	1.56	0.04	0	18.95
36	0	0.64	0	0.12	0.76	0.58	0.69	7.04	1.20	0.53	0	0	11.56
37	0	0	0	4.32	0.38	5.97	2.16	7.87	5.40	0.67	0.28	0	27.05
38	0.19	0	0	0	0.14	1.95	1.39	5.99	7.18	1.04	0.51	0.14	18.53
39	T	0	0	0.43	0	6.76	3.00	2.34	2.00	0.38	0	0	14.91
1939-40	0	0	2.56	0.49	0.71	0.40	6.02	5.27	0.10	3.29	0	0	18.84
41	0	0	0	0.98	0.74	6.30	3.03	4.42	7.01	4.32	0.96	0.12	27.88
42						(Seasonal total only)							14.82

a. Estimated.
b. Partially estimated.

TABLE D-3

SEASONAL PRECIPITATION RECORDS OF OTHER STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED

In Inches

Hydrographic Unit No. 1

Murrieta Hot Springs 7S/3W-13N

Season	Precipitation
1946-47	6.12
48	7.43
49	9.91
50	6.26

Pauba Ranch (Station A) 7S/2W-26A

Season	Precipitation
1919-20	13.94
21	11.06

Santa Rosa Ranch 7S/4W-28P (Cienega)

Season	Precipitation
1924-25	9.20
26	25.85
27	33.95
28	17.28
29	17.42
1929-30	22.87
31	19.98
32	22.52
33	19.66
34	16.18
1934-35	29.78
36	18.29
37	38.42
38	36.90
39	21.72
1939-40	27.62
41	40.57

Santa Rosa Ranch 7S/3W-19C (Gate)

Season	Precipitation
1923-24	8.50
1924-25	8.94
26	19.99
27	30.21
28	12.49
29	12.00
1929-30	19.87
31	11.06
32	20.78
33	13.97
34	9.50
1934-35	20.56
36	13.00
37	27.78
38	26.22
39	16.42
1939-40	22.52
41	30.54

Santa Rosa Ranch 7S/3W-34G (Mesa)

Season	Precipitation
1922-23	5.62
24	11.75
1924-25	15.06
26	25.48
27	35.29
28	16.33
29	18.63

Santa Rosa Ranch 7S/3W-34G (Mesa) (continued)

Season	Precipitation
1929-30	22.87
31	13.64
32	25.84
33	16.52
34	18.58
1934-35	25.77
36	18.97
37	42.07
38	39.79
39	20.57
1939-40	28.08
41	42.60

Santa Rosa Ranch (E) 7S/3W-32P

Season	Precipitation
1942-43	28.92
44	19.63
45	20.38
46	16.41
1947-48	10.09
49	13.63
50	10.95
51	7.80
1952-53	9.19

Hydrographic Unit No. 2

Aguanga (Upper) 8S/2E-7D

Season	Precipitation
1928-29	8.88
1929-30	17.01
31	8.75
32	18.16
33	11.64[a]
34	4.62[a]
1934-35	13.77[a]
36	8.22[a]
37	22.02[a]
38	15.71[a]
39	13.03[a]

Aguanga (Upper) 8S/2E-7D (continued)

Season	Precipitation
1939-40	14.08[a]
41	24.20[a]
42	14.93[a]
43	13.28[a]
44	14.00[a]
1944-45	10.45[a]
46	12.89[a]
47	10.73[a]
48	7.68[a]

Anza (Cartier) 7S/3E-4K

Season	Precipitation
1949-50	10.50
51	13.40
52	35.77
53	17.20
54	14.83

Coahuila 7S/3E-31M

Season	Precipitation
1911-12	15.87[a]
13	4.43
14	18.87
1914-15	27.95
16	22.70
17	14.13
18	15.00

Rancho Ramona 8S/1E-7P

Season	Precipitation
1950-51	4.25

SEASONAL PRECIPITATION RECORDS OF OTHER STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

Hydrographic Unit No. 3

Aguanga No. 1 (Lower) 8S/1E-34G

Season	Precipitation
1908-09	11.94[a]
1909-10	15.42
11	13.33
12	12.83
13	8.19
14	15.43
1914-15	20.69
16	22.92
17	10.89
18	14.02
19	10.17

Aguanga No. 1 (Lower) 8S/1E-34G (continued)

Season	Precipitation
1919-20	15.02
21	8.10
22	24.17
23	8.35
24	10.82
1924-25	7.18
26	16.04
27	19.71
28	8.48[a]

Pauba Ranch 8S/1W-10R (Station K)

Season	Precipitation
1923-24	10.77
25	6.64
26	17.48
27	16.75

Radec 8S/1E-19Q

Season	Precipitation
1951-52	19.40
53	11.65
54	12.04

Vail Lake 8S/1W-10M

Season	Precipitation
1952-53	9.43
54	11.55

Hydrographic Unit No. 5

Rainbow 9S/2W-5D (Honor Camp No. 2)

Season	Precipitation
1949-50	11.66
51	12.99
52	31.05
53	14.69
54	18.80

Rainbow 9S/3W-1Q (Steinberg)

Season	Precipitation
1951-52	32.52
53	14.13
54	19.35

Santa Rosa Ranch (B) 8S/3W-7M1

Season	Precipitation
1942-43	29.24
44	19.36
1946-47	13.81
48	9.20
1949-50	10.13
51	7.67
52	29.52

Santa Rosa Ranch (C) 8S/4W-12P1

Season	Precipitation
1942-43	27.87
44	19.56
45	18.93
1948-49	12.86
50	10.24
51	7.75
1952-53	13.22

Santa Rosa Ranch (D) 8S/4W-12P2

Season	Precipitation
1943-44	19.58
45	19.00
1947-48	9.23
1950-51	7.98
1952-53	12.92

Santa Rosa Ranch (DR) 8S/4W-12L

Season	Precipitation
1943-44	19.38
1947-48	9.01
1949-50	9.55
1951-52	31.22

Santa Rosa Ranch 8S/3W-7A (Saxman)

Season	Precipitation
1945-46	18.81
47	16.79
48	12.06
49	14.74
1949-50	13.46
51	9.74

Sky Ranch 8S/5W-23R

Season	Precipitation
1949-50	14.42
51	11.43
52	43.72
53	16.33
54	25.09

Hydrographic Unit No. 6

Fallbrook (No. 3) 9S/4W-24K

Season	Precipitation
1936-37	32.24
38	21.98
39	17.00

Fallbrook (No. 3) 9S/3W-24K (continued)

Season	Precipitation
1939-40	19.80
41	30.05
42	16.11
43	18.94

Lake O'Neill 10S/4W-5Q

Season	Precipitation
1953-54	10.70

SEASONAL PRECIPITATION RECORDS OF OTHER STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

Agua Tibia (No. 1) 9S/1W-30Q

Season	Precipitation
1931-32	21.67
33	15.72
34	9.40
1934-35	23.40
36	12.28
37	33.63
38	19.65
39	15.34
1939-40	17.41
41	30.49
42	17.29
43	19.85

Agua Tibia (No. 2) 9S/1W-30H

Season	Precipitation
1940-41	42.32
42	23.98
43	26.72

Bonsall Basin 10S/3W-10J

Season	Precipitation
1939-40	16.06
41	27.10
42	16.76
43	15.90

Chihuahua Mountain 9S/3E-35A

Season	Precipitation
1911-12	15.19[b]
13	13.53
14	26.02
15	26.84[b]

Chihuahua Valley 9S/3E-23E

Season	Precipitation
1952-53	14.31
54	15.23

Cuyamaca (Key Station)[c]

Deadman's Hole 10S/2E-1F

Season	Precipitation
1911-12	17.31[b]
13	12.19
14	23.81
1914-15	32.45
16	34.92
17	21.40
18	19.67
19	14.07
1919-20	24.63
21	12.72
22	38.93
23	15.02
24	15.15

Adjacent to Watershed

Elsinore 5S/5W-34R
(Station 13802)

Season	Precipitation
1916-17	15.89[a]
18	11.94
19	8.37
1919-20	17.18[a]
21	11.33[a]
22	31.59[a]
23	12.36
24	10.60
1924-25	8.59
26	20.53
27	24.37
28	11.50
29	11.66[a]
1929-30	18.95[a]
31	12.59[a]
32	23.27[a]
33	14.07[a]
34	10.76[a]
1934-35	22.89
36	13.71
37	31.82
38	25.91
39	15.31
1939-40	16.40
41	36.02
42	14.60[a]
43	19.48
1944-45	11.64[a]
1946-47	13.76[a]
1948-49	13.01
50	10.32
51	8.18
52	22.75

Elsinore 6S/5W-8K[c]
(Key Station)

Elsinore 6S/4W-2M
(Railroad Canyon Dam)

Season	Precipitation
1927-28	3.39
29	6.56
1929-30	15.73
31	9.68
32	16.62
33	9.67
34	7.90

Elsinore 6S/4W-2M
(Railroad Canyon Dam) (continued)

Season	Precipitation
1934-35	14.89[a]
36	7.78
37	20.95
38	16.53
39	11.80
1939-40	10.43
41	23.84
42	8.89
43	13.33
44	15.18
1944-45	9.94
46	7.29
47	7.98
48	3.86
49	6.75
1949-50	3.96
51	4.07
52	14.81

Escondido No. 1[c]
(Key Station)

Fallbrook 9S/3W-20H
(H. E. White)

Season	Precipitation
1909-10	18.29
11	17.70
12	16.65
13	10.59
14	23.66
1914-15	29.90
16	29.78
17	19.26
18	16.93
19	11.74
1919-20	19.10
21	16.78
22	34.66
23	15.07
24	11.52
1924-25	11.59
26	21.96
27	28.33
28	12.63
29	12.80
1929-30	19.59
31	16.64
32	24.29
33	13.17
34	12.63

SEASONAL PRECIPITATION RECORDS OF OTHER STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

Adjacent to Watershed (continued)

Fallbrook 9S/3W-20H
(H. E. White) (continued)

Season	Precipitation
1934-35	25.55
36	16.39
37	34.51
38	25.90
39	20.51
1939-40	21.00
41	33.31
42	19.56
43	21.86
44	15.66
1944-45	13.42
46	11.95
47	10.24
48	7.86

Fallbrook (No. 1) 9S/3W-21E

Season	Precipitation
1876-77	8.67
78	24.84
79	7.70
1879-80	20.45
81	13.47[a]
82	12.24
83	13.32
84	40.77
1884-85	12.70
86	26.23
87	10.82
88	20.10
89	23.46
1889-90	26.91
91	19.68
92	13.49
93	21.27
94	9.81
1894-95	23.85
96	9.27
97	21.58
98	10.98
99	8.70
1899-1900	13.47
01	16.60
02	12.45
03	23.49

Fallbrook (No. 4) 9S/3W-20E

Season	Precipitation
1932-33	11.74
34	11.00
1934-35	19.42
36	14.51
37	32.35
38	24.51
39	17.38
1939-40	19.09
41	30.59
42	16.87
43	19.22

Fallbrook (No. 5) 9S/4W-25R

Season	Precipitation
1938-39	16.82
40	19.26
41	30.65
42	17.21
43	18.14

Fallbrook 9S/3W-31M
(Steele)

Season	Precipitation
1950-51	7.80
52	24.36
53	12.47
54	12.29

Hemet Lake 6S/3E-7K1

Season	Precipitation
1896-97	21.35[b]
98	13.50
99	11.60
1899-1900	13.20
01	19.70
02	16.22
03	19.33
04	7.61
1904-05	28.57
06	23.36
07	29.85
08	19.16
09	27.11
1909-10	19.98
11	21.17
12	17.68
13	14.10
14	24.38
1914-15	27.27
16	25.44
17	17.34
18	16.57
19	15.78

Hemet Lake 6S/3E-7K1
(continued)

Season	Precipitation
1919-20	23.83
21	15.23
22	34.21
23	20.10
24	14.20
1924-25	14.13
26	25.18
27	30.86
28	13.53
29	12.54
1929-30	28.27
31	11.99
32	27.61
33	12.24
34	6.12
1934-35	20.56
36	16.87
37	31.34
38	25.53
39	15.42
1939-40	21.12

Hemet Reservoir 6S/3E-7K2

Season	Precipitation
1940-41	30.82
42	17.12
43	22.36
44	16.09
1944-45	16.37
46	16.65
47	18.24
48	10.50[a]
49	13.52
1949-50	13.01
51	10.58

Meagher 10S/1W-3M

Season	Precipitation
1937-38	18.58
39	16.05
1939-40	20.45
41	31.25
42	18.31
43	18.70

SEASONAL PRECIPITATION RECORDS OF OTHER STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

Adjacent to Watershed (continued)

Mendenhall Valley 10S/1E-2R

Season	Precipitation
1911-12	30.95
13	24.69
14	37.40
15	53.72
16	45.62

Mount Palomar 9S/1E-27Q

Season	Precipitation
1938-39	29.07
1939-40	24.83
41	42.01
42	20.59
43	28.69
44	27.41
1944-45	23.21
46	26.77

Nellie 10S/1E-9H

Season	Precipitation
1901-02	42.45
1904-05	54.01
06	77.40
07	49.96
1909-10	44.21
11	44.96
12	39.06
13	39.59
14	52.95
1914-15	67.19[a]
16	65.12
17	44.57
18	30.85
19	28.83
1919-20	50.70[a]
21	32.04[a]
22	73.20[a]
23	33.93[a]

Oceanside, C.A.A. 11S/5W-13Q

Season	Precipitation
1945-46	10.40
47	8.85
48	6.36
49	8.27
1949-50	7.46
51	5.82

Oceanside (No. 1) 11S/5W-26E

Season	Precipitation
1892-93	13.10
94	6.95
1894-95	14.33
96	7.12
97	16.08
98	6.91
99	4.99
1899-1900	9.61
01	9.20
02	8.76
03	14.14
04	4.52
1904-05	16.29
06	15.45
07	11.33
08	9.41
09	10.57

Oceanside (No. 2) 11S/5W-26C

Season	Precipitation
1909-10	11.12[b]
11	12.26
12	11.67
13	6.50
14	14.15
1914-15	22.12
16	17.42
17	14.29
18	10.50
19	8.62
1919-20	9.27
21	10.64
22	19.06
23	9.04
24	6.06
1924-25	6.19
26	12.44

Oceanside (No. 3) 11S/5W-26D

Season	Precipitation
1926-27	11.74[b]
28	11.19
29	7.54
1929-30	13.77
31	11.22
32	17.57
33	11.66
34	7.97

Oceanside (No. 3) 11S/5W-26D (continued)

Season	Precipitation
1934-35	19.26
36	7.70
37	22.98
38	15.43
39	13.80
1939-40	14.95
41	24.95
42	12.61
43	13.37

Oceanside (No. 4) 11S/4W-19E

Season	Precipitation
1926-27	15.97
28	10.88
29	8.62
1929-30	11.84
31	10.26
32	15.40
33	11.88
34	8.90
1934-35	21.47
36	8.67
37	23.40
38	14.83
39	12.79
1939-40	15.54
41	26.80
42	14.76
43	15.55

Oceanside (No. 4A) 11S/5W-24C

Season	Precipitation
1924-25	6.13
26	13.60
27	16.05
28	11.09
29	8.62

Oceanside 11S/4W-19P (Crouch)

Season	Precipitation
1873-74	16.56
1874-75	5.59
76	9.80
77	3.41
78	15.94
79	7.81

SEASONAL PRECIPITATION RECORDS OF OTHER STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

Adjacent to Watershed (continued)

Oceanside 11S/4W-19P
(Crouch) (continued)

Season	Precipitation
1879-80	14.24
81	9.16
82	9.25
83	4.84
84	25.66
1884-85	8.61
86	16.72
87	8.28
88	9.55
89	10.88
1889-90	14.90
91	10.36
92	8.47
93	9.21
94	4.87
1894-95	11.67
96	6.16
97	11.70
98	5.06
99	5.07
1899-1900	5.29
01	10.43
02	5.61
03	11.70
04	4.40
1904-05	14.32
06	14.99
07	10.26
08	8.36
09	10.23
1909-10	9.72
11	12.41
12	11.32
13	6.06
14	10.21
1914-15	14.49
16	13.70

Pala 9S/2W-27L

Season	Precipitation
1939-40	16.30
41	30.28
42	16.88
43	18.44

Paloma Valley 6S/3W-22G

Season	Precipitation
1939-40	11.00
41	26.09
42	10.49
43	18.69
44	15.99

Paloma Valley 6S/3W-22G
(continued)

Season	Precipitation
1944-45	13.39
46	11.22
47	9.85
48	6.93
49	9.82
1949-50	6.63
51	4.28
52	20.33

Palomar Mountain Observatory
9S/1E-34B

Season	Precipitation
1942-43	16.34
44	27.41
1944-45	23.22
46	26.77
47	24.86
48	19.43
49	24.47
1949-50	15.89
51	18.29
52	50.63
53	20.13
54	30.05

Puerta La Cruz 10S/3E-17K

Season	Precipitation
1911-12	13.84
13	11.53
14	19.52
15	28.06
16	30.51
17	15.10

Red Mountain Ranch 9S/3W-16R

Season	Precipitation
1925-26	18.08
27	22.69
28	11.97
29	12.42
1929-30	18.59
31	15.55
32	22.36
33	11.75
34	12.39
1934-35	21.51
36	14.69
37	34.52
38	24.84
39	18.66
1939-40	19.02
41	30.19
42	17.29
43	20.36

Rincon of Warner Ranch
10S/2E-16K

Season	Precipitation
1913-14	27.20
15	42.71
16	45.18

San Jacinto (Key Station)[o]

San Luis Rey 11S/4W-5K

Season	Precipitation
1901-02	9.74
03	14.88
04	6.51
1904-05	19.80
06	23.26
07	15.10
08	10.63
09	17.30
1909-10	10.99
11	11.19
12	11.97
13	6.87
14	17.33
1914-15	21.91
16	20.10
17	15.43
18	12.59
19	8.07
1919-20	9.23
21	10.63

Tripp Flats 7S/2E-3F

Season	Precipitation
1948-49	9.77
50	12.85
51	11.58
52	26.23

Wight 9S/2W-31P

Season	Precipitation
1929-30	16.02[a]
31	13.54
32	19.94
33	13.20
34	7.35
1934-35	17.07
36	10.76
37	27.50
38	16.85
39	13.61
1939-40	16.04
41	25.61
42	16.40
43	14.49

SEASONAL PRECIPITATION RECORDS OF OTHER STATIONS WITHIN AND ADJACENT TO THE SANTA MARGARITA RIVER WATERSHED

In Inches
(continued)

Season	Precipitation	Season	Precipitation	Season	Precipitation
Adjacent to Watershed (continued)					
Winchester (USWB) 5S/2W-27E		Winchester (USWB) 5S/2W-27E (continued)		Winchester (USWB) 5S/2W-27E (continued)	
1940-41	20.17	1944-45	12.05	1949-50	6.85
42	9.33[a]	46	9.69[a]	51	4.44
43	12.86[a]	47	8.86		
44	12.07[a]	48	6.86[a]		
		49	8.85		

a. Partially estimated.
b. Partial season.
c. See Table 4 "Seasonal Precipitation and Indices of Wetness at Key Stations", Chapter II.

APPENDIX E

RECORDS OF STREAM AND SPRING DISCHARGE
NOT PREVIOUSLY PUBLISHED

TABLE OF CONTENTS

RECORDS OF STREAM AND SPRING DISCHARGE
NOT PREVIOUSLY PUBLISHED

APPENDIX E

TABLE E-1

COAHUILA CREEK, NEAR ANZA

Location and description: Water-stage recorder, latitude 33°31'30", longitude 116°48'20", in Section 31, T.7S., R.2E., on Parks Ranch, about 8 miles west of Anza, Riverside County. Elevation of gage about 3,360 feet.

Drainage area: 80 square miles.

Records available: December 18, 1950, through September, 1954, Division of Water Resources.

Remarks: Records fair, control for station is small concrete dam. Storm flows estimated by application of broad-crested weir formula. No regulation or diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1951

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1				0.05	0.05	0.05	0.05	0.06	0.05	0.05	0.05	0.04	
2				.05	.05	.05	.05	.06	.05	.05	.05	.04	
3				.06	.05	.05	.05	.06	.05	.05	.05	.04	
4				.06	.05	.06	.05	.06	.05	.05	.05	.04	
5				.06	.05	.06	.05	.06	.05	.05	.05	.04	
6				.06	.05	.06	.05	.06	.05	.05	.05	.04	
7				.06	.05	.06	.05	.06	.05	.05	.05	.04	
8				.06	.05	.06	.05	.06	.05	.05	.05	.04	
9				.06	.05	.06	.05	.06	.05	.05	.05	.04	
10				.06	.05	.06	.05	.06	.05	.05	.05	.04	
11				.06	.05	.06	.05	.06	.05	.05	.05	.04	
12				.06	.05	.07	.05	.06	.05	.05	.05	.04	
13				.06	.05	.07	.05	.06	.05	.05	.05	.04	
14				.06	.05	.06	.05	.06	.05	.05	.05	.04	
15				.06	.05	.06	.05	.06	.05	.05	.05	.04	
16				.06	.05	.06	.05	.06	.05	.05	.05	.04	
17				.06	.05	.06	.05	.06	.05	.05	.05	.04	
18			0.06	.06	.05	.06	.05	.06	.05	.05	.05	.04	
19			.06	.06	.05	.06	.05	.05	.05	.05	.05	.04	
20			.06	.06	.05	.06	.05	.05	.05	.05	.05	.04	
21			.06	.06	.05	.06	.05	.05	.05	.05	.05	.04	
22			.05	.06	.05	.06	.05	.05	.05	.05	.05	.04	
23			.05	.06	.05	.06	.05	.05	.05	.05	.05	.04	
24			.04	.06	.05	.06	.06	.05	.05	.05	.05	.04	
25			.04	.06	.05	.06	.06	.05	.05	.05	.05	.04	
26			.04	.06	.05	.06	.06	.05	.05	.05	.05	.04	
27			.04	.06	.05	.06	.06	.05	.05	.05	.05	.04	
28			.04	.06	0.05	.06	.06	.05	.05	.05	.05	.04	
29			.04	.06		.06	.06	.05	.05	.05	.05	.04	
30			.04	.06		.04	0.06	.05	0.05	.05	.05	0.04	
31			0.04	0.05		0.04		0.05		0.05	0.05		
Total sec. ft. days			--	1.83	1.40	1.81	1.57	1.73	1.50	1.55	1.55	1.20	Year period
Mean sec. ft.			--	0.06	0.05	0.06	0.05	0.06	0.05	0.05	0.05	0.04	--
Max. sec. ft.			--	0.06	0.05	0.07	0.06	0.06	0.05	0.05	0.05	0.04	--
Min. sec. ft.			--	0.05	0.05	0.04	0.05	0.05	0.05	0.05	0.05	0.04	--
Total ac. ft.			--	3.6	2.8	3.6	3.1	3.4	3.0	3.1	3.1	2.4	--

COAHUILA CREEK, NEAR ANZA
(continued)

Location and description: Water-stage recorder, latitude 33°31'30", longitude 116°48'20", in Section 31, T.7S., R.2E., on Parks Ranch, about 8 miles west of Anza, Riverside County. Elevation of gage about 3,360 feet.

Drainage area: 80 square miles

Records available: December 18, 1950, through September, 1954, Division of Water Resources.

Remarks: Records fair, control for station is small concrete dam. Storm flows estimated by application of broad-crested weir formula. No regulation or diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1952

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Year period
1	0.04	0.04	0.05	0.14	0.05	2.2	0.07	0.08	0.05	0.05	0.05	0.05	
2	.04	.03	0.05	0.05	.05	0.5	0.07	.08	.05	.05	.06	.05	
3	.04	.04	0.05	0.05	.05	0.08	0.07	.08	.05	.05	.06	.05	
4	.04	.04	0.05	0.05	.05	0.06	0.07	.08	.05	.05	.06	.05	
5	.04	.05	0.06	0.05	.05	0.06	0.07	.06	.05	.05	.06	.05	
6	.04	.05	0.04	0.05	.05	0.06	0.08	.06	.05	.05	.05	.05	
7	.04	.05	0.04	0.05	.05	0.6	0.08	.06	.05	.05	.05	.05	
8	.04	.05	0.04	0.05	.05	4.8	0.08	.06	.05	.05	.04	.05	
9	.04	.05	0.04	0.05*	.05	1.0	0.08	.06	.05	.05	.04	.05	
10	.04	.05	0.04	0.05	.05	7.9	0.6	.06	.05	.06	.04	.05	
11	.04	.05	0.04	0.05*	.05	80	1.4	.06	.05	.06	.04	.05	
12	.04	.05	0.06	0.05	.06	4.0	0.08	.06	.05	.06	.04	.05	
13	.04	.04	0.05	6.0	.06	4.8	0.08	.06	.05	.06	.04	.05	
14	.04	.04	0.05	0.6	.05	4.2	0.08	.06	.05	.06	.04	.05	
15	.04	.04	0.04	0.06	.05	2.3	0.08	.06	.05	.06	.05	.05	
16	.04	.04	0.04	13	.05	86	0.08	.06	.05	.06	.05	.06	
17	.04	.04	0.04	8.8	.05	37	0.08	.06	.05	.05	.05	.06	
18	.04	.04	0.04	130	.06	8.1	0.08	.06	.05	.05	.06	.06	
19	.04	.05	0.04	8.5	.06	0.4	0.08	.06	.05	.05	.06	.05	
20	.04	.05	0.04	0.06	.06	0.08	0.08	.06	.05	.05	.06	.05	
21	.04	.05	0.04	0.06	.06	0.08	0.08	.06	.05	.05	.06	.05	
22	.04	.05	0.04	0.06	.06	0.07	0.08	.06	.05	.05	.05	.05	
23	.04	.05	0.04	0.06	.06	0.07	0.08	.06	.05	.05	.05	.05	
24	.04	.05	0.05	0.06	.06	0.08	0.08	.06	.05	.05	.05	.05	
25	.05	.05	0.05	0.06	.06	0.07	0.08	.06	.05	.05	.05	.05	
26	.03	.05	0.05	0.06	.06	0.08	0.08	.05	.05	.05	.05	.05	
27	.03	.05	0.05	0.06	.06	0.07	0.08	.05	.05	.02	.05	.05	
28	.03	.05	0.06	0.06	.06	0.07	0.09	.05	.05	.01	.05	.05	
29	.03	.05	0.06	0.06	0.06	0.08	0.08	.05	.05	.03	.05	.05	
30	.03	0.05	41	0.06		0.08	0.08	.05	0.05	.04	.05	0.05	
31	0.03		3.3	0.06		0.07		0.05		0.05	0.05		
Total sec. ft. days	1.19	1.39	45.3	168	1.59	245	4.20	1.88	1.50	1.52	1.56	1.53	
Mean sec. ft.	0.04	0.05	1.46	5.42	0.05	7.90	0.14	0.06	0.05	0.05	0.05	0.05	1.30
Max. sec. ft.	0.05	0.05	41	130	0.06	86	1.4	0.08	0.05	0.06	0.06	0.06	130
Min. sec. ft.	0.03	0.03	0.04	0.05	0.05	0.06	0.07	0.05	0.05	0.01	0.04	0.05	0.01
Total ac. ft.	2.4	2.8	90	333	3.1	485	8.3	3.7	3.0	3.0	3.1	3.0	940

* Estimated.

COAHUILA CREEK, NEAR ANZA
(continued)

Location and description: Water-stage recorder, latitude 33°31'30", longitude 116°48'20", in Section 31, T.7S., R.2E., on Parks Ranch, about 8 miles west of Anza, Riverside County. Elevation of gage about 3,360 feet.

Drainage area: 80 square miles.

Records available: December 18, 1950, through September, 1954, Division of Water Resources.

Remarks: Records fair, control for station is small concrete dam. Storm flows estimated by application of broad-crested weir formula. No regulation or diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1953

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1	0.05	0.06	0.06	0.07	0.06	0.3	0.06	0.06	0.05	0.05	0.04	0.04	
2	.05	.06	0.08	.06	.06	.4	.06	.06	.05	.05	.04	.04	
3	.05	.06	0.06	.06	.06	.9	.06	.06	.05	.05	.04	.04	
4	.05	.06	0.06	.06	.06	.2	.06	.06	.05	.05	.04	.04	
5	.05	.06	0.06	.06	.06	.06	.06	.06	.05	.05	.04	.04	
6	.05	.06	0.06	.08	.06	.06	.06	.06	.05	.05	.04	.04	
7	.05	.06	0.06	.5*	.06	.06	.06	.06	.05	.05	.04	.04	
8	.05	.06	0.06	.08*	.06	.06	.06	.06	.05	.05	.04	.04	
9	.05	.06	0.06	.08	.06	.06	.06	.06	.05	.05	.04	.04	
10	.05	.06	0.06	.08	.06	.06	.06	.06	.05	.05	.04	.04	
11	.05	.06	0.06	.08	.06	.06	.06	.06	.05	.05	.04	.04	
12	.05	.06	0.06	.08	.06	.06	.06	.06	.05	.05	.04	.04	
13	.05	.06	0.06	.08	.06	.06	.06	.05	.05	.05	.04	.04	
14	.05	.06	0.06	.08	.06	.06	.06	.06	.05	.04	.04	.04	
15	.05	.07	0.06	.08	.06	.06	.06	.06	.06	.04	.04	.04	
16	.05	.4	0.06	.07	.06	.06	.06	.05	.06	.04	.04	.04	
17	.05	.05	2.3*	.07	.07	.06	.06	.05	.06	.04	.04	.04	
18	.05	.05	0.7*	.07	.07	.06	.06	.05	.06	.04	.04	.04	
19	.05	.05	0.06*	.07	.07*	.06	.06	.05	.06	.04	.04	.04	
20	.05	.05	3.8*	.07	.07*	.07	.06	.05	.06	.04	.04	.04	
21	.05	.05	0.6*	.07	.07*	06	.4	.05	.06	.04	.04	.04	
22	.05	.05	0.06	.07	.07*	.06	.4	.05	.06	.04	.04	.04	
23	.05	.08	0.06	.07	.1*	.06	.07	.05	.05	.04	.04	.04	
24	.05	.06	0.06	.07	.07*	.06	.06	.05	.05	.04	.04	.04	
25	.05	.06	0.06	.07	.3*	.06	.06	.05	.05	.04	.04	.04	
26	.05	.06	0.06	.07	.08	.06	.06	.05	.05	.04	.04	.04	
27	.05	.06	0.06	.06	.08	.06	.06	.05	.05	.04	.04	.04	
28	.05	.06	0.08	.06	0.08	.06	.3	.05	.05	.04	.04	.04	
29	.05	.06	0.07	.07		.08	.07	.05	.05	.04	.04	.04	
30	.05	0.06	0.07	.07		.06	0.06	.05	0.05	.04	.04	0.04	
31	0.05		0.5	0.06		0.06		0.05		0.04	0.04		
Total sec. ft. days	1.55	2.11	9.52	2.62	2.09	3.45	2.74	1.69	1.58	1.37	1.24	1.20	Year period
Mean sec. ft.	0.05	0.07	0.31	0.08	0.07	0.11	0.09	0.05	0.05	0.04	0.04	0.04	0.09
Max. sec. ft.	0.05	0.4	3.8	0.5	0.3	0.9	0.4	0.06	0.06	0.05	0.04	0.04	3.8
Min. sec. ft.	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.04	0.04	0.04	0.04
Total ac. ft.	3.1	4.2	19	5.2	4.1	6.8	5.4	3.3	3.1	2.7	2.5	2.4	62

* Estimated.

COAHUILA CREEK, NEAR ANZA
(continued)

Location and description: Water-stage recorder, latitude 33°31'30", longitude 116°48'20", in Section 31, T.7S., R. 2E., on Parks Ranch, about 8 miles west of Anza, Riverside County. Elevation of gage about 3,360 feet.

Drainage area: 80 square miles.

Records available: December 18, 1950, through September, 1954, Division of Water Resources.

Remarks: Records fair, control for station is small concrete dam. Storm flows estimated by application of broad-crested weir formula. No regulation or diversions above station.

Daily discharge in second-feet, for the year ending September 30, 1954

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Year
1	0.04	0.05	0.05	0.05	0.06	0.06	0.07	0.05	0.05	0.05	0.05	0.05	
2	.04	.05	.05	.05	0.06	0.06	.07	.05	.05	.05	.05	.05	
3	.04	.05	.05	.05	0.06	0.05	.06	.05	.05	.05	.05	.06	
4	.04	.05	.05	.05	0.06	0.06	.06	.05	.05	.05	.05	.06	
5	.04	.05	.05	.06	0.06	0.06	.06	.05	.05	.05	.05	.06	
6	.04	.05	.05	.06	0.06	0.06	.06	.05	.05	.05	.04	.06	
7	.04	.05	.05	.06	0.06	0.06	.06	.05	.05	.05	.04	.06	
8	.04	.04	.05	.06	0.06	0.06	.06	.05	.05	.05	.04	.06	
9	.04	.04	.05	.06	0.06	0.06	.06	.05	.05	.05	.04	.06	
10	.04	.04	.05	.06	0.06	0.06	.06	.05	.05	.05	.04	.06	
11	.04	.04	.05	.06	0.06	0.06	.06	.05	.05	.05	.04	.06	
12	.04	.04	.05	.07	0.06	0.06	.06	.05	.05	.05	.05	.06	
13	.05	.04	.05	.07	0.4	0.06	.06	.05	.06	.05	.05	.06	
14	.05	.05	.05	.06	1.2	0.06	.06	.05	.06	.05	.05	.06	
15	.05	.05	.06	.06	0.6	0.06	.06	.05	.05	.05	.05	.06	
16	.05	.05	.06	.06	0.07	0.09	.06	.05	.05	.05	.05	.06	
17	.05	.05	.06	.06	0.06	0.88	.06	.05	.05	.05	.05	.06	
18	.05	.05	.06	.06	0.06	0.08	.06	.05	.05	.08	.05	.05	
19	.05	.05	.05	.5	0.06	0.07	.06	.05	.05	.05	.05	.05	
20	.05	.05	.05	.3	0.06	0.07	.06	.05	.06	.05	.05	.05	
21	.05	.05	.05	.06	0.06	0.08	.05	.05	.05	.05	.05	.05	
22	.05	.05	.05	.06	0.06	7.2	.05	.05	.05	.05	.05	.05	
23	.05	.05	.05	.06	0.06	2.4	.05	.05	.05	.05	.05	.05	
24	.05	.05	.05	.07	0.06	1.4	.05	.05	.05	.05	.05	.05	
25	.05	.05	.05	.7	0.06	6.7	.05	.05	.05	.05	.05	.05	
26	.05	.05	.05	.09	0.06	0.6	.05	.05	.05	.05	.05	.05	
27	.05	.05	.05	.06	0.06	0.09	.05	.05	.06	.05	.05	.05	
28	.05	.05	.05	.06	0.06	0.09	.05	.05	.06	.05	.05	.05	
29	.05	.05	.05	.06		0.09	.05	.05	.05	.05	.05	.05	
30	.05	0.05	.05	.06		0.08	0.05	.05	0.05	.05	.05	0.05	
31	0.05		0.05	0.06		0.07		0.05		0.05	0.05		
Total sec. ft. days	1.43	1.44	1.59	3.20	3.71	20.9	1.72	1.55	1.55	1.58	1.49	1.65	Year period
Mean sec. ft.	0.05	0.05	0.05	0.10	0.13	0.67	0.06	0.05	0.05	0.05	0.05	0.06	0.11
Max. sec. ft.	0.05	0.05	0.06	0.7	1.2	7.2	0.07	0.05	0.06	0.08	0.05	0.06	7.2
Min. sec. ft.	0.04	0.04	0.05	0.05	0.06	0.06	0.05	0.05	0.05	0.05	0.04	0.05	0.04
Total ac. ft.	2.[illegible]	2.9	3.1	6.3	7.3	41	3.4	3.1	3.2	3.1	3.0	3.3	82

COLE CANYON CREEK, NEAR MURRIETA

Location and description. Water-stage recorder, latitude 33°33'40", longitude 117°14'10", in Section 18, T.7S., R.3W., 500 feet upstream from Murrieta Creek confluence, about 1.5 miles northwest of Murrieta, Riverside County. Elevation of gage about 1,115 feet.

Drainage area: 8.8 square miles.

Records available: December 26, 1952, through May 17, 1954, Division of Water Resources

Remarks. Records fair, cobble and sand bottom. No regulation or diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1953

Day	Oct.	Nov.	Dec.	Jan.	Feb	Mar.	Apr.	May	June	July	Aug.	Sep.	
1				0									
2				0									
3				0									
4				0									
5				0									
6				0									
7				4.1									
8				5.1									
9				1.9									
10				1.1									
11				0.7									
12				0.4									
13				0.3									
14				0.3									
15				0.3									
16				0.2									
17				0.2									
18				0.2									
19				0.1									
20				0.1									
21				0.1									
22				0.1									
23				0.1									
24				0.1									
25				0.08									
26			0	0.06									
27			0	0.04									
28			0.7	0.03									
29			0	0.02									
30			0.7	0									
31			0.02	0									
Total sec. ft. days			--	15.6	0	0	0	0	0	0	0	0	Year period
Mean sec. ft.			--	0.50	0	0	0	0	0	0	0	0	--
Max. sec. ft.			--	5.1									--
Min. sec. ft.			0	0									0
Total ac. ft.			--	31	0	0	0	0	0	0	0	0	--

COLE CANYON CREEK, NEAR MURRIETA
(continued)

Location and description: Water-stage recorder, latitude 33°33'40", longitude 117°14'10", in Section 18, T.7S., R.3W., 500 feet upstream from Murrieta Creek confluence, about 1.5 miles northwest of Murrieta, Riverside County. Elevation of gage about 1,115 feet.

Drainage area: 8.8 square miles.

Records available: December 26, 1952, through May 17, 1954, Division of Water Resources.

Remarks: Records fair, cobble and sand bottom. No regulation or diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1954

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Year period
1				0	0.4	0.6	2.4	0.3					
2				0	0.2	0.6	2.0	.2					
3				0	0.2	0.5	1.7	.2					
4				0	0.2	0.5	1.4	.2					
5				0	0.2	0.5	1.3	.1					
6				0	0.1	0.5	1.3	.08					
7				0	0.08	0.4	1.4	.06					
8				0	0.08	0.4	1.2	.04					
9				0	0.04	0.4	1.0	.02					
10				0	0	0.4	0.9	.02					
11				0	0	0.4	0.8	.01					
12				0	0	0.3	0.8	.01					
13				0	35	0.3	0.8	.01					
14				0	45	0.3	0.7	.01					
15				0	7.4	0.3	0.7	.01					
16				0	4.4	0.4	0.6	.01					
17				0	3.1	2.0	0.6	0.01					
18				0	2.8	1.1	0.5						
19				73	2.1	0.6	0.4						
20				32	1.8	3.9	0.3						
21				1.1	1.6	5.9	0.4						
22				0	1.3	31	0.4						
23				0	1.1	15	0.4						
24				0	1.0	7.5	0.3						
25				34	0.9	12	0.3						
26				5.0	0.8	4.2	0.3						
27				2.6	0.7	3.2	0.3						
28				1.9	0.7	2.6	0.4						
29				1.3		2.0	0.4						
30				1.0		13	0.4						
31				0.6		3.2							
Total sec. ft. days	0	0	0	152	111	114	24.4	--					
Mean sec. ft.	0	0	0	4.90	3.96	3.68	0.81	--					--
Max. sec. ft.				73	45	31	2.4	--					--
Min. sec. ft.				0	0	0.3	0.3	--					0
Total ac. ft.	0	0	0	301	220	226	48	--					--

LANCASTER CREEK, NEAR RADEC

Location and description: Water-stage recorder, latitude 33°29'10", longitude 116°52'50", in Section 9, T.8S., R.1E., on Stardust Ranch, about 2.7 miles northeast of Radec, Riverside County. Elevation of gage about 1,800 feet.

Drainage area: 115 square miles.

Records available: December 18, 1950, through December 29, 1951, Division of Water Resources.

Remarks: Records poor. Diversions above station. Stream known variously as Wilson Creek, Cottonwood Creek. Control washed out by peak flow of about 200 cfs. on December 30, 1951.

Daily discharge, in second-feet, for the year ending September 30, 1951

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Year period
1				0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	
2				.2	.2	.2	.2	.2	.2	.2	.2	.2	
3				.2	.2	.2	.2	.2	.2	.2	.2	.2	
4				.2	.2	.2	.2	.2	.2	.2	.2	.2	
5				.2	.2	.2	.2	.2	.2	.2	.2	.2	
6				.2	.2	.2	.2	.2	.2	.2	.2	.2	
7				.2	.2	.2	.2	.2	.2	.2	.2	.2	
8				.2	.2	.2	.2	.2	.2	.2	.2	.2	
9				.2	.2	.2	.2	.2	.2	.2	.2	.2	
10				.2	.2	.2	.2	.2	.2	.2	.2	.2	
11				.2	.2	.2	.2	.2	.2	.2	.2	.2	
12				.2	.2	.2	.2	.2	.2	.2	.2	.2	
13				.2	.2	.2	.2	.2	.2	.2	.2	.2	
14				.2	.2	.2	.2	.3	.2	.2	.2	.2	
15				.2	.2	.2	.2	.2	.2	.2	.2	.2	
16				.2	.2	.2	.2	.2	.2	.2	.2	.2	
17				.2	.2	.2	.2	.2	.2	.2	.2	.2	
18			0.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	
19			.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	
20			.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	
21			.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	
22			.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	
23			.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	
24			.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	
25			.2	.2	.2	.2	.3	.2	.2	.2	.2	.2	
26			.2	.2	.2	.2	.3	.2	.2	.2	.2	.2	
27			.2	.2	.3	.2	.2	.2	.2	.2	.2	.2	
28			.2	.2	0.2	.2	.2	.2	.2	.2	.2	.2	
29			.2	.2		.2	.2	.2	.2	.2	.2	.2	
30			.2	.2		.2	0.2	.2	0.2	.2	.2	0.2	
31			0.2	0.2		0.2		0.2		0.2	0.2		
Total sec. ft. days			--	6.2	5.7	6.3	6.2	6.3	6.0	6.2	6.2	6.0	
Mean sec. ft.			--	0.20	0.20	0.20	0.21	0.20	0.20	0.20	0.20	0.20	--
Max. sec. ft.			--	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	--
Min. sec. f			--	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	--
Total ac. ft.			--	12	11	12	12	12	12	12	12	12	--

LANCASTER CREEK, NEAR RADEC
(continued)

Location and description: Water-stage recorder, latitude 33°29'10", longitude 116°52'50", in Section 9, T.8S., R.1E., on Stardust Ranch, about 2.7 miles northeast of Radec, Riverside County. Elevation of gage about 1,800 feet.

Drainage area: 115 square miles.

Records available: December 18, 1950, through December 29, 1951, Division of Water Resources.

Remarks: Records poor. Diversions above station. Stream known variously as Wilson Creek, Cottonwood Creek. Control washed out by peak flow of about 200 cfs. on December 30, 1951.

Daily discharge, in second-feet, for the year ending September 30, 1952

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Year period
1	0.2	0.2	0.2										
2	.2	.2	.2										
3	.2	.2	.2										
4	.2	.2	.2										
5	.2	.2	.2										
6	.2	.2	.2										
7	.2	.2	.2										
8	.2	.2	.2										
9	.2	.2	.2										
10	.2	.2	.2										
11	.2	.2	.2										
12	.2	.2	.2										
13	.2	.2	.2										
14	.2	.2	.2										
15	.2	.2	.2										
16	.2	.2	.2										
17	.2	.2	.2										
18	.2	.2	.2										
19	.2	.2	.2										
20	.2	.2	.2										
21	.2	.2	.2										
22	.2	.2	.2										
23	.2	.2	.2										
24	.2	.2	.2										
25	.2	.2	.2										
26	.2	.2	.2										
27	.2	.2	.2										
28	.2	.2	.2										
29	.2	.2	0.2										
30	.2	0.2											
31	0.2												
Total sec. ft. days	6.2	6.0	--										
Mean sec. ft.	0.20	0.20	--										--
Max. sec. ft.	0.2	0.2	--										--
Min. sec. ft.	0.2	0.2	--										--
Total ac. ft.	12	12	--										--

TEMECULA CREEK, NEAR AGUANGA

Location and description: Water-stage recorder, latitude 33°25'10", longitude 116°50'20", in Section 2, T.9S., R.1E., about 2 miles southeast of Aguanga, San Diego County. Elevation of gage about 2,240 feet.

Drainage area: 71 square miles.

Records available: January 10, 1951, through September 30, 1954, Division of Water Resources.

Remarks: Records fair for low flows, storm flows not rated. Diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1951

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1					0.7	0.8	0.7	0.8	0.8	0.7*	0.6	0.6	
2					.7	.9	0.7	.8	.8	0.6*	.6	.6	
3					.7	.8	0.7	.7	.8	0.6	.6	.6	
4					.7	.8	0.7	.7	.8	0.6	.5	.6	
5					.7	.7	0.7	.7	.8*	0.6	.5	.6	
6					.7	.7	0.7	.7	.8*	0.6	.6	.6	
7					.7	.7	0.7	.7	.8*	0.6	.6	.6	
8					.7	.7	0.6	.7	.7*	0.6	.6	.6	
9					.7	.7	0.6	.8	.7*	0.6	.6	.6	
10				0.7	.7	.7	0.6	.8	.6*	0.6	.6	.6	
11				.7	.7	.7	0.6	.8	.6*	0.6	.6	.6	
12				.7	.7	.7	0.6	.8	.6	0.6	.6	.6	
13				.7	.7	.7	0.6	.8	.6	0.6	.6	.6	
14				.7	.7	.7	0.6	.8	.6	0.6	.6	.6	
15				.7	.7	.7	0.6	.6	.6	0.7	.6	.6	
16				.7	.7	.7	0.6	.7	.6	0.6*	.6	.6	
17				.7	.7	.7	0.7	.7	.6	0.6*	.6	.6	
18				.7	.7	.7	0.7	.7	.6	0.7*	.6	.6	
19				.7	.7	.7	0.7	.7	.6	0.6*	.6	.6	
20				.7	.7	.7	0.7	.8	.6	0.6*	.6	.6	
21				.7	.7	.7	0.7	.8	.6	0.6*	.5	.6	
22				.7	.7	.7	0.7	.7	.6	0.6*	.5	.6	
23				.7	.7	.7	0.7	.7	.6	0.6*	.5	.6	
24				.7	.7	.7	0.7	.7	.6	0.6*	.5	.6	
25				.7	.7	.7	0.9	.7	.7	0.6*	.5	.6	
26				.7	.7	.7	0.8	.7	.7	0.6*	.5	.6	
27				.7	.7	.7	0.8	.7	.7	0.6*	.5	.6	
28				.7	0.7	.7	0.8	.8	.7	1.0*	.8	.6	
29				.7		.7	1.0	.8	.7*	0.6*	.8	.6	
30				.7		.7	0.9	.8	0.7*	0.6*	.8	0.6	
31				0.7		0.7		0.7		0.6*	0.7		
Total sec.-ft. days				--	19.6	22.2	21.1	22.9	20.2	19.3	18.4	18.0	Year period
Mean sec. ft.				--	0.70	0.72	0.70	0.74	0.67	0.62	0.59	0.60	--
Max. sec. ft.				--	0.7	0.9	1.0	0.8	0.8	1.0	0.8	0.6	--
Min. sec. ft.				--	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.6	--
Total ac. ft.				--	39	44	42	45	40	38	36	36	--

* Estimated.

TEMECULA CREEK, NEAR AGUANGA
(continued)

Location and description: Water-stage recorder, latitude 33°25'10", longitude 116°50'20", in Section 2, T.9S., R.1E., about 2 miles southeast of Aguanga, San Diego County. Elevation of gage about 2,240 feet.

Drainage area: 71 square miles.

Records available: January 10, 1951 through September 30, 1954, Division of Water Resources.

Remarks: Records fair for low flows, storm flows not rated. Diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1952

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Year period
1	0.7	0.8	0.6	0.9	0.9	1.1[b]	2.2	1.3	0.9	0.8	0.9	0.6	
2	.7	.8	0.6	0.8	.8	1.0	2.1	1.2	.9	0.8	.9	.6	
3	.7	.8	0.5	0.8	.8	1.0	2.1	1.2	.9	0.8	.8	.6	
4	.7	.8	0.5	0.8	.8	1.0	2.1	1.2	.9	0.8	.8	.7	
5	.7	.7	0.8	0.7	.7	1.0	2.0	1.1	.9	0.8	.8	.6	
6	.7	.6	0.6	0.7	.7	1.0	1.9	1.0	.9	0.8	.8	.6	
7	.7	.6	0.5	0.7	.7	1.2	2.1	1.0	.9	0.8	.8	.6	
8	.7	.6	0.6	0.7	.7	2.0	2.5	1.0	.9	0.8	.7	.6	
9	.7	.6	0.6	0.7	.7	1.5	2.2	0.9	.9	0.8	.7[b]	.6	
10	.7	.6	0.5	0.7	.8	--[a]	--[a]	0.9	.9	0.8	.7[b]	.6	
11	.7	.6	0.5	0.7	.8	--[a]	--[a]	0.8	.8	0.8	.7[b]	.6	
12	.7	.6	0.8	0.7	.8	--[a]	3.2[b]	0.9	.8	0.8	.7[b]	.7	
13	.7	.6	0.6	1.1	.8	--[a]	2.7[b]	0.9	.8	0.8	.7[b]	.6	
14	.7	.5	0.6	0.8	.8	4.1[b]	2.2[b]	0.9	.8	0.8	.7[b]	.6	
15	.7	.6	0.6	0.8	.8	--[a]	2.1[b]	0.9	.8	0.7	.7	.6	
16	.7	.6	0.6	--[a]	.8	--[a]	2.1[b]	0.9	.8	0.8	.7	.6	
17	.7	.6	0.6	4.0[b]	.8	--[a]	2.0[b]	0.9	.8	0.7	.7	.6	
18	.6	.5	0.6	--[a]	.7	--[a]	1.9[b]	0.9	.8	0.8	.7	.6	
19	.6	.6	0.6	--[a]	.7	--[a]	1.9[b]	0.8	.8	0.7	.7	.8	
20	.7	.6	0.5	3.2[b]	.7	--[a]	1.8[b]	0.9	.8	0.7	.6	.8	
21	.7	.7	0.5	--[c]	.7	--[a]	1.8[b]	0.9	.8	0.7	.6	.7	
22	.8	.7	0.5	--[c]	.7	4.6[b]	1.7	0.9	.8	0.7	.6	.6	
23	.7	.7	0.5	--[c]	.7	4.3[b]	1.6	0.9	.8	0.7	.7	.7	
24	.7	.7	0.6	--[c]	.7	3.9[b]	1.5	0.9	.8	0.7	.7	.6	
25	.9	.7	0.6	--[c]	.7	3.8	1.5	0.9	.8	0.8	.7	.6	
26	.9	.7	0.6	--[c]	.7	3.6	1.5	0.8	.8	--[a]	.7	.8	
27	.9	.7	0.6	--[c]	.7	3.4	1.6	0.8	.8	2.4[b]	.7	.7	
28	.8	.7	0.6	1.1[b]	.7	3.3	1.6	0.8	.8	1.0[b]	.5	.6	
29	.8	.6	0.6	1.0	0.7	3.2	1.5	0.8	.8	--[a]	.7	.6	
30	.8	0.5	1.2	1.0		2.9	1.4	0.9	0.8	1.0[b]	.7	0.6	
31	0.8		1.0	0.9		2.5		0.9		0.9[b]	0.6		
Total sec. ft. days	22.6	19.4	19.2	--	21.6	--	--	29.1	25.0	--	22.0	19.1	
Mean sec. ft.	0.73	0.65	0.62	--	0.74	--	--	0.94	0.83	--	0.71	0.64	--
Max. sec. ft.	0.9	0.8	1.2	--	0.9	--	--	1.3	0.9	--	0.9	0.8	--
Min. sec. ft.	0.6	0.5	0.5	--	0.7	1.0	1.4	0.8	0.8	0.7	0.6	0.6	--
Total ac. ft.	45	38	38	--	43	--	--	58	50	--	44	38	--

a. Flow exceeds maximum station rating of 4.8 cfs.
b. Estimated.
c. No record.

TEMECULA CREEK, NEAR AGUANGA
(continued)

Location and description: Water-stage recorder, latitude 33°25'10", longitude 116°50'20", in Section 2, T.9S., R.1E., about 2 miles southeast of Aguanga, San Diego County. Elevation of gage about 2,240 feet.

Drainage area: 71 square miles.

Records available: January 10, 1951, through September 30, 1954, Division of Water Resources.

Remarks: Records fair for low flows, storm flows not rated. Diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1953

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1	0.6	0.6*	0.9	1.2	0.8	1.1	0.9	1.0	0.8	0.6	0.7	0.6	
2	.6	0.6*	0.9	1.0	0.8	1.1	0.9	1.0	.8	.6	.7	.6	
3	.6	0.6*	0.9	1.0	0.8	1.0	0.9	0.9	.8	.6	.7	.6	
4	.6	0.6*	0.9	0.9	0.8	0.9	0.9	0.9	.8	.6	.7	.6	
5	.6	0.6*	1.0	0.9	0.8	0.9	0.9	0.9	.8	.6	.7	.5	
6	.6	0.6*	1.0	0.9	0.8	0.9	0.9	0.8	.8	.6	.6	.5	
7	.6	0.7	1.0	1.0	0.8	0.9	0.9	0.8	.8	.6	.6	.5	
8	.6	0.7	1.0	0.9	0.8	0.9	0.9	0.8	.8	.6	.6	.5	
9	.6	0.7	1.0	0.9	0.8	0.9	1.0	0.8	.8	.6	.6	.4	
10	.6	0.7	1.0	0.9	0.8	0.9	1.0	0.8	.8	.6	.7	.4	
11	.6	0.7	1.6	0.9	0.8	0.9	0.9	0.8	.8	.7	.7	.4	
12	.6	0.7	1.6	0.8	0.8	0.9	0.9	0.8	.8	.8	.7	.4	
13	.6	0.7	1.6	0.9	0.8	0.9	0.9	0.8	.7	.6	.6	.3	
14	.6	0.8	1.1	0.8	0.8	0.9	0.9	0.8	.7	.6	.6	.4	
15	.6	1.1	1.0	0.8	0.8	0.9	0.9	0.8	.8*	.6	.6	.5	
16	.6	1.4	1.0	0.9	0.8	0.9	0.9	0.8	.8*	.6	.5	.5	
17	.6	0.9	1.6	0.9	0.8	0.9	0.9	0.8	.8	.6	.5	.5	
18	.6	0.8	1.2	0.9	0.8	0.9	0.9	0.8	.8	.6	.5	.5	
19	.6	0.8	1.2	0.9	0.8	0.9	0.9	0.8	.8	.6	.5	.5	
20	.6	0.8	1.6	0.8	0.8	1.0	1.0	0.8	.8	.6	.5	.5	
21	.6	0.8	1.4	0.8	0.8	0.9	1.1*	0.8	.8	.6	.5	.5	
22	.6	0.9	1.4	0.8	0.8	0.9	1.0*	0.8	.7	.6	.5	.5	
23	.6	1.2	1.3	0.8	1.0	0.9	1.0*	0.8	.7	.6	.5	.5	
24	.6	0.9	1.2	0.8	1.0	0.9	1.0*	0.8	.7	.6	.5	.5	
25	.6	0.8	1.2	0.8	0.9	0.9	1.0*	0.8	.7	.6	.5	.5	
26	.6	0.8	1.2	0.8	0.9	0.9	1.0*	0.8	.7	.6	.5	.5	
27	.6	0.8	1.1	0.8	0.9	0.9	1.1*	0.8	.6	.6	.5	.5	
28	.6	0.8	1.3	0.8	0.9	0.9	1.0	0.9	.6	.6	.6	.5	
29	.6*	0.8	1.2	0.8		0.9	1.0	0.8	.6	.6	.6	.5	
30	.6*	0.9	1.2	0.8		0.9	1.0	0.8	0.6	.7	.6	0.5	
31	0.6*		1.3	0.8		0.9		0.8		0.7	0.7		
Total sec. ft. days	18.6	23.8	36.9	27.0	23.2	28.5	28.5	25.6	22.5	19.1	18.3	14.7	Year period
Mean sec. ft.	0.60	0.79	1.19	0.87	0.83	0.92	0.95	0.83	0.75	0.62	0.59	0.49	0.79
Max. sec. ft.	0.6	1.4	1.6	1.2	1.0	1.1	1.1	1.0	0.8	0.8	0.7	0.6	1.6
Min. sec. ft.	0.6	0.6	0.9	0.8	0.8	0.9	0.9	0.8	0.6	0.6	0.5	0.3	0.3
Total ac. ft.	37	47	73	53	46	56	56	51	45	38	36	29	567

* Estimated.

TEMECULA CREEK, NEAR AGUANGA
(continued)

Location and description: Water-stage recorder, latitude 33°25'10", longitude 116°50'20", in Section 2, T.9S., R.1E., about 2 miles southeast of Aguanga, San Diego County. Elevation of gage about 2,240 feet.

Drainage area: 71 square miles.

Records available: January 10, 1951 through September 30, 1954, Division of Water Resources.

Remarks: Records fair for low flows, storm flows not rated. Diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1954

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Year period
1	0.5	0.6	0.6	0.6	0.7	0.8	1.3	1.0	0.8	0.7	0.7	0.8	
2	.5	.6	.6	0.6	0.7	0.8	1.2	0.9	.8	.7	.7	.7	
3	.4	.6	.6	0.6	0.7	0.8	1.1	0.9	.8	.7	.7	.7	
4	.4	.6	.6	0.6	0.7	0.8	1.0	0.9	.8	.6	.7	.6	
5	.4	.6	.6	0.6	0.7	0.8	1.0	0.9	.8	.5	.7	.6	
6	.4	.6	.6	0.6	0.7	0.8	1.0	0.9	.8	.6	.7	.6	
7	.4	.6	.6	0.6	0.7	0.8	1.0	0.9	.8	.6	.7	.6	
8	.4	.5	.6	0.6	0.7	0.8	1.0	0.9	.8	.6	.7	.5	
9	.4	.5	.6	0.6	0.7	0.8	1.0	0.9	.8	.6	.7	.5	
10	.4	.6	.6	0.6	0.7	0.7	1.0	0.9	.8	.6	.7	.6	
11	.5	.6	.6	0.6	0.7	0.7	1.0	0.9	.8	.6	.6	.6	
12	.5	.6	.6	0.8	0.7	0.7	1.0	0.9	.8	.6	.7	.6	
13	.5	.6	.6	0.7	1.1	0.7	0.9	0.9	.8	.6	.7	.5	
14	.6	.6	.7	0.7	1.1	0.7	0.9	0.9	.8	.6	.6	.5	
15	.6	.6	.6	0.7	0.9	0.7	0.9	1.0	.8	.6	.6	.5	
16	.6	.5	.6	0.7	0.9	0.8	0.9	1.0	.7	.6	.6	.5	
17	.6	.6	.6	0.7	0.8	1.0	0.9	0.9	.7	.6	.6	.5	
18	.6	.6	.6	0.7	0.8	0.8	0.9	0.9	.7	.7	.5	.5	
19	.6	.6	.6	1.2	0.8	0.8	0.9	0.9	.7	.7	.5	.5	
20	.6	.6	.6	1.2	0.8	0.8	0.9	0.9	.7	.6	.5	.5	
21	.6	.6	.6	0.9	0.8	1.0	0.9	1.0	.7	.6	.6	.5	
22	.6	.6	.6	0.8	0.8	--[a]	0.9	1.0	.7	.6	.6	.5	
23	.7	.6	.6	0.8	0.8	--[a]	0.9	0.9	.7	.6	.6	.5	
24	.6	.6	.6	0.8	0.8	--[a]	0.9	0.9	.7	.7	.6	.5	
25	.6	.6	.6	1.0	0.8	--[a]	0.9	0.8	.7	.7	.6	.5	
26	.6	.5	.6	0.8	0.8	3.5[b]	0.9	0.8	.7	.7	.6	.5	
27	.6	.6	.6	0.7	0.8	3.8[b]	0.9	0.8	.7	.6	.6	.5	
28	.6	.5	.6	0.7	0.8	2.9[b]	0.9	0.8	.7	.6	.6	.5	
29	.6	.6	.6	0.7		2.1[b]	0.9	0.9	.7	.6	.6	.6	
30	.6	0.6	.6	0.7		2.2[b]	0.9	0.8	0.7	.6	.6	0.6	
31	0.6		0.6	0.7		1.6		0.8		0.6	0.6		
Total sec. ft. days	16.6	17.7	18.7	22.6	22.0	--	28.8	27.8	22.5	19.3	19.5	16.6	
Mean sec. ft.	0.54	0.59	0.60	0.73	0.79	--	0.96	0.90	0.75	0.62	0.63	0.55	--
Max. sec. ft.	0.7	0.6	0.7	1.2	1.1	--	1.3	1.0	0.8	0.7	0.7	0.8	--
Min. sec. ft.	0.4	0.5	0.6	0.6	0.7	0.7	0.9	0.8	0.7	0.6	0.5	0.5	0.4
Total ac. ft.	33	35	37	45	44	--	57	55	45	38	39	33	--

a. Flow exceeds maximum station rating of 4.8 cfs.
b. Estimated.

TEMECULA CREEK, NEAR OAKGROVE VALLEY

Location and description: Water-stage recorder, latitude 33°24'20", longitude 116°49'00", in Section 7, T.9S., R.2E., about 2 miles northwest of Oakgrove Valley, San Diego County. Elevation of gage about 2,460 feet.

Drainage area: 61 square miles.

Records available: Intermittent record from February 1, 1951 through September 30, 1954, Division of Water Resources.

Remarks: Records fair for low flows, storm flows not rated. One diversion above station.

Daily discharge, in second-feet, for the year ending September 30, 1951

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1					0.9						0.05		
2					.9						0.05		
3					.9						0.05		
4					.9						0.05		
5					.9						0.05		
6					.9								
7					.9								
8					.9								
9					.9								
10					.9					0.04			
11					.9					0.05			
12					.9					0.2			
13					.9					0.3			
14					.9					0.3			
15					.9					0.3			
16					.9					0.3			
17					.9								
18					.9								
19					.9								
20					.9								
21					.9								
22					.9								
23					.9								
24					.9								
25					.9					0			
26					0.9								
27													
28													
29													
30													
31													
Total sec. ft. days					--					--	--		Year period
Mean sec. ft.					--					--	--		
Max. sec. ft.					--					--	--		
Min. sec. ft.					--					0	--		
Total ac. ft.					--					--	--		

TEMECULA CREEK, NEAR OAKGROVE VALLEY
(continued)

Location and description: Water-stage recorder, latitude 33°24'20", longitude 116°49'00", in Section 7, T.9S., R.2E., about 2 miles northwest of Oakgrove Valley, San Diego County. Elevation of gage about 2,460 feet.

Drainage area: 61 square miles.

Records available: Intermittent record from February 1, 1951 through September 30, 1954, Division of Water Resources.

Remarks: Records fair for low flows, storm flows not rated. One diversion above station.

Daily discharge, in second-feet, for the year ending September 30, 1952

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1			0.8	1.2	1.2	1.5	1.9[b]	1.0	0.4[b]	0.6	0.5	0.08	
2			0.7	1.2	1.2	1.3	1.9[b]	1.0	.3	.5	.4	.1	
3			0.4	1.2	1.2	1.2	1.9[b]	1.0	.4	.4	.2	.3	
4			0.4	1.1	--[a]	1.2	1.9[b]	1.0	.5	.4	.3	.4	
5			1.0	1.0	--[a]	1.1	1.8[b]	0.9	.7	.3	.3	.3	
6			1.0	1.0	--[a]	1.0	1.8[b]	1.0	.8	.1	.3	.3	
7			1.0	1.0	--[a]	2.2	1.8[b]	0.8	.7	.3	.3	.09	
8			1.0	1.0	--[a]	3.8	1.8	0.8	.5	.3	.4	.06	
9			0.9	1.0	--[a]	2.6	1.7	0.8	.6	.3	.4	.06	
10			0.8	1.0	--[a]	3.5	2.8[b]	0.7	.6	.3	.2[b]	.2	
11			0.5	0.9	--[a]	--[a]	3.5	0.7	.5	.3	.1[b]	.4	
12			0.7	0.8	--[a]	--[a]	2.4	0.7	.7	.3	.2	.4	
13			--[a]	1.4	--[a]	--[a]	2.2	0.7	.7	.08	.2	.4	
14			--[a]	1.2	--[a]	--[a]	2.0	0.7	.6	.3	.4	.1	
15			--[a]	1.1	--[a]	--[a]	1.8	0.8	.4	.3	.4	.1	
16		0.7	--[a]	--[c]	--[a]	--[a]	1.6	0.8	.6	.3	.3[b]	.07	
17		.6	--[a]	--[a]	--[a]	--[a]	1.5	0.8	.6	.3	.1[b]	.1	
18		.4	0.8	--[c]	--[a]	--[a]	1.5	0.7	.6	.3	.1[b]	.4	
19		.3	0.8	--[a]	1.0	6.7	1.5	0.7	.5	.1	.2[b]	.6	
20		.3	0.7	--[a]	1.0	5.5	1.5	0.8	.5	.08	.1[b]	.6	
21		.4	0.7	2.7[b]	0.9	4.2	1.3	0.7	.5	.2	.4	.3	
22		.7	0.7	--[a]	1.0	2.9	1.3	0.7	.3	.3[b]	.4	.3	
23		.9	0.7	--[a]	1.0	2.2[b]	1.2	0.6	.6	.3[b]	.2	.2	
24		.9	0.7[b]	--[a]	0.8	1.9[b]	1.2	0.7	.6	.3	.08	.3	
25		.4	0.8[b]	--[a]	0.6	1.9[b]	1.3	0.6	.6	0.4	.07	.5	
26		.4	0.8[b]	--[a]	0.7	1.9[b]	1.3	0.6[b]	.6	--[a]	.08	.6	
27		.4	0.8	--[a]	0.9	1.9[b]	1.3	0.5[b]	.6	--[a]	.2	.6	
28		.4	0.8	--[a]	0.9	1.9[b]	1.3	0.4[b]	.6	--[a]	.4	.3	
29		.7	0.8	--[a]	0.9	1.9[b]	1.2	0.4[b]	.3	--[a]	.4	.2	
30		0.8	1.4	1.3		1.9[b]	1.1	0.4[b]	0.6	--[a]	.2	0.2	
31			1.2	1.3		1.9[b]		0.4[b]		--[a]	0.2		
Total sec. ft. days		--	--	--	--	--	51.2	22.4	16.5	--	8.03	8.56	Year period
Mean sec. ft.		--	--	--	--	--	1.71	0.72	0.55	--	0.26	0.29	--
Max. sec. ft.		--	--	--	--	--	3.5	1.0	0.8	--	0.5	0.6	--
Min. sec. ft.		--	--	--	--	--	1.1	0.4	0.3	--	0.07	0.06	--
Total ac. ft.		--	--	--	--	--	102	44	33	--	16	17	--

a. No record.
b. Estimated.
c. Flow exceeds maximum station rating of 8.6 cfs.

TEMECULA CREEK, NEAR OAKGROVE VALLEY
(continued)

Location and description: Water-stage recorder, latitude 33°24'20", longitude 116°49'00", in Section 7, T.9S., R.2E., about 2 miles northwest of Oakgrove Valley, San Diego County. Elevation of gage about 2,460 feet.

Drainage area: 61 square miles.

Records available: Intermittent record from February 1, 1951 through September 30, 1954, Division of Water Resources.

Remarks: Records fair for low flows, storm flows not rated. One diversion above station.

Daily discharge, in second-feet, for the year ending September 30, 1953

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1	0.2	0.9	0.9	1.6	1.3	1.5[a]	1.7	1.5	0.7	0.2	0.3	0.3	
2	.4	0.9	0.8	1.6	1.0	1.5[a]	1.7	1.5	.6	.2	.3	.3	
3	.6	0.6	0.7	1.5	0.6	--[b]	1.7	1.4	.6	.2	.3	.3	
4	.5	0.3	1.2[a]	1.5	0.7	--[b]	1.7	1.3	.6	.3	.3	.3	
5	.3	0.3	1.2	1.5	0.7	--[b]	1.8	1.3	.6	.2	.2	.3	
6	.2	0.7	1.2	1.5	0.7	--[b]	1.8	1.2	.6	.2	.2	.2	
7	.2	0.8	1.2	1.6	0.7	--[b]	1.7	0.7	.6	.2	.2	.2	
8	.3	0.9	1.2	1.5[a]	0.7	--[b]	1.7	1.0	.6	.2	.2	.2[a]	
9	.6	0.9	1.2	1.5[a]	0.7	1.3	1.6	1.0	.6	.2	.2	.2	
10	.6	0.4	1.2	1.5[a]	0.7	1.5	1.6	0.7	.6	.1	.2	.2	
11	.6	0.3	1.2	1.5[a]	0.7	1.3	1.5	0.6	.6	.2	.2	.2	
12	.3	0.3	1.2	1.2	0.7	1.3	1.5	0.5	.5	.4	.2	.2	
13	.2	0.6	1.2	0.9	0.7	1.3	1.5	0.9	.5	.4	.2	.2	
14	.2	1.0	1.2	0.8	0.7	1.3	1.6	0.9	.4	.2	.2	.1	
15	.2	1.6	1.3	1.4	0.7	1.3	1.5	1.0	.4	.2	.2	.2	
16	.3	1.9	1.3	1.4	0.7	1.4	1.5	0.9	.4[a]	.2	.2	.2	
17	.6	1.2	1.8	1.4	0.8	1.5	1.6	1.0	.4	.2	.2	.2	
18	.7	0.8	--[b]	1.4	1.1	1.5	1.6	1.0	.5	.3	.2	.3	
19	.6	0.7	--[b]	1.1	1.2	1.5	1.6	0.9	.5	.3	.2	.3	
20	.2	0.8	--[b]	0.8	1.2	1.8	1.6	0.8	.4	.3	.2	.3	
21	.2	1.2	--[b]	0.8	1.3	1.7	1.8	0.6	.3	.3	--[b]	.3	
22	.2	1.2	--[b]	1.3	1.3	1.7	1.7	0.9	.2	.3	--[b]	.3	
23	.4	1.4	--[b]	1.3	1.6	1.5	1.6	0.8	.2	.3	--[b]	.3	
24	.6	1.0	--[b]	1.3	1.7	1.6	1.7	0.6	.2	.4	--[b]	.2	
25	.6	0.6	1.5	1.3	1.6	1.7	1.5	0.9	.2	--[b]	.1	.2	
26	.6	0.7	1.5	1.0	1.6	1.7	1.5	0.9	.2	--[b]	.1	.3	
27	.6	1.2	1.5	0.6	1.5	1.7	1.5	0.6	.2	--[b]	.2	.4	
28	.2[a]	1.3	1.6	0.7	1.2	1.7	1.6	0.8	.3	.2	.2	.4	
29	.2[a]	1.2	1.5	1.3		1.7	1.5	0.8	.2	.2	--[b]	.4	
30	.3	1.2	1.6	1.3		1.7	1.5	0.6	0.2	.3	--[b]	0.3	
31	0.8		1.8	1.3		1.7		0.6		0.3	--[b]		Year period
Total sec. ft. day	12.5	26.9	--	39.4	28.1	--	48.4	28.2	12.9	--	--	7.8	
Mean sec. ft.	0.40	0.90	--	1.27	1.00	--	1.61	0.91	0.43	--	--	0.26	--
Max. sec. ft.	0.8	1.9	--	1.6	1.7	--	1.8	1.5	0.7	--	--	0.4	--
Min. sec. ft.	0.2	0.3	--	0.6	0.6	--	1.5	0.5	0.2	--	--	0.1	--
Total ac. ft.	25	53	--	78	56	--	96	56	26	--	--	15	--

a. Estimated.
b. No record.

TEMECULA CREEK, NEAR OAKGROVE VALLEY
(continued)

Location and description: Water-stage recorder, latitude 33°24'20", longitude 116°49'00", in Section 7, T.9S., R.2E., about 2 miles northwest of Oakgrove Valley, San Diego County. Elevation of gage about 2,460 feet.

Drainage area: 61 square miles.

Records available: Intermittent record from February 1, 1951 through September 30, 1954, Division of Water Resources.

Remarks: Records fair for low flows, storm flows not rated. One diversion above station.

Daily discharge, in second-feet, for the year ending September 30, 1954

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1	0.3	0.6	0.6	0.7	1.0	0.8	2.1	0.7	0.5	0.2	0.2	0.4	
2	.4	.6	.6	0.7	0.9	0.8	1.8	.6	.3	.2	.2	.3	
3	.3	.6	.6	0.6	0.9	0.8	1.6	.6	.5	.2	.2	.3	
4	.3	.6	.7	0.6	0.9	0.8	1.6	.6	.5	.2	.2	.3	
5	.4	.7	.7	0.6	0.9	0.8	1.4	.6	.5	.2	.3	.3	
6	.4	.7	.7	0.6	0.9	0.8	1.3	.5	.4	.2	.2	.2	
7	.4	.7	.7	0.6	0.9	0.8	1.2	.4	.3	.1	.2	.2	
8	.4	.6	.7	0.6	0.8	0.8	1.2	.5	.4	.2	.2	.2	
9	.5	.6	.7	0.6	0.8	0.8	1.1	.5	.5	.1	.1	.2	
10	.5	.6	.7	0.7	0.8	0.8	1.0	.6	.5	.1	.2	.2	
11	.6	.6	.7	0.7	0.8	0.8	1.0	.6	.5	.1	.2	.2	
12	.7	.6	.7	0.9	0.8	0.8	0.9	.6	.5	.2	.2	.2	
13	.7	.7	.7	1.0	1.4	0.8	0.9	.6	.5	.2	.3	.2	
14	.7	.7	.7	0.9	2.0	0.8	0.8	.6	.5	.2	.3	.2	
15	.6	.8	.7	0.9	1.4	0.8	0.7	.6	.3	.2	.2	.2	
16	.6	.8	.7	0.9	1.2	0.8	0.7	.6	.5	.2	.2	.3	
17	--a	.7	.7	0.9	1.2	1.8	0.7	.5	.5	.2	.2	.3	
18	--a	.7	.6	0.9	1.1	1.1	0.7	.5	.4	.3	.2	.2	
19	--a	.6	.6	1.7	1.1	1.0	0.7	.4	.4	.3	.2	.2	
20	--a	.7	.6	2.0	1.1	1.0	0.8	.3	.3	.2	.2	.2	
21	.6	.7	.6	1.4	1.0	1.0	0.8	.5	.3	.3	.3	.2	
22	.6	.7	.6	1.2	1.0	--b	0.7	.5	.3	.3	.3	.3	
23	.6	.7	.6	1.2	1.0	--b	0.7	.5	.3	.3	.3	.3	
24	.6	.6	.6	1.2	0.9	4.8	0.7	.4	.3	.4	.2	.3	
25	.5	.6	.7	1.4	0.9	--b	0.7	.5	.3	.4	.3	.3	
26	.5	.6	.7	1.2	0.8	4.5	0.7	.5	.4	.3	.3	.3	
27	.5	.6	.7	1.0	0.8	3.4	0.7	.6	.4	.2	.3	.3	
28	.6	.6	.7	1.0	0.8	2.7	0.8	.6	.2	.2	.2	.3	
29	.6	.6	.7	1.0		2.5	0.8	.6	.2	.2	.2	.4	
30	.6	0.6	.7	1.0		2.8	0.7	.5	0.2	.1	.2	0.4	
31	0.6		0.7	1.0		2.3		0.5		0.1	0.2		
Total sec. ft. days	--	19.5	20.7	29.7	28.1	--	29.5	16.6	11.7	6.6	7.0	7.9	Year period
Mean sec. ft.	--	0.65	0.67	0.96	1.00	--	0.98	0.54	0.39	0.21	0.23	0.26	--
Max. sec. ft.	--	0.8	0.7	2.0	2.0	--	2.1	0.7	0.5	0.4	0.3	0.4	--
Min. sec. ft.	--	0.6	0.6	0.6	0.8	0.8	0.7	0.3	0.2	0.1	0.1	0.2	--
Total ac. ft.	--	39	41	59	56	--	58	33	23	13	14	16	--

a. No record.
b. Flow exceeds maximum station rating of 8.6 cfs.

TEMECULA CREEK, NEAR RADEC

Location and description: Water-stage recorder, latitude 33°27'50", longitude 116°55'40", in Section 19, T.8S., R.1E., near Sunny Brook Ranch, a[illegible] 7 mile west of Radec, Riverside County. Elevation of gage about 1,560 feet.

Drainage area: 133 square miles.

Records available: December 8, 1950, through September 30, 1954, Division of Water Resources.

Remarks: Records good for low flows through flat V-notch of concrete curb in sand bottom. High flows partially estimated. Diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1951

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Year period
1				1.3	4.3	4.1	1.5	3.5	0.06				
2				1.3	3.9	4.6	1.5	2.9	0.06				
3				1.4	3.1	3.3	1.1	1.8	0.05				
4				1.6	3.3	3.3	1.0	1.1	--[b]				
5				0.8	3.2	3.2	1.0	0.9	--[b]				
6				0.9	3.1	3.2	1.2	0.8	--[b]				
7				1.3	3.0	3.3	1.6	1.0[a]	--[b]				
8			0.8[a]	1.4	2.8	3.3	1.0	1.0[a]	0.06				
9			0.2[a]	1.4	2.8	3.6	1.1	1.4	0.03				
10			0.5[a]	1.5	2.3	3.9	1.2	1.6	0.01				
11			0.2[a]	1.9	2.2	3.8	0.8	1.8	0				
12			0.2[a]	1.9	2.8	3.7	0.6	1.7	0				
13			0.7	1.9	2.9	3.4	0.6	1.2	0				
14			1.0	2.0	2.6	2.5	0.6	1.0	0				
15			0.9	2.0	2.4	3.1	0.6	1.1	0				
16			0.9	--[b]	2.0	3.5	0.6	0.9	0				
17			0.9	--[b]	2.4	3.5	0.6	0.8	0				
18			1.0	--[b]	2.6	3.2	0.6	0.7	0				
19			1.1	--[b]	2.6	3.1	0.7	0.6	0				
20			1.1	--[b]	2.5	2.4	0.8	0.6	0				
21			1.4	--[b]	2.4	2.5	0.7	0.6	0				
22			1.3	--[b]	2.6	2.1	0.6	0.6	0				
23			1.3	2.0	2.6	1.3	0.6	0.6	0				
24			1.3	1.6	2.6	0.9	0.8	0.5	0				
25			1.4	1.9	2.6	1.1	1.3	0.3	0				
26			1.4	1.8	2.5	1.7	2.8	0.2	0				
27			1.4	1.9	3.8	1.3	2.5	0.09	0				
28			1.3	1.7	3.4	1.0	2.5	0.09	0				
29			0.9	4.9		1.0	12	0.09	0				
30			0.3[a]	10		1.0	7.1	0.09	0				
31			0.6	4.8		1.5		0.09					
Total sec. ft. days			--	--	79.3	83.4	49.6	29.0	--	0	0	0	
Mean sec. ft.			--	--	2.83	2.69	1.65	0.94	--	0	0	0	--
Max. sec. ft.			--	--	4.3	4.6	12	3.5	--				--
Min. sec. ft.			--	--	2.0	0.9	0.6	0.09	0				0
Total ac. ft.			--	--	157	165	98	57	--	0	0	0	--

a. Estimated.
b. No record.

TEMECULA CREEK, NEAR RADEC
(continued)

Location and description. Water-stage recorder, latitude 33°27'50", longitude 116°55'40", in Section 19, T.8S., R.1E., near Sunny Brook Ranch, about 0.7 mile west of Radec, Riverside County. Elevation of gate about 1,560 feet.

Drainage area: 133 square miles.

Records available: December 8, 1950, through September 30, 1954, Division of Water Resources.

Remarks: Records good for low flows through flat V-notch of concrete curb in sand bottom. High flows partially estimated. Diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1952

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1	0	0	0.7	24[b]	9[b]	37	22	11	2.0	0.2		0	
2	0	0	0.7	15[b]	9[b]	27	21	10	1.9	0.1		0	
3	0	0	0.7	10[b]	9[b]	18	19	9.0	1.9	0.08		0	
4	0	0	0.7	8[b]	8.5	15	18	8.0	1.8	0.03		0	
5	0	0	1.0	7[b]	8.0	14	18	7.5	1.7	0		0	
6	0	0	0.7	7[b]	7.5	12	16	7.0	1.7	0		0	
7	0	0	0.9	7[b]	7.5	46	15	6.5	1.7	0		0	
8	0	0	1.1	7[b]	7.0	60	24	6.5	1.7	0		0	
9	0	0	1.2	6[b]	7.0	41	19	6.5	1.6	0		0	
10	0	0	1.2	6[b]	7.0	104	25	5.6	1.5	0		0	
11	0	0	1.1	6[b]	6.5	169	54	4.9	1.4	0		0	
12	0	0	1.7	6[b]	7.0	74	32	4.9	1.3	0		0	
13	0	--[a]	1.5	47[b]	6.0	62	27	4.9	1.2	0		0	
14	0	--[a]	1.5	26[b]	5.2	44	22	4.9	1.1	0		0	
15	0	0.8	2.0	17[b]	4.9	86	20	4.9	1.0	0		0	
16	0	0.6	2.3	200[b]	4.9	195	18	4.6	1.0	0		0	
17	0	0.09	2.3	120[b]	5.2	93	16	4.1	0.9	0		0	
18	0	0.09	2.3	--[a]	6.0	71	16	4.1	0.8	0		0	
19	0	0.09	2.5	--[a]	4.9	58	15	4.1	0.8	0		1.4	
20	0	0.09	2.9	--[a]	4.6	50	15	3.5	0.7	0		0.02	
21	0	0.09	2.6	--[a]	4.6	42	14	2.6	0.6	0		0.01	
22	0	0.6	2.5	29[b]	4.3	35	14	3.1	0.4	0		0	
23	0	1.2	2.2	24[b]	4.9	32	12	3.1	0.1	0		0	
24	0	1.0	2.2	21[b]	4.9	30	12	2.6	0.2	0		0	
25	0	1.1	2.2	24[b]	4.3	30	12	2.6	0.9	0		0	
26	0.2	1.0	2.0	22[b]	4.3	31	14	2.5	0.6	8.1		0	
27	0.2	0.9	2.0	17[b]	4.3	31	12	2.6	0.4	2.8		0	
28	0	0.8	2.0	14[b]	4.1	30	12	2.2	0.6	0[b]		0	
29	0	0.8	3.5	12[b]	4.6	27	12	1.8	0.4	0[b]		0	
30	0	0.8	130[b]	11[b]		26	12	1.8	0.4	1.2		0	
31	0		44[b]	10[b]		24		1.9		0			
Total sec.-ft. days	0.4	--	224	--	175	1,614	558	149	32.3	12.5	0	1.43	Year period
Mean sec.-ft.	--	--	7.23	--	6.03	52.1	18.6	4.81	1.08	0.40	0	0.05	--
Max. sec.-ft.	0.2	--	130	--	9	195	54	11	2.0	8.1		1.4	--
Min. sec.-ft.	0	0	0.7	--	4.1	12	12	1.8	0.1	0		0	0
Total ac.-ft.	0.8	--	444	--	346	3,200	1,100	295	64	25	0	2.8	--

a. No record.
b. Estimated.

TEMECULA CREEK, NEAR RADEC
(continued)

Location and description: Water-stage recorder, latitude 33°27'50", longitude 116°55'40", in Section 19, T.8S., R.1E., near Sunny Brook Ranch about 0.7 mile west of Radec, Riverside County. Elevation of gage about 1,560 feet.

Drainage area: 133 square miles.

Records available: December 8, 1950, through September 30, 1954, Division of Water Resources.

Remarks: Records good for low flows through flat V-notch of concrete curb in sand bottom. High flows partially estimated. Diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1953

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1		0[a]	--[b]	4.3	2.6	4.6	1.8	2.3	0.2				
2		0[a]	--[b]	3.7	2.5	7.5	1.7	1.8	0.2				
3		0.01[a]	--[b]	3.3	2.2	5.2	1.7	1.4	0.2				
4		0[a]	--[b]	3.3	2.2	4.3	1.6	1.1	0.08				
5		0.01[a]	1.7	3.1	2.2	4.3	1.7	1.0	0.09				
6		0.03[a]	2.2	3.1	2.2	4.6	2.1	0.9	0.09				
7		0	2.5	12	2.2	3.8	1.9	0.9	0.09				
8		0	2.3	13	2.2	3.1	1.8	1.0	0.09				
9		0	2.3	9.5	2.2	3.1	1.7	1.0	0.1				
10		0	2.3	7.5	2.2	2.8	1.6	0.9	0.1				
11		0	2.3	6.0	2.2	2.6	1.5	0.8	0.1				
12		0	2.0	5.2	2.2	2.5	1.3	0.8	0.06				
13		0	1.9	4.9	2.2	2.3	1.3	0.7	0.05				
14		0.1	1.9	4.9	2.2	2.3	1.3	0.7	0				
15		4.5	1.9	4.6	2.1	2.2	1.1	0.8	0				
16		3.7	1.9	4.3	2.2	2.0	1.0	1.0	0				
17		1.0	2.8	4.1	1.8	2.0	1.0	0.9	0				
18		0.8	3.5	3.9	1.9	2.0	1.0	0.8	0.08				
19		0.8	2.6	3.9	1.9	1.9	1.0	0.8	0.06				
20		0.8	4.9	3.7	1.9	2.8	1.1	0.8	0.04				
21		0.8	6.5	3.7	1.9	3.5	2.0	0.7	0.02				
22		0.9	4.3	3.5	1.9	2.6	2.3	0.7	0.02				
23		1.2	3.7	3.5	3.3	2.8	1.6	0.7	0				
24		1.1	3.3	3.3	3.5	2.8	1.4	0.8	0				
25		1.1	2.8	3.3	3.1	2.8	1.4	1.3	0				
26		--[b]	2.6	3.1	2.8	2.8	1.3	1.0	0				
27		--[b]	2.5	3.1	2.8	2.8	1.4	0.8	0				
28		--[b]	3.4	3.1	2.8	2.5	3.7	0.8	0				
29		--[b]	3.3	3.1		2.5	3.1	0.8	0				
30		--[b]	3.0	3.1		2.2	2.5	0.4	0				
31			5.6	2.8		1.9		0.4					
Total sec.-ft. days	0	--	--	144	65.4	95.1	49.9	28.8	1.67	0	0	0	Year period
Mean sec. ft.	0	--	--	4.65	2.34	3.07	1.66	0.93	0.06	0	0	0	--
Max. sec. ft.		--	--	13	3.5	7.5	3.7	2.3	0.2				--
Min. sec. ft.		0	--	2.8	1.8	1.9	1.0	0.4	0.02				0
Total ac. ft.	0	--	--	285	129	188	99	57	3.3	0	0	0	--

a. Estimated.
b. No record.

TEMECULA CREEK, NEAR RADEC
(continued)

Location and description: Water-stage recorder, latitude 33°27'50", longitude 116°55'40", in Section 19, T.8S., R.1E., near Sunny Brook Ranch, about 0.7 mile west of Radec, Riverside County. Elevation of gage about 1,560 feet.

Drainage area: 133 square miles.

Records available: December 8, 1950, through September 30, 1954, Division of Water Resources.

Remarks: Records good for low flows through flat V-notch of concrete curb in sand bottom. High flows partially estimated. Diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1954

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1	0	0	0.4	1.6	3.7	2.8	34	4.2	0.8*	0	0	4.2	
2	0.1	0	0.4	1.6	3.3	2.6	28	4.2	0.8*	0	0	0.1	
3	0.1	0	0.6	1.6	3.1	2.3	24	3.1	0.7*	0	0	0.09	
4	0.1	0	1.2	1.6	2.8	2.3	19	2.8	0.6*	0	0	0.09	
5	0.1	0	1.0	1.6	2.8	2.2	16	2.7	0.6*	0	0	0.06	
6	0	0	1.3	1.6	2.8	2.2	15	2.7	0.6*	0	0	0	
7	0*	0	1.5	1.6	3.3	2.2	14	2.6	0.5*	0.05	0	0	
8	0*	0	1.8	1.6	3.1	2.2	13	2.6	0.4*	0	0	0	
9	0	0	1.8	1.6	3.1	2.2	12	2.5	0.4	0	0	0	
10	0	0	1.8	1.6	2.3	2.2	11	2.5	0.5	0.02	0	0	
11	0	0*	1.8	1.6	1.7	2.2	11	2.4	0.5	0	0	0	
12	0	0*	1.8	1.8	1.7	2.2	9.8	2.2	0.5	0	0	0	
13	0	0	1.7*	1.7	4.6	2.0	8.8	2.2	0.5	0	0	0	
14	0	0.01	1.7*	1.6	101	2.0	8.2	2.2	0.4	0	0	0.03	
15	0	0	1.7*	1.6	36	1.7	7.2	2.2	0.4	0	0	0.03	
16	0	0	1.7*	1.7	18	1.7	6.5	2.3	0.4	0	0	0.04	
17	0	0	1.6	1.7	14	9.6	6.0	2.1	0.4	0	0	0.05	
18	0	0	1.6	1.8	11	6.1	5.6	1.8	0.4	0	0	0.04	
19	0	0	1.6	18	9.0	5.4	5.2	1.6	0.4*	0	0	0.02	
20	0	0.02	1.6	42	8.0	11	5.2	1.6	0.3*	0	0	0	
21	0	0.02	1.6	11	7.5	38	5.0	1.6	0.2*	0	0	0	
22	0.01	0.03	1.6	7.0	5.6	233	4.8	1.6*	0.1*	0	0	0	
23	0.06	0.03	1.6	4.9	4.1	131	4.6	1.5*	0.06*	0	0.01	0	
24	0	0.05	1.6	4.1	3.9	69	4.4	1.4*	0*	0	0.03	0	
25	0	0.04	1.6	77	3.7	124	4.6	1.2*	0*	0	0.03	0	
26	0	0.05	1.6	28	3.3	63	4.6	1.1*	0*	0	0.04	0	
27	0	0.05	1.6	14	3.3	46	4.3	1.0*	0*	0	0.03	0	
28	0	0.06	1.6	9.0	2.8	37	4.3	1.0*	0*	0	0.03	0	
29	0	0.1	1.6	6.5		31	4.3	1.0*	0*	0	0	0	
30	0	0.4	1.6	4.6		76	4.2	0.9*	0	0	0	0.03	
31	0		1.6	4.1		45		0.8*		0	0		
Total sec. ft. days	0.47	0.86	46.2	260	270	960	305	63.6	10.5	0.07	0.17	4.78	Year period
Mean sec. ft.	0.02	0.03	1.49	8.39	9.64	31.0	10.2	2.05	0.35	--	0.01	0.16	5.28
Max. sec. ft.	0.1	0.4	1.8	77	101	233	34	4.2	0.8	0.05	0.04	4.2	233
Min. sec. ft.	0	0	0.4	1.6	1.7	1.7	4.2	0.8	0	0	0	0	0
Total ac. ft.	0.9	1.7	91	515	535	1,900	604	126	21	0.1	0.3	9.5	3,804

* Estimated.

SANTA GERTRUDIS CREEK, NEAR TEMECULA

Location and description: Water-stage recorder, latitude 33°31'20", longitude 117°10'00", in Section 35, T.7S., R.3W., at State Highway 71 bridge, about 2 miles northwest of Temecula, Riverside County. Elevation of gage about 1,040 feet.

Drainage area: 88 square miles.

Records available: December 19, 1952, through April, 1954. Division of Water Resources.

Remarks: Records fair, shifting sand bottom. No regulation or diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1953

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1				0		0							
2				0		5.5							
3				0		0							
4				0		0							
5				0		0							
6				0		0							
7				0.4		0							
8				0		0							
9				0		0							
10				0		0							
11				0		0							
12				0		0							
13				0		0							
14				0		0							
15				0		0							
16				0		0							
17				0		0							
18				0		0							
19			0	0		0							
20			31	0		0							
21			0	0		0							
22			0	0		0							
23			0	0		0							
24			0	0		0							
25			0	0		0							
26			0	0		0							
27			0	0		0							
28			0	0		0							
29			0	0		0							
30			4.1	0		0							
31			4.4	0		0							
Total sec. ft. days			--	0.4	0	5.5	0	0	0	0	0	0	Year period
Mean sec. ft.			--	--	0	0.18	0	0	0	0	0	0	--
Max. sec. ft.			--	0.4		5.5							--
Min. sec. ft.			0	0		0							0
Total ac. ft.			--	0.8	0	11	0	0	0	0	0	0	--

SANTA GERTRUDIS CREEK, NEAR TEMECULA
(continued)

Location and description: Water-stage recorder, latitude 33°31'20", longitude 117°10'00", in Section 35, T.7S., R.3W., at State Highway 71 bridge, about 2 miles northwest of Temecula, Riverside County. Elevation of gage about 1,040 feet.

Drainage area 88 square miles.

Records available: December 19, 1952, through April, 1954, Division of Water Resources.

Remarks: Records fair, shifting sand bottom. No regulation or diversions above station.

Daily discharge, in second-feet, for the year ending September 30, 1954

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Year period
1				0	0	0							
2				0	0	0							
3				0	0	0							
4				0	0	0							
5				0	0	0							
6				0	0	0							
7				0	0	0							
8				0	0	0							
9				0	0	0							
10				0	0	0							
11				0	0	0							
12				0	0	0							
13				0	39	0							
14				0	34	0							
15				0	0	0							
16				0	0	0							
17				0	0	0							
18				0	0	0							
19				0.7	0	0							
20				5.2	0	0							
21				0	0	0							
22				0	0	21							
23				0	0	1.8							
24				0	0	0							
25				25	0	1.6							
26				0	0	0							
27				0	0	0							
28				0	0	0							
29				0		0							
30				0		0							
31				0		0							
Total sec. ft. days	0	0	0	30.9	73	24.4	0						
Mean sec. ft.	0	0	0	1.00	2.61	0.79	0						--
Max. sec. ft.				25	39	21							--
Min. sec ft				0	0	0							0
Total ac. ft.	0	0	0	61	145	48	0						--

WARM SPRINGS CREEK, NEAR MURRIETA

Location and description: Water-stage recorder, latitude 33°31'50", longitude 117°10'30", in Section 27, T.7S., R.3W., at State Highway bridge, about 2 miles southeast of Murrieta, Riverside County. Elevation of gage about 1,040 feet.

Drainage area: 58 square miles.

Records available: December 19, 1952, through May, 1954, Division of Water Resources.

Remarks: Records fair, shifting sand bottom. No regulation or diversions above station.

Daily discharge in second-feet, for the year ending September 30, 1953

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1				1.0	0.1	0.4	0.2	0.1*	0.05*				
2				0.2	.1	2.7	.2	.1*	.05*				
3				0.1	.1	0.8	.2	.1*	.05*				
4				0.1	.1	0.3	.2	.1*	.05*				
5				0.1	.1	0.2	.2	.1*	.05*				
6				0.2	.1	0.2	.2	.1*	.05*				
7				0.5	.1	0.1	.2	.1*	.04*				
8				0.2	.1	0.2	.2	.1*	.04*				
9				0.1	.1	0.2	.2	.1*	.04*				
10				0.1	.1	0.2	.2	.1*	.04*				
11				0.1	.1	0.2	.2	.1*	.04*				
12				0.1	.1	0.2	.2	.1*	.04*				
13				0.1	.1	0.2	.2*	.1*	.03*				
14				0.1	.1	0.3	.2*	.09*	.03*				
15				0.1	.1	0.3	.2*	.09*	.03*				
16				0.1	.1	0.4	.2*	.09*	.03*				
17				0.1	.1	0.3	.2*	.09*	.03*				
18				0.1	.1	0.3	.2*	.08*	.02*				
19			0.2*	0.1	.1	0.3	.2*	.08*	.02*				
20			36	0.1	.1	0.4	.2*	.08*	.02*				
21			12	0.1	.1	0.4	.2*	.08*	.02*				
22			1.2	0.1	.1	0.4	.1*	.07*	.02*				
23			0.6	0.1	.3	0.4	.1*	.07*	.02*				
24			0.4	0.1	.2	0.4	.1*	.07*	.02*				
25			0.3	0.1	.2	0.4	.1*	.07*	.01*				
26			0.3	0.1	.2	0.3	.1*	.07*	.01*				
27			0.3	0.1	.2	0.3	.1*	.06*	.01*				
28			0.4	0.1	0.2	0.3	.1*	.06*	.01*				
29			0.4	0.1		0.3	.1*	.06*	.01*				
30			0.4	0.1		0.2	0.1*	.06*	0.01*				
31			6.7	0.1		0.2		0.06*					
Total sec.-ft. days			--	4.7	3.5	11.8	5.1	2.63	0.89	0	0	0	Year period
Mean sec. ft.			--	0.15	0.12	0.38	0.17	0.08	0.03	0	0	0	--
Max. sec. ft.			--	1.0	0.3	2.7	0.2	0.1	0.05				--
Min. sec. ft.			--	0.1	0.1	0.2	0.1	0.06	0.01				0
Total ac. ft.			--	9.3	6.9	23	10	5.2	1.8	0	0	0	--

* Estimated.

WARM SPRINGS CREEK, NEAR MURRIETA

Location and description: Water-stage recorder, latitude 33°31'50", longitude 117°10'30", in Section 27, T.7S., R.3W., at State Highway bridge, about 2 miles southeast of Murrieta, Riverside County. Elevation of gage about 1,040 feet.

Drainage area: 58 square miles.

Records available: December 19, 1952, through May, 1954, Division of Water Resources.

Remarks: Records fair, shifting sand bottom. No regulation or diversions above station.

Daily discharge in second-feet, for the year ending September 30, 1954

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	
1	0.01	0.01	0	0.01	0.2	0.07	0.4	0.04					
2	.01	.01	0	0.01	0.2	0.06	.3	.04					
3	.01	.01	0	0.01	0.2	0.06	.3	.03					
4	.01	.01	0	0.01	0.2	0.06	.2	.03					
5	.01	.01	0	0.01	0.2	0.06	.1	.03					
6	.01	0	0	0.01	0.2	0.06	.09	.03					
7	.01	0	0	0.01	0.2	0.06	.09	.02					
8	.01	0	0	0.01	0.2	0.06	.09	.02					
9	.01	0	0	0.01	0.2	0.06	.09	.02					
10	.01	0	0.01	0.01	0.2	0.06	.09	.02					
11	.01	0	.01	0.01	0.2	0.06	.09	.02					
12	.01	0	.01	0.01	0.2	0.06	.09	.02					
13	.01	0	.01	0.01	44*	0.06	.09	.01					
14	.01	0	.01	0.01	70*	0.06	.08	.01					
15	.01	0	.01	0.01	5.8*	0.06	.08	.01					
16	.01	0	.01	0.01	1.4*	0.2	.08	.01					
17	.01	0	.01	0.01	0.8	0.2	.08	.01					
18	.01	0	.01	0.01	0.4	0.07	.07	.01					
19	.01	0	.01	0.8	0.3	0.07	.07	.01					
20	.01	0	.01	38	0.2	0.2	.07	.01					
21	.01	0	.01	2.7	0.2	0.8	.06	.01					
22	.01	0	.01	0.4	0.1	38	.06	.01					
23	.01	0	.01	0.3	0.1	18	.06	.01					
24	.01	0	.01	0.3	0.1	8.2	.06	.01					
25	.01	0	.01	44	0.09	9.0	.05	.01					
26	.01	0	.01	3.4	0.08	2.0	.05	.01					
27	.01	0	.01	1.4*	0.08	1.2	.05	.01					
28	.01	0	.01	0.8	0.07	0.9	.05	.01					
29	.01	0	.01	0.6		0.5	.04	.01					
30	.01	0	.01	0.5		4.6	0.04	.01					
31	0.01		0.01	0.2		0.9		0.01					
Total sec. ft. days	0.31	0.05	0.22	93.6	126.	85.8	3.07	0.51					Year period
Mean sec. ft.	0.01	--	--	3.02	4.50	2.77	0.10	0.02					--
Max. sec. ft.	0.01	0.01	0.01	44	70	38	0.4	0.04					--
Min. sec. ft.	0.01	0	0	0.01	0.07	0.06	0.04	0.01					0
Total ac. ft.	0.6	0.1	0.4	185	249	170	6.1	1.0					--

* Estimated.

TABLE E-2

TEMECULA CREEK, ABOVE AGUANGA VALLEY

Location and description: Water-stage recorder and six-inch Parshall flume, in Section 35, T.8S., R.1E., about one mile southeast of Aguanga, Riverside County. Elevation of gage about 2,080 feet.

Records available: May 19 through November 23, 1953, Division of Water Resources.

Remarks: Records good. No diversions immediately above recorder.

Daily discharge, in second-feet
for the period May 19 through November 23, 1953

Day	May	June	July	Aug.	Sept.	Oct.	Nov.
1		0.8	0.5	0.6	0.5	0.5	0.5
2		.8	.5	.6	.5	.5	.5
3		.7	.5	.6	.5	.5	--*
4		.7	.6	.5	.5	.5	--*
5		.8	.5	.5	.4	.4	--*
6		.8	.5	.5	.4	.4	--*
7		.7	.5	.5	.4	.4	--*
8		.8	.5	.5	.4	.4	--*
9		.8	.5	.5	.4	.4	--*
10		.7	.5	.5	.4	.4	--*
11		.7	.7	.5	.4	.5	--*
12		.7	.8	.5	.4	.5	--*
13		.7	.6	.4	.4	--*	--*
14		.7	.5	.4	.4	.5	--*
15		.7	.5	.4	.4	.5	--*
16		--*	.5	.4	.4	.5	--*
17		.7	.5	.4	.5	.5	--*
18		.8	.5	.3	.5	--*	.6
19	0.7	.7	.5	.3	.5	--*	.6
20	.7	.7	.5	.3	.5	--*	.6
21	.7	.6	.5	.4	.5	--*	.6
22	.7	.6	.5	.4	.5	--*	.6
23	.7	.5	.5	.3	.5	--*	0.6
24	.7	.5	.5	.3	.5	--*	
25	.7	.5	.5	.4	.4	--*	
26	.7	.5	.5	.4	.5	--*	
27	.8	.6	.5	.4	.6	--*	
28	.8	.6	.5	.4	.6	.6	
29	.8	.5	.5	.5	.5	.6	
30	.7	0.5	.6	.5	0.5	.6	
31	0.7		0.6	0.5		0.6	
Total sec. ft. days	--	--	16.4	13.7	13.9	--	--
Mean sec. ft.	--	--	0.53	0.44	0.46	--	--
Max. sec. ft.	--	--	0.7	0.6	0.6	--	--
Min. sec. ft.	--	--	0.5	0.3	0.4	--	--
Total ac. ft.	--	--	32	27	28	--	--

* No record.

TEMECULA CREEK, BELOW AGUANGA VALLEY

Location and description: Water-stage recorder and 18-inch rectangular contracted weir, in Section 29, T.8S., R.1E., about two miles west of Aguanga, Riverside County. Elevation of gage about 1,760 feet.

Records available: July 2 through September, 1954, Division of Water Resources.

Remarks: Records good. Intermittent diversion above weir at 8S/1E-29Q (Barton). No diversion at 8S/1E-29R (Trunnell) during this period.

Daily discharge, in second-feet,
for the period July 2 through September, 1954

Day	July	Aug.	Sept.
1		1.0	--*
2	0.8	0.9	--*
3	0.8	0.9	--*
4	0.9	0.9	--*
5	0.9	0.9	--*
6	0.8	0.9	--*
7	0.8	0.9	--*
8	0.8	0.8	0.9
9	0.8	0.9	0.9
10	0.9	0.9	0.9
11	0.8	0.9	0.9
12	0.9	0.8	1.0
13	1.0	0.8	1.0
14	1.0	0.9	0.9
15	0.9	0.9	1.0
16	0.9	0.9	1.0
17	0.8	0.9	1.0
18	1.0	0.8	1.0
19	1.0	0.8	1.0
20	0.8	0.8	1.0
21	0.9	0.9	1.0
22	1.0	0.9	0.9
23	1.0	0.9	1.0
24	1.1	0.9	1.0
25	1.0	0.9	0.9
26	0.9	0.9	1.0
27	0.9	0.9	0.9
28	0.8	0.8	0.9
29	0.8	0.9	0.9
30	0.7	0.8	0.9
31	0.8	0.9	
Total sec. ft. days	--	27.2	--
Mean sec. ft.	--	0.88	--
Max. sec. ft.	--	1.0	--
Min. sec. ft.	--	0.8	--
Total ac. ft.	--	54	--

* No record.

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 1

Stream	Murrieta Creek				Santa Gertrudis Creek[a]	Tucalota Creek	Warm Springs Creek[b]	Cole Canyon Creek[c]
Stream mile	30.1-0.4	30.1-6.4	30.1-7.4	30.1-8.5	30.1-3.9-0.6	30.1-3.9-2.6-10.7	30.1-4.8-0.5	30.1-9.0-0.1
Date								
5- 8-14	1.2							
12- 1-15	1.1							
2-13-17	2.1							
3-17-17	3.5							
3-27-17	1.7							
10-28-17	0.8							
12-29-17	1.5							
5-14-18	(1555) 1.3							
8-24-18	(1705) 0.6							
9- 1-18	(1040) 0.6							
9- 8-18	(1030) 0.7							
9- 2-19	(0945) 0.5							
12- 2-52		(1330) 0			(1030) 0.05[d]		(0945) 35	(1300) 0
12- 2-52							(1130) 16	
12- 4-52					(0930) 0		(1540) 0.2	
12- 5-52					(1030) 0.05[d]		(1130) 19	(1300) 0
12- 5-52								
12-16-52							(1400) 0	
12-20-52				(1405) 1[d]				

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 1
(continued)

Stream	Murrieta Creek				Santa Gertrudis Creek[a]	Tucalota Creek	Warm Springs Creek[b]	Cole Canyon Creek[c]
Stream mile	30.1-0.4	30.1-6.4	30.1-7.4	30.1-8.5	30.1-3.9-0.6	30.1-3.9-2.6-10.7	30.1-4.8-0.5	30.1-9.0-0.1
Date								
12-30-52				(2035) 1.5[d]				
12-31-52				(0020) 2[d]				
1- 7-53				(0905) 0				
1- 8-53		(1710) 0	(1715) 0.2[d]	(1545) 1[d]				
1-15-53				(1300) 0				
12-21-53						(1400) 0.01		
1-25-54		(1340) 24						
2-13-54						0		

Note: Time of observation in parenthesis.
a. See daily discharge record for period December 19, 1952-April, 1954.
b. See daily discharge record for period December 19, 1952-May, 1954.
c. See daily discharge record for period December 26, 1952-May 17, 1954.
d. Estimated.

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 2

Stream	Lancaster Creek			Coahuila Creek	Wilson Creek			
Stream mile	41.6- 0.1	41.6- 3.6[a]	41.6- 5.5[b]	41.6- 7.5	41.6-7.2- 1.8[c]	41.6-7.2- 2.5	41.6-7.2- 4.5[d]	41.6-7.2- 6.3
Date								
4-27-43	(1610) 2.2	(1000) 2.4	3.3					
5-28-43	2.2							
7-23-43		(1025) 1.4	(1210) 2.4					
7-30-43	(1155) 0.4							
8-26-43	(1315) 0.5	(1030) 1.0	(1135) 2.1					
9-13-44		(1345) 1.4	(1435) 1.8					
5-18-45		1.2	1.5					
5-10-46		1.2	0.9					
8-16-46		0.8	0.7					
4-18-47		(1130) 0.6	(1255) 0.7					
7- 9-47		(1040) 0.6	(1140) 0.5					
4-28-48		(1145) 0.6	(1210) 0.3					
6-30-48		(1300) 0.5	(1350) 0.2					
9- 3-48		(1310) 0.3	(1350) 0.2					
5- 4-49		(1035) 0.3	(1120) 0.2					
6-15-49		(1030) 0.4	(1120) 0.2					
11-21-50			(1625) 0.3					
1-31-51				(1550) 0.2[e]	(1645) 0.009		(1740) 0.04	
2- 1-51								(1125) 0.05
9-23-52				0	(1045) 0.06		(1340) 0.2	
7-31-53					(1320) 0.2		(1240) 0.2	

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 2
(continued)

Stream	Lancaster Creek			Coahuila Creek	Wilson Creek			
Stream mile	41-6-0.1	41.6-3.6[a]	41.6-5.5[b]	41.6-7.5	41.6-7.2-1.8[c]	41.6-7.2-2.5	41.6-7.2-4.5[d]	41.6-7.2-6.3
Date								
12-18-53					(1410) 0.2		(1440) 0.2	
12-23-53								(1300) 0.03
5-14-54					(0900) 0.2	(1015) 0.05	(1220) 0.09	

Note: Time of observation in parenthesis.
a. Upstream from diversion 8S/1E-7R (Rancho Ramona).
b. Upstream from diversion 8S/1E-9Q (Stardust Ranch).
c. Upstream from diversion 7S/1E-35E (Kerr).
d. Upstream from diversion 7S/1E-24C (Shipley).
e. Rained two days prior to measurement.

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 3

Stream	Temecula Creek								Arroyo Seco Creek			Smith Creek	Chihuahua Creek		Cooper Cienega	Rattlesnake Creek
Stream mile	42.2	45.5[a]	46.5[b]	47.5[c]	48.1[d]	55.2[e]	55.5[e]	57.1[f]	41.1-0.1	41.1-1.4	41.1-2.7	47.4-0.1	55.1-4.0	55.1-5.9	55.1-6.0-0.1	57.3-0.1
Date																
4-27-43		(1450) 12		(1315) 5.3					(1630) 2.8							
5-18-43		(1250) 6.0	(1430) 7.0													
7-30-43									(1245) 0.2							
8-26-43									(1330) 0.07							
8-27-43		(1035) 4.2														
10- 7-43		(1110) 4.0														
8- 9-44		(1330) 2.8														
5-18-45		(1315) 4.7														
11-29-45		(1050) 3.4														
5-10-46		(1225) 3.8														
8-16-46		(1335) 0.7														
4-18-47		(1400) 1.6														
6-18-47		(1240) 1.0														
7-30-47		(1305) 0.4														
4-28-48										0.2						
5-28-48		(1350) 1.5														
6-30-48										0.08						
8- 4-48		(1430) 0.5								1.5						
9- 3-48		(1540) 0.4								(1055) 0.02						
11- 4-48										0.04						
5- 4-49		(1305) 2.1														
6-15-49		(1240) 0.6														

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 3
(continued)

Stream	Temecula Creek								Arroyo Seco Creek			Smith Creek	Chihuahua Creek		Cooper Cienega	Rattlesnake Creek
Stream mile	42.2	45.5[a]	46.5[b]	47.5[c]	48.1[d]	55.2[e]	55.5[e]	57.1[f]	41.1-0.1	41.1-1.4	41.1-2.7	47.4-0.1	55.1-4.0	55.1-5.9	55.1-6.0-0.1	57.3-0.1
Date																
11- 9-50		(1130) 0.6														
11-16-50	(1430) 1.1															
11-17-50						(1500) 1.0										
11-22-50			(1220) 0.2													
12-26-50	(1720) 0.9		(1330) 0.4													
1-10-51													(1730) 0.02			
1-11-51													(1050) 0.03	(1000) 0.05	(0930) 0.02	
1-17-51								(1445) 0.1								
3-21-51	(1400) 1.2		(1250) 2.4				(0830) 0.9									
4-17-51	(1050) 1.0		(1645) 0.5													
4-26-51			(1240) 2.6[g]													
5- 8-51			(1640) 1.1													
5-28-51			(1350) 0.2													
7- 3-51	(a.m.) 0.6		(p.m.) 0.1													
9- 4-51	(1200) 0.3															
11-15-51	(1200) 0.4												0.008			
12-26-51	(1130) 0.6															
4- 8-52[g]							(1155) 1.7[h]	(1050) 1.0								(0950) 0.6
9-17-52																(1200) 0

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 3
(continued)

Stream	Temecula Creek								Arroyo Seco Creek			Smith Creek	Chihuahua Creek		Cooper Cienega	Rattlesnake Creek
Stream mile	42.2	45.5[a]	46.5[b]	47.5[c]	48.1[d]	55.2[e]	55.5[e]	57.1[f]	41.1-0.1	41.1-1.4	41.1-2.7	47.4-0.1	55.1-4.0	55.1-5.9	55.1-6.0-0.1	57.3-0.1
Date																
12-17-52											(1200) 0					
12-30-52											(1430) 0.2[1]					
1-23-53											(1515) 0.8[1]					
3-20-53												(1415) 3.8				
8-26-53																0
12-17-53													(1525) 0.01			
12-22-53								0.08		(1030) 0.3						
2-14-54											50[1]					
5-13-54																0.1[1]

Miscellaneous measurements of stream discharge, at
Temecula Creek Near Oakgrove Valley gaging station,
stream mile 54.0, not included in mean daily discharge records

In Second-Feet

Date	Time	Discharge	Date	Time	Discharge	Date	Time	Discharge
1-26-51	1230	0.9	7-30-51	1730	0.08	10-1-51	1615	0.2
1-31-51	0850	1.0	8-6-51	1530	0.04	10-8-51	1700	0.2
3-7-51	1405	1.0	8-13-51	1305	0.1	10-15-51	1730	0.2
3-21-51	1430	0.8	8-20-51	1630	0.03	10-22-51	1600	0.2
4-5-51	1430	0.9	8-27-51	1600	0.06	10-29-51	1545	0.2
5-7-51	--	0.7	9-11-51	1650	0.08	11-5-51	1630	0.3
7-9-51	1600	0.2	9-17-51	1630	0.06	11-15-51	0945	0.8
7-24-51	0845	0.1	9-24-51	1630	0.2	2-11-52	1510	0.9

Hydrographic Unit No. 3
(continued)

Miscellaneous measurements of stream discharge, at
Temecula Creek Below Aguanga Valley gaging station,
stream mile 48.1, not included in mean daily discharge record

In Second-Feet

Date	Time	Discharge	Date	Time	Discharge	Date	Time	Discharge	Date	Time	Discharge
9- 3-48	1500	1.5	1- 2-52	1500	1.8	8-19-52	1250	1.0	4- 1-53	1545	1.3
11- 4-48	1520	1.7	1-15-52	1100	1.5	8-20-52	1115	1.1	4-28-53	1200	1.5
11-22-50	1530	1.5	1-29-52	1130	1.4	8-22-52	1455	0.9	5-19-53	1400	1.3
12-26-50	1115	1.7	2- 4-52	1515	1.4	8-25-52	1100	1.1	6- 9-53	1230	1.1
3-21-51	1045	1.7	2-19-52	1125	1.3	8-26-52	1445	0.8	6-30-53	1230	1.1
4- 5-51	1340	1.7	3- 4-52	1545	1.4	8-27-52	1320	1.0	7-14-53	1120	1.2
4-26-51	1500	1.8	3-25-52	1245	1.6	9- 2-52	1445	0.9	9- 1-53	1100	1.3
5- 8-51	1655	1.3	4- 8-52	1800	1.4	9- 5-52	1000	1.1	9-18-53	1025	1.2
5-28-51	1410	0.9	4-22-52	1410	1.3	9-10-52	1150	0.9	9-29-53	1030	1.2
7- 3-51	p.m.	1.5	5-13-52	1455	0.6	9-12-52	1130	1.2	10-13-53	1335	1.2
7-31-51	1400	1.0	5-27-52	1130	1.0	9-17-52	1510	0.8	10-30-53	1130	1.2
8-13-51	1130	1.1	6-10-52	1420	1.1	9-19-52	1405	1.3	11-13-53	1100	1.2
8-20-51	1000	1.0	6-24-52	1345	1.1	9-22-52	1205	1.2	11-24-53	1330	1.2
8-27-51	1240	1.0	7- 8-52	1345	1.0	10- 3-52	1000	1.2	12- 8-53	1000	1.2
9-11-51	1230	1.1	7-23-52	1445	1.0	10-14-52	1110	1.2	12-22-53	1025	1.2
9-24-51	1400	1.2	7-25-52	1405	0.7	10-17-52	1415	1.2	1- 6-54	1420	1.2
10- 8-51	1500	1.3	7-29-52	1200	1.1	11- 3-52	1145	1.3	1-22-54	1225	1.3
10-22-51	1400	1.4	7-30-52	1630	1.1	12- 9-52	1330	1.5	2- 4-54	1505	1.3
10-29-51	1530	1.4	8- 7-52	1330	0.6	12-26-52	1205	1.6	2-19-54	1535	1.3
11- 5-51	1400	1.4	8-11-52	1500	0.9	1-23-53	1415	1.5	3- 8-54	1240	1.2
11-27-51	1000	1.4	8-12-52	1520	0.6	2- 3-53	1520	1.5	4- 2-54	1000	1.5
12-11-51	1145	1.5	8-14-52	1440	0.8	2-19-53	1140	1.5	5- 6-54	1445	1.1
12-18-51	1420	1.4	8-15-52	1100	0.9	3- 5-53	1225	1.5	6-15-54	1500	0.9
12-27-51	1115	1.4	8-18-52	1445	0.8	3-19-53	1515	1.6	7- 1-54	0915	1.0

Note: Time of observation in parenthesis.
a. Upstream from diversion 8S/1E-19M1 (Sunny Brook Ranch).
b. Downstream from diversion 8S/1E-29L (Gibbon-Cottle).
c. Upstream from diversion 8S/1E-29L (Gibbon-Cottle).
d. Downstream from diversion 8S/1E-29Q (Barton). See separate tabulation.
e. Downstream from diversion 9S/2E-17F (Oviatt-Brinkerhoff).
f. Downstream from diversion 9S/2E-21L (Oviatt-Cummings).
g. After rain.
h. Not diverting upstream.
i. Estimated.

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 4

Stream	Temecula Creek											Pechanga Creek
Stream mile	30.2	31.1[b]	31.8	32.2	32.3	34.2	34.7	35.0	35.6	35.7	41.0	31.0-6.4
Date												
4-11-1894											7	
9-1898											2	
11-14-05[a]		5.8									2.5	
12-30-05[a]		4.6										
1-12-06[a]		4.4										
2-10-06[a]		4.4										
3- 5-06[a]		6.0										
3-18-06[a]		17										
4-13-06[a]		12										
5-15-06[a]		6.4										
6-26-06[a]		2.6										
8- 5-06[a]		0.8										
10-10-06[a]		3.9										
11-12-06[a]		7.6										
12- 4-06[a]		7.2										
7-12-08		2.6										
4-3,4-10		13									13	
7-25,26-10		5.3									2.0	
11-1,2-10		5.9									1.7	
2-1,2-11		16									14	

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 4
(continued)

Stream	Temecula Creek											Pechanga Creek
Stream mile	30.2	31.1[b]	31.8	32.2	32.3	34.2	34.7	35.0	35.6	35.7	41.0	31-0-6.4
Date												
9-19-11		5									1.2	
3-10-14		10										
5- 8-14		9.1										
7-11-15											2.4	
11-22-16											14	
2-13-17	14											
3- 7-17	26											
3-27-17	15											
10-27-17		4.1										
10-28-17	13			7.4							(1510) 4.8	
12-28-17											(1100) 5.2	
12-29-17	(1530) 13											
5-11-18											(1625) 11	
5-14-18	(1545) 15			(1635) 5.5								
8-24-18		(1035) 3.4[c]						(1125) 2.7[d]			(1320) 2.3	
8-24-18		(1640) 0.02[e]						(1610) 2.2[d]				
9- 1-18		(0940) 6.2[f]						(0845) 3.1[d]				
9- 8-18		(1000) 7.2						(0915) 2.3[d]				
9- 9-18								(1030) 3.0[d]				
8-23-19		(0900) 4.1						(0700) 2.8[d]				

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 4
(continued)

Stream	Temecula Creek											Pechanga Creek
Stream mile	30.2	31.1[b]	31.8	32.2	32.3	34.2	34.7	35.0	35.6	35.7	41.0	31-0-6.4
Date												
8-23-19		(1700) 3.0										
9- 2-19	(0930) 6.4[f]	(0900) 3.2[f]						(0800) 2.6[d]				
12-21-19											5.8	
3- 6-20		18									25	
3-19-20		10										
3-22-20		469										
3-23-20		384										
3-29-20											88	
7-12-20		4.9						1.7			3.4	
4-27-43											(1650) 14	
5-18-43											(1545) 6.1	
8-27-43											(1150) 2.6	
8- 9-44											2.5	
5-18-45											2.8	
5-10-46											1.7	
8-16-46											0.8	
4-18-47											(1505) 2.8	
6-18-47											(1345) 1.9	
7-30-47											(1350) 1.3	
5-28-48											(1055) 3.3	

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 4
(continued)

Stream	Temecula Creek											Pechanga Creek
Stream mile	30.2	31.1[b]	31.8	32.2	32.3	34.2	34.7	35.0	35.6	35.7	41.0	31.0- 6.4
Date												
8- 4-48											(1030) 1.8	
9- 3-48											(1110) 1.6	
1-24-51										(1145) 0.4		(1350) 0.002[g]
1-24-51												(1350) 0.009[h]
12- 2-52	(1050) 3[i]											
12- 5-52										(1050) 3[i]		
12-17-52										(1200) 3[i]		
12-22-52										(1200) 4[i]		
12-30-52										(1425) 4[i]		
1-23-53		(1530) 5[i]								(1520) 0.05		
3-11-53	(1110) 5.5											
3-12-53		(1400) 4.6										
12-18-53									(1540) 0.09			
4-19-54	(1210) 6.1	(1155) 4.7	(1600) 1.5		(1625) 0.7		(1145) 0.5		(1210) 0.1			
5-24-54		(1510) 3.1	(1345) 1.6		(1315) 1.2	(1200) 0.5	(1100) 0.4		(1030) 0.08			

Note: Time of observation in parenthesis.

a. Measurements from W.S.P. 300, which includes 20 discharge measurements and eight months of daily gage height readings for period November, 1905 through December 31, 1906.

b. Downstream from Highway Bridge Pumping Plant. Plant in operation for period 1912 through April, 1930.

c. Bridge Pumping Plant diverting 3.1 cfs.

d. Total flow diverted.

e. Bridge Pumping Plant diverting 3.7 cfs.

f. Not diverting at Bridge Pumping Plant.

g. 450 feet upstream from Collier Spring.

h. 300 feet upstream from Collier Spring.

i. Estimated.

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 5

Stream	De Luz Creek			Tributary of De Luz Creek				Santa Margarita River	Sandia Creek		
Stream mile	12.2-4.8	12.2-6.6	12.2-7.6	12.2-6.6-0.2	12.2-6.6-2.0	12.2-6.6-2.5	12.2-6.6-4.0	20.5	20.7-0.1	20.7-1.3	20.7-6.0
Date											
9- 1-18								(1325) 8.4			
9- 8-18								(1330) 7.1			
6-19-53									(0840) 0.07	(0915) 0.05	
7- 8-53									(1100) 0	(1200) 0	
9-25-53		0.2		(1540) 0.1							
12-17-53									(0935) 0		
12-22-53	(1500) 0.3			0.2*	0	0.02*	0				0.01*
4-27-54		0.8*	0	0.4*							

Miscellaneous measurements of stream discharge of Santa Margarita River near Temecula.
Mean daily discharge records are available in U.S.G.S. publications since 1923.
Prior to October 1, 1952, U.S.G.S. referred to this station as Temecula Creek at Railroad Canyon

In Second-Feet

Date	Time	Discharge	Date	Time	Discharge	Date	Time	Discharge
4-11-1894	--	14	10-29-17	--	14	9- 9-18	1450	7.2
4-3,4-10	--	17	5-14-18	--	16	9- 9-18	1635	6.0
7-25,26-10	--	5.9	8-24-18	1055	4.1	9- 9-18	1735	5.5
11-1,2-10	--	12	8-24-18	1705	1.4	9- 9-18	1840	5.5
2-1,2-11	--	22	9- 1-18	1030	9.4	9- 9-18	1920	5.7
9-19-11	--	6.6	9- 8-18	1025	8.6	9- 2-19	0945	6.9
5- 8-14	--	10	9- 9-18	0830	8.7	12-21-19	--	15
12- 1-15	--	10	9- 9-18	0950	9.0	3- 6-20	--	19
2-13-17	--	16	9- 9-18	1100	9.0	3-23-20	--	460
3-17-17	--	30	9- 9-18	1210	8.8	3-29-20	--	93
3-27-17	--	17	9- 9-18	1310	8.5	7-12-20	--	6.3
10-28-17	--	14						

Note: Time of observation in parenthesis.
* Estimated.

MISCELLANEOUS MEASUREMENTS OF STREAM DISCHARGE

In Second-Feet

Hydrographic Unit No. 6

Stream	Santa Margarita River			Fallbrook Creek	
Stream mile	10.5	11.6[b]	12.1	8.8-6.1	8.8-7.6
Date					
9- 1-18	(1625) 1.6[a]	(1530) 4.3	(1500) 2.1		
9- 8-18	(1640) 1.6[a]	(1545) 3.6	(1505) 2.7		
6-22-53				0.016[c]	
6-26-53				0.013[c]	
6-30-53				0.011[c]	
7- 3-53				0.011[c]	
7- 9-53				0.011[c]	0.05[d]
12-22-53				(1430) 0.003	(1500) 0.01

Note: Time of observation in parenthesis.
a. Total flow diverted in O'Neill Ditch.
b. Mean daily discharge for this location for period June, 1925 through March, 1926, published by United States Geological Survey as Santa Margarita River near De Luz Station.
c. Mean daily discharge. Continuous record available for period June 20 through July 9, 1953.
d. Estimated.

Table E-4

MISCELLANEOUS MEASUREMENTS OF SPRING DISCHARGE

Spring number	Date	Flow, gpm
6S/1E-25H	9-18-53	Trickle
25Q	9-23-53	0.3
6S/2E-30M	9-18-53	Trickle
6S/4W-35Q	8-11-54	Dry
7S/1E-17G	11- 2-53	0.5[a]
20G1	2- 1-51	0.9
20G2	2- 1-51	0.1
24G	9- 2-53	0.5
25G	9- 2-53	Less than 1[a]
30G	2- 1-51	0.4
7S/2E- 6Q	9-23-53	1.5
20H	3- 8-51	1.4
32H	12- 4-53	0.4
7S/1W-18Q	8-10-54	Trickle
20J	8-10-54	0.5[a]
21E	8-10-54	Dry
7S/3W-21J	8-11-54	Dry
22N	8- 9-54	Trickle
27C2	8- 9-54	Trickle
27F	8- 9-54	Trickle
8S/1E- 2P	11- 2-53	0.1[a]
8G	2-16-51	0.6
8K1	2-16-51	Trickle
8Q	2-16-51	11.0
8S/2E-19B	3- 6-51	Trickle
21G1	11- 2-53	Less than 0.5[a]
21G3	11- 2-53	Less than 0.5[a]
22B	11- 2-53	Trickle
22G1	11- 2-53	3.5[a]
22G2	11- 2-53	3.2[a]
22P1	11- 2-53	0.7[a]
22P2	11- 2-53	Less than 0.5[a]
26Q	11- 2-53	7[a]
28A	11- 2-53	1.5[a]
36E	8-11-54	Dry
8S/3E-31G2	8-28-53	8[a]
8S/1W-18B	8-10-54	Trickle
18C	8-10-54	1.5[a]
21C	2- 9-51	2.0
25B	1-25-51	Less than 1[a]
36H	1-25-51	2.4
36K	1-25-51	3.3
36Q	1-25-51	2.1
8S/2W-31C	7-16-53	2[a,b]
8S/3W- 1N2	8-11-54	50[a,b]
9S/2E-10G	8-26-53	0.5[a]
23K	2-16-51	0.1
34L	3- 6-51	0.8
9S/3W- 1H	7-14-53	0.2[a]
9S/4W- 5P	8-25-54	5[a]

a. Estimated.
b. Reported by owner.

APPENDIX F

WATER WELL DATA

TABLE OF CONTENTS

WATER WELL DATA

WATER WELL DATA FOR WELLS IN AND
ADJACENT TO SANTA MARGARITA RIVER WATERSHED

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
					Hydrographic Unit No. 1				
5S/1W- 28K1[a]		Searl Bros.	1892	20	--	windmill	stock	water level	
32Q1		Searl Bros.		--	3	5 HP. electric	domestic	water levels	
33R1[a]		Searl Bros.		90	--	15 HP. electric	irrigation	water levels	
34M1[a]		Searl Bros.		--	24	electric	irrigation	water levels	
34N1[a]		Searl Bros.		90	12	electric	irrigation	water levels, analysis	
34P1[a]		Searl Bros.		120	18	electric	irrigation	water levels, analysis	
34R1[a]		--		--	12	--	not used	water level	
5S/2W- 34P1[a]		K. Young		25	--	windmill	stock	water levels, analysis	
6S/1W- 3E1[a]		Searl Bros.		--	--	10 HP. electric	irrigation	water levels, analysis	
3E2[a]		Searl Bros.		--	14	--	not used	water levels	
3E3[a]		Randolph Baatz	1947	136	--	20 HP. electric	domestic, irrigation	water levels	
3E4[a]		Randolph Baatz	prior to 1900	80	7	--	not used	--	unable to measure
3E5[a]		Randolph Baatz	1926	85	36	--	domestic	--	unable to measure
4G1		Searl Bros.		--	--	electric	irrigation	water levels	
4H1		Edgar Searl		--	--	1 HP. electric	domestic	--	unable to measure
4J1		A. C. Mohlenhoff	July, 1950	121	10	7 HP. electric	irrigation, stock	analysis	
4J2		A. C. Mohlenhoff	1953	140	10	--	not used	water level	
4J3		L. H. Allert		120	8	5 HP. electric	domestic	water level	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
						Hydrographic Unit No. 1 (continued)			
6S/1W- 4K1		Searl Bros.		--	16	20 HP. electric	irrigation	water levels	
5G1		Garbani Bros.		105	12	diesel	irrigation	water levels, analysis	
5H1		Garbani Bros.		107	12	20HP. electric	irrigation	water levels	
5H2		Garbani Bros.		--	12	15 HP. electric	irrigation	water level	
6A1		Garbani Bros.		105	16	30 HP. electric	irrigation	water level	
10D1		A. C. Mohlenhoff	prior to 1930	62	36	¾ HP. electric	domestic	water level	
10M1		Harold Wilhem		--	8	windmill	domestic	water level	
10M2		Harold Wilhem		77	8	--	not used	water level	open casing
14N1		J. R. Whaley		70	--	gasoline engine	domestic	water level	
15C1		J. R. Whaley	about 1915	44	12	1 HP. electric	stock	water level	
15C2		J. R. Whaley	1952	79	36	7½ HP. electric	domestic	water level	
15H1		J. R. Whaley	1952	54	36	15 HP. electric	stock	water level	
26P1		T. Duncan		200	--	gasoline engine	stock	water level log	
31N1		--		--	10	gasoline engine	domestic	analysis	
6S/2W- 1A1		Searl Bros.		80	16	windmill	stock	water levels, analyses	
2G1		Francis Domenigoni		--	--	windmill	stock	water level	
2J1		Francis Domenigoni		--	--	--	not used	water levels	
2J2		Francis Domenigoni	Sept., 1951	110	12	30 HP. electric	irrigation	water level log	
2N1		Francis Domenigoni		--	--	--	stock	--	

(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
6S/2W- 2P1		Francis Domenigoni	1953	--	--	25 HP. electric	irrigation	--	
3R1		Pete Domenigoni		135	12	--	not used	water levels	
3R2		Pete Domenigoni		28	48	windmill	stock	water levels, log	
3R3		Pete Domenigoni		37	10	--	not used	water levels	
3R4		Pete Domenigoni		58	10	--	not used	water levels	
3R5		Pete Domenigoni		--	12	--	not used	--	abandoned
3R6		Pete Domenigoni		37	10	--	not used	water level	
3R7		Pete Domenigoni	1908	22	--	--	not used	log	
4L1		Francis and William Hedler	July, 1951	50	10	1 HP. electric	domestic	water levels, log	
4R1		Antonio Domenigoni		25	--	--	not used	log	
9A1		F. Domenigoni		112	--	--	--	log	
9A2		Antonio Domenigoni		46	--	--	--	log	
9J1		E. W. Connell	July, 1953	146	12	15 HP. electric	irrigation	water levels, log	
9K1		E. W. Connell		87	12	15 HP. electric	irrigation	water level, log	
9K2		E. W. Connell	July, 1953	102	6	3 HP. electric	domestic	water level, log	
9Q1		--		--	--	windmill	stock	--	
10D1		Francis Domenigoni	Aug., 1951	110	12	windmill	domestic	log	
10D2		Francis Domenigoni		125	12	20 HP. electric	irrigation	log	
10E1		Francis Domenigoni		19	--	windmill	stock	log	
10K1		--		--	--	windmill	domestic	water levels	
11A1		Searl Bros.		45	7	windmill	stock	water levels, analyses	

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
6S/2W-15D1		--		--	--	--	stock	water level	
16C1		--		--	42	windmill	stock	water level	
16C1		--		--	27	--	not used	water level	
17N1		Fred Pourroy		16	18	windmill	stock	water levels, analysis	
19E1		--		--	72	windmill	stock	water levels	
19H1		Fred Pourroy		37	72	--	domestic	water levels	
19N1		Mrs. Arthur Mc Elhinney	1945	32	48	1 HP. electric	domestic	water levels	
19N2		Mrs. Arthur Mc Elhinney		35	48	1 HP. electric	domestic	water levels	
19N3		Mrs. Arthur Mc Elhinney		--	--	--	stock, domestic	water levels	
20A1		Frederick Domenigoni	June, 1951	108	10	--	domestic	log	
20N1		Richardson		--	--	--	not used	water levels	
20R1		--		--	36	windmill	abandoned	--	
21D1		H. Bergman	June, 1949	79	8	--	not used	water levels, log	
21Q1		Gilbert Stearns		--	36	--	not used	water levels	
21R1		Gilbert Stearns		40	48	½ HP. electric	domestic	water level	
27N1		Arthur Vial		--	48	windmill	stock, domestic	water levels, analysis	
28A1		Karl Frick		--	10	--	not used	--	
28B1		Karl Frick		--	10	--	not used	water levels	
28C1		Karl Frick		--	54	windmill	not used	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
					Hydrographic Unit No. 1 (continued)				
6S/2W-28G1		Karl Frick		20	--	windmill	-	water levels	
28G2		Karl Frick	July, 1948	126	12	5 HP. electric	irrigation	water levels, log, analysis	
28G3		Karl Frick		175	10	$1\frac{1}{2}$ HP. electric	irrigation	water levels, log, analysis	
28J1		Arthur Vial		22	--	windmill, electric	domestic	water levels	
-28J2		Arthur Vial	1952	80	12		not used	water levels	
29M1		--		--	18	windmill	stock	water levels	
29R1		Pierre Pourroy		--	7	windmill	stock	water levels, analysis	
30A1		Richardson		--	--	windmill	domestic	water levels	
30C1		--		--	72	windmill	domestic	water levels, analysis	
30F1		Mc Elhinney		--	72	windmill	stock	water levels	
30F2		Mc Elhinney		--	48	windmill	stock	water levels	
30R1		Richardson		--	72	windmill	domestic	water levels	
31L1		Fontana Bros.		51	72	$\frac{1}{2}$HP. electric	domestic	water levels, analysis	
31L2		Fontana Bros.		35	72	2 HP. electric	--	water levels	
31P1		--		--	--	--	not used	water levels	
31P2		--		--	--	windmill	domestic	water levels	
31R1		R. M. Cummins	Feb., 1950	81	10	2 HP. electric	irrigation	water levels, log	
31R2		R. M. Cummins		40	72	windmill	domestic	water levels	
32A1		Pierre Pourroy	Dec., 1950	199	10	10 HP. electric	irrigation	water level, log, analyses	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other [b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
6S/2W-32H1		Pierre Pourroy		--	10	5 HP. electric	irrigation	water level, analysis	
32H2		Pierre Pourroy		--	--	windmill	--	water levels	
32L1		Pierre Pourroy		40	10	--	not used	water levels	
32L2		Pierre Pourroy		--	--	windmill	not used	water levels	
32R1		Pierre Pourroy		--	8	--	not used	water levels	
33E1		Pierre Pourroy		31	42	windmill	domestic	water levels, analysis	
34C1		--		--	--	$\frac{3}{4}$ HP. electric	domestic	water levels	
6S/3W-26D1 [a]		S. W. Reigle	June, 1951	110	10	1 HP. electric	domestic	water level, log	
26E1		Alex Mahas	1951	40	8	--	domestic, irrigation	water level, log	
31P1		Lazy B. Ranch		--	--	$\frac{1}{2}$ HP. electric	domestic	analysis	
31R1		W. L. Moreno	Oct., 1948	66	8	--	domestic	water level, log, analysis	
35D1		George D. Evans	Oct., 1948	50	16	windmill	domestic	water levels, log	
35D2		George D. Evans		--	--	windmill	domestic	water level	
35D3		George D. Evans	Oct., 1948	--	8	electric	domestic	--	
6S/4W-21J1 [a]	Elsinore 94	F. G. Perkins		190	12	electric	--	water levels	
21R1 [a]	Elsinore 95	I. P. Chappel		250	16	electric	domestic	water levels	
22F1 [a]	Elsinore 99 Local No. 55	Sidney Kelsey		48	60	windmill	not used	water levels	
22G1 [a]	Elsinore 100 Local No. 52	Albert Kaznier		--	6	--	not used	water levels	

WATER WELL DATA
(continued)

Well numbers State	Other	[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)						
6S/4W-22M1[a]	Elsinore	97	H. H. Hillebrand		400	12	40 HP. electric	irrigation	water levels	
23N1[a]	Elsinore	114	Fred Rathke		100	8	1/3 HP. electric	domestic	water levels	
26B1	Elsinore	113	C. R. Dawson		80	48	1 HP. electric	domestic	water levels	
26E1[a]			Harry Davis		320	--	10 HP. electric	irrigation	water levels	
26L1	Elsinore	111	L. M. Carter		101	8	½ HP. electric	domestic	water levels	
26L2	Elsinore	109	Fred Oest		130	--	½ HP. electric	domestic	--	
26M1	Elsinore	108	Ben Edwards		102	--	1 HP. electric	domestic	water levels	
26M2			de Leon		91	--	3 HP. electric	domestic	water level	
26Q1			Tony Stellino		--	--	--	--	analysis	
27C1[a]	Elsinore	115	A. Brenner		--	--	electric	irrigation	water levels	
27C2[a]			L. L. Black		--	--	electric	--	--	
27G1[a]	Elsinore	106	Clyde Blakely		200	12	¾ HP. electric	domestic	water levels	
27J1	Elsinore	110	William R. Parks	1949	275	10	--	domestic, irrigation	--	unable to measure
27M1[a]			John P. Garrett	Apr., 1953	160	8	1 HP. electric	domestic	water levels	
27N1			Nick Cacia		112	8	1 HP. electric	--	water levels	
27N2[a]			William Wright	June, 1950	141	12	electric	domestic, stock	water levels, log	
28B1[a]	Elsinore	96	J. P. Chappel		190	12	--	not used	water levels	
28D1[a]	Elsinore	92	Charles de Boer		--	--	5 HP. electric	--	water level, analysis	
28H1[a]	Elsinore	91	--		--	6	windmill	not used	water levels, analysis	
28L1[a]	Elsinore	90	L. Kinnster		--	48	¾ HP. electric	domestic	water levels	
28M1[a]	Elsinore	81	W. W. Hillis		58	2	¼ HP. electric	domestic	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
6S/4W-28P1[a]	Elsinore 82	--		--	12	windmill	--	water levels	
28P2[a]	Elsinore 83	V. Cleveland		40	--	electric	domestic	water levels	
28P3[a]		V. Cleveland	July, 1951	72	10	1 HP. electric	domestic	water levels	
28P4[a]		V. Cleveland		32	6	--	not used	water level	
28R1[a]	Elsinore 84	--		--	8	windmill	stock	water levels	
33A1		--		--	--	½ HP. electric	--	--	unable to measure
33A2[a]	Elsinore 86	J. E. Tarr		70	36	electric	domestic, irrigation	water levels	
33B1[a]	Elsinore 85	L. H. Kingsland		74	12	electric	domestic	water levels	
33B2[a]		J. E. Tarr		68	42	windmill	domestic, irrigation	--	
33H1		--		--	7	½ HP. electric	domestic	water levels	
33H2		--		--	--	--	--	--	
33H3		Blake		--	10	1/3 HP. electric	--	water levels	
33H4		J. T. Hutchinson	About 1942	110	10	½ HP. electric	domestic	water levels	
33H5		Mary Turku		--	8	½ HP. electric	domestic	water levels	
33H6		Antonio Stellino	Nov., 1947	55	6	--	not used	water level, log	
34B1	Elsinore 155	Bill Stuart		--	6	gasoline engine	--	water levels	
34D1	Elsinore 163	E. W. Robison	1925	252	12	gasoline engine	domestic	water level	
34E1		--		70	48	2 HP. electric, windmill	--	water levels	
34E2		--		--	--	--	--	--	
34E3	Elsinore 88	S. M. Morrison		90	--	1 HP. electric	domestic	water levels	
34E4	Elsinore 87	Don Trenary		100	12	1 HP. electric	domestic	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
6S/4W-34E5		--		84	8	1 HP. electric	--	water level	
34E6		--		--	8	--	not used	water levels	open casing
34G1	Elsinore 154	C. J. Spore		40	24	windmill, electric	domestic	water levels	
34G2		C. J. Spore		--	24	electric	--	water level	
34G3		C. J. Spore		--	12	--	not used	water levels	open casing
34J1		--		--	12	--	not used	water level	open casing
34J2		Henry Langstraat		154	12	--	domestic, irrigation, stock	water levels, analysis	
34J3		--		--	10	1/3 HP. electric	domestic	water levels	
34J4		Bob and Lea Phillips		60	6	½ HP. electric	domestic	water level	
34J5		Arthur H. Cooper		60	4	electric	domestic	water levels	
34J6		Dr. Hunter		--	6	1 HP. electric	domestic	water level, analysis	
34J7		John Fitzpatrick		51	20	½ HP. electric	domestic	water levels	
34J8		Arthur H. Cooper		--	16	electric	--	water level	
34J9		--		--	8	½ HP. electric	domestic	water levels, analysis	
34J10		Allen	Aug., 1950	51	24	¼ HP. electric	domestic	water level	
34K1	Elsinore 153	G. E. Parry		125	12	1 HP. electric	domestic	water levels	
34L1		--		--	8	1 HP. electric	--	water level, analysis	
34L2		--		--	--	--	--	--	
34L3		Glen A. Vincent		--	--	--	--	--	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
						Hydrographic Unit No. 1 (continued)			
6S/4W-34M1		Lord		--	--	5 HP. electric	--	water levels, analysis	
34P1		C. C. Karl		--	12	gasoline engine	--	water levels	
34Q1		--		81	--	windmill	domestic	water levels	
34Q2		C. E. Bittikofer		180	12	5 HP. electric	--	water levels, analyses	
34Q3		--		110	8	1 HP. electric	domestic	water levels	
34Q4		Frank E. Collier		--	42	gasoline engine	--	water levels, log	
34Q5		--		--	--	½ HP. electric	domestic	water level	
34Q6		Russel O. Freeman	July, 1951	96	10	½ HP. electric	domestic	water level, log	
34R1	Elsinore 152	Guy S. Clark		--	--	1 HP. electric	domestic	water levels, analysis	
34R2		Guy S. Clark		--	--	windmill	--	water levels	
34R3		Guy S. Clark	Apr., 1951	100	8	½ HP. electric	domestic	water level, log analyses	
34R4		--		--	--	windmill	domestic	water level	
34R5		--		--	--	--	domestic	--	unable to measure
34R6		--		--	--	--	domestic	--	
34R7		--		--	10	electric	domestic	water level	
34R8		B. L. Freeman		--	8	½ HP. electric	domestic	water levels	
34R9		Orville Grow		--	--	--	domestic	water level	
35C1		--		50	--	windmill	not used	water levels	
35D1		Charles B. Withrow	Apr., 1952	202	12	30 HP. electric	irrigation	water levels, log	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
6S/4W-35F1	Elsinore 150	H. E. Blackforn		--	36	½ HP. electric, windmill	domestic	water levels, analysis	
35L1		--		--	8	1½ HP. electric	domestic	water level	
35L2				--	--	electric	not used	--	unable to measure
35M1	Wildomar 260 Elsinore 151	Wildomar School		313	12	electric	domestic	water levels	
35M2		Stephens		75	8	electric	domestic	water levels, analysis	
35M3		Thomas L. Sayer		67	8	1/3 HP. electric	--	water level	
35M4		Turner		about 60	8	electric	domestic	water level	
35M5		--		--	7	1/3 HP. electric	--	--	
35N1		Orville Grow	1953	200	12	electric	irrigation	water levels, analysis	
35P1		Mrs. Joan Kelly	1910	165	12	windmill, electric	domestic	water levels	
35P2	Wildomar 259	May Hillman	1926	294	12	25 HP. electric	not used	water levels, log	
35Q1		Thomas Wilks	about 1888	30	7	electric	domestic	water levels, analysis	orriginally 225 ft. deep
35Q2		Thomas Wilks	Sept. 1953	80	10	electric	domestic, irrigation	--	
36B1		--		--	--	windmill	--	--	
36C1		--	1953	--	8	1 HP. electric	--	water level	
36D1	Elsinore 149	H. A. Smith		--	8	electric	domestic	water levels, analysis	
7S/1E-4F1		Ed Shockley		--	4'x4'	windmill	not used	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/1E-4G1		Ed Shockley	about 1950	70	12	1 HP. electric	domestic, stock	water levels	
4L1		Ed Shockley	about 1950	--	10	2½ HP. electric	not used	water levels	
4P1		Campbell		--	12	electric	stock	water levels	
4P2		Campbell		--	36	windmill, 1/3 HP. electric	domestic	water levels	
6P1		Duncan Industries		--	18	--	not used	water levels	
6Q1		C. O. Pollard	about 1952	about 40	36	--	--	log	
7A1		S. T. Creech		--	8	windmill	stock	water level	
7A2		S. T. Creech		--	48	--	not used	water level	
7A3		S. T. Creech		--	8	--	not used	water level	open casing
7A4		S. T. Creech		--	8	--	not used	water level	
7C1		Duncan Industries		--	--	--	not used	water levels	
7D1		Duncan Industries		74	10	windmill	not used	water levels, log	
7D2		Duncan Industries	May, 1953	42	16	5 HP. electric	irrigation	water level, log	
7D3		Duncan Industries		about 50	--	5 HP. electric	irrigation	--	unable to measure
7E1		Duncan Industries		--	24	--	not used	water levels	test hole
7E2		Duncan Industries		--	uncased	--	not used	water levels	test hole
7E3		Duncan Industries	about 1950	about 40	12	--	not used	water levels	
7E4		Duncan Industries		--	24	--	not used	--	unable to measure
8D1		S. T. Creech	about Apr., 1951	48	36	5 HP. electric	domestic, irrigation	water level, log	

WATER WELL DATA
(continued)

Well numbers State	Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/1W- 6G1		John Kazaroff	Oct., 1950	83	8	gasoline engine	stock	water levels, log	
6H1		John Kazaroff	Feb., 1950	170	10	windmill	domestic, stock	water level, log	
7E1		J. N. Bashaw		138	--	gasoline engine	domestic	water levels	
8L1		Bessie Wilson		35	48	gasoline engine	domestic, irrigation	water levels	
8L2		Bessie Wilson		35	12	--	irrigation	water levels	
10R1		G. W. Millholland		60	48	windmill	domestic	water levels, mineral analysis	
12G1		L. E. Pittam	about 1948	83	10	½ HP. electric	irrigation	--	unable to measure
12H1		State Division of Forestry	Aug. 1952	72	8	electric	domestic	log	unable to measure
12J1		Duncan Industries		--	--	1/3 HP. electric	domestic	--	unable to measure
12K1		Duncan Industries		--	14	10 HP. electric	irrigation	water level	
12R1		F. W. Pittam	Aug., 1953	48	12	electric	domestic, irrigation	log	
14A1		Cyrus J. Mc Daniel		24	42	windmill, 1/3 HP. electric	domestic	water levels, mineral analysis	
18E1		--		--	60	windmill	stock	water levels	
18J1		William Willis		29	--	gasoline engine	irrigation	water levels, mineral analysis	
18M1		--		--	60	windmill	not used	water levels	
18Q1		Vail Co.		--	8	windmill	not used	water levels	
18Q2		Vail Co.		about 40	--	windmill	stock	water levels, mineral analysis	
30N1		Vail Co.		206	10	windmill	stock	water levels, mineral analyses	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/2W- 1E1		Batts		--	--	windmill	--	--	
1F1		Batts		--	15	windmill	not used	water level	
2L1		A. C. Robertson		--	--	--	--	--	
2M1		A. C. Robertson		34	7	windmill	stock	water levels	
2P1		A. C. Robertson		--	7	windmill	stock	water levels	
2P2		A. C. Robertson		37	--	windmill, 1½ HP. electric	domestic, irrigation	water levels, mineral analysis	
2R1		Bashaw		60	8	gasoline engine	irrigation	--	unable to measure
3H1		A. C. Robertson		97	12	electric	domestic	water levels	
3J1		Harold Sewell		--	7	1 HP. electric	domestic	water levels	
3L1		M. A. Nicolas	Apr., 1951	128	12	--	not used	water level, log	
4D1		Fred Pourroy		about 60	60	windmill	domestic	water levels, mineral analysis	
4E1		--		--	12	windmill	domestic	--	unable to measure
4J1		M. A. Nicolas		--	10	--	not used	water levels	
4J2		M. A. Nicolas	May, 1951	86	12	5 HP. electric	domestic	water levels, log, mineral analysis	
4J3		M. A. Nicolas	about 1935	104	10	--	not used	water level, log	
4J4		M. A. Nicolas		--	48	windmill	not used	water levels	
4K1		M. A. Nicolas	1951	about 90	--	7½ HP. electric	irrigation	water levels, mineral analysis	
5C1		Fred Pourroy		70	10	windmill	stock	water levels	
5H1		Cummins		91	48	20 HP. electric	domestic, irrigation	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/2W-5J1		Alamos School		--	--	--	domestic	--	
5M1		Fred Pourroy		about 50	48	windmill	stock	water levels	
6A1		--		--	--	windmill	--	--	
6C1		Smoll		69	--	½ HP. electric	--	--	unable to measure
6C2		Smoll		41	--	electric	domestic	--	unable to measure
6Q1		--		--	72	--	not used	water levels	abandoned
7J1		Alex Borel		--	48	windmill	stock	water levels	
7R1		V. V. Hilliard		--	--	--	domestic	water levels	
8A1		Alex Borel		--	16	--	not used	water levels	
8E1		Alex Borel		--	48	windmill	not used	water levels	
8H1		Alex Borel		--	16	5 HP. electric	irrigation, stock	mineral analysis	unable to measure
8M1		Alex Borel	1952	--	--	--	--	mineral analysis	abandoned
8M2		Alex Borel	Nov., 1927	366	--	windmill, 1½ HP. electric	domestic	water levels, log	
9F1		--		--	--	windmill	not used	--	abandoned
10D1		M. A. Nicolas		21	6	windmill	stock	water levels	
12G1		Bill Knezevich		about 30	--	--	domestic, stock	water levels	
12R1		Alex Borel		--	48	--	not used	water levels	
13R1		Alex Borel		--	--	windmill	domestic	water levels	
16J1		M. A. Nicolas	Jan., 1950	81	8	--	not used	water levels, log	
16J2		M. A. Nicolas		--	12	windmill	not used	water levels	
16J3		M. A. Nicolas		112	10	--	not used	log	

WATER WELL DATA
(continued)

Well numbers State	Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/2W-16J4		M. A. Nicolas		about 60	8	--	not used	water levels	
18P1		L. J. Servel		--	10	--	not used	water levels	
19C1		L. J. Servel		--	--	5 HP. electric	irrigation	water levels	
19C2		L. J. Servel		400	--	20 HP. electric	irrigation	--	
19C3		L. J. Servel		--	10	--	not used	water levels	
20E1		--		--	--	--	--	--	
20P1		J. Nicolas		--	--	windmill, gasoline engine	--	mineral analysis	
21E1		--		--	12	windmill	--	--	
24F1		Vail Co.		--	48	windmill	stock	water levels	
26N1	MV 129	Vail Co.		201	--	windmill	domestic, stock	water levels, log	
26N2	MV 133	Vail Co.		260	--	--	not used	water levels, log	abandoned
27R1		Vail Co.		--	10	windmill	stock	water levels	
30D1		Vail Co.		--	12	--	not used	water levels	
30D2		L. Roripaugh		--	--	1 HP. electric	domestic	--	unable to measure
30D3		Vail Co.		--	8	windmill	not used	water level	
33E1		Vail Co.		95	7	windmill	stock	water levels	
7S/3W- 2G1		J. A. Richmond		20	60	½ HP. electric	domestic	water level, mineral analysis	
2G2		J. A. Richmond		13	72	--	not used	water level	
2K1		I. H. Gentry		59	48	windmill, ½ HP. electric	domestic	water levels	
2P1		Andrew James		--	36	windmill	domestic	water levels	

WATER WELL DATA
(continued)

Well numbers State	Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/3W-5C1		--		--	--	--	--	--	
5L1		J. Borenstein	1943	49	9	gasoline engine	domestic, stock	water levels, log, mineral analysis	
5P1		--		--	8	windmill	stock	water levels	
6D1		E. W. Bennett		--	--	3 HP. electric	irrigation	water levels	
6E1		E. W. Bennett		375	11	--	--	water level	
6J1		Powers		40	12	gasoline engine	--	water levels	
6K1		E. W. Bennett	Aug., 1953	300	9	--	irrigation	water levels, log	originally 1,355 ft. deep
7A1		J. W. Powers		about 90	24	--	not used	water levels	
7A2		J. W. Powers		about 90	12	--	not used	water levels	
7A3		J. W. Powers		about 90	12	--	not used	water levels	open casing
7E1		J. W. Powers		413	12	--	not used	water levels	open casing
7E2		J. W. Powers	1952	102	12	3 HP. electric	domestic	water levels	
7E3		J. W. Powers	1954	152	--	--	not used	water level	abandoned
7E4		J. W. Powers	1954	--	8	--	--	water level	
7L1		T. E. and C. H. Bailey		70	10	½ HP. electric	domestic	water levels, log	
7N1		Willis Thompson	May, 1953	135	10	20 HP. electric	irrigation	water level	originally 190 ft. deep
7R1		Sam Termini	1946	285	10	20 HP. electric	irrigation	water levels, log	
7R2	MV 2	Howard Morrow	Dec., 1925	449	12	20 HP. electric	irrigation	water levels, log, mineral analyses	
8R1		Harvey Blackmore		133	8	1 HP. electric	domestic	water levels	
9M1		Harvey Blackmore		--	12	windmill, 1 HP. electric	not used	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other h	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/3W-9Q1	Jackie Coogan Well	--	1922	735	--		not used	log	abandoned
10H1		William B. Coleman	June, 1950	91	8	windmill, gasoline engine	domestic	water levels, log	
10H2		W. E. Whitney		18	--	small gasoline engine	domestic	--	
10H3		William B. Coleman		45	24	--	not used	water levels	
12H1		L. J. Servel		74	16	--	windmill	water levels	
12J1		L. J. Servel		70	8	1 HP. electric	domestic	water levels, mineral analysis	
12P1		V. G. Comparette		--	72	--	not used	water levels	
12P2		V. G. Comparette	Nov., 1953	150	8	½ HP. electric	domestic	water levels	
14J1		Hugo Guenther	1911	174	--	--	--	log	
14N1		H. Fisch		100	5	1 HP. electric	domestic	water levels, log	
14N2		Beatrice Eliason		--	--	¾ HP. electric	domestic	--	unable to measure
15N1		--		--	8	windmill	domestic	water levels	
15Q1		M. J. Yoder		--	--	2 HP. electric	domestic, stock	--	unable to measure
15Q2	MV 57	M. J. Yoder	prior to 1923	318	--	15 HP. electric	--	water levels, log	
15Q3	MV 57A	M. J. Yoder	July, 1923	1120	16	--	not used	water levels, log	
16C1		Charles Yoder	Dec., 1953	210	6	electric	domestic	water level, log	unable to measure
16G1		C. E. Yoder		168	14	windmill	domestic	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
						Hydrographic Unit No. 1 (continued)			
7S/3W-16H1		C. E. Yoder		50	36	gasoline engine	domestic	water level	
16K1		O. R. Rail		--	--	electric	irrigation	water levels	
16M1		O. R. Rail	about 1947	114	12	1 HP. electric	domestic	water levels	
16N1		Ralph Bates		90	8	windmill, ½ HP. electric	domestic, stock	water levels	
16N2		John Inchausti, Robert Rash		59	36	windmill, electric	domestic	water levels, mineral analysis	
16N3		John Inchausti, Robert Rash		100	9	1 HP. electric	domestic	water levels, mineral analysis	
16N4		--		--	6	windmill, 1/3 HP. electric	domestic	water levels	
16N5		C. S. Gordon		--	--	3 HP. electric	domestic	water levels, mineral analyses	
16N6		Joe Kalberer		60	6	½ HP. electric	domestic	water levels	
16N7		Mrs. John Farthing	1926 or earlier	296	10	--	not used	--	abandoned
17C1		T. C. Wickerd		--	8	1 HP. electric	domestic	water level	
17D1		M. J. Oakley		--	--	25 HP. electric	irrigation	mineral analysis	unable to measure
17E1		E. E. Rasch		80	--	½ HP. electric	domestic	water level	
17E2		C. V. Potter		122	8	¾ HP. electric	domestic	water levels, log	
17E3		Paul Thompson		80	8	windmill, ½ HP. electric	domestic	water levels, mineral analysis	
17E4		V. E. Clark		--	--	¼ HP electric	domestic	mineral analysis	unable to measure
17F1		--		--	6	1 HP. electric	--	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/3W-17F2		N. L. Thorne		about 65	--	windmill, $\frac{1}{2}$ HP. electric	domestic	water levels	
17F3		V. E. Clark	Aug., 1953	65	20	--	not used	water levels, log	
17G1		Claude Fox		71	9	$\frac{1}{2}$ HP. electric	domestic	water levels, mineral analysis	
17G2		E. Bryant		--	72	windmill	domestic	--	
17H1		H. C. Arthur		70	8	$\frac{3}{4}$ HP. electric	--	water level, mineral analysis	
17H2		E. Bryant	1953	93	16	1 HP. electric	domestic	water levels	
17J1	MV 25A	Robert Jones	Apr., 1926	303	12	10 HP. electric	irrigation	water levels, log	
17J2	MV 42A	L. Smith		--	--	$\frac{1}{2}$ HP. electric	--	water levels	
17J3	MV 42	L. Smith		296	12	$7\frac{1}{2}$ HP. electric	domestic, irrigation	water level, log	
17K1		--		--	--	--	domestic, stock	--	
17K2		Ray Bezanson		69	24	1 HP electric	domestic	water levels	
17L1		Willis A. Thompson		42	--	electric	domestic	--	
17L2	MV 19	Willis A. Thompson	about 1913	105	--	--	--	water levels, log	abandoned
17L3	MV 19A	Willis A. Thompson	Apr., 1926	47	7	windmill	stock	water levels, log	
17M1		R. Thompson		--	--	electric	irrigation	--	unable to measure
17P1		Ira Rail		--	--	windmill	domestic	water level	
17P2		Sam Barnes		52	--	--	domestic	water level	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
		Hydrographic Unit No. 1 (continued)							
7S/3W-17P3		Nora Cotter		--	--	--	domestic	water level	
17P4		--		--	--	electric	--	water levels	
17Q1		Horstman		--	--	--	domestic	--	
17Q2		P. Samaniego	1942	58	8	½ HP. electric	domestic	water levels	
17Q3		Max Thompson		38	7	--	domestic	water levels	
17R1		H. Sykes		--	--	windmill	domestic	water level	
18A1		R. R. Swain		--	8	windmill, ½ HP. electric	domestic	water levels, mineral analyses	
18A2		--		83	14	windmill	--	water levels	
18A3	MV 4	C. J. and M. W. Thompson	July, 1925	416	12	electric	irrigation	water levels, log	unable to measure (1953)
18A4		Singletary	about 1944 or 1945	--	--	1 HP. electric	--	--	
18H1		G. W. Sipe		158	8	1 HP. electric	domestic	water levels	
18H2		Paul Anderson		64	6	--	domestic	water level	
18L1	MV 15	Amos J. Sykes	1926	51	72	25 HP. electric	irrigation	water levels, log	
18L2	MV 14	Amos J. Sykes		--	--	windmill	stock	water levels	
18L3	MV 13	Amos J. Sykes		70	--	windmill	domestic	water levels	
18M1		Vail Co.		--	8	windmill	stock	water levels, mineral analyses	
18Q1	MV 10	John Mc Cool	1918	44	12	--	not used	water levels, log	abandoned
19A1		C. W. Barnett		45	6	1/3 HP. electric	not used	water level, mineral analysis	
19A2		C. W. Barnett		--	24	1/3 HP. electric	domestic	water levels, mineral analysis	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/3W-19A3		C. W. Barnett		23	16	gasoline engine	not used	water levels	
19B1		H. B. and Anna Shaw	June, 1948	101	16	½ HP. electric	--	log	
19H1		Frank Angus		29	12	windmill	not used	water levels	
19H2		Frank Angus		18	--	windmill	domestic, stock	water level	
20A1		Clarylin Smith		50	7	electric	domestic	water levels, log	
20A2		Clarylin Smith		60	7	--	--	water level, log	
20A3		Malone		48	--	--	domestic	water levels, log	
20A4		Al Reed		--	12	1 HP. electric	domestic	water levels	
20A5		--		--	--	--	--	--	
20A6		--		--	--	--	--	--	
20A7		Clarylin Smith		85	20	--	not used	water level	
20A8		G. W. Gagnon	Oct., 1945	68	8	--	domestic, industrial	water level, log	
20B1		U. Tarwater		--	--	--	domestic	water level	
20B2		U. Tarwater	prior to 1934	36	--	¼ HP. electric	domestic	water level	
20B3		C. S. Ercel		--	6	¼ HP. electric	domestic	water level	
20C1		J. Young		--	--	windmill	domestic	water level	
20C2		J. Young		29	--	windmill	not used	water level	
20C3		Walter Coy	1945	102	6	¼ HP. electric	domestic	water level, log	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/3W-20C4		E. H. Curran		125	10	1 HP. electric	domestic	water level, mineral analysis	
20D1		Mike Mance		80	6	½ HP. electric	domestic	mineral analysis	unable to measure
20D2		J. Young		--	--	windmill	domestic, irrigation	water level	
20D3		Floyd Rail		--	--	--	--	water level	
20E1		--		--	--	windmill	stock	--	
20H1		Maude Buchanan		54	8	windmill	domestic	water levels, mineral analysis	
20H2		Walter Nielsen		--	7"x7"	1 HP. electric	domestic	water levels	
20H3		Walter Nielsen	Nov., 1953	196	12	30 HP. electric	irrigation	water levels, log	
20K1		Howell		60	12	--	not used	water levels	open casing
20L1		L. P. Rios	Nov., 1950	124	10	7½ HP. electric	domestic, irrigation	water levels, log	
20Q1		Howell		120	--	windmill	domestic	water levels	
20Q2		Silas M. Hathaway		128	12	15 HP. electric	--	water levels, log	
20R1		Howell		60	--	1 HP. electric	--	--	unable to measure
20R2		George Contreras		--	--	¾ HP. electric	not used	water levels	
20R3		George Contreras	Sept., 1949	106	12	10 HP. electric	irrigation	water levels, log	
21D1		--		--	--	--	--	mineral analysis	
21D2		L. I. Prestwich	Nov., 1948	101	10	5 HP. electric	domestic, irrigation	water levels, log	
21D3		Roscoe Frohlich		85	8	1 HP. electric	domestic	water levels	
21D4		Mack Stone		149	6	--	not used	water levels	open casing

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. I (continued)					
7S/3W-21E1		Mack Stone		186	10	$1\frac{1}{2}$ HP. electric	domestic	water levels, log	
21F1		Warren Lipking	Apr., 1951	84	10	$7\frac{1}{2}$ HP. electric	irrigation	water level, log	
21F2		Nettie Lloyd		--	8	windmill	domestic	water level, mineral analysis	
21F3		Warren Lipking		--	8	1 HP. electric	domestic	water levels	
21G1		Charnock		40	6	windmill	stock	water levels	
21H1	Vernard 1	--		3,106	16	--	not used	log	Wildcat oil well
21J1		Myrtle A. Provolt		27	10	windmill	domestic, stock	water levels	
21K1		Carlington Cain	about 1926	about 300	14	20 HP. electric	not used	water levels	
21K2		Carlington Cain	Sept., 1953	312	12	20 HP. electric	irrigation	water levels, log	
21K3		Carlington Cain		10	60	--	not used	water level	
21L1		Fred Mays	Nov., 1949	117	12	$7\frac{1}{2}$ HP. electric	irrigation	water levels, log	
21L2		Carlington Cain	1951	104	8	1 HP. electric	domestic	water level, log	
21M1		George Contreras	Oct., 1947	50	6	--	domestic	log	unable to measure
21M2		Fred Mays		about 110	8	1 HP. electric	domestic	water level	
21M3		Fred Mays		--	--	$\frac{1}{2}$ HP. electric	domestic	water level	
21N1		C. D. Westbrook		18	18	windmill	--	water levels	
21N2		A. W. Tordoff	Nov., 1950	73	10	$\frac{1}{2}$ HP. electric	domestic	water levels, log	
21N3		C. D. Westbrook		45	12	--	not used	water levels	open casing
21P1		Warren Lipking		252	16	electric	not used	water levels, log, mineral analysis	
21P2		A. W. Tordoff		62	12	--	not used	water levels	open casing
21P3		--		--	--	--	--	--	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/3W-21P4		Warren Lipking	Dec., 1953	94	12	electric	irrigation	water level, log	
21Q1		Carlington Cain		120	16	10 HP. electric	irrigation	water levels, mineral analysis	
21R1		Charles Philo		50	10	windmill	stock	--	
21R2		Charles Philo	1928	80	--	½ HP. electric	domestic, irrigation	water levels	originally 150 ft. deep
22C1		--		60	--	--	--	water level	
23A1		Guenther's Murrieta Hot Springs		--	--	--	--	--	
23A2		Guenther's Murrieta Hot Springs		--	--	electric	--	--	
23D1		Dr. Nathaniel Davis	1934	590	8	--	not used	log	unable to measure
23D2		Dr. Nathaniel Davis		--	--	2 HP. electric	domestic, irrigation	--	
24A1		Albert Ceas		--	12	7½ HP. electric	irrigation	water levels, mineral analysis	
24Q1		J. C. Bishop	Nov., 1950	31	--	½ HP. electric	domestic	water level, log	
24Q2		Leo Roripaugh		314	--	electric	domestic	log	
25E1		Leo Roripaugh		--	--	electric	irrigation	--	
25M1		J. B. Shamel		108	8	windmill	--	water levels, mineral analysis	
25M2	MV 67	J. B. Shamel		562	12	30 HP. electric	irrigation	water levels, log	
26N1	MV 86	Leo Roripaugh	Dec., 1913	103	10	--	--	water levels, log	
26R1	MV 68	J. B. Shamel		41	8	1 HP. electric	domestic	water levels, log	unable to measure (1954)
27A1	MV 80	F. H. Hall	Apr., 1925	165	10	--	not used	water levels, log	
27H1	MV 79A	A. J. Sykes	June, 1926	423	16	--	--	water levels, log	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/3W-27H2	MV 79	G. T. Hall		90	8	windmill	domestic, stock	water levels, mineral analysis	
27J1	MV 78	Frank Burnham	1927	319	10	--	not used	log	abandoned
27K1		A. J. Sykes		--	--	--	not used	water levels	artesian
27L1		--		--	--	--	--	--	
27M1		Jack Klubnikin	Apr., 1951	112	12	15 HP. electric	irrigation	water levels, log	
27M2		Dutton		37	12	--	not used	water levels	open casing
27M3		L. S. Brown		29	7	windmill	domestic	water levels	
27M4		Dutton		14	24	--	not used	water levels	open casing
27N1		Carl F. Brellow	Jan., 1953	303	14	--	not used	water level, log	abandoned
27N2		Carl F. Brellow	Sept., 1953	301	12	15 HP. electric	irrigation	water levels, log mineral analysis	
27P1		E. M. Lincoln	July, 1951	232	14	15 HP. electric	irrigation	water levels, log mineral analysis	
27Q1		E. M. Lincoln		16	--	windmill, 1/6 HP. electric	not used	water level	
27Q2	MV 84A	E. M. Lincoln	1926	164	20	3 HP electric	--	water levels, log	
28B1		Warren Lipking		15	8	--	not used	water levels	open casing
28B2		Warren Lipking		81	7	windmill	not used	water levels	
28D1		C. D. Westbrook	Sept., 1950	67	10	--	not used	water levels, log	open casing
28E1		Mike Mance		74	8	windmill	stock	water levels	
28F1		Mike Mance	Apr., 1950	150	12	--	irrigation	water levels, log	
28F2		Mike Mance	1951	72	12	--	not used	water levels	open casing
28F3		Mike Mance	1945	70	12	15 HP. electric	irrigation	water levels	originally 117 ft. deep

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/3W-28G1		Mike Mance		23	8	windmill	stock	--	
28H1		Fred Mays		22	10	windmill	stock	water levels	
28P1		--		31	8	--	not used	water level	
28Q1		--		54	6	windmill	stock	water level	
28Q2		--		51	6	--	not used	--	open casing
29A1		Sweezy and Roen	Mar., 1950	275	12	25 HP. electric	irrigation	water levels, log, mineral analysis	
29B1		Howell		98	12	10 HP. electric	domestic, irrigation	water levels, log	
29C1	MV 50	R. H. Ballard		85	10	--	domestic	water levels	
29D1	MV 50A	A. B. Mattison		76	6	--	not used	water levels, log	abandoned
29G1		Byron O. Lilly		124	12	windmill	--	water levels, log	
29J1		Sweezy and Roen	Mar., 1950	150	7	electric	domestic	water levels, log, mineral analyses	
34C1		E. M. Lincoln		--	14	7½ HP. electric	irrigation	water levels	
34G1		Carlington Cain		--	12	--	--	--	
35B1		Jack Roripaugh	Mar., 1930	505	16	20 HP. electric	irrigation	log, mineral analysis	
35B2	Roripaugh Artesian	Jack Roripaugh		--	--	--	--	mineral analysis	
35C1		Leo Roripaugh		--	--	--	irrigation	--	
35F1	MV 89	Roy S. Roripaugh		42	--	windmill	not used	water levels, log	abandoned
35K1	MV 92	Ralph Barnett		42	6	windmill	domestic	water levels, log	
35P1	MV 93	Vail Co.		124	12	--	--	water levels, log	
35P2	MV 132	Vail Co.	May, 1926	452	20	--	not used	water levels, log	abandoned

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
7S/4W- 1A1		E. W. Bennett	1952	197	10	--	not used	water levels, log, mineral analysis	open casing
1A2		E. W. Bennett		--	--	10 HP. electric	--	--	unable to measure
1C1	Elsinore 159	William Curtis		--	10	windmill	domestic	water levels	
1E1		Kenneth Freeman		123	16	windmill, 1 HP. electric	domestic, stock	water levels, mineral analysis	originally 150 ft. deep
1E2		Kenneth Freeman	Aug., 1951	104	10	5 HP. electric	irrigation	water level, log	
1H1		E. W. Bennett		about 23	12	--	not used	water levels	
1L1		C. F. Smith		50	--	windmill	--	--	
1L2		C. F. Smith		86	12	5 HP. electric	irrigation	water levels	
1L3		--		about 110	--	--	not used	--	
1M1		R. J. Brown		--	--	windmill	--	water level	
1N1		Bert Taylor	Jan., 1951	50	7	1½ HP. electric	domestic	water levels, log	
1N2		Sutter		--	--	--	--	--	
1P1	Elsinore 158	R. J. Brown		--	--	windmill	domestic	water levels	
1P2		--		--	24	electric	domestic	water level, mineral analysis	
1Q1		Shaw		--	--	7½ HP. electric	irrigation	water levels	
1Q2		Shaw		about 65	--	windmill, 1 HP. electric	domestic	water levels, mineral analysis	
1Q3		--		--	12	windmill	domestic	water level	
1Q4		Gurney Edgar Paule		about 120	--	windmill	stock	water levels	
1Q5		Hayworth		66	--	½ HP. electric	domestic, stock	water levels, mineral analysis	

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
		--							
				Hydrographic Unit No. 1 (continued)					
7S/4W-1Q6		--		65	--	$\frac{1}{2}$ HP. electric	domestic, stock	water levels	
1Q7		--		--	--	--	not used	--	
2F1	Wildomar 224	R. J. Brown	1921	150	8	--	--	water levels, log	
2G1		R. J. Brown	Apr., 1951	231	12	10 HP. electric	irrigation	water levels, log	
2G2	Wildomar 232 Elsinore 157	R. J. Brown		200	12	electric	not used	water levels	
3A1		--		--	--	electric	domestic	--	
3A2		--		--	4	electric	domestic	--	
3A3		--		--	8	$\frac{3}{4}$ HP. electric	domestic	water level, mineral analysis	
3B1		--		--	12	5 HP. electric	not used	water levels	
11A1		Vail Co.		--	7	--	stock	water levels, mineral analysis	
12B1		Gurney Edgar Paule	May, 1952	100	12	$7\frac{1}{2}$ HP. electric	irrigation	water levels, log	
12C1		Shaw		--	--	--	not used	water level	
12D1	Elsinore 156	John Belk		--	--	windmill	stock	water levels	
12G1		--		--	12	windmill	stock	water level, mineral analysis	
12H1		Verna Freeman	Aug., 1947	75	7	$2\frac{3}{4}$ Hp. gasoline engine	domestic	log	unable to measure
12H2		Verna Freeman		--	--	windmill	--	water levels	
12J1	Wildomar 231	J. M. W. Thompson	1913	36	60	--	not used	water levels, log	abandoned
12J2	Wildomar 230	J. M. W. Thompson		--	60	--	not used	water levels	
12R1		Willis A. Thompson		--	--	$7\frac{1}{2}$ HP. electric	--	water levels	
27L1		Vail Co.		--	--	windmill	stock	--	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
8S/2W- 7A1	MV 131 Shrode Well	Vail Co.	Feb., 1926	604	12	windmill	stock	water levels, log, mineral analysis	
8S/3W- 1P1		Vail Co.		24	--	windmill	not used	water levels	
1P2	Cantarini Murrieta	Vail Co.	Jan., 1952	822	30	30 HP. electric	irrigation	water level, log, analysis	
1P3	O'Kell 14	Vail Co.	Mar., 1927	229	--	--	not used	water levels, log	abandoned
1Q1	MV 96	Vail Co.		301	10	--	not used	log	abandoned
11R1		--		--	--	--	--	--	
11R2		--		--	--	--	--	--	
11R3	MV 109	William Freideman	1921	103	--	windmill	domestic	water levels, log	
12B1	MV 100	Vail Co.		95	10	--	not used	log	abandoned
12C1	MV 98	Vail Co.	prior to 1925	245	8	½ HP. electric	domestic	water levels, log	
12C2	MV 98A	Vail Co.	1911	246	10	--	not used	log	abandoned
12L1		--		--	6	windmill	domestic	--	
12L2		--		--	--	--	--	--	
12M1	MV 101	Temecula School		--	--	3 HP. electric	domestic	water levels	
12M2		State Division of Forestry	Dec., 1949	94	--	2 HP. electric	--	--	unable to measure
12M3		Catholic Church		19	8	--	not used	--	
12M4		--		--	--	--	--	--	
12M5		Irene Shirley		--	--	--	domestic	--	
12M6		Joe Escallier		--	7	--	domestic	water levels	
12N1		--		--	--	--	domestic	--	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 1 (continued)					
8S/3W-12N2	MV 114	M. Machado		50	12	--	--	water levels, log	
12N3		--		--	--	--	domestic	--	
12N4		--		--	--	--	--	--	
12N5		Howard Taylor		80	12	--	domestic	water levels, mineral analysis	
12N6		Alfred Knott	about 1913	60	--	--	domestic	log	
12N7		--		--	--	--	--	--	
12N8		Carl Swanguen		--	--	--	domestic	--	
12N9		--		--	--	--	--	--	
12N10		Forest L. White	Sept., 1951	40	20	¼ HP. electric	domestic	water levels, log	
12N11		Henry Gray	1921	69	--	hand pump	not used	log	abandoned
12N12	MV 115	A. F. Neinke	prior to 1927	50	8	electric	domestic	log	
12N13		H. Leatham	Aug., 1953	72	8	--	not used	water level, log, mineral analysis	
12P1		Pete Escallier		125	--	--	domestic	water levels	
12P2		--		--	--	--	--	--	
12P3		--		--	--	--	--	--	
12P4		--		--	--	--	--	--	
12P5		--		--	--	--	--	--	
12P6		--		--	--	--	--	--	
12P7		Alex Borel		--	20	¼ HP. electric	domestic	water levels	
12P8		H. Leatham		85	12	--	domestic	water levels	
12P9		Paul Flures		55	8	windmill	domestic	water levels	

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
Hydrographic Unit No. 1 (continued)									
8S/3W-12Q1		--		145	12	--	not used	water levels	
12Q2		H. Midgly	Mar., 1950	200	8	--	--	water levels, log, mineral analysis	
13B1		--		29	3'x3'	windmill	domestic	water levels	
13C1		Lena Munoa	about 1910	about 65	7	windmill	domestic	water levels	
13D1		Fred Ramirez		59	8	windmill	domestic	water levels	
13D2		Doming Almaraz		45	8	windmill	domestic	water levels	
13F1		Temecula Meat Co.		--	--	1 HP. electric	industrial	--	unable to measure
13F2		Joe Freeman		--	8	windmill	domestic	water levels	
13K1	,	Dick Evans		about 55	12	1 HP. electric	domestic	water levels, mineral analysis	
13L1		--		--	4'x4'	--	not used	--	
13R1	T F I	Vail Co.	Dec., 1926	85	--	--	not used	water levels, log	abandoned

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
					Hydrographic Unit No. 2				
6S/1E-25J1		Walter Hogarth		32	40	$\frac{3}{4}$ HP. gasoline engine	domestic	water levels, log	
25R1		Walter Hogarth	Winter 1954	33	8	--	not used	water level	open casing
25R2		Walter Hogarth	Winter 1954	45	8	--	not used	water level	open casing
36A1		Walter Hogarth		103	8	--	not used	water level	open casing
36K1		Ivan Mc Kinley		16	uncased	--	not used	water level, log	test hole
7S/1E- 1H1		Ivan Mc Kinley		69	10	--	not used	water level	
1J1		Ivan Mc Kinley		64	10	30 HP. electric	irrigation, stock	water levels	
9C1		Bader	about Mar., 1952	64	12	--	not used	water levels	
15D1		D. Ippolito		45	uncased	--	--	log	test hole
15D2		D. Ippolito		80	10	electric	domestic	water level, log	
15E1		D. Ippolito		200	14	electric	--	water level, log	
15E2		D. Ippolito		240	--	--	--	log	
15E3		D. Ippolito	approx. Jan., 1952	122	36	--	--	water level, log	
15E4		D. Ippolito		110	--	--	abandoned	log	test hole
15E5		D. Ippolito	July, 1950	210	10	$7\frac{1}{2}$ HP. electric	irrigation, domestic	water level, log	unable to measure
16N1		D. Ippolito		54	36	--	not used	water level, log	
16N2		D. Ippolito	Jan., 1952	155	8	--	not used	water level, log	open casing
16Q1		D. Ippolito		114	--	--	abandoned	log	test hole
16Q2		D. Ippolito		500	8	--	not used	water level, log	open casing
16Q3		D. Ippolito		120	10	--	--	water levels, log	

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 2 (continued)					
7S/1E-17G1		Charles Bader	Mar., 1952	75	12	5 HP. electric	domestic	water levels, log	
17G2		Charles Bader		--	6	--	not used	water levels	open casing
17G3		Charles Bader	Mar., 1951	75	--	3 HP. electric	irrigation	log	
18G1		--		--	--	windmill	domestic	--	
18K1		Duncan Industries		72	--	electric	domestic	water levels	
20P1		L. G. Robertson		--	12	--	not used	water levels	open casing
20Q1		R. W. Severns	1925	98	10	--	irrigation	analysis	
22J1		Knecht		10	36	windmill	not used	water levels	
26A1		--		--	--	--	domestic	--	unable to measure
29E1		Parks	about 1906	28	7	windmill	domestic, stock	water levels, analysis	
30H1		P. B. Cross		18	3'x4'	windmill, 1 HP. electric	domestic	water levels, analysis	
30J1		A. J. and C. G. Bendler		10	3'x5'	windmill	stock	water levels	
30J2		A. J. and C. G. Bendler		18	4'x16'	gasoline engine	stock	water levels, log analysis	
32C1		--		--	36	windmill	not used	water levels	
33P1		Tyler		--	10	windmill	domestic	water levels	
34E1		--	about 1926	--	48	--	domestic, stock	water levels	
7S/2E- 1H1[a]		--		--	8	windmill	domestic	water level	
2E1[a]		W. I. Smith		100	6	windmill	domestic	water levels	
3G1[a]		C. H. Tripp		44	--	windmill	domestic	water level	sealed

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 2 (continued)					
7S/2E- 6N1		Ivan Mc Kinley		--	24	--	domestic	water levels	
6N2		Ivan Mc Kinley		28	24	--	not used	water levels	open casing
11C1		Frank Lane	1943	--	uncased	windmill	domestic	water levels	
11C2		Frank Lane		26	--	--	not used	water levels	
11K1		Alexander	Dec., 1950	70	--	--	abandoned	log	
11M1		E. Hayes	after 1941	33	10	windmill	domestic	water level	
13D1		George Hepburn	1945 or 1946	144	--	gasoline engine	irrigation	water levels	
13D2		George Hepburn		--	8	windmill	domestic, stock	water levels, analysis	
13D3		Holland	about Oct., 1953	--	6	electric	domestic	water levels	
13N1		L. W. Holcomb		--	8	windmill	domestic	water levels	
13R1		C. A. Buchanan		--	8	windmill	domestic	water level	
14H1		G. H. Olds	about 1923	102	8	windmill, gasoline engine	domestic	water levels	
14H2		G. H. Olds	about 1951	75	8	--	not used	water levels	open casing
22A1		Head		--	8	windmill	domestic	water levels	
22K1		T. C. Pomeroy		--	--	windmill	domestic	water levels	
23K1		Coahuila Indian Reservation		--	8	windmill	domestic	water levels	
23M1		Castillo		22	7	windmill	not used	water levels	
23P1		Coahuila Indian Reservation		--	8	windmill	stock	water level	
24H1		C. W. Ayers	1952	--	--	--	not used	water level	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
					Hydrographic Unit No. 2 (continued)				
7S/2E-26B1		Coahuila Indian Reservation	1940	94	8	windmill	--	water level, log	unable to measure
29P1		Bradley		--	6	--	not used	water levels	open casing
29R1		--		--	12	windmill	stock	water levels	
32A1		Parks		--	12	--	not used	water levels	
32F1		Betty B. Murcell		--	12	gasoline engine	domestic	water levels, mineral analysis	artesian
32J1		Parks		--	7	windmill	domestic	water levels, mineral analysis	artesian
32J2		Parks		30	8	windmill	stock	water levels	
33C1		Coahuila Indian Reservation	July, 1940	52	8	windmill	stock	water levels, log, mineral analysis	
7S/3E- 4H1		Edmund G. Herring	Fall 1949	135	8	windmill	irrigation	--	
4H2		Edmund G. Herring	Spring 1950	124	12	--	irrigation	log	
4J1		J. E. Cartier	1951 or 1952	91	12	gasoline engine	stock, irrigation	water levels, log	
6E1[a]		--		--	6	windmill	domestic	water levels	
7R1		A. T. Thompson		210	10	windmill	domestic, stock	water levels, mineral analyses	
7R2		A. T. Thompson	Apr., or May, 1951	220	8	--	not used	--	unable to measure
8E1		Marjorie and Edward F. Roalfe		125	6	windmill	domestic, stock	water levels	
8Q1		C. Hornback	prior to 1916	107	8	windmill	domestic, stock	water levels	
9P1		Dickson Bros.	1952	220	8	windmill	not used	water levels, log	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 2 (continued)					
7S/3E-10L1		George M. Schmoll	Oct., 1949	252	8	windmill	domestic	water levels, log	
10M1		Nye		280	8	windmill	domestic	water levels	
11Q1		J. D. Sherman	1948	38	6	--	not used	water levels	
13D1		Elmer E. Everett	Aug., 1950	32	12	--	domestic, stock	water levels, log	
13D2		Elmer E. Everett		10.8	40	--	not used	water levels	
13D3		Elmer E. Everett		9.5	8	2½ HP. gasoline engine	domestic, stock	water levels	
14C1		J. D. Sherman		135	8	windmill	domestic, stock	water levels, mineral analysis	
14P1		Lappos		56	12	--	not used	water levels	
14R1		Anne Hurd		--	--	windmill	--	--	unable to measure
14R2		Anne Hurd	Aug., 1951	112	10	electric	irrigation	--	unable to measure
15D1		John Pena		213	8	windmill	domestic, stock	--	unable to measure
15J1		--		68	8	windmill	stock	water levels	
15N1		Bob Holcomb		70	6	windmill	domestic	water levels	
15N2		Bob Holcomb	Summer 1953	106	48	--	irrigation	water levels	contains laterals
15P1		John Bohlen		70	7	windmill	domestic, stock	water levels, mineral analysis	artesian
15Q1		John Bohlen		--	7	windmill	stock	water levels	
15Q2		John Bohlen		--	7	windmill	stock	--	
15Q3		John Bohlen		--	12	windmill	stock	water levels	
16K1		W. W. Register	Oct., 1949	54	8	4 HP. gasoline engine	domestic	--	unable to measure
16K2		Lichwald	1942	60	8	windmill	stock	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 2 (continued)					
7S/3E-16L1		Register	1953	54	6	--	--	--	
16N1		E. G. Register	Aug., 1950	190	7	--	not used	water levels, log	
16P1		H. A. Bergman	June, 1948	138	8	windmill	domestic	water levels, mineral analyses	
16P2		Robert L. Register	prior to 1943	101	4	--	domestic, stock	water levels, log	
16Q1		State Division of Forestry	Apr., 1950	148	--	--	domestic	--	unable to measure
17B1		--		110	--	windmill	domestic, stock	water levels	Former owner J. H. Arbuckle
17C1		Lincoln Barhmen		--	8	windmill	domestic, stock	water levels, mineral analysis	
17J1		G. Lee Ison	Feb., 1953	260	8	--	not used	water levels, log	open casing
17R1		G. Lee Ison		--	6	windmill	stock	water levels	
18A1		Lydia King		--	10	4.5 to 6 HP. gasoline engine	domestic	water levels	
18N1		Florence Stonebreaker	1937	100	8	windmill	domestic	water levels	
18N2		Florence Stonebreaker		20	6	hand pump	not used	water levels	
20A1		H. A. Pursche	Nov., 1951	583	16	windmill	irrigation	water levels, mineral analyses	
20B1		H. A. Pursche	prior to 1916	--	10	windmill	irrigation	water levels, mineral analysis	
20B2		H. A. Pursche		--	--	gasoline engine	--	water level	
20C1		H. A. Pursche		--	--	windmill	irrigation	water levels, mineral analysis	
20C2		H. A. Pursche	Sept., 1954	305	14	--	irrigation	water levels, log, mineral analyses	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 2 (continued)					
7S/3E-20E1		Encinitas Ranch		94	--	windmill	domestic	--	unable to measure
20G1		H. A. Pursche	Apr., 1951	230	12	windmill	--	water levels, log	
20G2		H. A. Pursche	Nov., 1950	158	12	windmill	irrigation	--	unable to measure
20H1		H. A. Pursche		--	--	windmill	irrigation	water levels, mineral analysis	
20J1		H. A. Pursche	Apr., 1951	100	8	windmill	domestic, irrigation	log	
20J2		H. A. Pursche	Apr., 1951	76	8	windmill	domestic	water levels, log mineral analysis	
20J3	Rig Well	H. A. Pursche	1950	300	12	gasoline engine	irrigation	water levels, log	
20J4	Van Winkle 1	H. A. Pursche	Sept., 1950	127	uncased	--	not used	log	abandoned
20J5		H. A. Pursche		--	--	--	irrigation	water levels	
20J6		H. A. Pursche		--	10	--	not used	--	
20M1		--		--	--	windmill	domestic	water levels	
20Q1	Van Winkle 3	H. A. Pursche		55	uncased	--	not used	log	abandoned
20Q2		H. A. Pursche	1953	52	18	--	not used	water levels	
20Q3		H. A. Pursche	1953	57	12	--	not used	water levels, log	
20R1	Van Winkle 2	H. A. Pursche	Apr., 1951	120	8	--	not used	water levels, log	
20R2		H. A. Pursche		80	4	--	not used	water levels	abandoned
20R3		H. A. Pursche	June, 1953	168	12	--	not used	water level, log	
21B1		Hugo G. Westphalen		--	--	windmill	domestic	water levels	
21C1		Hamilton School		135	8	windmill	domestic	water levels	
21F1		--		--	6	windmill	not used	water levels	
21G1		Hugo G. Westphalen		--	--	Butane gas engine	irrigation	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 2 (continued)					
7S/3E-21J1		C. T. Johnson	July, 1912	40	8	windmill	not used	water levels	
21J2		C. T. Johnson	Sept., 1950	232	12	--	irrigation	water levels, log	
21J3		C. T. Johnson	1924	201	10	windmill	domestic, irrigation	water levels, log	
21K1		C. S. Contreras	1930	62	6	windmill	domestic, stock	water levels, mineral analysis	
21K2	8ent 1	C. S. Contreras	about 1951	387	10	--	not used	water levels, log	
21L1		L. J. Hamilton	Nov., 1949	88	8	windmill	--	water levels, log, mineral analysis	
21L2		L. J. Hamilton		30	8	windmill	not used	water levels	
21L3		L. J. Hamilton	Apr., 1952	117	12	--	irrigation	water levels, log	
21L4		L. J. Hamilton	1900	--	8	--	not used	--	
21P1		L. J. Hamilton	Oct., 1949	191	12	Butane gas engine	irrigation	water levels, log	
21P2		L. J. Hamilton	Aug., 1953	178	12	gasoline engine	irrigation	log	
21R1		C. T. Johnson	1935	45	8	windmill	stock	water levels, log	
21R2		C. T. Johnson	1947	230	12	--	not used	water levels, log	
22B1		L. J. Hamilton		--	--	gasoline engine	irrigation	water levels	
22B2		L. J. Hamilton		.97	--	--	irrigation	--	
22B3		L. J. Hamilton		48	60	--	not used	water levels	
22B4		L. J. Hamilton		93	8	--	not used	water levels	
22C1		L. J. Hamilton		--	6	windmill	domestic, stock	water levels	
22D1		E. G. Herring	July, 1951	101	12	windmill	irrigation, stock	water levels, log	

(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
			Hydrographic Unit No. 2 (continued)						
7S/3E-22D2		H. R. Lichwald	prior to 1924	--	--	windmill	domestic, stock	water levels	
22D3		H. R. Lichwald	1948	44	--	windmill	domestic, stock	water levels	
22D4		H. R. Lichwald	Feb., 1950	107	10	--	not used	water levels, log	
22D5		H. R. Lichwald	Feb., 1950	107	uncased	--	not used	log	abandoned
22D6		H. R. Lichwald		210	10	--	irrigation	water levels	
22J1		--		--	8	windmill	--	water levels	
22N1		C. T. Johnson	about June, 1950	136	8	--	not used	water levels, log	
23D1		Evert Ranch		--	--	--	not used	water levels	
23R1		D. Raisis		49	--	windmill	domestic	water levels	
23R2		A. Lappos		90	7	windmill	domestic	water levels	
27C1		Coahuila Indian Reservation	about 1930	--	8	windmill	stock	water level	
27M1		Coahuila Indian Reservation	June, 1940	115	8	windmill	stock	water levels, log, mineral analyses	
31L1		Coahuila Indian Reservation	Aug., 1940	73	8	windmill	--	water level, log	
34E1		Coahuila Indian Reservation	Nov., 1945	249	8	gasoline engine	not used	water levels, log	
7S/4E-19B1		--		--	36	--	not used	water levels	
19G1		--		--	8	windmill	not used	water levels	
19H1		L. Figaro		--	48	windmill	domestic	water levels	
20B1		Lockwood		--	--	windmill	domestic, stock	water level	
20C1		Poorman		--	--	windmill	stock	--	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 2 (continued)					
7S/4E-20K1		--		--	--	--	stock	--	
20L1		--		--	--	windmill	stock	--	
8S/1E-2E1		--		--	48	--	not used	water levels	open casing
2P1		Mrs. Farrand		14	48	--	irrigation	water levels	
5H1		C. J. Clark		37	36	½ HP. electric	domestic	water levels	
5J1		George Marion	Oct., 1953	75	10	electric	domestic	log	
6B1		J. E. Shanko		43	36	windmill, ½ HP. electric	domestic	water levels	
6B2		J. E. Shanko		about 100	--	windmill	--	water levels	
6M1		Bert Sharp		20	36	windmill	domestic	water levels	
7M1		James Oviatt		312	uncased	--	not used	log	abandoned
7N1	No. 5	James Oviatt		105	12	electric	irrigation	water levels, log, mineral analysis	originally 362 ft. deep
7N2	T-5	James Oviatt	Dec., 1948	36	uncased	--	not used	water level, log	abandoned test hole
7P1	No. 6	James Oviatt	Nov., 1948	130	12	--	not used	water levels, log	open casing
7P2		James Oviatt		--	--	--	--	--	being drilled 1954
7Q1	No. 13	James Oviatt	Oct., 1950	236	8	15 HP. electric	irrigation	water levels, log, mineral analysis	
7Q2	No. 1	James Oviatt	Apr., 1947	73	12	--	not used	water levels, log	originally 82 ft. deep open casing
7Q3	No. 12	James Oviatt		45	uncased	--	not used	water levels, log	originally 70 ft. deep

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 2 (continued)					
8S/1E- 7Q4		James Oviatt	Oct., 1950	81	8	7½ HP. electric	domestic	water levels, mineral analysis	
8E1		H. R. Wood		112	10	windmill	--	water levels	
8K1		Martin		--	10	electric	stock, domestic	water levels	unable to measure Nov., 1953
8N1		J. C. Tyler	Nov., 1953	428	uncased	--	not used	log	test hole
12N1		--		56	8	--	--	water levels	open casing
17A1		J. C. Tyler	May, 1948	113	8	--	not used	water levels	open casing
17A2		J. C. Tyler	1948	132	10	5 HP. electric	domestic	water levels, log, mineral analysis	
17A3		J. C. Tyler	Oct., 1952	140	uncased	--	not used	log	abandoned test hole
17A4		J. C. Tyler	Oct., 1952	273	uncased	--	not used	log	abandoned test hole
17C1		J. C. Tyler		61	8	--	not used	water levels	open casing
17E1		Cottonwood School		100	--	--	not used	--	abandoned
17E2		Cottonwood School	1953	81	12	3 HP. electric	domestic	water levels, mineral analysis	
17H1		J. C. Tyler	about 1939	130	6	2 HP. electric	domestic	log	
18B1	No. 2	James Oviatt	1946	261	12	--	not used	water levels, log	open casing
18H1		--	1945	92	8	windmill	domestic	water levels, mineral analysis	
18K1		Joe Costellic	Sept., 1939	198	8	windmill	not used	water levels, log, mineral analyses	
8S/2E- 5A1		--		--	6	windmill	not used	water levels	
5C1		Betty B. Murcell	Aug., 1952	91	10	gasoline engine	stock	water levels, log	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other [b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 2 (continued)					
8S/2E-5C2		Betty C. Murcell	Aug., 1952	48	--	--	not used	log	abandoned
11K1		Mc Grew		--	--	gasoline engine	domestic, stock	--	unable to measure
8S/3E-2E1[a]		Coahuila Indian Reservation		--	8	windmill, gasoline engine	domestic, stock	water levels, mineral analyses	
2J1[a]		Coahuila Indian Reservation		--	6	windmill	stock	water levels, mineral analysis	
8C1		Howard Bailey		--	--	windmill, gasoline engine	domestic, stock	water levels, mineral analyses	
8Q1		Woods		90	6	--	not used	water levels	
8Q2		Woods		98	8	windmill	domestic	--	unable to measure
8S/1W-12J1	T-6	James Oviatt	Dec., 1948	23	uncased	--	not used	log	abandoned test hole
12K1	No. 7	James Oviatt	1948	67	14	--	not used	water levels, log, mineral analysis	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
					Hydrographic Unit No. 3				
8S/1E-19E1		--		62	--	--	not used	water levels	
19F1		S. T. Anderson	1947	110	6	--	--	water levels, log, mineral analyses	
19F2		C. W. Haggard	Dec., 1948	106	6	--	domestic	water level, log	
19F3		C. W. Haggard	about 1941	110	8	--	domestic	mineral analysis, log	
19H1		G. L. Coffer	about 1937	62	8	windmill	domestic	water levels, log, mineral analysis	
19H2		Lulu Miller	1934	82	10	windmill	domestic	water levels, log, mineral analysis	
19H3		Irene Barton		--	--	windmill	not used	water level, mineral analysis	abandoned
19H4		Irene Barton	Apr., 1952	155	8	electric	domestic	water levels, log, mineral analysis	
19J1		Clinton C. Davidson	1947	47	4	¼ HP. electric	domestic	water levels, log, mineral analysis	unable to measure (May 1951)
19K1		W. W. Cottle		19	10	windmill	domestic	water levels, mineral analysis	
19Q1		W. R. Gibbon	Spring 1942	87	12	windmill, electric	domestic	water levels, log, mineral analyses	
19Q2		W. R. Gibbon	Mar., 1952	87	12	15 HP. electric	Irrigation	Log	
20L1		E. M. Dold		147	8	electric	domestic	--	
20L2		L. W. Hagman		--	8	windmill	domestic	--	unable to measure
20M1		G. A. Spaniol	about 1942	100	8	--	domestic	water levels, log, mineral analysis	
20M2		G. A. Spaniol	prior to 1932	41	48	windmill	domestic	water levels, log, mineral analysis	
20P1		--		--	8	windmill	not used	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
		Hydrographic Unit No. 3 (continued)							
8S/1E-20F?		L. W. Hagman	Apr., 1954	130	10	--	domestic	water levels, log, mineral analysis	
27J1		P. Bergman		--	7	electric	domestic	water levels	
27J2		P. Bergman		20	10	windmill	stock	water levels	
27Q1		P. Bergman		--	10	¾ HP. electric	domestic	water levels	
28B1		G. Holmes		125	12	windmill, electric	domestic	water levels	
28B2		G. Holmes		81	8	--	not used	water levels	
28P1		D. B. Trunnell		--	--	--	--	--	
29A1		D. B. Trunnell		107	8	windmill, gasoline engine	not used	water levels	
29H1		Robert L. Burchett	1937	105	8	1 HP. electric	domestic	water levels	unable to measure
29J1		J. F. Bergman	1939	16	--	windmill, ½ HP. electric	domestic	water levels, mineral analyses	
33F1		D. B. Trunnell		140	8	--	domestic, irrigation	water levels, mineral analyses	
33F2		D. B. Trunnell		12	--	--	not used	--	abandoned
33G1		D. B. Trunnell	1952	260	12	15 HP. electric	irrigation	water levels, log, mineral analysis	
34L1		E. W. Deter	Aug., 1949	130	6	--	domestic	water levels	
34L2		E. W. Deter		--	8	windmill	not used	water levels	abandoned
34M1		Van Gordon	Summer 1948	140	--	½ HP. electric	domestic	--	unable to measure
34P1		F. A. Payne	about 1940	87	--	clectric	domestic	water levels	
36P1		P. Bergman		59	36	windmill	domestic	water levels	
8S/2E-31P1		L. Offen		--	--	2 HP. electric	domestic	--	unable to measure

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 3 (continued)					
8S/2E-33C1	No. 11	James Oviatt		126	8	windmill	stock	water level, log	
33C2		James Oviatt		63	--	--	not used	log	abandoned
8S/1W-13K1	Tyrrell 1	G. L. Knox	July, 1947	279	10	windmill	stock	water levels, log, mineral analyses	originally 2,594 ft. deep
13Q1		G. L. Knox		190	10	5 HP. electric	domestic, irrigation	water levels, mineral analysis	
20G1		Smith		165	--	--	domestic	--	unable to measure
22K1		U. S. A.		--	72	hand pump	domestic	water levels, mineral analyses	
24B1		G. L. Knox	Feb., 1954	183	10	15 HP. electric	irrigation	log	
25Q1		Bernard Appel		--	--	2 HP. electric	--	water level, mineral analysis	
9S/1E- 1B1		H. Walker		207	10	--	not used	water levels	
1B2		H. Walker		125	12	windmill	domestic	water levels	
1Q1		A. A. Ward	1949	33	10	¼ HP. electric	domestic, stock	water levels, log, mineral analysis	
1Q2		A. A. Ward		27	4	windmill	not used	water levels	open casing
12A1		A. A. Ward	1948	47	6	windmill	domestic, stock	water levels, log, analysis	
12H1		A. A. Ward	Fall 1949	111	16	--	not used	water levels, log	
9S/2E- 6D1		--		58	9	--	--	water level	
6L1		W. R. Scott	Dec., 1951	256	14	--	domestic	water level, log	unable to measure
7D1		A. Christino		85	9	--	not used	water levels	open casing
7D2		A. Christino	Oct., 1953	100	10	electric	--	water levels	
8Q1		James Oviatt		--	8	windmill	stock	water levels	
8Q2		James Oviatt		--	8	windmill	stock	water levels	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 3 (continued)					
9S/2E- 9P1	No. 3	James Oviatt	Feb., 1946	96	12	windmill	not used	water levels, log	
15F1	No. 9	James Oviatt		145	8	windmill	stock	water levels, log	
15R1	No. 10	James Oviatt		65	8	windmill	stock	water levels, log, mineral analysis	
15R2		James Oviatt		38	--	--	not used	log	abandoned
16A1		James Oviatt		160	--	--	not used	log	abandoned
16B1		James Oviatt		200	--	--	not used	log	abandoned
16E1		P. Bergman		60	8	--	not used	water levels	open casing
16F1	Roberts Well No. 8	James Oviatt		480	12	--	not used	water levels, log	
16G1		Bergman		80	7	--	not used	water levels	
16L1	Crooked hole	James Oviatt		196	--	--	not used	log	abandoned
16L2	T-3	James Oviatt	Dec., 1948	42	uncased	--	not used	log	abandoned
16N1		James Oviatt		202	--	--	not used	log	abandoned
16P1	T-2	James Oviatt	Dec., 1948	65	8	--	not used	log	abandoned
17J1		Wentworth		--	--	windmill	domestic	--	unable to measure
17K1		Bergman		--	8	windmill	domestic, stock	water level	
17K2		E. Hattebuhr		40	8	½ HP. electric	domestic	water levels	
17K3		Anna Bergman	Aug., 1953	61	12	5 HP. electric	irrigation	water level, log	
17K4		Bergman		--	8	½ HP. electric	--	--	unable to measure
17P1		R. F. Raybold	1947	26	60	--	not used	log	originally 60 ft. deep
17R1		United States Forestry Service		32	36	3 HP. electric	domestic	water levels, log	unable to measure (Apr., 1954)

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
		Hydrographic Unit No. 3 (continued)							
9S/2E-20A1		Painter, Mc Alpine, and Knox		40	10	1 HP. electric	domestic	water levels	
20A2		D. L. Martin		60	10	¼ HP. electric	domestic	water levels	
20A3		D. L. Martin	Sept., 1953	80	10	1 HP. electric	domestic, irrigation	--	
20A4		Harry A. Christman	June, 1953	67	8	1 HP. electric	domestic	water levels	
20B1		M. M. Lloyd		85	8	1 HP. electric	domestic	water levels	
21D1	T-4	James Oviatt	Dec., 1948	26	uncased	--	not used	log	abandoned
21E1	No. 14	James Oviatt	Nov., 1950	140	8	--	not used	water levels, log	unable to measure (June, 1952)
22G1		H. Taylor		--	--	gasoline engine	domestic	water levels	
22J1	No. 4	James Oviatt	1946	153	12	windmill	stock	water levels, log	
22N1		C. H. and M. A. Snaveley Jr.		--	--	hand pump	not used	water levels	
23K1		Dorothy Veazey	Feb., 1950	55	uncased	--	not used	water level, log	abandoned
26E1		Herman Silveria	1946	37	10	--	not used	water levels, log	
26E2		Herman Silveria	about 1947	50	10	--	domestic	log	unable to measure
26E3		Ralph D. Buzard		78	8	½ HP. electric	domestic, stock	water levels	
26E4		Ralph D. Buzard		56	--	hand pump	stand by	--	unable to measure
26E5		H. C. Scranton	Nov., 1953	84	15	gasoline engine	domestic	water levels	
26L1		B. E. Ward		100	8	½ HP. electric	domestic	--	unable to measure
26L2		B. E. Ward	Oct., 1953	104	8	5 HP. electric	irrigation	water levels	
27H1		C. W. and R. B. Burr	Nov., 1950	90	10	1 HP. electric	not used	water levels, log	
27J1		P. C. Morrissey	1931	35	10	½ HP. electric	not used	water level, log, mineral analyses	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 3 (continued)					
9S/2E-27K1		Michael and Clara Koman	Jan., 1950	35	10	--	not used	water levels, log	
27K2	Pond well	See Remarks	Jan., 1950	100	10	$7\frac{1}{2}$ HP. electric	recreation	log	well drilled for Koman on property of Deane Bottorf, formerly owned by P. C. Morrissey
27K3	Corral well	P. C. Morrissey.	1947	35	8	--	not used	water levels, log	
35J1[a]		William R. Hartly		150	12	5 HP. electric	domestic	water levels	
35J2[a]		Holcomb Estates		82	--	--	not used	water level	
9S/3E-9M1		Lloyd Mitchell		--	--	--	not used	water levels	
15J1		S. J. Curtis	1953	about 60	36	--	not used	water levels	
15Q1[a]		S. J. Curtis	1953	60	36	--	not used	water levels	
15R1[a]		S. J. Curtis		57	36	5 HP. electric	irrigation	water levels	
15R2[a]		S. J. Curtis		60	30	$1\frac{1}{2}$ HP. electric	domestic	water level	
16A1		Roy C. Jackson		105	8	windmill	domestic, stock	water levels, log, mineral analysis	
16A2		Roy C. Jackson	about 1947	52	8	--	irrigation	water levels	
16A3		Roy C. Jackson	about 1930	32	--	--	not used	--	abandoned
16B1		Harriet B. Carr	Sept., 1948	60	12	$1\frac{1}{2}$ HP. electric	domestic, irrigation	water levels	
16B2		Harriet B. Carr	1940	19	4'x6'	--	stand by	water levels	
16F1		L. Zimmerman	Apr., 1951	27	6	$\frac{1}{2}$ HP. electric	domestic, stock	water levels, log	unable to measure
16K1		J. R. Tobin	about 1948	50	10	electric	domestic, stock	water level	unable to measure

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 3 (continued)					
9S/3E-17C1		L. M. Oxley		115	10	1 HP. electric	domestic	water levels	
17L1		Snider		--	36	--	domestic	water level	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
					Hydrographic Unit No. 4				
8S/1W- 6B1	Pv 8	Vail Co.	Dec., 1926	110	--	--	not used	water levels, log	abandoned
8S/2W- 2J1	E 7 N	Vail Co.	Dec., 1926	125	--	--	not used	water levels, log	abandoned
3K1	L 8 N	Vail Co.	Jan., 1927	206	--	--	not used	water levels, log	abandoned
11H1		Vail Co.		48	12	windmill	stock	water levels	
11J1	P. R. 30	Vail Co.	May, 1919	119	20	15 HP. electric	irrigation	water levels, log, mineral analysis	
11J2	30-A	Vail Co.	July, 1925	122	7	--	not used	water levels, log	
11J3	Diesel Jr.	Vail Co.	1929	60	--	--	not used	log	abandoned
11J4	New Diesel	Vail Co.	May, 1940	171	--	--	irrigation	water level, log	
11J5	P. R. 26	Vail Co.	Nov., 1918	117	7	--	not used	log	open casing
11L1	P. R. 40	Vail Co.	June, 1952	298	16	30 HP. electric	irrigation	water levels, log, mineral analysis	
11P1	P. R. U. C. well	Vail Co.	July, 1925	78	7	1 HP. electric	--	log, mineral analysis	
11P2	New C. G C. well	Vail Co.	1953	114	8	--	not used	log	
12F1	Pv 9	Vail Co.	Feb., 1927	127	--	--	not used	water levels, log	abandoned
12H1	Windmill well	Vail Co.	about 1904	515	12	windmill	stock	water levels, log, mineral analyses	
12H2	Pv 5	Vail Co.	1924	--	--	--	--	water levels	
12K1	J. K. well	Vail Co.	Oct., 1929	155	20	40 HP. electric	irrigation	water levels, log mineral analyses	
15C1	China Garden well	Vail Co.	1903	540	--	--	irrigation	water levels, log mineral analyses	artesian
15D1	No. 50	Vail Co.	June, 1953	--	--	25 HP. electric	irrigation	water levels	
16A1	Dairy artesian	Vail Co.	1903	548	12	--	domestic, stock	water levels, log mineral analyses	artesian

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other [5]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 4 (continued)					
8S/2W-16G1	Main Camp Artesian	Vail Co.	1903	--	--	--	domestic, stock	water levels, mineral analyses	artesian
17F1	Cantarini D	Vail Co.	Jan., 1927	90	--	--	not used	water levels, log	abandoned
17G1	Studley Artesian	Vail Co.	1903	--	--	--	irrigation	water levels, mineral analyses	artesian
17M1	Navy well	Vail Co.	July, 1951	2,471	16	--	irrigation	water levels, log, mineral analyses	artesian
17Q1	Cantarini A	Vail Co.	Aug., 1925	239	7	--	not used	water levels, log	abandoned
18M1	T F 3	Vail Co.	Jan., 1927	102	--	--	not used	water levels, log	abandoned
18N1	T F 2	Vail Co.	Jan., 1927	125	--	--	not used	water levels, log	abandoned
18N2	T F 4	Vail Co.	Feb., 1927	87	--	--	not used	water levels, log	abandoned
18R1	Mc Sweeny domestic	Vail Co.	Feb., 1927	44	--	--	not used	water levels, log	abandoned
19J1	School House well	Little Temecula School District	May, 1921	53	7	--	not used	water levels, log, mineral analysis	abandoned
20B1	P. R. 27	Vail Co.	Dec., 1918	213	17	1 HP. electric	domestic	water levels, log	) known collectively as "Cantarini Well"
20B2	P. R. 28	Vail Co.	Apr., 1919	220	12	--	not used	water levels, log, analysis	)
20B3	P. R. 29	Vail Co.	Mar., 1919	133	12	--	not used	water levels, log, analysis	)
20B4	Caterpillar pump	Vail Co.	Jan., 1953	--	16	25 HP. electric	irrigation	water level, mineral analysis	
20C1	New 28	Vail Co.	Jan., 1954	298	16	--	irrigation	water levels, log	
20C2		Vail Co.		about 100	16	--	not used	water level	abandoned
20E1	Cantarini Camp or Cant. Wm.	Vail Co.		--	7	--	not used	water levels	
20L1	Pen well	Vail Co.	1930	524	16	--	not used	water levels, log, mineral analysis	

(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 4 (continued)					
8S/2W-21G1	L T 1	Vail Co.	Jan., 1927	84	--	--	not used	water levels, log	abandoned
22L1	Nienke Well	E. S. Gardner	Oct., 1928	220	8	windmill	--	water levels, log mineral analysis	
26N1		Pechanga Indian Reservation		76	12	windmill	--	water levels, log	
27E1		F. A. Cascara		--	36	--	domestic	water level	
28C1	Ludy	Vail Co.		--	12	--	not used	water levels	
28K1	L T 2	Vail Co.	Jan., 1927	153	--	--	not used	water levels, log	abandoned
28M1		E. S. Gardner		--	--	5 HP, electric	irrigation	water levels	
29B1		Pechanga Indian Reservation		200	4	--	not used	log	abandoned
29C1	Grant Howard	Bartolomeo and Clara M. Simonelli	Feb., 1918	500	12	--	not used	water levels, log	
29F1		Pechanga Indian Reservation		80	8	--	not used	water level, log	open casing
29G	Government	Pechanga Indian Reservation		--	12	windmill	stock	water levels mineral analysis	
29J1		Pechanga Indian Reservation		200	4	--	not used	log	abandoned
33C1		--		--	--	½ HP, electric	irrigation	water levels	
33G2		Jan Johnson		17	48	--	--	water levels	
33K1		--		--	--	electric	not used	--	
33K2		Hamre		116	8	¾ HP, electric	domestic	--	unable to measure
33K3		Paulson		--	--	gasoline engine	not used	water levels	
34B1		Pechanga Indian Reservation		80	12	--	not used	water level, log	
34F1		W. E. Moore		123	7	1 HP electric	domestic	water level	

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
Hydrographic Unit No. 4 (continued)									
8S/2W-34M1		Dave Garcia		--	--	windmill	domestic	water level	
35C1		Pechanga Indian Reservation		--	--	windmill	--	water levels	
8S/3W-24A1		Vail Co.		--	36	--	domestic	water levels	
24H1		--		57	60	½ HP. electric	irrigation	water levels	
9S/2W- 4A1		--		--	--	--	--	--	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
					Hydrographic Unit No. 5				
8S/2W-30P1		--		--	36	--	--	water level	
31D1		O. L. Crabtree		24	54	gasoline engine	not used	water levels	
31D2		O. L. Crabtree		30	--	$\frac{3}{4}$ HP. electric	--	water levels	
31E1		O. L. Crabtree		17	60	gasoline engine	--	water levels	
8S/3W- 7D1		Vail Co.		--	5'x5'	--	domestic	water level	
7D2		Vail Co.		26	5'x5'	gasoline engine	not used	water level	
8D1		W. H. Saxman		--	48	gasoline engine	domestic	water level	
31P1		Charles Sawday		74	72	--	domestic	water levels	
32N1	Primary Water Well 71	Gavilan Development Co.		--	24	--	not used	water levels, mineral analysis	
32N2		Gavilan Development Co.	Dec., 1953	43	24	--	not used	water levels, mineral analysis	
32N3		Gavilan Development Co.	Apr., 1954	211	24	--	not used	water levels, mineral analyses	
36H1		--		--	8'x8'	1 HP. electric	--	water level	
36J1		V. D. Simpson		13	60	$\frac{1}{4}$ HP. electric	--	water level	
36J2		J. M. Mc Kathnie		13	48	--	not used	water levels, log	
36J3		J. M. Mc Kathnie		22	48	1 HP. electric	domestic	water levels, log	
36J4		D. B. Chamness		11	60	1/3 HP. electric	domestic	water levels	
36R1		O. L. Burch		21	8	--	domestic	log	
36R2		Mrs. J. R. Beck		17	--	--	domestic	water levels	
36R3		Mrs. J. R. Beck		--	--	--	--	water level	
36R4		--		--	--	--	--	--	
8S/4W-20A1		R. F. Matthews		--	36	$3\frac{1}{2}$ HP. electric	--	water level	

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 5 (continued)					
8S/4W-20A2		R. F. Matthews		11	--	gasoline engine	--	water level	
20A3		E. L. Berger		--	--	5 HP. electric	domestic, irrigation	--	
20B1		Anna Doerrer		32	4'x5½'	windlass	domestic	water level	
20L1		Kinney		--	--	gasoline engine, hand pump	domestic, irrigation	water level	
20P1		Shaver		--	48	5 HP. electric	domestic, irrigation	water level	
22Q1		John Parker		about 30	48	1 HP. electric	domestic	water level	
28L1		Mrs. Harris		25	48	6 HP. gasoline engine	irrigation	water level	
28L2		Mrs. Harris		24	--	--	not used	--	
28M1		--		--	60	1 HP. electric	domestic	water level	
29J1		R. W. Bleecker	June, 1954	about 34	48	windmill	domestic	water level, mineral analysis	
29J2		R. W. Bleecker		about 37	9	gasoline engine	irrigation	--	
29M1		F. R. Garnsey		53	30	1 HP. electric	domestic	water level	
29Q1		--		48	60	gasoline engine	--	water level	
32B1		Mrs. Finest		32	54	½ HP. electric	domestic	water level	
32B2		De Luz School		--	6	½ HP. electric	--	water level, mineral analysis	
32C1		Homer C. Mc Dowell	1938	20	72	1½ HP. electric	domestic, irrigation	water level	
34F1		Rivers Ranch		33	66	windmill, gasoline engine	domestic	water level, mineral analysis	
8S/5W-23Q1		G. C. Snow		12	2½'x2½'	--	not used	water level	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
		Hydrographic Unit No. 5 (continued)							
8S/5W-23Q2		G. C. Snow		18	5'x5'	--	domestic	water level	
23Q3		G. C. Snow		20	36	--	domestic	water level	
23Q4		G. C. Snow		40	36	--	not used	water level	
23Q5		G. C. Snow		17	--	--	not used	water level	
23Q6		G. C. Snow		30	36	--	domestic	water level	
9S/2W- 6N1		W. N. Davis	Mar., 1951	234	8	5 HP. electric	irrigation	water level, log	
9S/3W- 1A1		G. R. Reynolds	1947	20	8	2 HP. electric	domestic, stock	water levels, log	
1F1		Charles E. Stubblefield		46	48	1 HP. electric	domestic	water levels	
1F2		Charles E. Stubblefield		43	60	2 HP. electric	domestic, irrigation	water levels	
1F3		Charles E. Stubblefield		18	54	--	not used	water levels	
1F4		Charles E. Stubblefield		--	6	windmill	--	water level	
1H1		H. H. Cummins		19	60	½ HP. electric	irrigation	water levels	
1H2		H. H. Cummins		30	72	--	not used	water levels	
1H3		H. H. Cummins		145	12	2 HP. electric	--	water levels	
1J1		Vernon L. Beattle		69	72	1 HP. electric	irrigation	water levels	
1J2		Vernon L. Beattle		25	3'x5'	½ HP. electric	irrigation	water levels	
1J3		Vernon L. Beattle		42	36	1 HP. electric	irrigation	water levels	
1J4		Vernon L. Beattle		--	10	2 HP. electric	irrigation	water level	
1J5		Vernon L. Beattle		35	36	½ HP. electric	irrigation	water levels	
1L1		Greer		15	60	¾ HP. electric	--	water level	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 5 (continued)					
9S/3W- 1L2		Clara Mc Donald		--	--	$\frac{1}{2}$ HP. electric	--	water level	
1M1		Charles E. Stubblefield		29	48	windmill	not used	water levels	
1N1		J. J. Moffat		40	42	$1\frac{1}{2}$ HP. electric	--	water level	
1N2		Zana Royal		--	--	--	--	--	
1P1		Zana Royal		50	60	1 HP. electric	irrigation	water levels	
1P2		J. S. Boren		23	48	2 HP. electric	irrigation	water levels	
1P3		J. S. Boren		42	48	$1\frac{1}{2}$ HP. electric	irrigation	water levels, analysis	
1P4		--		17	4'x$4\frac{1}{2}$'	windmill	not used	water levels	
1P5		J. S. Boren		31	48	1 HP. electric	domestic	water levels, analysis	
1Q1		Robert Steinberg		35	60	1 HP. electric	irrigation	water levels	
1Q2		Robert Steinberg		36	--	2 HP. electric	domestic, irrigation	water levels, analysis	
1Q3		Albert A. James		--	--	1 HP. electric	domestic	--	
1R1		George E. Shoudy		68	12	--	not used	water levels	
1R2		George E. Shoudy	1934	25	--	$\frac{1}{2}$ HP. electric	irrigation	water levels	
1R3		George E. Shoudy		38	72	1 HP. electric	irrigation	water levels	
1R4		George E. Shoudy		98	12	$\frac{3}{4}$ HP. electric	irrigation	water level	
1R5		George E. Shoudy		17	--	$\frac{3}{4}$ HP. electric	irrigation	water levels	
1R6		Harry A. Chapman		--	--	$1\frac{1}{2}$ HP. electric	--	--	
1R7		W. A. James		20	--	1 HP. electric	domestic, irrigation	--	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 5 (continued)					
9S/3W- 6A1		D. H. Bullock		88	60	7½ HP. electric	irrigation	water levels	
6A2		D. H. Bullock		102	48	2 HP. electric	irrigation	water levels	
6A3		D. H. Bullock		73	60	2 HP. electric	irrigation	water levels	
6B1		Charles Sawday		93	--	10 HP. electric	irrigation	water levels	
6D1		E. H. Tipton	Mar., 1950	55	--	5 HP. electric	domestic, irrigation	water levels	
6D2		E. H. Tipton	Dec., 1952	88	36	1 HP. electric	irrigation	water levels	
6H1		Joe Hayes		--	--	--	domestic, irrigation	water levels	
6P1		H. Harrison	prior to 1926	22	--	gasoline engine	domestic	--	
7C1		A. R. Merickle		10	60	--	not used	--	
7C2		Calloway		32	60	5 HP. electric	domestic	water levels	
7F1		A. R. Merickle		12	--	½ HP. electric	--	water levels	
7F2		Fry		--	--	1/3 HP. electric	domestic	--	
7L1		Tompkins	about 1948	70	--	1½ HP. electric	domestic, irrigation	--	
7P1		W. D. Edwards		38	--	5 HP. electric	domestic, irrigation	--	
8N1		L. C. Kenworthy		50	--	5 HP. electric	domestic, irrigation	--	
9E1		G. G. Pepple		--	--	5 HP. electric	domestic, irrigation	--	
11A1		O. Lester Riggle		--	60	1 HP. electric	domestic, irrigation	water levels	
11A2		O. Lester Riggle		19	6'x6'	1½ HP. electric	domestic, irrigation	water levels	

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
		Hydrographic Unit No. 5 (continued)							
9S/3W-11G1		C. C. Chandler		18	60	1 HP. electric	irrigation	water levels	
11G2		C. C. Chandler		6	60	--	not used	--	
11K1[a]		C. C. Chandler		38	6"x6"	--	not used	water level	
11K2[a]		C. C. Chandler		90	--	½ HP. electric	domestic, irrigation	water levels	
11L1		Joseph H. Feuerborn		55	3"x6"	7½ HP. electric	irrigation	water levels	
11L2		Joseph H. Feuerborn		--	12	1 HP. electric	domestic	water level	
11L3		Joseph H. Feuerborn		62	4½"x4½"	7½ HP. electric	irrigation, stock	water levels	
11M1		James Macres		31	4"x4"	5 HP. electric	domestic, irrigation	water level	
12B1		Dean Ramsy		--	60	1/3 HP. electric	domestic	water levels	
12B2		C. H. Ramsy		27	3"x5"	1 HP. electric	--	water level	
12C1		Conally		--	5"x7"	¼ HP. electric	domestic, irrigation	water levels	
12D1		Rollin Brown		18	5"x5"	¼ HP. electric	domestic, irrigation	water levels	
12D2		Rollin Brown		46	4"x4"	--	not used	water levels	
12D3		Rollin Brown		45	48	½ HP. electric	irrigation	water levels	
12D4		V. Johnson		--	48	--	--	water level	
12E1		W. H. Hitt		26	60	¼ HP. electric	domestic	water levels	
12F1[a]		S. E. Rafter		26	48	¼ HP. electric	not used	water levels	
12F2[a]		Rainbow Valley Grange		29	6"x6"	¼ HP. electric	domestic	water levels	
12F3[a]		L. S. Brownell		57	--	1½ HP. electric	domestic, irrigation, stock	water levels, analysis	

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
					Hydrographic Unit No. 5 (continued)				
9S/3W-12F4[a]		E. H. Hitt		28	6'x6'	¼ HP. electric	domestic, irrigation	water levels, log	
12F5[a]		S. E. Rafter		37	60	1½ HP. electric	irrigation	water levels	
12F6[a]		Fallbrook School District		35	--	--	domestic	water level	
12G1		--		31	60	electric	domestic	water levels	
12G2		Cleveland		--	8	2 HP. electric	irrigation	--	
17C1		T. C. Nicola		--	--	10 HP. electric	irrigation	analysis	
17K1		R. T. Grey		--	66	10 HP. electric	irrigation	water level	
17K2		R. T. Grey		--	60	electric	--	water level	
18E1		Papenhausen		38	48	gasoline engine	irrigation	water level	
9S/4W-1G1		Boyer and Christenson	prior to 1949	29	--	½ HP. electric	domestic, irrigation, stock	water level	
5Q1		Newton T. Bryant		--	60	1 HP. electric	domestic	--	
5Q2		Frank J. Chestmolowicz		--	5'x5'	gasoline engine	domestic	mineral analysis	
10G1		--		29	48	windmill	domestic	water level	
13L1		Costello and Barrymore		24	48	3 HP. electric	irrigation	water level	
13L2		Costello and Barrymore		42	60	3 HP. electric	domestic	water level	
13P1		Bruce Sikkings		84	48	5 HP. electric	industrial, domestic, irrigation	water levels	
13P2		Johnston		--	48	3 HP. electric	domestic, irrigation	water level	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 5 (continued)					
9S/4W-13Q1		Harry E. Held		81	60	3 HP. electric	domestic, irrigation	water level, analysis	
29C1	25WW3	U. S. Navy	Sept., 1944	37	6	--	not used	water levels, log, analyses	
29C2	25WW2	U. S. Navy		--	6	--	not used	water levels	
29L1	25WW4	U. S. Navy	Sept., 1945	105	10	20 HP. electric	military	water levels, log, analyses	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 6					
9S/3W-18K1		Martin		75	60	--	domestic, irrigation	analysis	
18P1		L. C. Stokes		58	--	3 HP. electric	domestic, irrigation	water levels, analysis	
19C1		S. C. Myers	prior to 1935	about 50	4'x4'	2 HP. electric	domestic, irrigation	water levels	
19C2		Alta M. Terrier		40	--	1/3 HP. electric	domestic	--	unable to measure
19C3		Alta M. Terrier		60	48	5 HP. electric	irrigation	water level	
19D1		Carl G. Daving	prior to 1915	40	54	5 HP. electric	irrigation	analysis	
19E1		R. T. Grey		--	48	3 HP. electric	irrigation	--	
19F1[G]		R. T. Grey		--	48	3 HP. electric	domestic, irrigation	--	
19M1		Robt. J. Marks	1950	90	60	5 HP. electric	irrigation	water level, analysis	
19M2		G. Hugo	prior to 1945	80	48	1 HP. electric	irrigation	--	
9S/4W-24H1		A. T. & S. F. R. R.	May, 1917	27	52	--	not used	water level, log	abandoned
24N1		Mark Mc Cahan	prior to 1930	25	54	3 HP. electric	irrigation	water level	
24P1		Elmer Allen	about 1930	65	48	1 HP. electric	irrigation	--	
24P2		Frank Pucelli	1925	86	72	3 HP. electric	irrigation	water level	
24P3		Frank Pucelli	1931	91	72	3 HP. electric	irrigation	--	
24P4		Philips		--	--	--	irrigation	--	
24Q1		William T. Scott		--	60	--	not used	water levels	
24Q2		Werneche		--	60	¼ HP. electric	domestic	water level	
24R1		William Waltz	prior to 1910	80	36	2 HP. electric	domestic	water level, analysis	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other [b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 6 (continued)					
9S/4W-25E1		John T. Owens		31	--	2 HP. electric	domestic, irrigation	water levels, analysis	
25E2		Pratt Mutual Water Co.		54	180	5 HP. electric	domestic, irrigation	water level	
25E3		T. B. Rogers	1940	350	8	3 HP. electric	irrigation	log	unable to measure
25E4		T. B. Rogers	prior to 1900	50	84	5 HP. electric	irrigation	--	
25E5		T. B. Rogers	prior to 1920	50	72	2 HP. electric	domestic	water level	
26F1		U. S. Navy		--	--	--	--	--	
26M1		U. S. Navy		--	--	--	--	--	
32C1	Test hole 1 dam site	U. S. Navy	1934	79	--	--	not used	water level. log	abandoned test hole
32C2	Test hole 2 dam site	U. S. Navy	May, 1934	132	8	--	not used	water level, log	abandoned test hole
32C3	Test hole 3 dam site	U. S. Navy	May, 1934	150	--	--	not used	log	abandoned test hole
32C4	Test hole 4 dam site	U. S. Navy	June, 1934	99	--	--	not used	log	abandoned test hole
32C5	Test hole 6 dam site	U. S. Navy	June, 1934	53	--	--	not used	log	abandoned test hole
32C6	Core hole 53	U. S. Navy	May, 1951	103	--	--	not used	log	test hole
32C7	Core hole 75	U. S. Navy	May, 1951	139	--	--	not used	log	test hole
32C8	Core hole 92 B	U. S. Navy	May, 1951	137	--	--	not used	water level, log	test hole
32C9	Core hole 111	U. S. Navy	May, 1951	201	--	--	not used	water level, log	test hole

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 6 (continued)					
9S/4W-32C10	Core hole 117	U. S. Navy	May, 1951	137	--	--	not used	water level, log	test hole
32C11	Core hole 94	U. S. Navy	May, 1951	120	--	--	not used	water level, log	test hole
32C12	Core hole 74	U. S. Navy	May, 1951	175	--	--	not used	water level, log	test hole
32C13	Core hole 95	U. S. Navy	May, 1951	85	--	--	not used	water level, log	test hole
32C14	Core hole 73	U. S. Navy	May, 1951	59	--	--	not used	water level, log	test hole
35L1	RSM 17-A	U. S. Navy	June, 1934	51	18	--	not used	water level, log	abandoned
10S/4W-5D1	Hospital well 25WW1	U. S. Navy	Dec., 1943	80	18	75 HP. electric	military	water levels, log, analyses	
5D2	RSM 18A3	U. S. Navy	Feb., 1939	71	12	--	not used	log	abandoned
5E1	RSM 18A1	U. S. Navy	Feb., 1939	44	--	--	not used	log	abandoned
5E2	RSM 18A2	U. S. Navy	Feb., 1939	85	--	--	not used	log	abandoned
7A1	--	U. S. Navy	Aug., 1942	144	20	--	not used	water level, log	abandoned
7H1	G. S. test well 1	U. S. Navy	June, 1951	130	6	--	observation	water levels, log, analyses	
7J1	Navy 3	U. S. Navy	1942	162	20	--	military	water levels, log, analysis	
7J2	Navy 2	U. S. Navy	July, 1942	82	14	--	--	water levels, log, analysis	
7Q1		U. S. Navy		--	1½	--	observation	water levels	
7R1	Navy CB 1 24WW2	U. S. Navy		166	12	100 HP. electric	military	water levels, log, analyses	
7R2		U. S. Navy		--	--	--	--	--	
7R3		U. S. Navy		--	1½	--	observation	water levels	
7R4		U. S. Navy		--	1½	--	observation	water levels	
8E1		U. S. Navy		--	--	--	not used	--	abandoned

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
			Hydrographic Unit No. 6 (continued)						
10S/4W- 8E2	Navy 1	U. S. Navy	June, 1942	205	14	--	not used	water level, log	abandoned
18E1	RSM 11-F 23WW3	U. S. Navy	Jan., 1937	130	20	100 HP. electric	military	water levels, log, analyses	
18E2	RSM 11-E	U. S. Navy		120	--	--	not used	log	abandoned
18L1		U. S. Navy	Feb., 1946	102	6	--	observation	water levels, log	
18M1	RSM 11-X 23WW2	U. S. Navy	Aug., 1929	169	12	--	--	water levels, log, analyses	
18M2	RSM 9-B 22WW5	U. S. Navy	Aug., 1950	165	24	125 HP. electric	military	water levels, log, analyses	
19E1	RSM 10	U. S. Navy		113	--	--	--	log	
19E2	Test hole 7	U. S. Navy	Spring 1951	66	--	--	not used	water level, log	abandoned
19L1	Test hole 8	U. S. Navy	Spring 1951	48	--	--	not used	water level, log	abandoned
10S/5W-12R1	Green 15 RSM 12-B	U. S. Navy	Feb., 1920	98	12	--	not used	water levels, log	open casing
13G1	G. S. test well 3	U. S. Navy	June 1951	85	6	--	observation	water levels, log, analyses	
13J1	G. S. test well 2	U. S. Navy	June, 1951	97	6	--	--	water levels, log, analyses	
13R1	11-D 23WW1	U. S. Navy	July, 1934	164	4	--	not used	water levels, log, analyses	
14P1	RSM 9-E 33WW1	U. S. Navy	May, 1934	320	16	15 HP. electric	military	water levels, log, analyses	
14Q1	Green 16	U. S. Navy	Mar., 1920	100	12	--	not used	water levels, log	open casing
23G1	Green 6 RSM 9-D	U. S. Navy		132	12	--	not used	log	abandoned
23J1	23WW4	U. S. Navy	Sept., 1950	140	24	--	military	water levels, log, analyses	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 6 (continued)					
10S/5W-23J2	RSM 6-A 23WW5	U. S. Navy	1912	179	12	--	not used	water levels, log, analysis	abandoned
23J3	G. S. test well 5	U. S. Navy	June, 1951	140	6	--	--	water level, log, analyses	
23J4	G. S. auger hole	U. S. Navy	Sept., 1951	11	2	--	not used	water levels, log	abandoned
23L1	G. S. test well 4	U. S. Navy	June, 1951	170	6	--	observation	water levels, log, analyses	
23Q1	G. S. test well 6	U. S. Navy	June, 1951	290	6	--	--	water levels, log, analyses	
24C1	RSM 11-C	U. S. Navy	June, 1934	103	16	--	not used	water level, log	abandoned
24C2	RSM 8-A	'U. S. Navy	July, 1912	112	12	--	not used	water level, log	abandoned
24C3		U. S. Navy		--	--	--	--	--	
24D1	RSM 11-B	U. S. Navy	July, 1934	160	16	--	not used	water level, log	abandoned
24F1		U. S. Navy		--	--	--	not used	--	abandoned
24G1	RSM 8	U. S. Navy	Fall 1912	150	12	--	not used	water level, log	abandoned
24H1	22WW4	U. S. Navy	July, 1950	172	24	--	military	water levels, log, analysis	
24H2	RSM 9-B	U. S. Navy	July, 1934	225	16	--	not used	water level, log	abandoned
24H3	RSM 9	U. S. Navy		130	12	--	not used	log, analyses	abandoned
24N1	Green 7 RSM 9-H	U. S. Navy		141	12	--	not used	water levels, log, analysis	capped
26L1	G. S. test well 7	U. S. Navy	June, 1951	175	6	--	--	water levels, log, analyses	
26L2	G. S. auger hole	U. S. Navy	Sept., 1951	24	1½	--	observation	water levels, log	
26L3	G. S. auger hole	U. S. Navy	May, 1951	--	1¼	--	not used	water levels, log	abandoned

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 6 (continued)					
10S/5W-35C1		U. S. Navy		--	--	--	--	--	
35G1	RSM 4-H	U. S. Navy		--	--	--	--	log	abandoned
35J1	Green 5 D RSM 4-E	U. S. Navy	May, 1926	95	14	--	observation	water levels, log, analysis	
35K1	RSM 4-I	U. S. Navy	Nov., 1936	166	18	diesel engine	irrigation	water levels, log, analyses	
35K2	RSM 4-G	U. S. Navy		146	--	--	not used	log	abandoned
35K3	Green 5 E RSM 5 (old)	U. S. Navy	1912	150	12	--	not used	log	abandoned
35K4	G. S. auger hole	U. S. Navy	May, 1951	28	1½	--	--	water levels, log	
35K5	G. S. test well 8	U. S. Navy	June, 1951	149	6	--	--	water levels, log, analyses	
35R1	Green 4 E RSM 4-DD	U. S. Navy	May, 1937	154	18	--	--	water levels, log	
35R2	Green 2 A RSM 4-D	U. S. Navy	May, 1929	187	12	--	observation	water levels, log	
35R3	G. S. auger hole	U. S. Navy	May, 1951	23	1½	--	observation	water levels, log	
11S/5W-1E1	Windmill No. 4	U. S. Navy		--	--	windmill	--	water levels	
2A1	RSM 4-BB 22WW3	U. S. Navy	Apr., 1937	156	18	60 HP. electric	military	water levels, log, analyses	
2A2	RSM 4-B2	U. S. Navy	Apr., 1937	156	--	--	not used	log	abandoned
2A3	RSM 4 B1	U. S. Navy	Apr., 1937	168	--	--	not used	log	abandoned
2A4	Green 2 RSM 4-B 2 (old)	U. S. Navy	Apr., 1912	185	12	--	not used	water level, log	abandoned

WATER WELL DATA
(continued)

Well numbers: State	Well numbers: Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 6 (continued)					
11S/5W- 2A5	G. S. auger hole	U. S. Navy	May, 1951	18	1½	--	observation	water levels, log	
2B1		U. S. Navy	Apr., 1912	132	12	--	observation	water levels, log	
2B2	Green 1 RSM 1 (old)	U. S. Navy		118	12	--	observation	water levels, log	
2C1	Green 17A	U. S. Navy		190	12	--	--	log	
2D1	RSM 5-A5	U. S. Navy		124	18	30 HP. electric	irrigation	water levels, log, analyses	
2D2	RSM 5-A4	U. S. Navy	Jan., 1938	120	18	--	not used	water level, log	abandoned
2E1	RSM 5-A2	U. S. Navy	Dec., 1937	145	18	--	irrigation	water levels, log, analyses	
2E2	RSM 5-A1	U. S. Navy	Dec., 1937	106	--	--	not used	water levels, log	abandoned
2E3	RSM 20	U. S. Navy	Sept., 1929	92	12	--	observation	water levels, log, analysis	
2E4	G. S. auger hole	U. S. Navy	May, 1951	26	1½	--	observation	water level, log	
2F1	RSM 4-C1 22WW2	U. S. Navy	May, 1927	153	18	30 HP. electric	irrigation	water levels, log, analyses	
2F2	RSM 5-A3	U. S. Navy	Jan., 1938	142	--	--	not used	log	abandoned
2F3	G. S. auger hole	U. S. Navy	Oct., 1951	17	1½	--	--	water levels, log	
2K1	RSM 4-C, Green 17 22WW1	U. S. Navy	May, 1921	192	12	--	military	water levels, log, analyses	
2K2	G. S. test well 9	U. S. Navy	June, 1951	300	6	--	--	water levels, log, analyses	
2M1		U. S. Navy		--	10	--	--	water level	open casing
2N1	O. B. 3	U. S. Navy		--	10	--	not used	water levels	abandoned

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other b	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
			Hydrographic Unit No. 6 (continued)						
11S/5W- 2N2	Green 19	U. S. Navy	Sept., 1925	131	12	--	not used	log, analyses	abandoned
2N3	Green 18	U. S. Navy	Sept., 1925	130	--	--	not used	log, analysis	abandoned
2N4	G. S. test well 11	U. S. Navy	June, 1951	200	6	--	--	water levels, log, analyses	
2N5	O. B. 3	U. S. Navy		--	14	--	--	water levels	open casing
2P1	G. S. test well 10	U. S. Navy	July, 1951	300	6	--	observation	water levels, log, analysis	
9G1	Test well 1	A.T. & S.F. R.R.		124	--	--	--	log	
9G2	Test well 2	A.T. & S.F. R.R.		180	10	--	--	log	
9G3	Test well 3	A.T. & S.F. R.R.		150	4	--	--	log	abandoned
9G4	Test well 4	A.T. & S.F. R.R.		151	--	--	--	log	abandoned
9G5	Test well 5	A.T. & S.F. R.R.		203	6	--	--	log	abandoned
9G6	Test well 6	A.T. & S.F. R.R.		155	--	--	--	log	abandoned
9G7	Test well 7	A.T. & S.F. R.R.		159	--	--	--	log	abandoned
9J1	G. S. test well 13	U. S. Navy	July, 1951	300	6	--	observation	water levels, log, analyses	
9J2	G. S. auger hole	U. S. Navy	Oct., 1951	20	1¼	--	observation	water levels, log	
10A1		U. S. Navy		--	10	--	not used	water levels	open casing
10B1	G. S. test well 12	U. S. Navy	May, 1951	204	6	--	observation	water levels, log, analyses	
10E1		U. S. Navy		--	--	--	--	--	
10F1		U. S. Navy		--	--	--	--	--	

WATER WELL DATA
(continued)

Well numbers State	Well numbers Other[b]	Owner	Date drilled	Well depth, in feet	Casing diameter, in inches	Pumping equipment	Use	Other data available	Remarks
				Hydrographic Unit No. 6 (continued)					
11S/5W-10G1	Obs. well 1	U. S. Navy		--	10	--	observation	water levels	
10G2		U. S. Navy		--	--	--	--	--	

a. Well outside watershed adjacent to hydrographic unit.
b. Numbers with prefix "Elsinore" refer to well numbers used in the Santa Ana River Investigation.
Numbers with prefixes "Wildomar", "MV", "TF", "PV", "E", "L", "PR", and "LT", were assigned by the Vail Co. All other well numbers are local designations assigned by well owners.

APPENDIX G

RECORDS OF DEPTHS TO GROUND WATER AT WELLS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED

TABLE OF CONTENTS

RECORDS OF DEPTHS TO GROUND WATER AT WELLS
IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED

Measurements made by Division of Water Resources, unless otherwise indicated.

Reference point elevations to the nearest foot have been estimated from topographic maps, except where determined by barometric level as indicated.

Reference point elevations to the nearest tenth or hundredth foot have been determined by differential level.

APPENDIX G

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)

5S/1W-28K1 - Searl Bros. - Near Diamond Valley; map location only, see location of wells plate; outside watershed. Reference point - top of pump column pipe 0.5 foot above ground surface, at elevation 1,565 feet. 5/13/53, 13.3.

5S/1W-32Q1 - Searl Bros. - In Diamond Valley; 1.8 miles west of Highway 79 and 50 feet north of Newport Road; in metal pump house. Reference point - top of metal cover at ground surface, at elevation 1,578 feet. 8/27/53, 39.5; 11/20/53, 37.7; 4/22/54, 32.9.

5S/1W-33R1 - Searl Bros. - In Diamond Valley; 0.59 mile west of Highway 79, and 70 feet north of Newport Road; in metal pump house; outside watershed. Reference point - hole in pump base 0.8 foot above ground surface, at elevation 1,614 feet. 8/27/53, 52.0; 11/20/53, 55.1.

5S/1W-34M1 - Searl Bros. - In Diamond Valley; 0.25 mile west of Highway 79, and 0.27 mile north of Newport Road; outside watershed. Reference point - hole in casing 2 feet above ground surface, at elevation 1,610 feet. 8/27/53, 48.2; 11/20/53, 48.9; 4/22/54, 54.2.

5S/1W-34N1 - Searl Bros. - In Diamond Valley; 0.27 mile west of Highway 79, and 70 feet north of Newport Road; outside watershed. Reference point - top of outer casing at ground surface, at elevation 1,621 feet. 8/27/53, 60.2; 11/20/53, 55.7; 4/22/54, 59.2.

5S/1W-34P1 - Searl Bros. - In Diamond Valley; 0.25 mile north of Newport Road, and 0.1 mile west of Highway 79; outside watershed. Reference point - top of casing 0.7 foot above ground surface, at elevation 1,618 feet. 8/27/53, 53.7; 11/20/53, 53.9; 4/22/54, 52.6.

5S/1W-34R1 - In Diamond Valley; 0.5 mile east of Highway 79, and 50 feet north of Newport Road; outside watershed. Reference point - top of casing 1.5 feet above ground surface, at elevation 1,670 feet. 5/14/54, 81.7.

5S/2W-34P1 - Ko Young - In Domenigoni Valley; 0.39 mile east of Washington Avenue, and about 650 feet north of Newport Road; outside watershed. Reference point - top of floor 1 foot above ground surface, at elevation 1,479 feet. 5/12/53, 16.7; 11/6/53, 17.2; 4/22/54, 18.3.

6S/1W-3E1 - Searl Bros. - In Diamond Valley; 0.48 mile west of Highway 79, and 0.43 mile south of Newport Road; outside watershed. Reference point - top of concrete platform 0.7 foot above ground surface, at elevation 1,630 feet. 8/27/53, 58.1; 11/20/53, 57.6.

6S/1W-3E2 - Searl Bros. - In Diamond Valley; 0.48 mile west of Highway 79, and 0.43 mile south of Newport Road; outside watershed. Reference point - hole in casing cover 0.2 foot above ground surface, at elevation 1,627 feet. 8/27/53, 58.3; 11/20/53, 57.0; 4/22/54, 58.8.

6S/1W-3E3 - Randolph Baatz - In Diamond Valley; 0.24 mile west of Highway 79, and 310 feet north of Baatz Road; outside watershed. Reference point - pump base 1.5 feet above ground surface, at elevation 1,635 feet. 1947, 25; 1950, 50; 1951, 60; 4/14/54, 62.7.

6S/1W-4G1 - Searl Bros. - In Diamond Valley; 0.18 mile northeast of well 4K1; in metal pump house. Reference point - pump base at ground surface, at elevation 1,622 feet. 8/27/53, 85; 11/20/53, 80.9.

6S/1W-4J2 - A. C. Molhenhoff - In Diamond Valley; 0.5 mile west and 25 feet south of intersection of Highway 79 and Baatz Road; open casing. Reference point - top of casing 0.7 foot above ground surface, at elevation 1,628 feet. 5/14/54, 69.5.

6S/1W-4J3 - L. H. Allert - In Diamond Valley; 0.2 mile west and 0.04 mile south of intersection of Palm and Baatz Roads; at windmill 100 feet southeast of house. Reference point - hole in pump base 0.5 foot above ground surface, at elevation 1,627 feet. 4/14/54, 82.7.

6S/1W-4K1 - Searl Bros. - In Diamond Valley; 1 mile west and 0.63 mile south of intersection of Highway 79 and Newport Road; in metal pump house, 30 feet north of farm road. Reference point - hole in pump house at ground surface, at elevation 1,618 feet. 8/27/53, 82.4; 11/20/53, 80.9.

6S/1W-5Q1 - Garbari Bros. - In Diamond Valley; 1.2 miles west and 0.3 mile south of intersection of Highway 79 and Newport Road; in metal pump house 180 feet north of farm road. Reference point - hole in casing at ground surface, at elevation 1,576 feet. 5/12/53, 57.2; 11/20/53, 50.1; 4/22/54, 60.5.

6S/1W-5H1 - Garbani Bros. - In Diamond Valley; 1.1 miles west and 0.29 mile south of intersection of Highway 79 and Newport Road; in metal pump house 120 feet north of house. Reference point - hole in pump base at ground surface, at elevation 1,582 feet. 11/20/53, 52.3.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

6S/1W-5H2 - Garbani Bros. - In Diamond Valley; 1.1 miles west and 0.35 mile south of intersection of Highway 79 and Newport Road; beside metal building. Reference point - top of casing 0.6 foot below ground surface, at elevation 1,581 feet. 11/20/53, 51.2.

6S/1W-6A1 - Garbani Bros. - In Domenigoni Valley; 2.6 miles west and 0.16 mile south of intersection of Highway 79 and Newport Road; in metal pump house at northeast corner of eucalyptus grove. Reference point - hole in pump base at ground surface, at elevation 1,556 feet. 11/20/53, 52.1.

6S/1W-10D1 - A. C. Mohlenhoff - In Diamond Valley; 1.25 miles south and 0.5 mile west of intersection of Highway 79 and Newport Road; near pressure tank 45 feet south of house. Reference point - top of concrete pit at ground surface, at elevation 1,682 feet. 5/14/54, 53.7.

6S/1W-10M1 - Harold Wilhem - In Diamond Valley; 1.3 miles south from intersection of Palm Avenue and Baatz Road; at windmill 0.15 mile east of Palm Avenue. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,720 feet. 4/14/54, 37.8.

6S/1W-10M2 - Harold Wilhem - In Diamond Valley; 200 feet northwest of well 10M1, and 90 feet west of house; open casing. Reference point - top of casing 2 feet above ground surface. 4/13/54, 31.2.

6S/1W-14N1 - J. R. Whaley - In Diamond Valley; 0.6 mile south of well 15H1. Reference point - top of concrete pit at ground surface, at elevation 2,004 feet. 4/13/54, 49.0.

6S/1W-15C1 - J. R. Whaley - In Diamond Valley; 1.7 miles south from intersection of Palm Avenue and Baatz Road; 0.25 mile southeast (measured along dirt road) from intersection with Palm Avenue. Reference point - bottom of pump base at ground surface, at elevation 1,784 feet. 4/13/54, 27.9.

6S/1W-15C2 - J. R. Whaley - In Diamond Valley; 0.13 mile north of well 15C1. Reference point - bottom of pump base at ground surface, at elevation 1,778 feet. 4/13/54, 37.4.

6S/1W-15H1 - J. R. Whaley - In Diamond Valley; 0.44 mile southeast of well 15C1; in open field. Reference point - hole in board cover at ground surface, at elevation 1,890 feet. 4/13/54, 41.8.

6S/1W-26P1 - Duncan Industries - Near Sage; 1.7 miles northwest of Highway 79 (measured along dirt road) from intersection 1.4 miles north of Sage (measured along Highway 79). Reference point - Measured from planks covering top of casing 1.2 feet above ground level. 11/19/53, 10.5.

6S/2W-1A1 - Searl Bros. - In Domenigoni Valley; 3.5 miles west and 0.2 miles south of intersection of Highway 79 and Newport Road; at windmill. Reference point - top of pipe clamp 0.33 feet above ground surface, at elevation 1,532 feet. 5/11/53, 33.0; 3/6/53, 32.5; 4/7/53, pumping; 8/4/53, 34.4; 9/2/53, 34.6; 10/1/53, 34.9; 11/6/53, 35.3; 2/3/54, 35.7; 4/5/54, 35.8; 4/22/54, 36.2.

6S/2W-2J1 - Francis Domenigoni - In Domenigoni Valley; 0.3 mile south of Newport Road from intersection 2.8 miles west of Washington Avenue (measured along Newport Road) 90 feet south and 12 feet west of east ¼ corner, section 2. Reference point - 6 feet above ground surface. 3/6/53, 22.5; 4/7/53, 22.6.

6S/2W-2J2 - Francis Domenigoni - In Domenigoni Valley; 0.1 mile south of well 2J1. Reference point - ground surface. 9/27/51, 21(log).

6S/2W-3R1 - Pete Domenigoni - In Domenigoni Valley 0.1 mile northeast of well 3R2; 20 feet west of dirt road; open casing. Reference point - top of casing 0.43 foot above ground surface, at elevation 1,483.93 feet. 5/11/53, 14.3; 11/6/53, 16.1; 4/22/54, 15.7.

6S/2W-3R2 - Pete Domenigoni - In Domenigoni Valley; at windmill 0.93 mile east of Washington Avenue (measured along Holland Road); near Stone Reservoir, 100 feet east of house. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,478.91 feet. 5/11/53, 16.4; 11/6/53, 15.1; 4/22/54, 17.3.

6S/2W-3R3 - Pete Domenigoni - In Domenigoni Valley; 0.06 mile north of well 3R2; 75 feet north of large tree in open field. Reference point - top of casing 2.0 feet above ground surface, at elevation 1481.11 feet. 7/22/52, 12.1; 1/19/53, 12.3; 3/6/53, 11.6; 4/7/53, 12.0; 11/6/53, 15.6; 4/22/54, 15.2.

6S/2W-3R4 - Pete Domenigoni - In Domenigoni Valley; 36 feet south of well 3R3. Reference point - top of casing 1.1 feet above ground surface, at elevation 1,479.95 feet. 5/11/53, 12.5; 8/4/53, 14.4; 9/2/53, 14.8; 10/2/53, 14.1; 11/6/53, 14.4; 2/3/54, 14.4; 4/5/54, 14.1; 4/22/54, 14.1; 11/7/54, 14.7.

6S/2W-3R6 - Pete Domenigoni - In Domenigoni Valley; 0.06 mile north of well 3R2; 125 feet north of tree in open field. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,480 feet 11/6/53, 14.4.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

6S/2W-4L1 - Francis and William Hadler - In Domenigoni Valley; 0.45 mile west and 0.42 mile north of intersection of Washington Avenue and Holland Road; 0.15 mile north of house. Reference point - 3 feet above ground surface, at elevation 1,578 feet. 5/14/53, 16.0; 11/6/53, 17.6; 4/22/54, 15.0.

6S/2W-9J1 - E. W. Connell - In Domenigoni Valley; 0.51 mile south and 200 feet west of intersection of Holland Road and Washington Avenue. Reference point - ground surface, at elevation 1,457 feet. 7/23/53, 41 (log); 10/53, 22 (owner).

6S/2W-9K1 - E. W. Connell - In Domenigoni Valley; 0.70 mile south and 0.25 mile west of Washington Avenue and Holland Road. Reference point - ground surface, at elevation 1,448 feet. 10/53, 22 (owner).

6S/2W-9K2 - E. W. Connell - In Domenigoni Valley; 80 feet south of well 9K1. 7/14/53, 36 (log).

6S/2W-10K1 - In Domenigoni Valley; at windmill, 0.8 mile south of Holland Road (measured along dirt road) from intersection 0.5 mile east of Washington Avenue (measured along dirt road) from intersection 0.5 mile east of Washington Avenue (measured along Holland Avenue; 50 feet east of house). Reference point - hole in floor board 0.5 foot above ground surface, at elevation 1,485 feet. 5/11/53, 7.4; 11/6/53, 16.7; 4/22/54, 12.3.

6S/2W-11A1 - Searl Bros. - In Domenigoni Valley; 0.35 mile south of well 9J2; at windmill. Reference point - top of casing 1.2 feet above ground surface, at elevation 1,517 feet. 5/12/53, 31.6; 8/4/53, 31.2; 9/2/53, 32.1; 10/1/53, 32.6; 11/6/53, 33.0; 1/7/54, 34.0; 2/3/54, 33.6; 4/22/54, 33.0.

6S/2W-15D1 - In Domenigoni Valley; 1.03 miles south and 0.04 mile east of intersection of Holland Road and Washington Avenue. Reference point - top of pump clamp 0.1 foot above ground surface. 5/11/53, 8.8.

6S/2W-16C1 - In Domenigoni Valley; 0.8 mile west of well 15D1. Reference point - top of casing 10 feet below ground surface. 5/14/53, 1.1.

6S/2W-16C2 - In Domenigoni Valley; 100 feet south of well 16C1. Reference point - top of casing 1.2 feet above ground surface. 5/14/53, 13.9.

6S/2W-17N1 - Fred Pourroy - In Domenigoni Valley; 75 feet east and 35 feet north of intersection of Scott and Leon Roads; at windmill. Reference point - top of casing 1 foot above ground surface, at elevation 1,401 feet. 5/19/53, 10.6; 11/6/53, 12.8; 4/22/54, 13.2.

6S/2W-19E1 - In Domenigoni Valley; 0.45 mile south and 250 feet east of intersection of Scott and Briggs Roads; at windmill. Reference point - top of pit 0.5 foot above ground surface, at elevation 1,418 feet. 5/18/53, 13.5; 11/16/53, 16.7.

6S/2W-19H1 - Fred Pourroy - In Domenigoni Valley; 0.45 mile south and 0.13 mile west of intersection of Scott and Leon Roads; 50 feet southwest of house. Reference point - top of pit 0.5 foot above ground surface, at elevation 1,420 feet. 5/19/53, 29.1; 11/6/53, 30.3; 4/22/54, 29.9.

6S/2W-19N1 - Mrs. Arthur McElhinney - In Domenigoni Valley; 0.9 mile south and 60 feet east of intersection of Scott and Briggs Roads; 40 feet west of brick house. Reference point - hole in concrete cover 0.5 foot above ground surface, at elevation 1,410 feet. 11/18/53, 25.0; 4/28/54, 24.3.

6S/2W-19N2 - Mrs. Arthur McElhinney - In Domenigoni Valley; 12 feet south of well 19N1. Reference point - top of concrete cover 1.2 feet above ground surface. 11/18/53, 28.1; 4/28/54, 25.3.

6S/2W-19N3 - Mrs. Arthur McElhinney - In Domenigoni Valley; 0.91 mile south and 370 feet east of intersection of Scott and Briggs Roads; at windmill, 40 feet northeast of house. Reference point - top of concrete slab 1.2 feet above ground surface, at elevation 1,381 feet. 11/18/53, 29.5; 4/28/54, 25.9.

6S/2W-20N1 - Richardson - In French Valley; 500 feet east and 300 feet north of intersection of Keller and Leon Roads; in eucalyptus grove, 40 feet west of house. Reference point - top of casing at ground surface, at elevation 1,448 feet. 11/12/53, 77.0; 4/22/54, 74.7.

6S/2W-21D1 - H. Bergman - In Domenigoni Valley; 1.3 mile east and 75 feet south of intersection of Scott and Leon Roads; open casing in shed. Reference point - top of casing, 1 foot above ground surface, at elevation 1,455 feet. 6/18/49, 20 (log); 4/16/54, 13.5.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

6S/2W-21Q1 - Gilbert Stearns - In French Valley; 0.25 mile north of Keller Road (measured along Winchester Road), and 0.07 mile east of Winchester Road; 50 feet northeast of house. Reference point - top of wood cover 1.16 feet above ground surface, at elevation 1,435.05 feet. 5/14/53, 22.8; 11/6/53, 23.6; 4/28/54, 20.2.

6S/2W-21R1 - Gilbert Stearns - In French Valley; 300 feet west of well 21Q1. Reference point - top of floor 0.5 foot above ground surface, at elevation 1,433.59 feet. 11/6/53, 22.6.

6S/2W-27N1 - Arthur Vial - In French Valley; 0.62 mile east of Washington Avenue (measured along farm road) from intersection 0.75 mile south of Keller Road (measured along Washington Avenue); at windmill 70 feet east of house. Reference point - top of concrete slab 0.5 foot above ground surface, at elevation 1,452.87 feet. 5/14/53, 14.7; 11/12/53, 14.8; 4/28/54, 17.1.

6S/2W-28B1 - Karl Frick - In French Valley; 0.24 mile east and 75 feet south of intersection of Winchester and Keller Roads. Reference point - top of casing 1.1 feet above ground surface, at elevation 1,413.82 feet. 4/7/53, 13.4; 5/14/53, 14.4; 8/4/53, 12.7; 9/2/53, 13.5; 10/2/53, 12.9; 11/12/53, 13.2; 1/7/54, 13.6; 2/3/54, 15.0; 4/5/54, 11.6; 4/28/54, 12.6.

6S/2W-28C1 - Karl Frick - In French Valley; 0.04 mile east and 225 feet south of intersection of Winchester and Keller Roads; at windmill. Reference point - top of pipe clamp 1.8 feet above ground surface, at elevation 1,412.80 feet. 5/14/53, 15.2; 11/12/53, 16.4; 4/28/54, 13.9.

6S/2W-28G1 - Karl Frick - In French Valley; 0.6 mile south and 0.34 mile west of intersection of Washington Avenue and Keller Road; at windmill 100 feet north of house. Reference point - top of floor board 0.5 foot above ground surface, at elevation 1,400.97 feet. 11/12/53, 15.9; 4/28/54, 10.0.

6S/2W-28G2 - Karl Frick - In French Valley; 0.55 mile south and 0.28 mile west of intersection of Washington Avenue and Keller Road; in pump house 50 feet north of house. Reference point - top of concrete slab 0.7 foot above ground surface, at elevation 1,419.65 feet. 7/48, 20 (log); 4/28/54, 23.9.

6S/2W-28G3 - Karl Frick - In French Valley; 200 feet southwest of well 28G2; 150 feet west of house, and beside small reservoir. Reference point - top of casing 0.35 foot above ground surface, at elevation 1,412.29 feet. 12/23/49, 30.5 (log); 5/15/53, 35.5; 4/28/54, 32.4.

6S/2W-28J1 - Arthur Vial - In French Valley; 0.47 mile west of well 27N1; at windmill, 60 feet south of house and 100 feet west of barn. Reference point - top of casing 0.4 foot above ground surface, at elevation 1,423.22 feet. 5/14/53, 25.9; 11/12/53, 17.6; 4/28/54, 21.7.

6S/2W-28J2 - Arthur Vial - In French Valley; 235 feet northeast of well 28J1; 135 feet north and 50 feet east of house. Reference point - top of casing 1.5 foot above ground surface, at elevation 1,425 feet. 11/12/53, 17.7; 4/28/54, 16.0.

6S/2W-29M1 - In French Valley; 0.78 mile south and 120 feet east of intersection of Keller and Leon Roads; at windmill. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,395 feet. 5/18/53, 19.2; 4/22/54, 18.4.

6S/2W-29R1 - Pierre Pourroy - In French Valley; 0.38 mile east of Beeler Roads (measured along Winchester Road), and 70 feet southeast of Winchester Road; at windmill. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,376.71 feet. 5/15/53, 18.1; 11/13/53, 19.4; 4/28/54, 19.2.

6S/2W-30A1 - Richardson - In French Valley; 180 feet west and 50 feet south of intersection of Leon and Keller Roads; at windmill, 70 feet northeast of house. Reference point - top of pipe clamp 0.5 foot above ground surface, at elevation 1,427 feet. 5/18/53, 34.9; 11/6/53, 33.2; 4/22/54, 37.5.

6S/2W-30C1 - In French Valley; 1.3 miles south and 0.44 mile east of intersection of Scott and Briggs Roads; at windmill, 150 feet north of bend in road. Reference point - top of wood floor 0.1 foot above ground surface, at elevation 1,395 feet. 5/22/53, 23.2; 11/18/53, 23.4; 4/28/54, 23.3.

6S/2W-30F1 - McElhinney - In French Valley; 0.66 mile east of Briggs Road (measured along farm road) from intersection 1.3 miles south of Scott Road (measured along Briggs Road); at windmill 120 feet northeast of road. Reference point - top of concrete pit 1.0 foot above ground surface, at elevation 1,400 feet. 5/22/53, 42.6; 11/18/53, 46.7; 4/28/54. 40.7.

6S/2W-30F2 - McElhinney - In French Valley; 0.5 mile east of Briggs Road (measured along farm road) from intersection 1.3 mile south of Scott Road (measured along Briggs Road); at windmill, 120 feet east of road. Reference point - top of concrete pit above ground surface, at elevation 1,380 feet. 5/[illegible]/53, 15.9; 11/18/53, 20.9; 4/28/54, 19.7.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

6S/2W-30R1 - Richardson - In French Valley; 0.9 mile south and 400 feet west of intersection of Keller and Leon Roads; at windmill. Reference point - top of 4 x 4 inch board 0.7 foot above ground surface, at elevation 1,380 feet. 5/18/53, 15.5; 11/12/53, 14.8; 4/22/54, 10.5.

6S/2W-31L1 - Fontana Bros. - In French Valley; 0.36 mile north and 0.08 mile west of intersection of Briggs and Thompson Roads; 30 feet east of quonset house. Reference point - top of wood floor 1.8 feet above ground surface, at elevation 1,358.77 feet. 1947, 38 (owner); 5/20/53, 40.9; 11/16/53, 47.8; 4/28/54, 47.4.

6S/2W-31L2 - Fontana Bros. - In French Valley; 0.44 mile north and 105 feet west of intersection of Briggs and Thompson Roads. Reference point - top of casing at ground surface, at elevation 1,345.74 feet. 1947, 9 (owner); 5/20/53, 14.4; 11/16/53, 18.4; 4/28/54, 16.9.

6S/2W-31P1 - In French Valley; 0.1 mile west and 120 feet south of intersection of Briggs and Los Alamos Roads. Reference point - top of wood cover, 1 foot above ground surface, at elevation 1,324.71 feet. 5/20/53, 18.9; 11/16/53, 13.4; 4/28/54, 3.9.

6S/2W-31P2 - In French Valley; 0.18 mile west and 0.09 mile north of intersection of Briggs and Los Alamos Roads; at windmill 15 feet east of house. Reference point - top of wood cover 0.3 foot above ground surface, at elevation 1,354.08 feet. 5/19/53, 36.6; 11/16/53, 37.3; 4/28/54, 37.5.

6S/2W-31R1 - R. M. Cummins - In French Valley; 0.17 mile north and 60 feet west of intersection of Thompson and Leon Roads; in metal pump house. Reference point - top of measuring pipe, at elevation 1,333 feet. 11/18/53, 16.9; 4/22/54, 14.6.

6S/2W-31R2 - R. M. Cummins - In French Valley; 0.1 mile west and 0.06 mile north of intersection of Winchester and Leon Roads; at windmill, 50 feet northeast of house. Reference point - top of pipe clamp 0.8 foot above ground surface, at elevation 1,330 feet. 11/18/53, 38.7; 4/22/54, 37.

6S/2W-32A1 - Pierre Pourroy - In French Valley; 0.93 mile north and 0.06 mile west of intersection of Winchester and Beeler Roads. Reference point - lower lip of measuring pipe 0.5 foot above ground surface, at elevation, 1,377.14 feet. 4/28/54, 27.5.

6S/2W-32H1 - Pierre Pourroy - In French Valley; 0.72 mile north and 0.05 mile west of intersection of Beeler and Thompson Roads. Reference point - top of pump base 1.6 feet above ground surface, at elevation 1,377.35 feet. 4/28/54, 29.0.

6S/2W-32L1 - Pierre Pourroy - In French Valley; 1.2 mile southwest from Beeler Road (measured along Winchester Road); 600 feet east of Winchester Road and 40 feet south of windmill. Reference point - top of casing 2 feet above ground surface, at elevation 1,358 feet. 5/15/53, 9.5; 11/13/53, 12.0; 4/28/54, 11.7.

6S/2W-32R1 - Pierre Pourroy - In French Valley; 0.25 mile west and 900 feet north of intersection of Beeler and Thompson Roads. Reference point - top of casing 2.2 feet above ground surface, at elevation 1,370.92 feet. 5/15/53, 28.9; 11/13/53, 29.4; 4/28/54, 29.9.

6S/2W-33E1 - Pierre Pourroy - In French Valley; 0.77 mile north and 75 feet east of intersection of Beeler and Thompson Roads; at windmill. Reference point - top of casing 0.7 foot above ground surface, at elevation 1,378.07 feet. 5/15/53, 26.9; 11/12/53, 28.0; 4/28/54, 26.8.

6S/2W-34C1 - In French Valley; 0.44 mile southeast of well 27M1; at windmill tower. Reference point - top of wood floor 1.1 feet above ground surface. 5/15/53, 18.0; 11/12/53, 14.7.

6S/3W-26D1 - S. W. Reigle - Near Murrieta; 0.1 mile south of intersection of Highway 395 and Keller Road; 150 feet southeast of sheet metal house; outside watershed. Reference point - ground surface. 6/18/51, 26 (log).

6S/3W-26E1 - Alex Mahas - Near Murrieta; 0.35 mile south and 50 feet east of intersection of Highway 395 and Keller Road; in small building. Reference point - ground surface. Summer 1951, 22 (log).

6S/3W-31R1 - W. L. Moreno - Near Wildomar; 0.3 mile northeast of Catt Road (measured along dirt road) from intersection 2.2 miles east of Highway 71 (measured along Catt Road). Reference point - ground surface. 10/7/48, 15 (log).

6S/3W-35D1 - George D. Evans - Near Murrieta; 1.1 miles south and 0.24 mile east of intersection of Highway 395 and Keller Road; at windmill 275 feet east of house. Reference point - top of casing 0.5 feet above ground surface, at elevation 1,560 feet. 10/9/48, 36 (log); 4/19/54, 18.7.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

6S/3W-35D2 - George D. Evans - Near Murrieta; 10 feet west of well 35D1; at windmill tower. Reference point - top of casing 0.7 foot above ground surface. 4/19/54, 19.1.

6S/4W-21J1 - F. G. Perkins - Near Sedco; 0.15 mile northwest from Corydon Street (measured along Cereal Street) from intersection 0.28 mile southwest of Highway 71 (measured along Corydon Street); 75 feet southeast of building; outside watershed. Reference point - top of casing, at elevation 1,265.04 feet. 6/18/48, 130.0.

6S/4W-21R1 - I. P. Chappel - Near Sedco; 0.53 mile southwest of Highway 71 (measured along Corydon Street) and 50 feet southeast of Corydon Street; outside watershed. Reference point - top of 2-inch nipple, at elevation 1,266.89 feet. 6/18/48, 58.8; 11/24/48, 63.1; 4/21/53, 93.7; 7/6/53, 93.1.

6S/4W-22F1 - Sidney Kelsey - Near Sedco; 1,200 feet north and 750 feet east of intersection of Highway 71 and Corydon Street; at windmill outside watershed. Reference point - top of casing, at elevation 1,290.36 feet. 6/18/48, 16.2; 11/26/48, 16.4; 4/22/49, 17.3; 5/6/52, 17.7; 2/23/53, 18.1; 4/4/53, 19.4; 7/6/53, 18.1; 11/9/53, 17.8.

6S/4W-22G1 - Albert Kaznier - Near Sedco; 100 feet west and 50 feet south of intersection of Orange and Almond Streets; outside watershed. Reference point - top of casing, at elevation 1,422.78 feet. 6/18/48, 34.8; 11/26/48, 34.2; 4/22/49, 34.7; 5/16/52, 36.3; 2/24/53, 36.3; 4/21/53, 36.5; 11/19/53, 36.0.

6S/4W-22M1 - H. H. Hillebrand - Near Sedco; 750 feet southwest of Highway 71 (measured along Corydon Street), and 75 feet northwest of Corydon Street; outside watershed. Reference point - top of casing, at elevation 1,272.78 feet. 6/18/48, 163.5; 11/24/48, 172.1; 9/18/50, 173.5; 11/10/53, 171.5.

6S4W-23N1 - Fred Rathke - Near Sedco; 300 feet north and 300 feet west of intersection of Bundy Road and Cherry Street; west of tank tower; outside watershed. Reference point - top of casing, at elevation 1,410.04 feet. 6/18/48, 47.4; 11/26/48, 43.9; 4/22/49, 45.4; 5/16/52, 48.3; 2/23/53, 47.1; 4/21/53, 54.1; 11/9/53, 51.4; 4/19/54, 48.2.

6S/4W-26B1 - C. R. Dawson - Near Sedco; 0.67 mile east and 500 feet south of intersection of Orange Street and Bundy Canyon Road; southeast of house. Reference point - top of casing 1.3 feet above ground surface, at elevation 1,409.13 feet. Note: Measurements are from owner's records except as indicated. 6/1/48, 48.2; 7/1/48, 48.4; 8/1/48, 49.0, 9/1/48, 49.3; 10/1/48, 49.3; 11/1/48, 49.5; 12/1/48, 49.2; 1/1/49, 49.4; 2/1/49, 49.6; 3/1/49, 49.8; 4/1/49, 49.7; 5/15/49, 50.8; 6/1/49, 50.5; 7/1/49, 51.9; 8/1/49, 51.6; 9/1/49, 52.0; 10/1/49, 51.5; 11/1/49, 51.5; 12/1/49, 51.8; 1/1/50, 51.5; 2/1/50, 51.7; 3/1/50, 51.8; 4/1/50, 52.0; 5/1/50, 52.3; 6/1/50, 52.7; 7/1/50, 53.3; 8/1/50, 53.1; 9/15/50, 53.7; 10/1/50, 53.7; 11/1/50, 53.7; 12/1/50, 53.8; 11/1/51, 54.0; 2/1/51, 54.1; 3/1/51, 54.2; 4/1/51, 54.3; 5/1/51, 54.7; 6/1/51, 55.2; 7/1/51, 57.0; 8/1/51, 55.3; 9/1/51, 54.3; 10/1/51, 55.3; 11/1/51, 55.2; 12/1/51, 55.3; 1/1/52, 55.2; 2/1/52, 54.8; 3/1/52, 53.8; 4/1/52, 51.6; 5/1/52, 49.6; 6/1/52, 49.8; 7/1/52, 49.6; 8/1/52, 48.7; 9/1/52, 48.4; 10/1/52, 47.1; 11/1/52, 47.0; 12/15/52, 47.1; 1/1/53, 47.0; 2/1/53, 47.3; 3/1/53, 47.5; 4/1/53, 48.4; 5/6/53, 48.6 (DWR); 7/7/53, 50.4 (DWR); 11/9/53, 52.1 (DWR); 4/19/54, 50.4 (DWR).

6S/4W-26E1 - Harry Davis - Near Sedco; 0.4 mile south and 75 feet west of intersection of Bundy Canyon Road and Cherry Street; outside watershed. Reference point - lower lip of measuring pipe 0.3 foot above ground surface, at elevation 1,362 feet. 2/20/48, 53.4 (Calif. Elec. Power Co.); 5/4/51, 55.6; (Calif. Elec. Power Co.); 11/9/53, 58.9; 4/19/54, 47.5.

6S/4W-26L1 - L. M. Carter - Near Sedco; 100 feet west and 25 feet south of intersection of White and Walnut Streets. Reference point - top of casing 0.67 foot above ground surface, at elevation 1,391.28 feet. 6/18/48, 61.8; 11/26/48, 59.6; 4/21/49, 58.2; 5/16/52, 65.8; 2/23/53, 63.5; 4/21/53, 66.5.

6S/4W-26M1 - Ben Edwards - Near Sedco; 600 feet east and 100 feet south of intersection of Orange and Walnut Streets. Reference point - hole in pump base, at elevation 1,350.96 feet. 6/18/48, 39.8; 11/26/48, 32.3; 4/21/49, 35.3; 4/21/53, 37.7; 11/9/53, 39.3.

6S/4W-26M2 - de Leon - Near Sedco; 660 feet north and 140 feet west of intersection of Grove and Cherry Streets. Reference point - ground surface. 7/15/53, 54.3.

6S/4W-27C1 - A. Brenner - Near Sedco; 900 feet north and 600 feet west of intersection of Canyon Drive and Orchard Street, 50 feet east of house; outside watershed. Reference point - hole in pump base 0.25 foot above ground surface, at elevation 1,307.55 feet. 6/18/48, 176.0; 11/26/48, 173.6; 4/21/49, 174.5; 9/18/50, 191.5; 5/16/52, 177.9; 4/21/53, 184.7; 11/9/53, 202.4.

6S/4W-27G1 - Clyde Blakely - Near Sedco; 100 feet east and 50 feet north of intersection of Walnut and Orchard Streets; outside watershed. Reference point - hole in pump base, at elevation 1,328.72 feet. 6/18/48, 175.0; 11/26/48, 180.8; 4/21/49, 171.7; 4/7/53, 182.3; 7/6/53, 192.8; 11/9/53, dry.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

6S/4W-27M1 - John P. Garrett - Near Sedco; 0.21 mile south and 300 feet east of intersection of Highway 71 and Walnut Street; outside watershed. Reference point - top of casing 0.7 foot above ground surface, at elevation 1,309.40 feet. 11/9/53, 122.0; 4/19/54, 123.5.

6S/4W-27N2 - William Wright - Near Sedco; 0.16 mile southeast of Bryant Street (measured along Palomar Street) and 75 feet southwest of Palomar Street; outside watershed. Reference point - lower lip of pipe 1.3 feet above ground surface, at elevation 1,292.17 feet. 6/7/50, 64 (log); 7/16/53, 66.4; 11/12/53, 66.3; 4/19/54, 64.2.

6S/4W-28B1 - I. P. Chappel - Near Sedco; 1,850 feet northeast of Palomar Street (measured along Corydon Street) and 300 feet northwest of Corydon Street; 75 feet southeast of barn; outside watershed. Reference point - top of casing, at elevation 1,264.07 feet. 6/18/48, 51.6; 11/24/48, 57.4; 4/19/49, 51.3; 4/21/53, 86.3; 11/10/53, 89.5.

6S/4W-28D1 - Charles de Boer - Near Sedco; 0.45 mile northwest of Corydon Street (measured along Palomar Street extended) and 100 feet southwest of Palomar Street extended; outside watershed. Reference point - ground surface. 3/17/47, 21.3 (Calif. Elec. Power Co.).

6S/4W-28H1 - Near Sedco; 1,400 feet southeast of Corydon Street (measured along Palomar Street) and 1,050 feet northeast of Palomar Street; at windmill; outside watershed. Reference point - top of casing, at elevation 1,289.34 feet. 6/18/48, 48.4; 11/24/48, 49.0; 4/21/49, 50.6; 4/20/53, 67.3.

6S/4W-28L1 - L. Kinnster - Near Sedco; 1,150 feet northeast of Grand Avenue (measured along Corydon Street) and 200 feet northwest of Corydon Street; at windmill; outside watershed. Reference point - top of wood floor, at elevation 1,279.18 feet. 6/18/48, 12.4; 11/24/48, 13.3; 4/21/49, 12.3; 4/21/53, 11.2; 7/6/53, 15.9; 11/10/53, 15.7.

6S/4W-28M1 - W. W. Hillis - Near Sedco; 360 feet northwest of Corydon Street (measured along Grand Avenue) and 100 feet southwest of Grand Avenue; outside watershed. Reference point - hole in pump base, at elevation 1,297.38 feet. 6/18/48, 25.4; 11/24/48, 26.2; 4/21/49, 26.5; 5/15/52, 25.2; 2/24/53, 24.9; 4/20/53, 23.1; 11/10/53, 24.5.

6S/4W-28PI - Near Sedco; 600 feet southeast of Corydon Street (measured along Grand Avenue) and 35 feet northeast of Grand Avenue; at windmill; outside watershed. Reference point - top of casing, at elevation 1,300.46 feet. 6/18/48, 29.9; 11/24/48, 27.1; 4/7/53, 31.8; 4/20/53, 29.0; 11/10/53, 33.0.

6S/4W-28P2 - V. Cleveland - Near Sedco; 1,550 feet southeast of Corydon Street (measured along Grand Avenue) and 240 feet southwest of Grand Avenue; outside watershed. Reference point - top of wood floor, at elevation 1,301.59 feet. 6/18/48, 28.8; 11/24/48, 25.6; 4/20/53, 32.8; 11/10/53, 33.5; 4/20/54, 32.0.

6S/4W-28R1 - Near Sedco; 1,900 feet northeast of Grand Avenue (measured along Bryant Street) and 500 feet southeast of Bryant Street; at windmill; outside watershed. Reference point - top of casing, at elevation 1,293.40 feet. 6/18/48, 38.4; 11/24/48, 39.4; 4/21/49, 40.4; 5/10/52, 45.4; 2/24/53, 47.0; 3/6/53, 47.0; 4/7/53, 48.2; 7/6/53, 47.8.

6S/4W-33A2 - J. E. Tarr - Near Wildomar; 850 feet southeast of Bryant Street (measured along Grand Avenue), and 150 feet northeast of Grand Avenue; outside watershed. Reference point - top of concrete floor 0.4 foot above ground surface, at elevation 1,304.97 feet. 6/18/48, 50.8; 11/16/50, 57.2 (R.C.F.C.&W.C.D.); 4/23/53, 58.0; 11/10/53, 60.0; 4/20/54, 58.5.

6S/4W-33B1 - L. H. Kingsland - Near Wildomar; 200 feet southeast of Bryant Street (measured along Grand Avenue) and 100 feet southwest of Grand Street; outside watershed. Reference point - top of casing 0.74 foot above ground surface, at elevation 1,318.73 feet. 6/18/48, 53.4; 4/21/49, 53.8; 4/20/53, 58.5; 11/10/53, 58.8; 4/20/54, 60.5.

6S/4W-33H1 - Near Wildomar; 0.31 mile northwest of Wesley Street (measured along Grand Avenue), and 120 feet southwest of Grand Avenue; 30 feet southwest of house. Reference point - top of casing 0.3 foot above ground surface, at elevation 1.308 feet. 4/20/54, 58.3.

6S/4W-33H3 - Blake - Near Wildomar; 0.43 mile southeast of Bryant Street (measured along Grand Avenue) and 220 feet southwest of Grand Avenue. Reference point - top of casing 0.5 foot above ground surface. 4/23/53, 57.1.

6S/4W-33H4 - J. T. Hutchinson - Near Wildomar; 0.43 mile southeast of Bryant Street (measured along Grand Avenue), and 130 feet northeast of Grand Avenue. Reference point - top of casing 0.4 foot above ground surface, at elevation 1,300 feet. 4/23/53, 45.9; 4/20/54, 53.4.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

6S/4W-33H5 - Mary Turku - Near Wildomar; 0.38 mile southeast of Bryant Street (measured along Grand Avenue) and 100 feet northeast of Grand Avenue. Reference point - top of casing 0.07 foot above ground surface, at elevation 1,295.54 feet. 4/23/53, 51.0; 11/12/53, 49.5; 4/20/54, 51.0.

6S/4W-33H6 - Antonio Stellino - Near Wildomar; 0.59 mile southeast of Bryant Street (measured along Grand Avenue) and 0.15 mile southwest of Grand Avenue; open casing at power pole. Reference point - top of casing at ground surface. 4/23/53, 32.9.

6S/4W-34B1 - Bill Stuart - Near Wildomar; 0.4 mile northwest of Orange Street (measured along Highway 71) and 120 feet northeast of Highway 71; in open field. Reference point - top of concrete floor 0.6 foot above ground surface, at elevation 1,286.32 feet. 4/22/53, 67.5; 7/16/53, 68.0; 11/12/53, 69.9; 4/14/54, 68.1.

6S/4W-34D1 - E. W. Robison - Near Wildomar; 0.38 mile northwest of Wesley Street (measured along Highway 71) and 750 feet southwest of Highway 71. Reference point - top of casing collar 0.5 foot above ground surface. 11/12/53, 91.5.

6S/4W-34E1 - Near Wildomar; 0.16 mile northwest of Wesley Street (measured along Grand Avenue), and 100 feet southwest of Grand Avenue; at windmill. Reference point - top of wood cover 1.3 foot above ground surface, at elevation 1,292.61 feet. 4/23/53, 61.0; 4/20/54, 62.9.

6S/4W-34E3 - S. M. Morrison - Near Wildomar; 520 feet northwest of well 34E1; at windmill 40 feet south of house. Reference point - top of casing 0.35 foot above ground surface, at elevation 1,301.18 feet. 6/18/48, 55.9; 11/24/48, 56.0; 5/16/52, 68.5; 2/24/53, 70.4; 4/23/53; 66.9; 11/12/53, 64.9; 4/19/54, 66.0.

6S/4W-34E4 - Don Trenary - Near Wildomar; 650 feet northwest of Wesley Street (measured along Grand Avenue) and 170 feet northeast of Grand Avenue; northwest of house. Reference point - top of casing, at elevation 1,287.47 feet. 6/18/48, 50.6; 11/24/48, 46.6; 4/23/53, 58.0.

6S/4W-34E5 - Near Wildomar; 400 feet northeasterly of well 34E4. Reference point - top of casing 0.5 foot above ground surface. 4/23/53, 63.6.

6S/4W-34E6 - Near Wildomar; 300 feet southeasterly of well 34E4; open casing in open field. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,287 feet. 3/6/53, 61.4; 4/7/53, 59.9; 4/23/53, 59.3; 8/5/53, 54.6; 9/1/53, 54.6; 10/5/53, 54.9; 1/7/54, 55.1; 2/3/54, 55.0; 4/2/54, 55.1; 4/19/54, 55.1.

6S/4W-34G1 - C. J. Spore - Near Wildomar; 700 feet southeast of Wesley Street (measured along Union Avenue) and 150 feet northeast of Union Avenue; open casing. Reference point - top of wood cover at ground surface, at elevation 1,258.62 feet. 11/29/48, 25.9; 4/21/49, 29.0; 4/23/53, 33.8; 11/12/53, 35.2; 4/20/54, 35.4.

6S/4W-34G2 - C. J. Spore - Near Wildomar; 110 feet northeast of well 34G1. Reference point - top of casing 2.8 feet above ground surface. 4/23/53, 34.6.

6S/4W-34G3 - C. J. Spore - Near Wildomar; 210 feet northwest of well 34G1; open casing. Reference point - top of casing 2 feet above ground surface. 2/19/53, 34.0; 4/23/53. 34.5.

6S/4W-34J2 - Henry Langstraat - Near Wildomar; 0.07 mile southeast of Gruwell Street (measured along Front Street) and 100 feet northeast of Front Street. Reference point - top of the casing 0.91 foot above ground surface, at elevation 1,253.10 feet. 4/28/53, 43.3; 3/4/54, 40.

6S/4W-34J3 - Near Wildomar; 0.05 mile northwest of Central Avenue (measured along Front Street), and 50 feet northeast of Front Street. Reference point - 2 feet above ground surface, at elevation 1,250 feet. 2/19/53, 36.1; 4/28/53, 35.1; 4/21/54, 35.6.

6S/4W-34J4 - Bob and Lea Phillips - Near Wildomar; 0.1 mile northwest of Central Avenue (measured along Darby Street) and 150 feet northeast of Darby Street. Reference point - top of casing 0.98 foot above ground surface, at elevation 1,244.63 feet. 4/28/53, 31.8.

6S/4W-34J5 - Arthur H. Cooper - Near Wildomar; 370 feet northwest of well 34J4. Reference point - top of casing 0.6 foot above ground surface, at elevation 1,248 feet. 4/28/53, 29.8; 11/12/53, 32.1; 4/21/54, 31.1.

6S/4W-34J6 - Dr. Hunter - Near Wildomar; 0.23 mile northwest of Central Avenue (measured along Darby Street) and 50 feet southwest of Darby Street. Reference point - top of concrete casing 1 foot above ground surface. 4/28/53, 47.1.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

6S/4W-34J7 - John Fitzpatrick - Near Wildomar; 75 feet southeast and 150 feet northeast of intersection of Gruwell and Darby Streets. Reference point - top of casing at ground surface, at elevation 1,252 feet. 4/28/53, 31.2; 11/12/53, 32.7; 4/20/54, 35.4.

6S/4W-34J8 - Arthur H. Cooper - Near Wildomar; 190 feet northwest of well 34J4. Reference point - at top of casing 0.67 foot above ground surface. 4/28/53, 29.7.

6S/4W-34J9 - Near Wildomar; 50 feet northeast and 50 feet southeast of intersection of Front and Elm Streets. Reference point - top of casing 0.67 foot above ground surface, at elevation 1,252 feet. 4/28/53, 33.0; 11/13/53, 32.5.

6S/4W-34J10 - Allen - Near Wildomar; 60 feet southeast of well 34J6. Reference point - lower lip of pipe 1 foot above ground surface. 4/28/53, 30.1.

6S/4W-34K1 - G. E. Parry - Near Wildomar; 1,500 feet southeast of Wesley Street (measured along Grand Avenue) and 200 feet northeast of Grand Avenue; in barn. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,277.15 feet. 11/29/48, 46.0; 4/21/49, 46.8; 5/16/52, 53.1; 2/24/53, 57.8; 11/13/53, 55.8.

6S/4W-34L1 - Near Wildomar; 200 feet northwest and 200 feet northeast of intersection of Grand and Wilson Avenues. Reference point - top of casing 0.45 foot above ground surface, at elevation 1,282.19 feet. 4/27/53, 61.4.

6S/4W-34M1 - Lord - Near Wildomar; 350 feet southwest and 75 feet southeast of intersection of Grand Avenue and Wesley Street; in pump house. Reference point - top of wood cover 0.5 foot above ground surface, at elevation 1,300 feet. 11/12/53, 80.1; 4/19/54, 78.9.

6S/4W-34P1 - C. C. Karl - Near Wildomar; 0.2 mile southwest of Grand Avenue (measured along Wilson Avenue) and 60 feet northwest of Wilson Avenue. Reference point - top of casing at ground surface, at elevation 1,318 feet. 4/27/53, 75.5; 11/13/53, 83.2.

6S/4W-34Q1 - Near Wildomar; 190 feet southwest and 100 feet southeast of intersection of Gruwell and Dunn Streets; at windmill. Reference point - top of casing at ground surface, at elevation 1,262 feet. 5/27/53, 38.7; 4/20/54, 40.5.

6S/4W-34Q2 - C. E. Bittikofer - Near Wildomar; 50 feet northeast and 50 feet northwest of intersection of Grand Avenue and Gruwell Street. Reference point - top of pump base 0.17 foot above ground surface, at elevation 1,278 feet. 4/24/53, 57.4; 11/13/53, 51.4; 4/20/54, 52.8.

6S/4W-34Q3 - Gruwell - Near Wildomar; 200 feet southwest and 100 feet northwest of intersection of Grand Avenue and Gruwell Street. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,292 feet. 4/27/53, 74.5; 11/13/53, 64.0; 4/20/54, 69.3.

6S/4W-34Q4 - Frank E. Collier - Near Wildomar; 350 feet southwest and 200 feet southeast of intersection of Grand Avenue and Gruwell Street. Reference point - top of casing 0.33 foot above ground surface, at elevation 1,266.56 feet. 2/3/27, 46.4; 4/24/53, 49.5; 11/13/53, 50.9; 4/20/54, 51.5.

6S/4W-34Q5 - Near Wildomar; 300 feet southeast and 100 feet northeast of intersection of Grand Avenue and Gruwell Street. Reference point - top of floor at ground surface. 4/27/53, 46.3.

6S/4W-34Q6 - Russel O. Freeman - Near Wildomar; 300 feet southwest and 200 feet southeast of intersection of Gruwell and Dunn Streets; 50 feet west of house. Reference point - ground surface. 7/28/51, 41 (log).

6S/4W-34R1 - Guy S. Clark - Near Wildomar; 75 feet northeast and 30 feet southeast of intersection of Grand Avenue and Elm Street. Reference point - top of wood cover, at elevation 1,261.31 feet. 11/29/48, 38.0; 4/21/49, 37.9; 5/16/52, 43.5; 2/23/53, 41.7; 4/7/53, 45.8; 4/27/53, 44.4; 7/6/53, 45.8; 11/13/53, 47.2.

6S/4W-34R2 - Guy S. Clark - Near Wildomar; 150 feet northeast and 150 feet southeast of intersection of Grand Avenue and Elm Street; at windmill. Reference point - top of guide bar 0.5 foot above ground surface, at elevation 1,260 foot. 3/6/53, 40.9; 4/7/53, 41.7; 4/27/53, 41.1; 8/5/53, 43.9; 9/1/53, 44.4; 10/5/53, 44.6; 11/13/53, 44.6; 1/7/54, 44.6; 2/3/54, 44.1; 4/2/54, 43.7; 4/21/54, 44.1.

6S/4W-34R3 - Guy S. Clark - Near Wildomar; 100 feet northwest and 50 feet southwest of intersection of Central Avenue and Olive Street. Reference point - ground surface 0.5 foot above ground surface. 4/5/51, 41 (log).

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

6S/4W-34R4 - Near Wildomar; 150 feet southeast and 100 feet northeast of intersection of Grand and Central Avenues; at windmill. Reference point - top of casing at ground surface. 4/27/53, 40.5.

6S/4W-34R7 - Near Wildomar; 280 feet northwest and 90 feet southwest of intersection of Dunn and Elm Streets. Reference point - top of casing 0.67 foot above ground surface, at elevation 1,359 feet. 4/27/52, 39.8.

6S/4W-34R8 - B. L. Freeman - Near Wildomar; 100 feet northwest and 100 feet southwest of intersection of Elm and Olive Streets. Reference point - top of casing, 0.67 foot above ground surface, at elevation 1,258 feet. 4/28/53, 42.5; 4/21/54, 42.6.

6S/4W-34R9 - Orcville Grow - Near Wildomar; 200 feet southeast and 190 feet northeast of intersection of Central Avenue and Olive Street. Reference point - top of casing at ground surface. 4/29/53, 31.5.

6S/4W-35C1 - Near Wildomar; 0.5 mile northeast of Highway 71 (measured along Central Avenue), and 90 feet southeast of Central Avenue, at windmill. 11/13/53, dry; 4/21/54, dry.

6S/4W-35D1 - Charles B. Withrow - Near Wildomar; 180 feet south and 150 feet east of intersection of Orange Street and Baxter Road; in metal building. Reference point - hole in casing 0.33 foot above ground surface, at elevation 1,305.40 feet. 4/4/52, 50 (log); 4/22/53, 62.5; 11/13/53, 56.4; 4/20/54, 57.3; 11/23/54, 60.5.

6S/4W-35F1 - H. E. Blackforn - Near Wildomar; 0.3 mile northeast of Highway 71 (measured along Central Avenue) and 100 feet southeast of Central Avenue; at windmill. Reference point - top of casing, at elevation 1,285.62 feet. 11/29/48, 33.8; 4/29/53, 37.8; 7/6/53, 38.2; 11/13/53, 39.5; 4/21/54, 39.2.

6S/4W-35L1 - Near Wildomar; 0.14 mile southeast of Central Avenue (measured along Highway 71) and 100 feet southwest of Highway 71. Reference point - top of pump base 1.0 foot above ground surface, at elevation 1,253.39 feet. 4/29/53, 46.4.

6S/4W-35M1 - Wildomar School - In Wildomar; south corner of intersection of Highway 71 and Central Avenue; in northwest corner of schoolyard. Reference point - (a) top of steel clamp 0.1 foot above ground surface, at elevation 1,256.02 feet (10/27/26 through 3/7/27); (b) top of casing at ground surface, at elevation 1,255.94 feet (11/3/45 to present). 10/27/26, 47.4 (Vail Co.); 11/4/26, 47.7 (Vail Co.); 2/3/27, 46.5 (Vail Co.); 3/7/27, 43.7 (Vail Co.); 11/3/45, 45.0; 11/29/48, 45.8; 4/21/49, 45.0; 5/16/52, 52.3; 2/23/53, 50.8; 4/28/53, 53.3; 11/3/53, 56.6; 4/21/54, 53.0.

6S/4W-35M2 - Stephens - Near Wildomar; 260 feet southeast and 200 feet northeast of intersection of Front Street and Central Avenue. Reference point - top of casing 0.04 foot above ground surface, at elevation 1,245.71 feet. 10/29/52, 30.7; 1/20/53, 34.5; 4/28/53, 31.2; 11/13/53, 33.5; 4/21/54, 33.7.

6S/4W-35M3 - Thomas L. Sayer - Near Wildomar; 300 feet northeast and 150 feet northwest of intersection of Front Street and Central Avenue. Reference point - top of casing 0.8 foot above ground surface. 4/28/53, 34.5.

6S/4W-35M4 - Turner - Near Wildomar; 150 feet northwest and 100 feet southwest of intersection of Highway 71 and Central Avenue. Reference point - top of casing 0.5 foot above ground surface. 11/3/45, 25.0 (owner).

6S/4W-35N1 - Orville Grow - Near Wildomar; 0.25 mile northeast and 0.25 mile southeast of intersection of Grand and Central Avenues; in open field, 850 feet east of barn. Reference point - top of casing 2.0 feet above ground surface, at elevation 1,235.6 feet. 4/29/53, 29.8; 9/1/53, 42.0.

6S/4W-35P1 - Mrs. Joan Kelly - Near Wildomar; 0.3 mile southeast of Central Avenue (measured along Highway 71), and 100 feet southwest of Highway 71; at windmill. Reference point - top of wood floor 1.0 foot above ground surface, at elevation 1,243.3 feet. 4/29/53, 40.5; 11/13/53, 44.8; 3/4/54, 40.8.

6S/4W-35P2 - May Hillman - Near Wildomar; 0.2 mile southwest and 0.27 mile southeast of intersection of Highway 71 and Central Avenue; in wood pump house. Reference point - hole in pump base, at elevation 1,233.58 feet. Note: Measurements from Vail Company records. 10/27/26, 27.1; 2/3/27, 24.9.

6S/4W-35Q1 - Thomas Wilks - Near Wildomar; 0.6 mile southeast of Central Avenue (measured along Highway 71) and 0.1 mile northeast of Highway 71; at windmill tower. Reference point - top of elbow on discharge pipe 1.0 foot above ground surface, at elevation 1,245.90 feet. 2/11/53, 2.8; 4/22/53, 1.5.

6S/4W-36C1 - Near Wildomar; 0.9 mile east and 200 feet south of intersection of Baxter Road and Central Avenue. Reference point - top of casing 0.4 foot above ground surface. 11/13/53, 43.6.

6S/4W-36D1 - H. A. Smith - Near Wildomar; 0.48 mile east and 150 feet south of intersection of Central Avenue and Baxter Road; 50 feet east of adobe house. Reference point - top of casing, at elevation 1,405 feet. 11/29/48, 35.6; 5/16/52, 36.8; 2/23/53, 35.6; 4/22/53, 41.0; 4/20/54, 36.9.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/1E-4F1 - Ed Shockley - In Weber Valley; 3.4 mile northeast of Highway 79 (measured along dirt road) from intersection 2.2 mile southeast of Sage (measured along Highway 79); 30 feet northwest of owner's house; under windmill tower. Reference point - hole in plank cover 1.4 feet above ground surface, at elevation 2,771 feet. 11/18/53, 29.7; 5/4/54, 27.9.

7S/1E-4G1 - Ed Shookly - In Weber Valley; 3.6 miles northeast of Highway 79 (measured along dirt road) from intersection 2.2 miles southeast of Sage (measured along Highway 79); 150 feet northeast of barn. Reference point - top of casing 2.7 feet above ground surface, at elevation 2,788 feet. 11/18/53, 32.3; 5/4/54, 30.9.

7S/1E-4L1 - Ed Shookly - In Weber Valley; 3.2 miles northeast of Highway 79 (measured along dirt road) from intersection 2.2 miles southeast of Sage (measured along Highway 79); 750 feet east of road and 100 feet north of fence. Reference point - top of casing 1.5 feet above ground surface, at elevation 2,743 feet. 11/18/53, 12.9; 5/4/53, 10.7.

7S/1E-4P1 - Campbell - In Weber Valley; 600 feet east of well 4P2. Reference point - top of casing 1.3 feet above ground surface. 11/18/53, 4.7; 5/4/54, 2.8.

7S/1E-4P2 - Campbell - In Weber Valley; 3.0 miles northeast of Highway 79 (measured along dirt road) from intersection 2.2 miles southeast of Sage (measured along Highway 79); at windmill east of dirt road. Reference point - top of plank cover 1.8 feet above ground surface, at elevation 2,736 feet. 11/18/53, 19.3; 5/4/54, 21.9.

7S/1E-6P1 - Duncan Industries - East of Sage; 0.9 mile east of Highway 79 (measured along dirt road) from intersection at Sage; 600 feet south of road; 130 feet south of reservoir; at base of power line pole. Reference point - top of casing 0.5 foot above ground surface, at elevation 2,392 feet. 11/18/53, 41.3; 5/4/54, 41.6.

7S/1E-7A1 - S. T. Creech - East of Sage; 1.6 miles east of Highway 79 (measured along dirt road) from intersection at Sage; at windmill 300 feet south of barn on Circle C Ranch. Reference point - top of casing 0.75 foot above ground surface, at elevation 2,491 feet. 11/16/53, 14.

7S/1E-7A2 - S. T. Creech - East of Sage; 1.7 miles east of Highway 79 (measured along dirt road) from intersection at Sage; 300 feet south of main residence of Circle C Ranch in east end of white building. Reference point - top of casing 0.7 foot above ground surface, at elevation 2,512 feet. 11/16/53, 16.3.

7S/1E-7A3 - S. T. Creech - East of Sage; 1.7 miles east of Highway 79 (measured along dirt road) from intersection at Sage; 30 feet north of main house on Circle C Ranch; open casing. Reference point - top of casing 1.5 feet above ground surface, at elevation 2,521 feet. 11/16/53, 15.8.

7S/1E-7A4 - S. T. Creech - East of Sage; 300 feet southwest of well 7A2. Reference point - top of casing 1.5 feet above ground surface, at elevation 2,510 feet. 11/16/53, 9.2.

7S/1E-7C1 - Duncan Industries - East of Sage; Tucalota Ranch; 600 feet south of well 6P1. Reference point - top of casing at ground surface, at elevation 2,382 feet. 11/18/53, 28.9; 5/4/54, 28.2.

7S/1E-7D1 - Duncan Industries - East of Sage; Tucalota Ranch; 0.4 mile east of Highway 79 (measured along dirt road) from intersection at Sage; at windmill beside foreman's house. Reference point - top of casing 1 foot above ground surface, at elevation 2,359 feet. No date, 45 (log); 11/18/53, 25.5; 5/4/54, 17.9.

7S/1E-7D2 - Duncan Industries - East of Sage; Tucalota Ranch; 0.4 mile east of Highway 79 (measured along dirt road) from intersection at Sage; well in corrugated metal shed, 600 feet west of well 7D3. Reference point - measuring pipe 1.3 feet above ground surface, at elevation 2,342 feet. 5/19/53, 8 (log); 11/18/53, 11.7.

7S/1E-7E1 - Duncan Industries - East of Sage; 0.4 mile east of Highway 79 (measured along dirt road) from intersection at Sage; 400 feet south of Tucalota Ranch house; test hole with capped casing. Reference point - top of casing 1.4 feet above ground surface at elevation 2,333 feet. 11/18/53, 9.5; 5/4/54, 7.9.

7S/1E-7E2 - Duncan Industries - East of Sage; 15 feet south of well 7E1. Reference point - hole in board cover at ground surface, at elevation 2,332 feet. 11/19/53, 9.5; 5/4/54, 7.7.

7S/1E-7E3 - Duncan Industries - East of Sage; 225 feet southeast of well 7D2. Reference point - hole near top of casing 1.3 feet above ground surface, at elevation 2,341 feet. 11/18/53, 12; 5/4/54, 9.8.

7S/1E-8D1 - Bill Ruckle - East of Sage; 300 feet southeast of well 7A2. Reference point - hole in board cover at ground surface, at elevation 2,520 feet. 11/16/53, 9.7.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/1W-6G1 - John Kazaroff - In Los Alamos Valley; 0.85 mile east of Warren Road (measured along dirt road) from intersection 0.5 mile north of intersection of Warren and Benton Road (measured along Warren Road); in wood pump house 30 feet north of dirt road. Reference point - top of casing 0.1 foot above ground surface. 10/26/50, 42 (log); 5/20/53, 48.9.

7S/1W-6H1 - John Kazaroff - In Los Alamos Valley; 0.3 mile northeast of well 6G1; at windmill 300 feet northeast of house. Reference point - ground surface. 2/10/50, 100 (log).

7S/1W-7E1 - J. N. Bashaw - In Los Alamos Valley; 200 feet south and 50 feet east of intersection of Warren and Benton Roads. Reference point - top of casing 0.6 foot above ground surface, at elevation 1,480 feet. 5/20/53, 37.1; 11/19/53, 39.3; 4/23/54, 38.9.

7S/1W-8L1 - Bessie Wilson - Near Sage; 2.3 miles northeast of intersection of Warren and East Benton Roads; 20 feet east of East Benton Road and 400 feet southeast of house. Reference point - hole in side of wooden pit 1.5 feet above ground surface, at elevation 1,685 feet. 5/26/53, 18.9; 11/19/53, 22.8; 5/13/54, 18.5.

7S/1W-8L2 - Bessie Wilson - Near Sage; 0.2 mile northeast of well 8L1; 200 feet south of East Benton Road near Tucalota Creek. Reference point - top of casing 2.0 feet above ground surface, at elevation 1,690 feet. 5/26/53, 5.6; 11/19/53, 12.9; 5/13/54, 5.7.

7S/1W-10R1 - G. W. Millholland - Near Sage; 0.25 mile north of East Benton Road (measured along dirt road) from intersection 2.9 miles west of Sage (measured along East Benton Road) at windmill 70 feet north of shop building. Reference point - top of concrete pit 0.3 foot above ground surface. 5/26/53, 38.5; 11/19/53, 38.1.

7S/1W-12K1 - Duncan Industries - Near Sage; 0.4 mile southwest of Sage (measured along East Benton Road); 200 feet south of East Benton Road. Reference point - hole in pump base 1.6 feet above ground surface, at elevation 2,261 feet. 11/25/53, 20.0.

7S/1W-14A1 - Cyrus J. McDaniel - Near Sage; 0.3 mile north of East Benton Road (measured along dirt road) from intersection 1.8 miles southwest of Sage (measured along East Benton Road); at windmill 150 feet south of house. Reference point - top of casing 1 foot above ground surface, at elevation 2,160 feet. 11/25/53, 19.5; 5/13/54, 20.4.

7S/1W-18E1 - Near Sage; at windmill 1.1 miles north and 150 feet east of intersection of Warren and East Benton Roads. Reference point - top of concrete pit 0.6 foot above ground surface, at elevation 1,612 feet. 5/26/53, 33.9; 11/19/53, 39.8; 4/28/54, 29.5.

7S/1W-18J1 - William Willis - Near Sage; 1.1 miles northeast of Warren Road (measured along East Benton Road); 250 feet north of East Benton Road and 100 feet northwest of house. Reference point - top of concrete cover 1.5 feet above ground surface, at elevation 1,672 feet. 11/19/53, 21.8; 5/13/54, 18.3.

7S/1W-18M1 - Near Sage; 0.42 mile north and 40 feet east of intersection of East Benton and Warren Roads; at windmill 60 feet southwest of old school building. Reference point - top of pipe clamps 1.7 foot above ground surface, at elevation 1,578 feet. 5/26/53, 24.6; 11/19/53, 27.5; 4/28/54, 20.6.

7S/1W-18Q1 - Vail Company - Near Sage; 0.6 mile east of Warren Road (measured along East Benton Road); 50 feet south of East Benton Road. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,593 feet. 5/26/53, 18.8; 8/27/53, 19.8; 11/19/53, 21.9; 5/13/54, 18.7.

7S/1W-18Q2 - Vail Company - Near Sage; at windmill 15 feet west of well 18Q1. Reference point - hole in casing 2.5 feet above ground surface, at elevation 1,593 feet. 8/27/53, 21.8; 11/19/53, 25.1.

7S/1W-30N1 - Vail Company - In Long Valley; map location only, see location of wells plate. Reference point - top of casing 1 foot above ground surface, at elevation 1,438 feet. 3/4/53, 16.0; 5/19/53, 17.4; 11/20/53, 16.3; 4/23/54, 16.4.

7S/2W-1F1 - Batte - In Los Alamos Valley; 0.55 mile north of Benton Road (measured along west line of section 1) and 0.4 mile northeast along Tucalota Creek; at windmill on north side of creek bed. Reference point - top of casing 2.0 feet above ground surface. 5/20/53, 34.7.

7S/2W-2M1 - A. C. Robertson - In Los Alamos Valley; at windmill 1.28 miles east of Washington Avenue and 20 feet south of Benton Road. Reference point - top of casing 0.4 foot above ground surface, at elevation 1,402.58 feet. 5/20/53, 11.7; 11/13/53, 13.5; 4/28/54, 14.9.

7S/2W-2P1 - A. C. Robertson - In Los Alamos Valley; at windmill 1.87 miles east of Washington Avenue and 0.2 mile southwest of Benton Road. Reference point - top of casing 1.1 feet above ground sruface, at elevation 1,411 feet. 5/20/53, 14.9; 11/13/53, 17.5; 4/28/54, 17.0.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/2W-2P2 - A. C. Robertson - In Los Alamos Valley, at windmill 1.87 miles easterly of Washington Avenue and 100 feet west of Benton Road. Reference point - top of concrete slab 0.5 foot above ground surface, at elevation 1,413.04 feet. 5/20/53, 17.0; 11/13/53, 18.7; 4/28/54, 18.4.

7S/2W-3H1 - A. C. Robertson - In Los Alamos Valley; 0.75 mile east of Washington Avenue and 250 feet northeast of Benton Road; 50 feet northeast of barn. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,438.84 feet. 5/20/53, 52.0; 11/13/53, 52.5; 4/28/54, 51.3.

7S/2W-3J1 - Harold Sewell - In Los Alamos Valley; 0.75 mile east of Washington Avenue and 30 feet south of Benton Road; in open field 125 feet north of house. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,434.72 feet. 5/20/53, 55.0; 11/13/53, 62.3; 4/28/54, 56.1.

7S/2W-3L1 - M. A. Nicolas - In Los Alamos Valley; 0.25 mile south and 0.25 mile east of intersection of Washington Avenue and Benton Road. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,377 feet. 4/5/54, 6.6.

7S/2W-4D1 - Fred Pourroy - In Los Alamos Valley; 0.22 mile east of Beeler Road and 300 feet south of Thompson Road extended; at windmill 25 feet northeast of house. Reference point - top of wood cover 0.5 foot above ground surface, at elevation 1,389.42 feet. 5/18/53, 40.7; 11/13/53, 40.9; 4/28/54, 40.0.

7S/2W-4J1 - M. A. Nicolas - In Los Alamos Valley; 0.1 mile south of Benton Road and 0.24 mile west of Washington Avenue; covered with oil drum. Reference point - hole in side of casing 0.9 foot above ground surface, at elevation 1,399.87 feet. 8/26/52, 49.8; 1/19/53, 49.2; 5/19/53, 53.6; 7/9/53, 54.4; 8/4/53, 53.9; 9/2/53, 56.5; 10/1/53, 59.1; 11/16/53, 53.2; 1/2/54, 52.2; 2/3/54, 55.9; 4/5/54, 51.3; 4/29/54, 51.2.

7S/2W-4J2 - M. A. Nicolas - In Los Alamos Valley; 500 feet south and 500 feet west of intersection of Benton Road and Washington Avenue; 75 feet south of dirt road. Reference point - top of casing 2.4 feet above ground surface, at elevation 1,404.60 feet. 8/26/52, 48.0; 9/3/53, 50.8; 11/16/53, 56.8; 4/29/54, 50.1.

7S/2W-4J3 - M. A. Nicolas - In Los Alamos Valley; 25 feet east of well 4J2. Reference point - top of casing 3.1 feet above ground surface. 4/29/54, 50.1.

7S/2W-4J4 - M. A. Nicolas - In Los Alamos Valley; 0.24 mile south of Benton Road and 250 feet west of Washington Avenue; at windmill south of house. Reference point - top of wood cover 0.16 foot above ground surface, at elevation 1,369.14 feet. 5/21/53, 17.2; 11/16/53, 21.8; 4/29/54, 12.7.

7S/2W-4K1 - M. A. Nicolas - In Los Alamos Valley; 40 feet west of well 4J1. Reference point - hole in casing 0.7 foot above ground surface, at elevation 1,399.18 feet. 8/26/52, 49.6; 5/19/53, 54.3; 8/4/53, 53.4; 9/2/53, 55.4; 11/16/53, 53.0; 1/7/54, 53.7; 2/3/54, 51.1; 4/5/54, 50.5; 4/29/54, 50.6.

7S/2W-5C1 - Fred Pourroy - In French Valley; at windmill 0.44 mile east of Winchester Road and 40 feet south of Thompson Road. Reference point - top of casing 0.4 foot above ground surface, at elevation 1,359.41 feet. 5/18/53, 23.4; 11/13/53, 24.1; 4/28/54, 24.1.

7S/2W-5H1 - Cummins - In Los Alamos Valley; 280 feet west of Beeler Road and 200 feet north of Benton Road; 40 feet north of house. Reference point - top of concrete casing 1.0 foot above ground surface, at elevation 1,369.75 feet. 5/19/53, 30.6; 11/12/53, 32.2; 4/29/54, 31.0.

7S/2W-5M1 - Fred Pourroy - Near Murrieta; at windmill 0.8 mile west and 0.2 mile south of intersection of Beeler and Benton Roads. Reference point - top of pipe clamp 1.3 feet above ground surface, at elevation 1,359.02 feet. 5/19/53, 26.4; 11/16/53, 29.1.

7S/2W-6Q1 - Near Murrieta; at windmill 0.25 mile north of Auld Road and 0.2 mile west of Winchester Road. Reference point - top of wooden cover 1.0 foot above ground surface, at elevation 1,345.6 feet. 5/21/53, 24.0; 11/16/53, 24.4.

7S/2W-7J1 - Alex Borel - Near Murrieta; 0.57 mile south and 470 feet west of intersection of Auld and Leon Roads; at windmill in field between two trees. Reference point - top of concrete blocks 0.8 foot above ground surface, at elevation 1,295.13 feet. 5/22/53, 6.6; 11/18/53, 7.3; 4/29/54, 3.8.

7S/2W-7R1 - V. V. Hilliard - Near Murrieta; 0.14 mile west and 50 feet south of intersection of Borrel and Leon Roads. Reference point - top of concrete casing 1.8 feet above ground surface, at elevation 1,282.88 feet. 5/22/53, 10.3; 11/18/53, 5.9; 4/29/54, 6.9.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/2W-8A1 - Alex Borel - Near Murrieta; at windmill 0.25 mile south and 300 feet west of intersection of Beeler and Auld Roads. Reference point - top of casing 1.5 feet above ground surface, at elevation 1,347.05 feet. 8/22/52, 17.4; 1/19/53, 17.2; 3/6/53, 17.8; 4/7/53, 19.5; 5/21/53, 20.7; 7/9/53, 19.4; 8/4/53, 20.8; 9/2/53, 21.0; 10/1/53, 19.8; 11/16/53, 20.0; 1/7/54, 19.0; 2/3/54, 19.0; 4/5/54, 18.8; 4/29/54, 18.8.

7S/2W-8E1 - Alex Borel - Near Murrieta; 0.3 mile south and 0.1 mile east of intersection of Auld and Leon Roads; at windmill 250 feet north of barn. Reference point - top of casing 1.3 feet above ground surface at elevation 1,333.64 feet. 5/22/53, 22.0; 4/29/54, 10.2.

7S/2W-8M2 - Alex Borel - Near Murrieta; at windmill 0.65 mile south and 200 feet east of intersection of Auld and Leon Roads. Reference point - top of casing 0.2 foot above ground surface, at elevation 1,292.86 feet. 11/21/27, 40 (log); 5/22/53, 73.7; 11/18/53, 51.5; 4/29/54, 41.2.

7S/2W-10D1 - M. A. Nicolas - In Los Alamos Valley; 100 feet east of intersection of Auld and Buck Roads; at windmill. Reference point - top of casing 1.7 feet above ground surface, at elevation 1,367.97 feet. 5/21/53, 9.6; 11/12/53, 12.7; 4/29/54, 9.1.

7S/2W-12G1 - Bill Knezevich - In Los Alamos Valley; 0.32 mile south and 0.25 mile west of intersection of Benton and Warren Roads; in metal pump house. Reference point - top of wood cover, at elevation 1,540 feet. 11/19/53, 8.7; 4/28/54, 5.6.

7S/2W-12R1 - Alex Borel - Near Sage; 0.25 mile northwest of well 7S/1W-18E1. Reference point - top of red brick pit 0.1 foot above ground surface. 5/26/53, 26.1; 11/19/53, 26.9; 4/28/54, 25.7.

7S/2W-13R1 - Alex Borel - In Glenoak Valley; 0.15 mile north and 0.12 mile west of intersection of Warren and Buck Roads; at windmill 100 feet northwest of house. Reference point - top of wood cover 0.5 foot above ground surface, at elevation 1,520 feet. 5/25/53, 11.1; 11/19/53, 14.8; 5/13/54, 8.7.

7S/2W-16J1 - M. A. Nicolas - Near Murrieta; 1.57 mile south and 10 feet west of intersection of Auld and Buck Roads. Reference point - top of casing 2.7 feet above ground surface. 1/30/50, 57 (log).

7S/2W-16J2 - M. A. Nicolas - Near Murrieta; at windmill 200 feet west of well 16J1. Reference point - top of casing 0.2 foot above ground surface, at elevation 1,380 feet. 11/16/53, 32.8; 4/29/54, 28.6.

7S/2W-16J4 - M. A. Nicolas - Near Murrieta; 250 feet south of well 16J1. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,380 feet. 11/16/53, 53.0; 4/29/54, 51.8.

7S/2W-18P1 - L. J. Servel - Near Murrieta; 0.25 mile northeast of well 19C1. Reference point - top of casing 0.7 foot above ground surface. 7/52, 79.5; 5/25/53, 81.7; 11/18/53, 83.3; 4/29/54, 83.7.

7S/2W-19C1 - L. J. Servel - Near Murrieta; 0.7 mile east of Winchester Road (measured along dirt road) from intersection 0.06 mile north of Webster Avenue; 30 feet east of well 19C2 pump house. Reference point - hole in top of casing 1.5 feet above ground surface, at elevation 1,145 feet. 11/18/53, 82.3; 4/29/54, 73.9.

7S/2W-19C3 - L. J. Servel - Near Murrieta; 0.2 mile southeast of well 19C1. Reference point - top of casing 1.0 foot above ground surface. 7/52, 114.5; 5/25/53, 112.5; 11/18/53, 111.7.

7S/2W-24F1 - Vail Company - In Glenoak Valley; 0.3 mile south and 300 feet east of intersection of Long Valley and Buck Roads; at windmill on bank of Santa Gertrudis Creek. Reference point - top of wood cover at ground surface. 5/25/53, 0.2; 11/19/53, 0.0.

7S/2W-26N1 - Vail Company - In Long Valley; 5.5 miles northeast of Highway 395 (measured along Long Valley Road); at windmill 100 feet south of Long Valley Road. Reference point - (a) top of casing 0.3 foot below ground surface, at elevation 1,307.68 feet (6/13/25 through 9/17/27); (b) top of 4 x 6 inch over casing at ground surface, at elevation 1,308.0 feet (5/19/53 to present). Note: Measurements from Vail Company records, except as indicated. When drilled, 150 (log); 6/13/25, 155.2; 5/4/26, 154.0; 9/8/26, 154.0; 10/15/26, 154.1; 11/3/26, 154.1; 1/13/27, 154.2; 2/19/27, 154.2; 3/15/27, 155.1; 4/25/27, 154.3; 5/14/27, 154.3; 6/5/27, 154.5; 6/18/27, 154.3; 7/18/27, 154.2; 8/16/27, 154.3; 9/17/27, 154.3; 5/19/53, 146.5 (DWR); 11/19/53, 154.7 (DWR); 4/29/54, 148.3 (DWR).

7S/2W-26N2 - Vail Company - In Long Valley; map location only, see location of wells plate. Reference point-top of casing, at elevation 1,312.60 feet. Note: Measurements from Vail Company records. 8/9/26, 87.1; 9/8/26, 88.3; 10/15/26, 88.8; 11/3/26, 88.2; 1/13/27, 89.1.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/2W-27R1 - Vail Company - In Long Valley; at windmill 0.2 mile northwest of well 26N1. Reference point - top of casing cover 2 feet above ground surface, at elevation 1,300 feet. 5/19/53, 138.5; 11/19/53, 147.8; 4/29/54, 144.7.

7S/2W-30D1 - Vail Company - Near Murrieta; 0.55 mile east of Banana Road (measured along Nicolas Road); open casing 250 feet south of Nicolas Road and 250 feet southeast of house. Reference point - top of casing 1.5 feet above ground surface. 5/20/53, 43.2; 11/18/53, 49.5; 4/29/54, 45.8.

7S/2W-30D3 - Vail Company - Near Murrieta; at windmill frame 10 feet west of well 30D1. Reference point - top of casing at ground surface. 4/29/54, 40.1.

7S/2W-33E1 - Vail Company - Near Temecula; 3.5 miles east Highway 395 (measured along Long Valley Road); at windmill 300 feet north of Long Valley Road. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,230 feet. 5/19/53, 84.8; 11/19/53, 94.0; 4/29/54, 84.8.

7S/3W-2G1 - J. A. Richmond - Near Murrieta; 0.12 mile west of Los Alamos Road (measured along dirt road) from intersection 1.9 miles northeast of Highway 395 (measured along Los Alamos Road); 150 feet west of garage. Reference point - top of concrete casing at ground surface, at elevation 1,420 feet. 4/23/54, 4.1.

7S/3W-2G2 - J. A. Richmond - Near Murrieta; 100 feet north of well 2G1 and 10 feet west of house. Reference point - top of wood cover at ground surface. 4/23/54, 9.8.

7S/3W-2K1 - I. H. Gentry - Near Murrieta; .09 mile southeast of Los Alamos Road (measured along dirt road) from intersection 1.7 miles northeast of Highway 395 (measured along Los Alamos Road). Reference point - at opening by discharge pipe. 8/19/52, 52; 11/25/53, 48.1.

7S/3W-2P1 - Andrew James - Near Murrieta; 1.25 miles northeast of Highway 395 (measured along Los Alamos Road) at windmill 35 feet west of Los Alamos Road. Reference point - top of casing 1 foot above ground surface, at elevation 1,300 feet. 11/25/53, 39.4; 4/23/54, 36.6.

7S/3W-5L1 - J. Borenstein - Near Murrieta; 0.32 mile north of well 5P1; north of house. Reference point - top of casing 1.3 feet above ground surface. 2/7/52, 18 (owner); 4/24/52, 18 (owner); 11/25/53, 30.1.

7S/3W-5P1 - Near Murrieta; 1.3 miles northeast of Adams Avenue (measured along Magnolia Street extended); at windmill 30 feet east of Magnolia Street extended. Reference point - top of casing 2.7 feet above ground surface. 2/4/53, 24.4; 11/25/53, 28.3.

7S/3W-6D1 - E. W. Bennett - Near Wildomar; 0.4 mile northeast of well 6E1. Reference point - top of casing at ground surface, at elevation 1,340 feet. 2/11/53, 13.7; 5/6/53, 42.5; 11/17/53, 38.3; 4/21/54, 13.4.

7S/3W-6E1 - E. W. Bennett - Near Wildomar; 0.71 mile northeast of Highway 71 (measured along Oak Springs Ranch road) and 0.13 mile north of Oak Springs Ranch road. Reference point - top of casing 2 feet above ground surface. 11/17/53, 6.2.

7S/3W-6J1 - Powers - Near Murrieta; 0.7 mile north of well 7A1 (measured along dirt road). Reference point - top of wood block at ground surface, at elevation 1,260 feet. 2/4/53, 7.56; 5/4/53, 8.9; 11/17/53, 9.6; 4/22/54, 7.7.

7S/3W-6K1 - E. W. Bennett - Near Murrieta; 0.58 mile east of Oak Springs Ranch road (measured along dirt road) from intersection 6.1 miles northeast of Highway 71 (measured along Oak Springs Ranch road); west of reservoir 950 feet south of dirt road. Reference point - top of casing 1.5 feet above ground surface, at elevation 1,320 feet. 11/17/53, 43.3; 4/21/54, 35.0.

7S/3W-7A1 - Powers - Near Murrieta; 12 feet northeast of well 17A2; open casing. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,200 feet. 5/4/53, 25.7; 4/22/54, 29.8.

7S/3W-7A2 - Powers - Near Murrieta; 30 feet west of well 7A3; open casing. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,200 feet. 5/4/24, 25.4; 4/22/54, 26.5.

7S/3W-7A3 - Powers - Near Murrieta; 1.1 miles easterly of Highway 71 (measured along dirt road) from intersection 0.9 mile northwest of Magnolia Street; open casing. Reference point - top of casing 3 feet above ground surface, at elevation 1,200 feet. 2/9/53, 26.6; 5/4/53, 27.3; 11/17/53, 29.3; 4/22/54, 28.6.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-7E1 - Powers - Near Murrieta; 0.25 mile east of Highway 71 (measured along Powers Ranch road); from intersection 0.8 mile northwest of Magnolia (measured along Highway 71); 100 feet south of Powers Ranch road and 50 feet south of corral. Reference point - top of casing 1.2 feet above ground surface, at elevation 1,175.20 feet. 2/11/53, 135.5; 3/16/53, 141.0; 4/7/53, 130.7; 5/6/53, 133.8; 7/9/53, 130.7; 8/5/53, 130.9; 9/1/53, 131.0; 10/5/53, 131.0; 11/17/53, 131.0; 1/7/54, 130.9; 2/3/54, 130.9; 4/2/54, 130.9; 4/22/54, 130.9.

7S/3W-7E2 - Powers - Near Murrieta; 0.77 mile northwest of Magnolia Street (measured along Highway 71) and 50 feet northeast of Highway 71. Reference point - top of casing 0.60 foot above ground surface, at elevation 1,147.71 feet. 5/6/53, 35.9; 11/18/53, 42.1; 4/22/54, 40.2.

7S/3W-7E3 - Powers - Near Murrieta; 200 feet north of well 7E2. Reference point - ground surface. 4/22/54, dry.

7S/3W-7E4 - Powers - Near Murrieta; 130 feet northeast of well 7E2. Reference point - top of casing 2 feet above ground surface, at elevation 1,150 feet. 4/22/54, 76.0.

7S/3W-7L1 - Thelma E. and Clifford H. Bailey - Near Murrieta; 0.55 mile northwest of Magnolia Street (measured along Highway 71) and 100 feet northeast of Highway 71. Reference point - top of casing 1.3 feet above ground surface, at elevation 1,146.02 feet. When drilled, 39 (log); 10/16/52, 39.8; 1/24/53, 40.0; 3/6/53, 47.2; 4/7/53, 41.9; 7/9/53, 42.9; 8/5/53, 43.3; 9/1/53, 44.1; 10/5/53, 43.5; 11/18/53, 45.1; 1/7/54, 46.2; 2/3/54, 43.8; 4/2/54, 49.2; 4/22/54, 46.1.

7S/3W-7N1 - Willis Thompson - Near Murrieta; 0.56 mile northwest of Magnolia Street (measured along Highway 71) and 0.44 mile southwest of Highway 71. Reference point - top of casing 1.84 feet above ground surface. 11/18/53, 39.9.

7S/3W-7R1 - Sam Termini - Near Murrieta; 75 feet northwest and 75 feet southwest of intersection of Adams Avenue and Magnolia Street. Reference point - measuring hole at ground surface, at elevation 1,165.8 feet. 6/46, 85 (log); 8/1/52, 179.7; 1/19/53, 153.1; 4/7/53, 150.5; 7/9/53, 153.0; 8/4/53, 156.2; 9/1/53, 158.1; 10/5/53, 155.5; 11/18/53, 152.7; 1/7/54, 158.7; 2/3/54, 156.2; 4/2/54, 134.8; 4/22/54, 141.1.

7S/3W-7R2 - Howard Morrow - Near Murrieta; 200 feet northwest and 140 feet northeast of intersection of Adams Avenue and Magnolia Street. Reference point - (a) not described 1.5 feet above ground surface, at elevation 1,171.89 feet (10/27/25 and 9/16/27), (b) top of measuring hole at ground surface, at elevation 1,170.4 feet (6/19/45 to present). 10/27/25, 78.0 (Vail Co.); 9/16/27, 125.0 (Vail Co.); 6/19/45, 93.2 (Calif. Elec. Power Co.); 10/31/52, 130; 4/22/54, 139.8.

7S/3W-8R1 - Harvey Blackmore - Near Murrieta; 0.55 mile north of Kalmia Street (measured along dirt road) from intersection 0.27 mile northeast of Jefferson Avenue (measured along Kalmia Street; 75 feet west of house. Reference point - top of pump mounting 1.6 feet above ground surface, at elevation 1,175 feet. 5/7/53, 39.3; 4/23/54, 35.5.

7S/3W-9M1 - Harvey Blackmore - Near Murrieta; 1.16 miles northeast of Jefferson Avenue (measured along Kalmia Street and 300 feet north of Kalmia Street, at windmill. Reference point - top of casing 4.0 feet above ground surface, at elevation 1,250 feet. 5/7/53, 76.2; 11/19/53, 74.6; 4/23/54, 74.4.

7S/3W-10H1 - William B. Coleman - Near Murrieta, 0.6 mile northeast of Highway 395 (measured along Los Alamos Road) and 250 feet north of Los Alamos Road; at windmill. Reference point - top of casing 1.5 feet above ground surface. 6/24/50, 35 (log); 11/25/53, 41.8.

7S/3W-10H3 - William B. Coleman - Near Murrieta, 0.6 mile northeast of Highway 395 (measured along Los Alamos Road) and 300 feet northwest of Los Alamos Road, north of house. Reference point - top of casing 1.9 feet above ground surface, at elevation 1,280 feet. 11/25/53, 35.2; 4/23/54, 34.6.

7S/3W-12H1 - L. J. Servel - Near Murrieta; 1.77 miles north of Webster Avenue (measured along Winchester Road) and 0.11 mile west of Winchester Road; at windmill 120 feet southeast of house and 50 feet south of barn. Reference point - top of casing 2.0 feet above ground surface, at elevation 1,325 feet. 7/52, 41.1; 11/20/53, 42.4; 4/23/54, 43.5.

7S/3W-12J1 - L. J. Servel - Near Murrieta; 1.77 miles north of Webster Avenue (measured along Winchester Road) and 0.16 mile west of Winchester Road; 200 feet north of house and 40 feet west of metal shed. Reference point - top of casing 1.5 feet above ground surface, at elevation 1,325 feet. 7/52, 39.6; 5/25/53, 40.3; 11/20/53, 40.6; 4/23/54, 41.1.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-12P1 - V. G. Comparette - Near Murrieta; 0.66 mile west and 0.27 mile north of intersection of Winchester Road and Hunter Road; 70 feet east of barn. Reference point - top of casing 1.8 feet above ground surface, at elevation 1,300 feet. 8/22/52, 44.4; 1/19/53, 43.2; 3/6/53, 46.5; 4/7/53, 45.9; 5/21/53, 48.1; 7/9/53, 43.5; 8/4/53, 43.6; 9/2/53, 43.5; 10/1/53, 43.7; 11/20/53, 43.7; 1/7/54, 43.8; 2/3/54, 44.0; 4/5/54, 44.4; 4/23/54, 43.7.

7S/3W-12P2 - V. G. Comparette - Near Murrieta; 25 feet south of well 12P1. Reference point - top of casing 1.2 feet above ground surface, at elevation 1,300 feet. 11/20/53, 41.8; 4/23/54, 41.9.

7S/3W-14N1 - H. Fisch - Near Murrieta; 0.5 mile east of Highway 395 (measured along Webster Avenue) and 250 feet north of Webster Avenue. Reference point - hole in pump base at ground surface. When drilled 45 (log); 11/19/53, 49.2.

7S/3W-15N1 - Near Murrieta; 0.28 mile west of Highway 395 (measured along Webster Avenue) and 300 feet south of Webster Avenue; at windmill. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,140 feet. 5/14/53, 92; 12/1/53, 86.1; 4/23/54, 85.4.

7S/3W-15Q2 - M. J. Yoder - Near Murrieta; 0.12 mile east and 0.12 mile south of intersection of Highway 395 and Webster Avenue; in barn. Reference point - ground surface, at elevation 1,170.07 feet. Note: Measurements from Vail Company records. 10/31/25, 104.4; 5/13/26, 103.4; 8/9/26, 105.7; 9/8/26, 105.9; 10/13/26, 106.0; 10/25/26, 106.0; 11/3/26, 106.0; 1/12/27, 104.6; 3/7/27, 105.1; 6/21/27, 103.8; 7/27/27, 104.1; 8/23/27, 104.4.

7S/3W-15Q3 - M. J. Yoder - Near Murrieta; 0.14 miles south and 0.12 miles east of intersection of Highway 395 and Webster Avenue; 25 feet southwest of metal shed. Reference point - top of casing 0.6 foot above ground surface, at elevation 1,150 feet. 12/1/53, 16.8; 4/23/54, 18.0.

7S/3W-16C1 - Charles Yoder - Near Murrieta; 0.5 mile north of Los Alamos Road (measured along dirt road) from intersection 0.85 mile northeast of Jefferson Avenue (measured along Los Alamos Road); at pressure tank near house. Reference point - ground surface, at elevation 1,242 feet. 12/30/53, 94 (log).

7S/3W-16G1 - C. E. Yoder - Near Murrieta; 0.83 mile northeast of Jefferson Avenue (measured along Los Alamos Road) and 30 feet northwest of Los Alamos Road; at windmill. Reference point - top of casing 0.9 foot above ground surface, at elevation 1,150 feet. 6/30/51, 38 (owner); 11/25/53, 41.4; 4/23/54, 50.5.

7S/3W-16H1 - C. E. Yoder - Near Murrieta; 0.87 mile northeast of Jefferson Avenue (measured along Los Alamos Road) and 35 feet southeast of Los Alamos Road; at windmill near tank. Reference point - top of metal flange 1.1 feet above ground surface, at elevation 1,140 feet. 11/25/53, 35.3.

7S/3W-16K1 - O. R. Rail - Near Murrieta; 0.51 mile northeast of Jefferson Avenue (measured along Los Alamos Road) and 0.16 mile southeast of Los Alamos Road. Reference point - hole in pump base at ground surface, at elevation 1,110 feet. 5/12/53, 22.9; 12/1/53, 22.8; 4/23/54, 23.5.

7S/3W-16M1 - O. R. Rail - Near Murrieta; 0.19 mile northeast and 0.04 mile northwest of intersection of Jefferson Avenue and Ivy Street; at windmill 20 feet southwest of driveway. Reference point - top of casing 0.7 foot above ground surface, at elevation 1,131.99 feet. 1947, 50 (owner); 10/16/52, 69.3; 5/12/53, 66.9; 12/1/53, 68.6; 4/22/54, 68.0.

7S/3W-16N1 - Ralph Bates - Near Murrieta; 0.04 mile northwest and 0.05 mile northeast of intersection of Jefferson Avenue and Ivy Street; at windmill. Reference point - top of casing at ground surface, at elevation 1,109.04 feet. 1944, 17 (owner); 5/12/53, 32.4; 12/1/53, 34.7.

7S/3W-16N2 - John Inchausti and Robert Rash - Near Murrieta; west corner of intersection of Jefferson Avenue and Ivy Street; at windmill 6 feet northwest of building. Reference point - top of casing at ground surface, at elevation 1,103.4 feet. 5/12/53, 24.5; 12/1/53, 33.8; 4/22/54, 33.0.

7S/3W-16N3 - John Inchausti and Robert Rash - Near Murrieta; 400 feet southeast and 200 feet northeast of intersection of Jefferson Avenue and Ivy Street; in garage. Reference point - top of casing 1.28 feet above ground surface, at elevation 1,102.38 feet. 5/12/53, 20; 12/1/53, 29.

7S/3W-16N4 - Near Murrieta; 0.1 mile southeast and 100 feet northeast of intersection of Jefferson Avenue and Ivy Street; at windmill near shed. Reference point - top of casing 1.3 feet above ground surface, at elevation 1,116.50 feet. 12/1/53, 42.5; 4/22/54, 42.2.

7S/3W-16N5 - C. S. Gordon - Near Murrieta; 460 feet southeast and 260 feet southwest of intersection of Jefferson Avenue and Ivy Street; in shed 300 feet southeast of house. Reference point - hole in pump base 1.5 feet above ground surface, at elevation 1,099.2 feet. 9/20/52, 21.7; 5/12/53, 23.2; 8/5/53, 24.4; 9/1/53, 26.7; 10/6/53, 25.0; 11/30/53, 25.2; 1/8/54, 25.1; 2/3/54, 25.4; 4/5/54, 25.2.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-16N6 - Joe Kalberer - Near Murrieta; 400 feet northeast and 30 feet southeast of intersection of Jefferson Avenue and Ivy Street; 25 feet southeast of house. Reference point - top of casing at ground surface, at elevation 1,103.59 feet. 5/12/53, 29.3; 12/1/53, 29.7; 4/24/54, 12.4.

7S/3W-17C1 - T. C. Wickerd - Near Murrieta; 0.1 mile southeast and 0.04 mile southwest of intersection of Jefferson Avenue and Lemon Street; 75 feet southeast of house. Reference point - top of casing 0.5 foot above ground surface. 5/7/53, 47.8.

7S/3W-17E1 - E. E. Rasch - Near Murrieta; 200 feet northwest and 200 feet northeast of intersection of Highway 71 and Lemon Street. Reference point - top of concrete slab 0.5 foot above ground surface. 5/5/53, 33.2.

7S/3W-17E2 - C. V. Potter - Near Murrieta; 0.14 mile northeast and 100 feet northwest of intersection of Highway 71 and Lemon Street; 5 feet north of garage. Reference point - top of casing 1.5 feet above ground surface, at elevation 1,130.2 feet. 11/11/45, 30 (log); 5/5/53, 37.5; 7/28/53, 37.5; 11/19/53, 37.0; 2/23/54, 41.4.

7S/3W-17E3 - Paul Thompson - Near Murrieta; 0.1 mile northwest and 200 feet northeast of intersection of Highway 71 and Lemon Street; at windmill 100 feet northeast of house. Reference point - top of casing 1 foot above ground surface. 11/19/53, 36.4.

7S/3W-17F1 - Near Murrieta; 0.1 mile southeast and 200 feet northeast of intersection of Adams Avenue and Lemon Street; 20 feet north of house. Reference point - top of casing 1.2 feet above ground surface, at elevation 1,134 feet. 5/7/53, 37.9; 11/19/53, 39.0; 4/23/54, 39.2.

7S/3W-17F2 - M. L. Thomas - Near Murrieta; 0.15 mile southeast and 300 feet northeast of intersection of Adams Avenue and Lemon Street; at windmill. Reference point - top of casing at ground surface. 9/2/52, 30.8; 11/19/53, 33.5.

7S/3W-17F3 - V. E. Clark - Near Murrieta; 285 feet northeast and 185 feet southeast of intersection of Adams Avenue and Lemon Street. Reference point - top of casing 1.7 feet above ground surface, at elevation 1,135 feet. 10/14/53, 40.2; 4/19/54, 40.6.

7S/3W-17G1 - Clyde Fox - Near Murrieta; 0.25 mile southeast of Lemon Street (measured along Jefferson Avenue) and 100 feet southwest of Jefferson Avenue; 75 feet northwest of house. Reference point - top of casing 1.2 feet above ground surface, at elevation 1,135.51 feet. 5/7/53, 45.3; 11/19/53, 47.0; 4/23/54, 46.7.

7S/3W-17H1 - H. C. Arthur - Near Murrieta; 0.07 mile northeast and 200 feet northwest of intersection of Jefferson Avenue and Kalmia Street. Reference point - top of casing 0.1 foot above ground surface, at elevation 1,132.45 feet. 5/6/53, 46.3.

7S/3W-17H2 - E. Bryant - Near Murrieta; 0.2 mile northeast of Jefferson Avenue (measured along Kalmia Street) and 100 feet southeast of Kalmia Street; 30 feet north of house. Reference point - hole in pump base at ground surface, at elevation 1,160 feet. 5/12/53, 72.6; 11/19/53, 76.5; 4/23/54, 75.5.

7S/3W-17J1 - Robert Jones - Near Murrieta; 0.07 mile southeast and 40 feet southwest of intersection of Kalmia Street and Jefferson Avenue, in metal shed. Reference point - hole in pump base 2.2 feet above ground surface, at elevation 1,125.16 feet. 4/26, 38 (log); 11/3/26, 38.9 (Vail Co.); 1/11/27, 38.2 (Vail Co.); 11/17/53, 48.2; 1/8/54, 54.2; 4/23/54, 49.0.

7S/3W-17J2 - M. Smith - Near Murrieta; 10 feet north of well 17J3, 2 feet northwest of garage. Reference point - top of casing 1 foot above ground surface, at elevation 1,113.92 feet. Note: Measurements from Vail Company records. 10/30/25, 28.9; 11/2/25, 28.9; 3/3/26, 28.7; 4/23/26, 28.8; 6/28/26, 29.7; 8/2/26, 30.4.

7S/3W-17J3 - M. Smith - Near Murrieta; 150 feet southeast and 100 feet southwest of intersection of Jefferson Avenue and Juniper Street; in garage. Reference point - hole in pump base 1.2 feet above ground surface, at elevation 1,114.27 feet. 5/12/53, 54.0.

7S/3W-17K2 - Ray Bazanson - Near Murrieta; 0.1 mile northwest and 75 feet northeast of intersection of Kalmia Street and Adams Avenue; 45 feet northwest of house. Reference point - hole in casing 2.2 feet above ground surface, at elevation 1,120 feet. 8/17/53, 38.1; 11/25/53, 38.9; 4/23/54, 39.0.

7S/3W-17L2 - Willis A. Thompson - Near Murrieta; map location only, see location of wells plate. Reference point - top of casing, at elevation 1,119.53 feet. About 1913, 37 (log); 11/3/26, 36.4 (Vail Co.).

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-17L3 - Willis A. Thompson - Near Murrieta; 500 feet northwest and 300 feet northeast of intersection of Washington Avenue and Kalmia Street; at windmill 50 feet east of house. Reference point - top of casing, at elevation 1,110 feet. 4/26, 22 (log); 5/12/53, 36.7; 11/30/53, 38.4; 4/23/54, 38.0.

7S/3W-17P1 - Ira Rail - Near Murrieta; 230 feet northwest and 100 feet southwest of First and B Streets. Reference point - top of boards 0.6 foot above ground surface. 5/15/53, 21.9.

7S/3W-17P2 - Sam Barnes - In Murrieta; 350 feet southeast and 150 feet southwest of intersection of Washington Avenue and Kalmia Street. Reference point - top of casing 1.6 feet above ground surface. 5/15/53, 26.2.

7S/3W-17P3 - Nora Cotter - In Murrieta; 100 feet northwest and 100 feet northeast of intersection of First Avenue and B Street. Reference point - top of casing 0.6 foot above ground surface. 5/15/53, 23.4.

7S/3W-17P4 - In Murrieta; at windmill 120 feet northeast and 50 feet southeast of intersection of Second Avenue and Kalmia Street. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,098 feet. Note: Measurements from Riverside County Flood Control and Water Conservation District records. 8/30/51, 21.0; 10/16/52, 21.4; 6/10/53, 22.0; 7/9/53, 22.4; 8/10/53, 22.8; 9/16/53, 23.1; 10/22/53, 23.5; 11/9/53, 23.6; 12/4/53, 23.8; 1/6/54, 24.1; 6/1/54, 23.5; 7/7/54, 23.7.

7S/3W-17Q2 - P. Samaniego - In Murrieta; 100 feet southwest and 200 feet northwest of intersection of Adams Avenue and Juniper Street; 55 feet southwest of house. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,104 feet. 5/15/53, 34.5; 12/1/53, 36.6.

7S/3W-17Q3 - Max Thompson - In Murrieta; 0.13 mile northeast and 150 feet southeast of intersection of Washington Avenue and B Street; 20 feet southeast of house. Reference point - top of casing 1.2 feet above ground surface, at elevation 1,100 feet. 5/20/53, 29.3; 2/18/54, 31.8.

7S/3W-17R1 - H. Sykes - In Murrieta; at windmill 250 feet northwest and 250 feet northeast of intersection of Ivy Street and Adams Avenue. Reference point - top of pipe clamp 1.0 foot above ground surface, at elevation 1,105.17 feet. 5/12/53, 65.2.

7S/3W-18A1 - R. R. Swain - In Murrieta; 0.12 mile northeast and 100 feet southeast of intersection of Magnolia Street and Highway 79; at windmill 25 feet northeast of house. Reference point - top of casing 0.6 foot above ground surface, at elevation 1,152.49 feet. 5/5/53, 59.0; 11/19/53, 58.0; 4/22/54, 60.2.

7S/3W-18A2 - Near Murrieta; at windmill 0.12 mile southeast and 150 feet northeast of intersection of Magnolia Street and Highway 71. Reference point - top of board cover casing 1 foot above ground surface. 5/5/53, dry; 11/19/53, dry; 4/22/54, dry.

7S/3W-18A3 - C. J. and M. W. Thompson - Near Murrieta; 0.22 mile southeast and 50 feet southwest of intersection of Magnolia Street and Highway 71. Reference point - (a) flange, at elevation 1,135.91 feet (10/27/25 through 9/16/27); (b) not reported (4/2/46 through 5/15/47). Note: Measurements from Vail Company records, except as indicated. 10/27/25, 44.5; 7/27/27, 97.0; 9/16/27, 89.4; 4/2/46, 60.0 (Calif. Elec. Power Co.); 7/12/46, 81.0 (Calif. Elec. Power Co.); 5/15/47, 77.4 (Calif. Elec. Power Co.).

7S/3W-18H1 - G. W. Sipe - Near Murrieta; 0.32 mile southeast and 150 feet northeast of intersection of Highway 71 and Magnolia Street. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,135 feet. 5/5/53, 43.2; 11/19/53, 39.6; 4/22/54, 40.9.

7S/3W-18H2 - Paul Anderson - Near Murrieta; 0.28 mile southeast and 125 feet northeast of intersection of Highway 71 and Magnolia Street; 10 feet south of house. Reference point - top of casing at ground surface, at elevation 1,155.6 feet. 5/15/53, 38.6.

7S/3W-18L1 - Amos J. Sykes - Near Murrieta; 0.37 mile northwest and 0.1 mile southwest of intersection of Lemon Street and Hayes Avenue; on north bank of Murrieta Creek south of barn. Reference point - (a) top of concrete casing, at elevation 1,111.30 feet (3/3/26 through 7/27/27); (b) hole in pump base 0.5 foot above ground surface, at elevation 1,113.23 feet (5/6/53 to present). Note: Measurements from Vail Company records, except as indicated. 3/3/26, 10.3; 4/23/26, 2.7; 6/28/26, 7.7; 8/2/26, 9.5; 8/30/26, 10.7; 10/13/26, 10.7; 11/3/26, 10.8; 1/11/27, 9.1; 7/27/27, 7.9; 5/6/53, 14.7 (DWR); 10/29/53, 22.6 (DWR); 11/19/53, 22.3 (DWR); 4/22/54, 5.0 (DWR).

7S/3W-18L2 - Amos J. Sykes - Near Murrieta; 0.31 mile northwest and 500 feet southwest of intersection of Lemon Street and Hayes Avenue; at windmill at northwest end of concrete reservoir. Reference point - top of concrete casing 0.6 foot above ground surface, at elevation 1,118.21 feet. 5/6/53, 19.0; 10/29/53, 21.6; 11/19/53, 23; 4/22/54, 17.7.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-18L3 - Amos J. Sykes - Near Murrieta; at windmill 140 feet southeast of well 18L2. Reference point - hole in metal plate 1.1 feet above ground surface, at elevation 1,124.09 feet. 11/19/53, 37.0; 4/22/54, 22.0.

7S/3W-18M1 - Vail Company - Near Murrieta; at windmill 0.2 mile northwest of confluence of Cole Canyon and Murrieta Creek and 100 feet southwest of Cole Canyon Creek. Reference point - top of casing 3.5 feet above ground surface, at elevation 1,125 feet. 5/6/53, 25.8; 11/19/53, 23.9.

7S/3W-18Q1 - John McCool - Near Murrieta; map location only, see location of wells plate. Reference point - top of concrete casing, at elevation 1,103.61 feet. Note: Measurements from Vail Company records. 1918, 6 (log); 10/27/25, 12.3; 3/3/26, 10.8; 4/23/26, 4.2; 6/28/26, 6.7; 8/2/26, 8.5; 8/30/26, 9.5; 10/13/26, 10.7; 11/3/26, 11.0; 1/11/27, 9.8; 7/27/27, 6.7; 9/16/27, 8.6.

7S/3W-19A1 - C. W. Barnett - Near Murrieta; 0.2 mile southwest and 0.18 mile northwest of intersection of Hayes Avenue and Kalmia Street; at windmill 20 feet northwest of house. Reference point - top of casing 0.9 foot above ground surface, at elevation 1,137.52 feet. 11/30/53, dry; 4/22/54, 44.7.

7S/3W-19A2 - C. W. Barnett - Near Murrieta; 100 feet northeast of well 19A1 and 200 feet northeast of house. Reference point - top of casing 1.1 foot above ground surface, at elevation 1,135.96 feet. 5/11/53, 45.9; 5/23/53, 46.2; 11/30/53, 48.2; 4/22/54, 44.2.

7S/3W-19A3 - C. W. Barnett - Near Murrieta; 350 feet north of well 19A2. Reference point - top of casing 1.9 feet above ground surface, at elevation 1,103.22 feet. 5/11/53, 12.9; 5/22/53, 13.0; 11/30/53, 15.9.

7S/3W-19H1 - Frank Angus - Near Murrieta; at windmill 0.65 mile southwest and 30 feet southeast of intersection of Washington Avenue and Kalmia Street. Reference point - top of casing 0.7 foot above ground surface, at elevation 1,098.51 feet. 5/14/53, 15.4; 11/30/53, 19.2; 4/22/54, 10.8.

7S/3W-19H2 - Frank Angus - Near Murrieta; at windmill 300 feet southwest of well 19H1. Reference point - top of concrete slab at ground surface, at elevation 1,102.72 feet. 5/14/53, 18.6.

7S/3W-20A1 - Clarylin Smith - In Murrieta; 300 feet southwest and 500 feet southeast of intersection of Adams and Ivy Street; at windmill 50 feet southwest of house. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,098.08 feet. 5/13/53, 35.1; 11/18/53, 37.4; 4/22/54, 37.1.

7S/3W-20A2 - Clarylin Smith - In Murrieta; 450 feet northwest of well 20A1. Reference point - (a) Recorder house floor 1.0 foot below ground surface, at elevation 1,091.59 feet (1/15/53 through 12/2/53); (b) top of casing 1.1 feet below ground surface, at elevation 1,091.53 feet (4/22/54). 1/15/53, 27.8; 2/6/53, 27.6; 3/6/53, 27.6; 4/3/53, 28.2; 5/1/53, 28.5; 6/5/53, 29.3; 7/3/53, 29.6; 8/4/53, 30.3; 9/1/53, 30.9; 10/2/53, 31.2; 11/3/53, 31.7; 12/2/53, 31.6; 4/22/54, 29.6.

7S/3W-20A3 - Malone - In Murrieta; 0.12 mile southwest and 40 feet southeast of intersection of Adams and Ivy Street; in stucco pump house. Reference point - top of casing. 7/25/51, 26

7S/3W-20A4 - Al Reed - In Murrieta; 400 feet southwest of well 20A3. Reference point - top of casing 0.65 foot above ground surface, at elevation 1,088.46 feet. 5/13/53, 23.4; 11/20/53, 26.0; 4/22/54, 23.4.

7S/3W-20A7 - Clarylin Smith - In Murrieta; 120 feet southwest of well 20A1; in stucco shed. Reference point - top of concrete casing at ground surface, at elevation 1,090 feet. 11/30/57, 28.0.

7S/3W-20A8 - G. W. Gagnon - In Murrieta; 100 feet northwest and 100 feet southwest of intersection of Ivy Street and Plum Avenue; under sink in plant. Reference point - ground surface. 10/7/45, 18 (log).

7S/3W-20B1 - U. Tarwater - In Murrieta; 150 feet southwest and 100 feet southeast of intersection of Washington Avenue and C Street) southwest of house. Reference point - top of collar 0.8 foot above ground surface. 5/15/53, 22.6.

7S/3W-20B2 - U. Tarwater - In Murrieta; 100 feet northeast and 100 feet southeast of intersection of Juniper Street and Washington Avenue; at windmill northeast of house. Reference point - top of casing 1.3 feet above ground surface. 5/15/53, 24.3.

7S/3W-20B3 - C. S. Erdel - In Murrieta; 200 feet northeast and 200 feet northwest of intersection of Washington Avenue and Ivy Street; 30 feet northwest of house. Reference point - top of casing 1.55 feet above ground surface. 5/15/53, 25.6.

7S/3W-20C1 - J. Young - In Murrieta; at windmill 200 feet northwest and 100 feet northeast of intersection of Juniper and First Streets. Reference point - top of casing 1.0 foot above ground surface. 5/21/53, 23.1.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-20C2 - J. Young - In Murrieta; at windmill 100 feet southwest and 50 feet northwest of intersection of Second and Juniper Streets. Reference point - top of casing 1.4 feet above ground surface. 5/21/53, 24.5.

7S/3W-20C3 - Walter Coy - In Murrieta; 100 feet southwest and 100 feet northwest of intersection of Second and C Streets. Reference point - ground surface. 1945, 14 (log).

7S/3W-20C4 - E. H. Curran - In Murrieta; 110 feet southwest and 60 feet northwest of intersection of B and Clay Streets. Reference point - pump base 0.25 foot above ground surface, at elevation 1,090 feet. 4/9/54, 29.5.

7S/3W-20D2 - J. Young - In Murrieta; 500 feet southwest and 100 feet southeast of intersection of Clay and Kalmia Streets; at windmill near water tower. Reference point - top of casing 4.2 feet below ground surface. 5/21/53, 8.3.

7S/3W-20D3 - Floyd Rail - In Murrieta; 600 feet southeast and 100 feet southwest of intersection of Kalmia and Clay Streets; at feed mill. Reference point - top of casing. 5/15/53, 19.3.

7S/3W-20H1 - Maude Buchanan - In Murrieta; 0.26 mile southeast and 200 feet southwest of intersection of Washington Avenue and Ivy Street; at windmill 100 feet southwest of house. Reference point - top of concrete casing 1.15 feet above ground surface, at elevation 1,101.95 feet. 5/13/53, 38.9; 11/18/53, 39.6; 4/22/54, 43.7.

7S/3W-20H2 - Walter Nielsen - In Murrieta; 0.21 mile southeast and 500 feet northeast of intersection of Washington Avenue and Ivy Street; 75 feet northeast of house. Reference point - top wood cover 0.2 foot above ground surface, at elevation 1,090.66 feet. 5/13/53, 28.8; 10/29/53, 30.0; 4/21/54, 28.5.

7S/3W-20H3 - Walter Nielsen - In Murrieta; 400 feet northeast of well 20H2. Reference point - tower lip of measuring pipe 1.4 feet above ground surface, at elevation 1,094.59 feet. 5/13/54, 48.0; 10/29/53, 57.5; 4/21/54, 48.4.

7S/3W-20K1 - Howell - Near Murrieta; 0.25 mile southeast and 200 feet northeast of intersection of Ivy Street and Hayes Avenue. Reference point - hole in barrel over casing 1.1 feet above ground surface, at elevation 1,078.41 feet. 5/14/53, 14.9; 11/18/53, 20.4; 4/22/54, 9.1.

7S/3W-20L1 - L. P. Rios - Near Murrieta; 400 feet southeast and 300 feet northeast of intersection of Ivy Street and Hayes Avenue; 150 feet northeast of house. Reference point - hole in casing 1.6 feet above ground surface, at elevation 1,080.2 feet. 11/14/50, 15 (log); 7/31/52, 21; 5/14/53, 20.8; 11/18/53, 20.4; 4/22/54, 8.2.

7S/3W-20Q1 - Howell - Near Murrieta; at windmill 0.5 mile southeast and 100 feet southwest of intersection of Hayes Avenue and Ivy Street. Reference point - top of 4 x 4-inch wood brace 1.2 feet below ground surface, at elevation 1,073.2 feet. 8/1/52, 8.9; 5/14/53, 15.4; 11/18/53, 14.6; 4/22/54, 9.7.

7S/3W-20Q2 - Silas M. Hathaway - In Murrieta; 200 feet northeast of well 20Q1. Reference point - lower lip of measuring pipe 2.4 feet above ground surface, at elevation 1,074.40 feet. 5/14/53, 24.3; 4/22/54, 8.0.

7S/3W-20R2 - George Contreras - In Murrieta; 200 feet northeast of well 20R3. Reference point - top of concrete casing 2.5 feet above ground surface, at elevation 1,062.43 feet. 5/13/53, 12.4; 9/1/53, 21.6; 10/5/53, 24.6; 10/29/53, 22.6; 1/7/54, 19.1; 2/3/54, 8.5; 4/5/54, 3.0; 4/22/54, 4.4.

7S/3W-20R3 - George Contreras - Near Murrieta; 0.5 mile southeast and 400 feet northeast of intersection of Ivy and Clay Streets. Reference point - top of casing 2.5 feet above ground surface, at elevation 1,063 feet. 9/13/49, 7 (log); 1/19/53, 11.2; 3/6/53, 9.4; 4/7/53, 10.5; 10/29/53, 23.1; 2/3/54, 14.5; 4/5/54, 5.0; 4/22/54, 6.2.

7S/3W-21D2 - L. I. Prestwich - Near Murrieta; 0.2 mile southeast and 150 feet southwest of intersection of Ivy Street and Jefferson Avenue; at edge of reservoir southwest of house. Reference point - top of casing 0.65 foot above ground surface, at elevation 1,114.47 feet. 11/20/48, 32 (log); 5/13/53, 43.4; 11/18/53, 41.5; 4/22/54, 41.0.

7S/3W-21D3 - Roscoe Frohlich - Near Murrieta; 300 feet south of well 21D2; in pump house attached to garage. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,127.68 feet. 5/14/53, 53.8; 11/18/53, 54.8; 4/22/54, 57.3.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-21D4 - Mack Stone - Near Murrieta; 0.3 mile southeast and 500 feet northeast of intersection of Ivy Street and Adams Avenue; open casing 40 feet northeast of house. Reference point - top of casing at ground surface, at elevation 1,153.28 feet. 3/6/53, 130.9; 3/7/53, 126.8; 5/13/53, 127.3; 7/9/53, 133.8; 8/4/53, 133.1; 9/1/53, 134.3; 10/5/53, 135.5; 11/18/53, 134.8; 2/3/54, 132.5; 4/5/54, 132.1.

7S/3W-21E1 - Mack Stone - Near Murrieta; 0.3 mile southeast and 100 feet northeast of intersection of Adams Avenue and Ivy Street; at pressure tank 40 feet east of house. Reference point - hole in pump base at ground surface, at elevation 1,120.34 feet. 5/13/53, 76.2; 11/19/53, 85.7; 4/22/54, 76.5

7S/3W-21F1 - Warren Lipking - Near Murrieta; 600 feet southeast and 300 feet northeast of intersection of Adams and Webster Avenues; 120 feet northeast of garage. Reference point - ground surface. 4/28/51, 24 (log).

7S/3W-21F2 - Nettie Lloyd - Near Murrieta; at windmill 600 feet southeast and 100 feet southwest of intersection of Highway 71 and Webster Avenue. Reference point - top of pipe bracket 0.5 foot above ground surface, at elevation 1,076.97 feet. 11/16/53, 15.2.

7S/3W-21F3 - Warren Lipking - Near Murrieta; 80 feet south of well 21F1. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,072 feet. 11/17/53, 45.7; 4/21/54, 27.9.

7S/3W-21G1 - Charnock - Near Murrieta; at windmill 0.3 mile southeast and 0.15 mile northeast of intersection of Highway 71 and Webster Avenue. Reference point - top of casing 1.45 feet above ground surface, at elevation 1,076.92 feet. 2/19/53, 11.3; 5/14/53, 12.0; 11/19/53, 13.5; 4/22/54, 12.0.

7S/3W-21J1 - Myrtle A. Provolt - Near Murrieta; 300 feet southeast and 100 feet southwest of intersection of Guava Street and Highway 71; at windmill 20 feet south of house. Reference point - top of 4 x 4 inch timber 0.7 foot above ground surface, at elevation 1,066 feet. 12/16/53, 12.3; 4/21/54, 8.5.

7S/3W-21K1 - Carlington Cain - Near Murrieta; 70 feet south of well 21K2. Reference point - top of casing 1.3 feet above ground surface, at elevation 1,059.70 feet. 5/14/53, 5.2; 11/17/53, 3.6; 4/21/54, 1.5.

7S/3W-21K2 - Carlington Cain - Near Murrieta; 200 feet northwest and 70 feet southwest of intersection of Highway 71 and Guava Street. Reference point - hole in concrete slab 1.5 feet above ground surface, at elevation 1,062 feet. 9/8/53, 7 (log); 11/24/53, 6.7; 4/21/54, 4.2.

7S/3W-21K3 - Carlington Cain - Near Murrieta; 0.26 mile southeast and 300 feet southwest of intersection of Highway 71 and Webster Avenue. Reference point - top of concrete casing 2 feet above ground surface, at elevation 1,067 feet. 11/24/53, 3.9.

7S/3W-21L1 - Fred Mays - Near Murrieta; 500 feet southwest and 100 feet northwest of intersection of Adams Avenue and Brown Street. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,058 feet. 11/4/49, 12 (log); 11/13/53, 33.3; 4/21/54, 18.8.

7S/3W-21L2 - Carlington Cain - Near Murrieta; 200 feet southwest and 150 feet southeast of intersection of Adams Avenue and Brown Street. Reference point - top of metal plate 1.0 foot above ground surface, at elevation 1,059 feet. 11/17/53, 24.8.

7S/3W-21M2 - Fred Mays - Near Murrieta; 0.13 mile southeast of Webster Street and 150 feet northeast of Washington Avenue. Reference point - hole in pump base 0.5 foot above ground surface, at elevation 1,080 feet. 11/13/53, 49.7.

7S/3W-21M3 - Fred Mays - Near Murrieta; 200 feet northeast and 100 feet northwest of intersection of Washington Avenue and Brown Street. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,077.80 feet. 5/13/53, 40.

7S/3W-21N1 - C. D. Westbrook - Near Murrieta; 350 feet southwest of intersection of Washington Avenue and Brown Street; at windmill. Reference point - top of casing 1.4 feet above ground surface, at elevation 1,061.31 feet. 5/13/53, 15.3; 11/16/53, dry; 4/21/54, 8.9.

7S/3W-21N2 - A. W. Tordoff - Near Murrieta; 100 feet northeast and 100 feet southeast of intersection of Washington Avenue and Brown Street. Reference point - top of casing 1 foot above ground surface, at elevation 1,070 feet. 11/10/50, 31 (log); 11/16/53, 44.8; 4/21/54, 29.2.

7S/3W-21N3 - C. D. Westbrock - Near Murrieta; 26 feet northeast of well 21N1; open casing. Reference point - top of casing 2.2 feet above ground surface, at elevation 1,061.81 feet. 5/13/53, 15.6; 11/16/53, 25.2; 4/21/54, 9.4.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-21P1 - Warren Lipking - Near Murrieta; 80 feet northeast and 50 feet southeast of intersection of Washington Avenue and Guava Street. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,055.39 feet. 11/17/53, 28.6; 4/21/54, 15.6.

7S/3W-21P2 - A. W. Tordoff - Near Murrieta; 0.06 mile northwest and 100 feet northeast of intersection of Washington Avenue and Guava Street; open casing. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,055.50 feet. 5/13/53, 18.8; 11/17/53, 26.7; 4/21/54, 13.6.

7S/3W-21P4 - Warren Lipking - Near Murrieta, 20 feet southwest of well 21P1 Reference point - ground surface. 12/4/53, 26 (log)

7S/3W-21Q1 - Carlington Cain - Near Murrieta; 0.12 mile northeast and 0.09 mile southeast of intersection of Washington Avenue and Guava Street; in pump house Reference point - top of casing 2.19 feet above ground surface, at elevation 1,054.13 feet. 5/14/53, 33.5; 11/17/53, 31.4; 4/21/54, 26.1.

7S/3W-21R2 - Charles Philo - Near Murrieta; 0.22 mile northwest of Fig Street (measured along Highway 71) 100 feet south of house. Reference point - top of casing 0.3 foot above ground surface, at elevation 1,061.79 feet. 5/14/53, 38.7, 11/16/53, 41 9; 4/22/54, 41.1.

7S/3W-22C1 - Near Murrieta; 0.3 mile south of Webster Avenue (measured along dirt road) from intersection 0.34 mile east of Highway 395; open casing 150 feet east of dirt road. Reference point - top of casing. 5/14/53, dry.

7S/3W-24A1 - Albert Ceas - Near Murrieta; 300 feet southeast of intersection of Webster Avenue and Banana Street; near garage. Reference point - top of casing 1.15 feet above ground surface, at elevation 1,106.61 feet. 5/19/53, 44.8; 11/19/53, 42.6; 4/23/54, 36.1.

7S/3W-24Q1 - T. C. Bishop - Near Murrieta; 0.54 mile south of Webster Avenue (measured along Banana Road) in shed southeast of Banana Street. Reference point - top of casing 8/19/54, 21.4.

7S/3W-25M1 - J. B. Shamel - Near Murrieta; 0.94 mile northeast of Highway 395 (measured along Banana Road) and 0.1 mile easterly of Banana Road; at windmill. Reference point - top of inner casing 1 foot above ground surface, at elevation 1,105.59 feet. 5/35, 56 (owner); 5/39, 47 (owner); 5/20/53, 60; 12/1/53, 55.5; 4/23/54, 53.2.

7S/3W-25M2 - J. B. Shamel - Near Murrieta, 0.76 mile northeast (measured along Banana Road) from intersection with Highway 395; 100 feet southeast of Highway. Reference point - top of discharge pipe 0 8 foot above ground surface, at elevation 1,069.71 feet Note: Measurements from Vail Company records, except as indicated. 7/8/25, 6.6; 11/10/25, 7.3; 5/14/26, 5.0; 8/9/26, 6.0; 9/10/26, 6.0; 10/13/26, 5.9; 11/3/26, 5.8; 1/12/27, 4.8; 3/17/27, 4.7; 4/9/27, 5.4; 5/7/27, 5.8; 6/24/27, 5.6; 7/12/27, 5.8; 8/6/27, 6.0; 9/3/27, 6.8; 10/3/27, 7.6; 2/53, 7 (owner)

7S/3W-26N1 - Leo Rori Paugh - Near Murrieta; 0.43 mile northeast of Banana Road (measured along Highway 71) and 200 feet southwest of Highway 71; in pump house. Reference point - top of casing, at elevation 1,058.46 feet. 7/1/25, 19.2; 11/10/25, 19.4; 5/14/26, 18.1; 9/3/26, 19.5; 10/26/26, 19.7; 11/2/26, 19.7; 1/12/27, 19.2; 7/30/27, 18.9; 8/23/27, 19.2; 9/1/27, 19.2; 9/23/27, 19.3.

7S/3W-26R1 - J. B. Shamel - Near Murrieta; 0.56 mile northeast (measured along Banana Road) from intersection with Highway 395; in house 400 feet southeast of road Reference point - (a) wood clamp 3.79 feet above ground surface, at elevation 1,065.90 feet (5/14/26 and 7/12/26), (b) top of wood support 3.25 feet above ground surface, at elevation 1,065.36 feet (5/20/53 to present). 5/14/26, 12.6 (Vail Co.); 7/12/26, 12.2 (Vail Co.); 5/20/53, 17.5; 11/20/53, 19 2

7S/3W-27A1 - F. H. Hall - Near Murrieta; 1.1 miles northwest of Banana Road (measured along Highway 395, and 0.03 mile northeast of Highway 395; south of Warm Springs Creek. Reference point - top of casing, at elevation 1,058 68 feet Note: Measurements from Vail Company records. 11/10/25, flowing; 5/13/26, flowing; 7/1/26, flowing, 8/4/26, flowing; 9/1/26, flowing, 10/18/26, flowing; 11/2/26, flowing; 1/11/27, flowing, 7/4/27, flowing, 7/30/27, flowing

7S/3W-27H1 - Amos J Sykes - Near Murrieta, 900 feet northeast of intersection of Warm Springs Creek and Highway 71; southeast of Warm Springs Creek Reference point - top of casing, at elevation 1,052.57 feet. Note: Measurements from Vail Company records. 7/1/26, flowing; 7/4/26, flowing; 9/3/26, flowing; 10/18/26, flowing.

7S/3W-27H2 - G. T. Hall - Near Murrieta; 0.22 mile northerly from Date Street (measured along Madison Street) from intersection 0 21 mile northeast of Highway 71 (measured along Date Street); at windmill, 75 feet northwest of house. Reference point - (a) top of casing, at elevation 1,049.80 feet (6/15/25 to 1/11/27); (b) top of casing 1.4 feet above ground surface, at elevation 1,051.53 feet (5/22/53 to present). Note: Measurements from Vail Company records, except as indicated 6/15/25, flowing; 11/10/25, 0.1, 5/13/26, flowing, 7/1/26, flowing; 8/4/26, 0.1; 9/3/26, 0.4; 10/26/26, 0.6; 11/3/26, 0.6; 1/11/27, flowing; 5/22/53, 9.9 (DWR); 11/19/53, 6.2 (DWR); 4/22/54, 3.5 (DWR).

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-27K1 - Amos J. Sykes - Near Murrieta; 140 feet northeast and 140 feet southeast of intersection of Highway 71 and Warm Springs Creek. Reference point - top of pump base 1.6 feet above ground surface, at elevation 1,047.44 feet. 5/26/53, flowing; 11/19/53, flowing.

7S/3W-27M1 - Jack Klubnikin - Near Murrieta; 0.13 mile southwest of Adams Avenue (measured along Elm Street) and northwest of Elm Street; under shed 20 feet northwest of house. Reference point - hole in casing 1.03 feet above ground surface, at elevation 1,037.32 feet. 4/22/51, 17.5 (log); 5/22/53, 20.8; 4/21/54, 14.9.

7S/3W-27M2 - Dutton - Near Murrieta; 450 feet northwest and 250 feet northeast of intersection of Adams Avenue and Elm Street; open casing. Reference point - top of casing 1.95 feet above ground surface, at elevation 1,038.96 feet. 5/25/53, 21.5; 11/13/53, 26.2; 4/21/54, 19.0.

7S/3W-27M3 - L. S. Brown - Near Murrieta; 120 feet northeast and 55 feet southeast of intersection of Adams Avenue and Elm Street; at windmill 7 feet northwest of house. Reference point - top of casing 1.3 feet above ground surface, at elevation 1,037.08 feet. 5/25/53, 19.2; 11/13/53, 24.1; 4/21/54, 11.2.

7S/3W-27M4 - Dutton - Near Murrieta; 30 feet northwest of well 27M2; open casing. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,040 feet. 11/13/53, dry; 4/21/54, 11.0.

7S/3W-27N1 - Carl F. Brellow - Near Murrieta; 50 feet northeast of well 27N2, and 20 feet northeast of house. Reference point - top of concrete base at ground surface, at elevation 1,035.08 feet. 5/26/53, 14.4.

7S/3W-27N2 - Carl F. Brellow - Near Murrieta; 0.08 mile southwest and 20 feet southeast of intersection of Washington Avenue and Elm Street; 12 feet south of house. Reference point - hole in pump base, at elevation 1,035 feet. 11/13/53, 24.7; 4/22/54, 23.2.

7S/3W-27P1 - E. M. Lincoln - Near Murrieta; 0.2 mile northwest of well 27Q2. Reference point - center line of air gage 3.25 feet above ground surface, at elevation 1,036.26 feet. 11/13/53, 32; 4/23/54, 22.

7S/3W-27Q1 - E. M. Lincoln - Near Murrieta; at windmill 50 feet north of well 27Q2. Reference point - top of casing 1.2 feet above ground surface, at elevation 1,031.90 feet. 5/22/53, 5.4.

7S/3W-27Q2 - E. M. Lincoln - Near Murrieta; 0.22 mile northwest and 200 feet southwest of intersection of Cherry Street and Adams Avenue; in metal pump house. Reference point - (a) top of casing, at elevation 1,031.13 feet (5/14/26 through 8/11/26); (b) hole in steel plate, at elevation 1,030.82 feet (5/22/53 to present). Note: Measurements from Vail Company records, except as indicated. 5/14/26, 8.6; 7/1/26, 8.9; 8/4/26, 10.0; 9/1/26, 11.9; 10/15/26, 15.9; 11/2/26, 15.5; 1/11/27, 12.6; 7/4/27, 8.3; 8/11/27, 13.0; 5/22/53, 4.7 (DWR); 11/13/53, 6.8 (DWR); 4/22/54, 4.2 (DWR).

7S/3W-28B1 - Warren Lipking - Near Murrieta; 0.2 mile southeast of Guava Street (measured along Washington Avenue) and 300 feet northeast of Washington Avenue; open casing. Reference point - top of casing 1.6 feet above ground surface, at elevation 1,051.50 feet. 5/13/53, 15.7; 11/17/53, dry; 4/21/54, dry.

7S/3W-28B2 - Warren Lipking - Near Murrieta; at windmill 60 feet southeast of well 28B1. Reference point - top of casing 0.96 foot above ground surface, at elevation 1,050.30 feet. 5/13/53, 14.6; 11/17/53, 20.8; 4/21/54, 17.8.

7S/3W-28D1 - C. D. Westbrook - Near Murrieta; 500 feet southwest and 150 feet northwest of intersection of Washington Avenue and Guava Street; open casing. Reference point - top of casing 2.8 feet above ground surface, at elevation 1,065.69 feet (9/26/50 through 12/2/53); (b) top of recorder house floor 2.9 feet above ground surface, at elevation 1,065.76 feet (9/26/50 through 5/11/54). 9/26/50, 46 (log); 5/14/53, 25.3; 11/16/53, 34.4; 12/2/53, 34.4; 1/6/54, 34.4; 2/3/54, 33.5; 3/10/54, 29.5; 4/6/54, 24.5; 5/3/54, 21.4.

7S/3W-28E1 - Mike Mance - Near Murrieta; 0.22 mile southwest of Douglas Avenue (measured along dirt road) from intersection 0.23 mile southeast of Guava Street (measured along Douglas Avenue); at windmill near barn. Reference point - top of casing 1.55 feet above ground surface, at elevation 1,080.89 feet. 5/13/53, 25.0; 11/16/53, 31.6; 4/21/54, 30.3.

7S/3W-28F1 - Mike Mance - Near Murrieta; 0.3 mile southeast of Guava Street (measured along Douglas Avenue) and 100 feet southwest of Douglas Avenue. Reference point - (a) top of casing 1.4 feet above ground surface, at elevation 1,066.54 feet (4/27/50 through 5/13/53); (b) top of casing 4.0 feet above ground surface, at elevation 1,069.5 feet (11/16/53 to present). 4/27/50, 20 (log); 5/13/53, 32.2; 11/16/53, 29.2; 4/21/54, 28.2.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/3W-28F2 - Mike Mance - Near Murrieta; 15 feet northwest of well 28F3; open casing. Reference point - top of casing 1.2 feet above ground surface, at elevation 1,054.08 feet. 5/13/53, 18.5; 11/16/53, 26.0; 4/21/54, 20.3.

7S/3W-28F3 - Mike Mance - Near Murrieta; 0.29 mile southeast of Guava Street (measured along Clay Avenue and 100 feet southwest of Clay Avenue; in metal pump house. Reference point - hole in casing at gr surface, at elevation 1,054 feet. 11/16/53, 26.1; 4/21/54, 19.3.

7S/3W-28H1 - Fred Mays - Near Murrieta; 1.1 miles northeast and 100 feet southeast of intersection of Fig Street and Washington Avenue; at windmill 15 feet southeast of fence. Reference point - top of casing 2.3 feet above ground surface, at elevation 1,044.36 feet. 5/14/53, 15.4; 11/16/53, 18.2; 4/21/54, 16.9.

7S/3W-28P1 - Near Murrieta; 0.25 mile southwest of Douglas Avenue (measured along dirt road) from intersection 0.75 mile southeast at Guava Street; at windmill, 720 feet northwest of dirt road. Reference point - top of casing 0.4 foot above ground surface. 11/17/53, dry.

7S/3W-28Q1 - Near Murrieta; 0.8 mile southeast and 0.25 mile southwest of intersection of Douglas Avenue and Guava Street; at windmill 330 feet southerly from fence corner. Reference point - top of casing 0.5 foot above ground surface. 11/17/53, dry.

7S/3W-29A1 - Sweezy and Roen - Near Murrieta; 0.14 mile northwest and 100 feet southwest of intersection of Hayes Avenue and Guava Street. Reference point - hole in casing 0.6 foot above ground surface, at elevation 1,078 feet. 3/29/50, 16 (log); 5/20/53, 30.3; 11/17/53, 34.4; 4/22/54, 12.7.

7S/3W-29B1 - Howell - 0.46 mile northwest of Guava Street (measured along Hayes Avenue) and 140 feet southwest of Hayes Avenue. Reference point - lower lip of pipe at ground surface, at elevation 1,077 feet. 8/1/52, 21.6; 11/18/53, 24.6; 4/22/54, 7.8.

7S/3W-29C1 - R. H. Ballard - Near Murrieta; 0.37 mile southwest and 0.25 mile southeast of intersection of Hayes Avenue and Ivy Street; in shed 250 feet east of house. Reference point - pump base at ground surface, at elevation 1,147.98 feet. Note: Measurements from Vail Company records, except as indicated. 5/13/26, 53.1; 7/1/26, 55.0; 8/2/26, 56.3; 8/30/26, 58.3; 7/27/27, 57.6; 8/21/53, 80.7 (DWR); 10/19/53, 82.2 (DWR); 4/15/54, 70.0 (DWR).

7S/3W-29D1 - A. B. Mattison - Near Murrieta; map location only, see location of wells plate. Reference point-clay pipe, at elevation 1,153.24 feet. Note: Measurements from Vail Company records. 10/30/25, 54.6; 5/13/26, 47.2; 6/1/26, 48.3; 1/11/27, 54.6; 7/27/27, 42.9.

7S/3W-29G1 - Byron O. Lilly - Near Murrieta; 0.18 mile northwest and 0.27 mile southwest of intersection of Hayes Avenue and Guava Street; at windmill in open field. Reference point - lower lip of pipe, at elevation 1,142 feet. 8/1/52, 106.3; 2/18/53, 95.4; 5/14/53, 99; 7/9/53, 107.3; 8/4/53, 106.6; 9/1/53, 109.4; 10/5/53, 112.9; 11/18/53, 105.3; 1/7/54, 128.0; 2/3/54, 115.1; 4/2/54, 84.9; 4/22/54, 84.8.

7S/3W-29J1 - Sweezy and Roen - Near Murrieta; 0.37 mile southwest and 0.05 mile northwest from intersection of Hayes Avenue and Guava Street; in open shed 100 feet west of house. Reference point - hole in pump base 1 foot above ground surface. 3/15/50, 20 (log); 5/14/53, 103.

7S/3W-34C1 - E. M. Lincoln - Near Murrieta; 0.25 mile southwest from well 27Q2, (measured along fence). Reference point - bottom of pump base 1.35 feet above ground surface, at elevation 1,030.18 feet. 5/22/53, 17.5; 11/13/53, 19.8; 4/22/54, 17.0.

7S/3W-35F1 - Roy S. Roripaugh - Near Murrieta; map location only, see location of wells plate. Reference point - concrete block, at elevation 1,044.61 feet. Note: Measurements from Vail Company records. 6/24/25, 8.2; 9/3/26, 8.4; 10/26/26, 8.4; 11/2/26, 8.4; 1/12/27, 7.4; 3/17/27, 5.8; 4/11/27, 6.1; 5/3/27, 6.3; 7/4/27, 7.0; 8/6/27, 7.5; 8/19/27, 7.4; 9/12/27, 7.5; 10/3/27, 7.5.

7S/3W-35K1 - Ralph Barnett - Near Murrieta; 0.17 mile southeast of Banana Road (measured along Highway 71) and 200 feet southwest of Highway 71; at windmill. Reference point - clamp, at elevation 1,037.26 feet. Note: Measurements from Vail Company records. 7/1/25, 9.6; 8/11/26, 9.4; 9/10/26, 9.4; 10/26/26, 9.5; 11/2/26, 9.5; 1/12/27, 9.8; 3/7/27, 7.9; 3/11/27, 8.1; 4/9/27, 8.4; 5/7/27, 8.4; 7/4/27, 8.9; 8/6/27, 9.3; 9/9/27, 9.2; 10/3/27, 9.3.

7S/3W-35P1 - Vail Company - Near Murrieta; map location only, see location of wells plate. Reference point - top of casing, at elevation 1,017.00 feet. 11/10/25, 6.6; 5/14/26, 3.2; 6/28/26, 3.4; 7/3/26, 3.5; 4/6/27, 0.4; 4/23/27, 11.0; 9/4/27, 16.2.

7S/3W-35P2 - Vail Company - Near Murrieta; map location only; see location of wells plate. Reference point - top of casing, at elevation 1,014.78 feet. Note: Measurements from Vail Company records. 8/11/26, 9.3; 10/15/26, 3.7; 11/2/26, 1.9; 1/11/27, flowing; 5/15/27, 1.7; 6/4/27, 3.9.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/4W-1A1 - E. W. Bennett - Near Wildomar; 0.2 mile west of Oak Springs Ranch road (measured along dirt road) from intersection 0.85 mile northeast of Highway 71 (measured along Oak Springs Ranch road); open casing. Reference point - lower lip of pipe 1.5 feet above ground surface, at elevation 1,298 feet. 9/22/49, 39 (log); 9/2/52, 49.7; 2/11/53, 41.5; 5/6/53, 55.8; 11/17/53, 78.6; 4/21/54, 70.7.

7S/4W-1C1 - William Curtis - Near Wildomar; 0.65 mile easterly of Highway 71 (measured along Catt Road) and 200 feet south of Catt Road; at windmill. Reference point - top of casing 2.0 feet above ground surface. 12/2/48, 22.7; 5/16/52, 24.1; 2/24/53, 25.9; 5/6/53, 25.8.

7S/4W-1E1 - Kenneth Freeman - Near Wildomar; 0.42 mile northwest of Santa Rosa Street (measured along Highway 71) and 0.11 mile southwest of Highway 71; at windmill frame. Reference point - top of pipe clamp at ground surface, at elevation 1,203.22 feet. 2/11/53, 9.2; 4/30/53, 9.5; 4/21/54, 9.9.

7S/4W-1E2 - Kenneth Freeman - Near Wildomar; 150 feet northwest of well 1E1. Reference point - ground surface. 8/31/51, 14.5 (log).

7S/4W-1H1 - E. W. Bennett - Near Wildomar; 0.61 mile northeast of Highway 71 (measured along Oak Springs Ranch road) and 100 feet northwest of Oak Springs Ranch road. Reference point - top of casing 1 foot above ground surface, at elevation 1,270 feet. 9/2/52, 11.8; 2/11/53, 12.9; 5/6/53, 13.9; 7/7/53, 15.9; 11/17/53, 20.1; 4/21/54, 20.1.

7S/4W-1L2 - C. F. Smith - Near Wildomar; 0.03 mile southwest and 150 feet northwest of intersection of Santa Rosa Street and Highway 71; at windmill 25 feet south of well 1L1. Reference point - top of casing 0.25 foot above ground surface, at elevation 1,203.15 feet. 4/30/53, 17; 11/17/53, 21.6; 3/30/54, 16.8.

7S/4W-1M1 - R. J. Brown - Near Wildomar; 0.33 mile northwest of Santa Rosa Street (measured along Clay Avenue) and 200 feet southwest of Clay Avenue. Reference point - top of wood cover 0.63 foot above ground surface, at elevation 1,195.00 feet. 2/11/53, 0.9.

7S/4W-1N1 - Bert Taylor - Near Wildomar; 0.06 mile north and 100 feet east of intersection of Santa Rosa Street and Grand Avenue. Reference point - top of casing 1.35 feet above ground surface, at elevation 1,999.91 feet. 1/28/51, 20 (log); 11/17/53, 15.6; 4/21/54, 15.2.

7S/4W-1P1 - R. J. Brown - Near Wildomar; 500 feet southwest and 300 feet southeast of intersection of Santa Rosa Street and Highway 71; at windmill. Reference point - top of wood cover, at elevation 1,187.4 feet. 12/2/48, 12.4; 5/15/52, 2.2; 2/24/53, 1.8; 3/2/53, 3.7; 4/7/53, 3.7.

7S/4W-1P2 - Near Wildomar; 75 feet northwest and 75 feet southwest of intersection of Santa Rosa Street and Clay Avenue. Reference point - top of casing 2.5 feet above ground surface. 4/30/53, 10.0.

7S/4W-1Q1 - Shaw - Near Wildomar; 0.25 mile southeast of Santa Rosa Street (measured along Highway 71) and 0.06 mile southwest of Highway 71; northeast of house. Reference point - top of concrete block 1.0 foot above ground surface, at elevation 1,211.11 feet. 5/1/53, 39.9; 11/18/53, 41.3; 4/21/54, 41.3.

7S/4W-1Q2 - Shaw - Near Wildomar; 0.25 mile southeast of Santa Rosa Street (measured along Highway 71) and 0.06 mile southwest of Highway 71; at windmill, 10 feet southeast of house. Reference point - top of pipe clamp 1.05 feet above ground surface, at elevation 1,231.58 feet. 11/18/53, 55.9; 4/21/54, 55.6.

7S/4W-1Q3 - Near Wildomar; 85 feet southwest of well 1Q2; at windmill 75 feet southwest of house and top of hill. Reference point - top of clamp 0.5 foot above ground surface, at elevation 1,226.6 feet. 11/18/53, 34.7.

7S/4W-1Q4 - Gurney Edgar Paule - Near Wildomar; 300 feet northwest of well 1Q5; at windmill. Reference point - top of wood block 1.0 foot above ground surface, at elevation 1,200.4 feet. 5/1/53, 37.5; 11/18/53, 34.9; 4/21/54, 34.8.

7S/4W-1Q5 - Hayworth - Near Wildomar; 0.39 mile southeast of Santa Rosa Road (measured along Highway 71) and 200 feet southwest of Highway 71; 75 feet southwest of house. Reference point - top of concrete casing 0.67 foot above ground surface, at elevation 1,195.48 feet. 5/1/53, 44.9; 11/18/53, 46.5; 4/21/54, 46.5.

7S/4W-1Q6 - Near Wildomar; 0.35 mile southeast of Santa Rosa Street (measured along Highway 71) and 200 feet northeast of Highway 71; 50 feet west of house. Reference point - top of casing 1.7 feet above ground surface, at elevation 1,204.16 feet. 5/1/53, 18.3; 11/18/53, 20.6; 4/21/54, 20.1.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

7S/4W-2F1 - R. J. Brown - Near Wildomar; 0.06 mile northwest and 75 feet northeast of intersection of Grand Avenue and McVicar Street. Reference point - top of casing, at elevation 1,221.67 feet. Note: Measurements from Vail Company records, except as indicated. 1921, 19 (log); 10/27/26, 18.7; 11/4/26, 18.7; 2/4/27, 17.8; 3/7/27, 13.5; 2/10/53, 14.6 (DWR).

7S/4W-2G1 - R. J. Brown - Near Wildomar; 200 feet southeast and 60 feet southwest of intersection of Clay Avenue and McVicar Street. Reference point - lower lip of pipe at ground surface, at elevation 1,208.08 feet. 5/5/51, 8.5; 2/16/53, 7.6.

7S/4W-2G2 - R. J. Brown - Near Wildomar; 50 feet northwest of well 2G1. Reference point - (a) top of pump base, at elevation 1,208.08 feet (10/28/26 through 3/7/27); (b) hole in motor base, at elevation 1,208.95 feet (12/2/48 to present). Note: Measurements from Vail Company records except as indicated. 10/28/26, 9.1; 11/4/26, 7.2; 2/4/27, 5.3; 3/7/27, 1.6; 12/2/48, 5.2 (DWR); 2/10/53, 7.6 (DWR); 2/24/53, 7.2 (DWR).

7S/4W-3A3 - Near Wildomar; 0.11 mile southwest and 250 feet southeast of intersection of Grand and Central Avenues. Reference point - top of casing 2 feet above ground surface. 4/29/53, 53.1.

7S/4W-3B1 - Near Wildomar; 0.22 mile southwest of Grand Avenue (measured along Central Avenue) and 25 feet southeast of Central Avenue. Reference point - top of wood floor 1.0 foot above ground surface, at elevation 1,285 feet. 4/29/53, 55.0; 4/21/54, 56.9.

7S/4W-11A1 - Vail Company - Near Wildomar; 0.15 mile southwest and 0.20 mile northwest of intersection of Grand Avenue and Santa Rosa Street; at windmill in open field. Reference point - top of cover 1.5 feet above ground surface, at elevation 1,216.92 feet. 2/11/53, 15.0; 11/30/53, 16.3.

7S/4W-12B1 - Gurney Edgar Paule - Near Wildomar; 0.35 mile southeast of Santa Rosa Street (measured along Clay Avenue) and 200 feet northeast of Clay Avenue. Reference point - top of casing 0.82 foot above ground surface, at elevation 1,178.75 feet. 5/18/52, 10 (log); 3/2/53, 18.6; 5/1/53, 14.9.

7S/4W-12C1 - Shaw - Near Wildomar; 0.24 mile southeast of Santa Rosa Street (measured along Clay Avenue) and 50 feet northeast of Clay Avenue. Reference point - top of horizontal angle iron 1.67 feet above ground surface, at elevation 1,184.41 feet. 5/1/53, 17.8.

7S/4W-12D1 - John Belk - Near Wildomar; southeast of intersection of Grand Avenue and Santa Rosa Street; at windmill. Reference point - (a) top of 2 x 4 column clamp (12/2/48 and 5/15/52); (b) top of casing (2/10/53); (c) top of wood support 1.7 feet above ground surface, at elevation 1,208.17 feet (8/5/53 to present). 12/2/48, 22.4; 5/15/52, 19.8; 2/10/53, 22.8; 8/5/53, 23.7; 10/5/53, 21.0; 1/7/54, 21.7; 2/3/54, 21.0; 4/2/54, 20.4.

7S/4W-12G1 - Near Murrieta; 0.75 mile southeast of Santa Rosa Street (measured along Clay Avenue) and 0.15 mile southwest of Clay Avenue; at windmill on west bank of creek. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,165.31 feet. 4/22/54, 15.6.

7S/4W-12H2 - Verna Freeman - Near Murrieta; 1.18 mile northwest of Magnolia Street (measured along Highway 71) and 200 feet southwest of S-curve of Highway 71; at windmill, 250 feet northwest of house. Reference point - top of wood cover 1.0 foot above ground surface, at elevation 1,166.44 feet. 3/6/53, 28.2; 4/7/53, 29.3; 5/4/53, 32.9; 4/2/54, 29.9; 4/21/54, 30.2.

7S/4W-12J1 - J. M. W. Thompson - Near Murrieta; 0.11 mile southeast of well 12G1 (measured along creek). Reference point - (a) top of concrete casing, at elevation 1,159.18 feet (10/28/26 through 2/4/27); (b) top of concrete casing 4.5 feet above ground surface, at elevation 1,159.53 feet (2/27/53 to present). 10/28/26, 17.1 (Vail Co.); 11/4/26, 17.2 (Vail Co.); 2/4/27, 16.7 (Vail Co.); 2/27/53, 16.2; 3/2/53, 16.4; 4/7/53, 16.8; 4/30/53, 17.2; 7/7/53, 18.3; 8/5/53, 18.9; 9/1/53, 19.9; 11/18/53, dry; 2/3/54, 14.5; 4/2/54, 14.7; 4/22/54, 15.8.

7S/4W-12J2 - J. M. W. Thompson - Near Murrieta; 0.10 mile southeast of well 12G1 (measured along Creek) and 50 feet northwest of well 12J1. Reference point - (a) top of concrete casing, at elevation 1,159.22 feet (10/27/26 through 2/4/27); (b) top of concrete casing 4.0 feet above ground surface, at elevation 1,159.70 feet (4/30/53 to present). Note: Measurements from Vail Company records, except as indicated. 10/27/26, 17.1; 11/4/26, 17.2; 2/4/27, 16.6; 4/30/53, 17.2 (DWR); 11/18/53, dry (DWR); 4/22/54, 15.7 (DWR).

7S/4W-12R1 - Willis A. Thompson - Near Murrieta; 0.67 mile northwest of Magnolia Street (measured along Highway 71) and 0.28 mile southwest of Highway 71; east bank of creek. Reference point - top of casing 1.3 feet above ground surface, at elevation 1,144.64 feet. 2/3/53, 29.6; 3/2/53, 33.9; 9/2/53, 44.2; 11/18/53, 42.5; 4/22/54, 33.0.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

8S/2W-7A1 - Vail Company - Near Temecula; 2.0 miles east of Highway 395 (measured along Long Valley Road); at windmill 0.7 mile south of Long Valley Road near San Diego Aqueduct. Reference point - (a) not reported, at elevation 1,143.78 feet (5/14/26 through 10/3/27); (b) top of pipe clamps 1.0 foot above ground surface, at elevation 1,144 feet (3/9/53); (c) top of casing, 0.8 foot above ground surface, at elevation 1,144 feet (5/19/53). Note: Measurements from Vail Company records, except as indicated. 5/14/26, 64.2; 7/5/26, 63.4; 8/11/26, 63.1; 9/8/26, 62.9; 10/26/26, 63.0; 11/3/26, 63.5; 1/11/27, 63.4; 3/8/27, 64.6; 4/4/27, 63.8; 5/1/27, 63.9; 6/4/27, 63.6; 7/2/27, 63.4; 8/4/27, 63.3; 9/3/27, 63.4; 10/3/27, 63.5; 3/9/53, 93.9 (DWR); 5/19/53, 80.4 (DWR).

8S/3W-1P1 - Vail Company - Near Temecula; 0.2 mile north of Long Valley Road (measured along dirt road) from intersection 0.3 mile northeast of Highway 395 (measured along Long Valley Road); at windmill 420 feet north of house. Reference point - top of cover 0.6 foot above ground surface, at elevation 1,058.6 feet. 5/19/53, 8.6; 11/12/53, 20.8; 4/21/54, 19.2.

8S/3W-1P2 - Vail Company - Near Temecula; 0.2 mile northwest of Long Valley Road (measured along dirt road) from intersection 0.7 mile easterly of Highway 395 (measured along Long Valley Road). Reference point - top of casing 2.71 feet above ground surface, at elevation 1,069.07 feet. 4/21/54, 13.0.

8S/3W-1P3 - Vail Company - Near Temecula; map location only; see location of wells plate. Reference point - Not reported, at elevation 1,091.50 feet. Note: Measurements from Vail Company records, except as indicated. 3/17/27, 45 (log); 3/21/27, 38.5; 4/1/27, 38; 4/30/27, 37.4.

8S/3W-1Q1 - Vail Company - Near Temecula; map location only; see location of wells plate. Reference point - top of casing, at elevation 1,069.26 feet. Note: Measurements from Vail Company records. 8/11/26, flowing; 10/26/26, flowing; 11/2/26, flowing; 1/13/27, flowing; 4/30/27, flowing; 7/18/27, flowing; 7/29/27, flowing; 8/8/27, flowing; 9/9/27, flowing; 9/17/27, flowing.

8S/3W-11R3 - William Freideman - In Temecula; 100 feet southwest and 200 feet northwest of intersection of Pujol and Sixth Streets; at windmill. Reference point - clamp, at elevation 1,012.50 feet. Note: Measurements from Vail Company records. 12/1/25, 24.3; 7/5/26, 24.2; 8/18/26, 24.5; 9/8/26, 24.6; 10/27/26, 24.5; 11/2/26, 24.5; 1/13/27, 24.3; 3/7/27, 23.2; 7/29/27, 24.2.

8S/3W-12C1 - Vail Company - Near Temecula; 0.44 mile easterly of Highway 395 (measured along Long Valley Road) and 30 feet north of Long Valley Road. Reference point - (a) top of casing (6/13/25 through 1/29/27); (b) hole in pump base (5/19/53 to present). Note: Measurements from Vail Company records, except as indicated. 6/13/25, flowing; 11/10/25, 4.1; 8/11/26, flowing; 9/8/26, flowing; 10/26/26, flowing; 1/11/27, flowing; 7/29/27, flowing; 1925, 14 (log); 5/19/53, 15.1 (DWR); 11/12/53, 18.2 (DWR); 4/21/54, 14.8 (DWR).

8S/3W-12C2 - Vail Company - Near Temecula; map location only, see well location plate. Reference point - Not reported, at elevation 1,064.70 feet. Note: Measurements from Vail Company records. 6/13/25, flowing; 10/26/26, flowing.

8S/3W-12M1 - Temecula School - In Temecula; at school house. Reference point - pump base 1.5 feet above ground surface, at elevation 1,028.45 feet. 8/24/27, 37.7; 5/6/53, 46.0; 4/20/54, 46.4.

8S/3W-12M6 - Joe Escallier - In Temecula; at west corner of intersection of Mercedes and Fifth Streets. Reference point - top of wood cover 1.2 feet above ground surface, at elevation 1,010.33 feet. 5/6/53, 23.6; 7/9/53, 23.9; 8/10/53, 24.0; 9/16/53, 25.2; 10/22/53, 23.7; 11/9/53, 23.7; 12/4/53, 23.6.

8S/3W-12N2 - M. Machado - In Temecula; 150 feet southwest and 150 feet northwest of intersection of Main and Pujol Streets. Reference point - top of casing, at elevation 1,004.90 feet. Note: Measurements from Vail Company records. 12/1/25, 18.2; 5/14/26, 18.0; 7/5/26, 18.3; 8/11/26, 18.6; 9/8/26, 18.8; 10/27/26, 18.5; 11/2/26, 18.4; 1/13/27, 18.1; 3/7/27, 18.2; 7/29/27, 18.6.

8S/3W-12N5 - Howard Taylor - In Temecula; 0.11 mile northwest and 200 feet northeast of intersection of Pujol and Main Streets. Reference point - top of casing 1.1 feet above ground surface, at elevation 1,007.38 feet. 5/6/53, 20.3; 7/9/53, 19.9; 8/6/53, 19.8; 9/8/53, 19.9; 11/12/53, 19.8; 2/8/54, 19.3; 3/30/54, 18.7.

8S/3W-12N10 - Forest L. White - In Temecula; 280 feet southeast and 150 feet southwest of intersection of Pujol and Sixth Streets. Reference point - top of casing 0.7 foot above ground surface, at elevation 1,017.71 feet. 5/6/53, 31.2; 11/12/53, 32.0; 4/20/54, 30.7.

8S/3W-12N13 - H. Leatham - In Temecula; 60 feet southwest and 15 feet northwest of intersection of Main and Front Street. Reference point - not described 1 foot above ground surface. 8/31/53, 15 (owner).

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 1

(Depths to water in feet measured from reference point)
(continued)

8S/3W-12P1 - Pete Escallier - In Temecula; 130 feet southeast and 200 feet southwest of intersection of Highway 395 and Main Street; in shed. Reference point - top of casing 0.6 foot above ground surface, at elevation 1,030.18 feet. 5/13/53, 45.7; 11/12/53, 45.4; 4/21/54, 44.9.

8S/3W-12P7 - Alex Borel - In Temecula; 120 feet southeast and 60 feet southwest of intersection of Front and Third Streets; southwest of building. Reference point - top of wood cover 0.8 foot above ground surface, at elevation 1,002.40 feet. 5/6/53, 16.9; 11/10/53, 16.8; 4/20/54, 16.5.

8S/3W-12P8 - H. Leatham - In Temecula; south corner of intersection of Main and Front Street; in shed. Reference point - top of casing, at elevation 1,002.85 feet. 5/6/53, 17.8; 7/9/53, 18.0; 8/10/53, 18.2; 9/16/53, 17.9; 10/22/53, 17.5; 11/9/55, 17.6; 12/24/53, 17.2.

8S/3W-12P9 - Paul Flures - In Temecula; 100 feet east and 100 feet northwest of intersection of Highway 395 and First Street; at windmill. Reference point - top of casing 0.6 foot above ground surface, at elevation 1,035.21 feet. 5/13/53, 47.2; 11/12/53, 47.4; 4/20/54, 47.3.

8S/3W-12Q1 - Near Temecula; 0.27 mile northeasterly of Highway 395 (measured along C Street) and 160 feet northwest of C Street; in cemetery. Reference point - pump base, at elevation 1,070.89 feet. 11/13/53, 78.5; 4/20/54, 79.4.

8S/3W-12Q2 - H. Midgly - Near Temecula; 190 feet northeast of well 12Q1; at northeast corner of cemetery. Reference point - top of casing, at elevation 1,067.03 feet. 11/13/53, 74.3; 4/20/54, 75.4.

8S/3W-13B1 - Near Temecula; 200 feet northwest and 150 feet northeast of intersection of Highway 395 and C Street; at windmill. Reference point - top of wood cover 0.5 foot above ground surface, at elevation 1,010.0 feet. 5/13/53, 26.2; 11/13/53, 26.4.

8S/3W-13C1 - Lena Munoa - In Temecula; 200 feet southeast and 100 feet southwest of intersection of Front and First Streets; at windmill 30 feet southwest of house. Reference point - top of casing 0.7 foot above ground surface, at elevation 999.85 feet. 5/6/53, 16.5; 11/10/53, 15.4; 4/20/54, 15.2.

8S/3W-13D1 - Fred Ramirez - In Temecula; 0.18 mile southeast and 150 feet southwest of intersection of Pujol and Main Streets; at windmill. Reference point - top of casing 0.35 foot above ground surface, at elevation 1,015.73 feet. 5/6/53, 35.1; 11/12/53, 32.3; 4/21/54, 31.7.

8S/3W-13D2 - Doming Almaraz - In Temecula; 100 feet southeast of well 13D1; at windmill 0.20 mile southeast of Main Street and 150 feet southwest of Pujol Street at windmill. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,018.09 feet. 5/6/53, 38.5; 11/12/53, 35.3.

8S/3W-13F2 - Joe Freeman - Near Temecula; 0.45 mile southeast of Main Street (measured along Pujol Street) and 140 feet northeast of Pujol Street; at windmill. Reference point - top of casing at ground surface, at elevation 1,013.05 feet. 5/13/53, 31.3; 4/20/54, 30.9.

8S/3W-13K1 - Dick Evans - Near Temecula; 0.82 mile southeast of Main Street (measured along Front Street) and .07 mile south of Front Street; 15 feet south of house. Reference point - top of casing 0.6 foot above ground surface, at elevation 993.15 feet. 5/6/53, 14.4; 7/9/53, 14.4; 8/6/53, 15.6; 9/8/53, 15.5; 11/10/53, 14.6; 1/7/54, 14.4; 2/8/54, 14.2; 3/30/54, 13.8.

8S/3W-13R1 - Vail Company - Near Temecula; map location only; see location of wells plate. Reference point - top of pipe, at elevation 1,014.92 feet. 12/30/26, 36.6; 1/2/27, 36.6; 2/5/27, 36.7; 3/8/27, 36.8; 4/4/27, 37.1.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)

6S/1E-25J1 - Walter Hogarth In Reed Valley; 0.2 mile northeast of Red Mountain Lookout Road (measured along dirt road) from intersection 1.3 miles north of Reed Valley Road (measured along Red Mountain Lookout Road) and 9.1 miles north of Wilson Valley Road (measured along Reed Valley and Lookout Mountain Roads); equipped with small gasoline engine, 75 feet west of foreman's house. Reference point - top of concrete casing 3.4 feet above ground surface. 9/18/53, 15.4; 11/19/53, 12.9; 5/5/54, 8.2.

6S/1E-25R1 - Walter Hogarth - In Reed Valley; 0.1 mile northeast of Red Mountain Lookout Road (measured along dirt road) from intersection 1.3 miles north of Reed Valley Road (measured along Red Mountain Lookout Road) and 9.1 miles north of Wilson Valley Road (measured along Reed Valley and Red Mountain Lookout Roads); open casing 100 feet southeast of dirt road. Reference point - top of casing 2 feet above ground surface. 5/5/54, 9.7.

6S/1E-25R2 - Walter Hogarth - In Reed Valley; open casing 100 feet southeast of well 25R1. Reference point - top of casing 1 foot above ground surface. 5/5/54, 14.2.

6S/1E-36A1 - Walter Hogarth - In Reed Valley; 1.15 miles north of Reed Valley Road (measured along Red Mountain Lookout Road) from intersection 7.8 miles north of Wilson Valley Road (measured along Reed Valley Road); open casing 50 feet east of Red Mountain Lookout Road. Reference point - top of casing 0.8 foot above ground surface. 5/5/54, 22.6.

6S/1E-36K1 - Ivan McKinley - In Reed Valley; 0.5 mile north of Reed Valley Road (measured along Red Mountain Lookout Road) from intersection 7.8 miles north of Wilson Valley Road (measured along Reed Valley Road); test hole 400 feet west of Red Mountain Lookout Road. Reference point - ground surface. 9/16/53, 6.

7S/1E-1H1 - Ivan McKinley - In Reed Valley; 7.3 miles north of Wilson Valley Road (measured along Reed Valley Road); 0.4 mile north of house and 300 feet west of Reed Valley Road. Reference point - top of casing 1 foot above ground surface. 11/19/53, 20.1.

7S/1E-1J1 - Ivan McKinley - In Reed Valley; 7.1 miles north of Wilson Valley Road (measured along Reed Valley Road); 0.2 mile north of foreman's house and 500 feet west of Reed Valley Road. Reference point - top of casing 1.5 feet above ground surface. 11/19/53, 14.4; 5/5/54, 11.8.

7S/1E-9C1 - Bader - East of Sage; 2.6 miles northeast of Highway 79 (measured along dirt road) from intersection 2.2 miles southeast of Sage (measured along Highway 79); in open field 800 feet south of fork in dirt road; open casing. Reference point - top of casing 0.4 foot above ground surface. 11/18/53, dry; 5/4/54, dry.

7S/1E-15D2 - D. Ippolito - In Lewis Valley; 2.7 miles northeast of Highway 79 (measured along dirt road) from intersection 2.9 miles southeast of Sage (measured along Highway 79); 250 feet northeast of Rancho Del Vallejo house. Reference point - hole in casing 0.6 foot above ground surface, at elevation 2,571 feet. 11/17/53, 54.1.

7S/1E-15E1 - D. Ippolito - In Lewis Valley; 2.7 miles northeast of Highway 79 (measured along dirt road) from intersection 2.9 miles southeast of Sage (measured along Highway 79), 600 feet southeast of Rancho Del Vallejo house in corrugated metal pump house. Reference point - top of casing 0.5 foot above ground surface, at elevation 2,542 feet. 11/17/53, 113.4.

7S/1E-15E3 - D. Ippolito - In Lewis Valley; Rancho Del Vallejo; concrete casing 500 feet east of well 15 E1. Reference point - top of concrete casing 2.4 feet above ground surface, at elevation 2,547 feet. 11/17/53, 82.0.

7S/1E-15E5 - D. Ippolito - In Lewis Valley; Rancho Del Vallejo; 1,200 feet east of house and 300 feet northeast of well 15E3; under small metal shelter. Reference point - ground surface. 7/6/50, 95 (log).

7S/1E-16N1 - D. Ippolito - In Lewis Valley; Rancho Del Vallejo, 1.6 miles northeast of Highway 79 (measured along main dirt road and dirt road leading to old abandoned house) from intersection 2.9 mile southeast of Sage (measured along Highway 79); 150 feet south of house, 20 feet west of dirt road and 3 feet from fence around house; open concrete casing. Reference point - top of 10 inch opening into well 2 feet above ground surface, at elevation 2,410 feet. 11/17/53, 32.9.

7S/1E-16N2 - D. Ippolito - In Lewis Valley; Rancho Del Vallejo, 12 feet north of well 16N1; open casing. Reference point - top of casing 2.2 feet above ground surface, at elevation 2,414 feet. 11/17/53, 32.2.

7S/1E-16Q2 - D. Ippolito - In Lewis Valley; Rancho Del Vallejo, 2.0 miles northeast of Highway 79 (measured along dirt road, from intersection 3.6 miles southeast of Sage (measured along Highway 79), 500 feet east of dirt road; open casing. Reference point - top of casing 0.6 foot above ground surface, at elevation 2,436 feet. 11/17/53, 75.2.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

7S/1E-16Q3 - D. Ippolito - In Lewis Valley; 1.8 miles northeast of Highway 79 (measured along dirt road); from intersection 2.9 miles southeast of Sage (measured along Highway 79); 50 feet east of road and 500 feet south of well 16Q1. Reference point - ground surface, at elevation 2,380 feet. When drilled, 59 (log); 11/17/53, 55 (owner).

7S/1E-17G1 - Charles Bader - In Lewis Valley; 0.85 mile northeast of Highway 79 (measured along dirt road) from intersection 2.2 miles southeast of Sage (measured along Highway 79); 150 feet east of ranch house. Reference point - hole in pump base 1 foot above ground surface, at elevation 2,359 feet. 5/5/53, 15.0; 11/17/53, 12.3; 5/4/54, 12.4.

7S/1E-17G2 - Charles Bader - In Lewis Valley; 100 feet northwest of well 17G1. Reference point - top of casing 0.7 foot above ground surface, at elevation 2,359 feet. 11/17/53, 11.9; 5/4/54, 11

7S/1E-18K1 - Duncan Industries - Near Sage; 2 miles southeast of Sage (measured along Highway 79); under corrugated metal shed 50 feet west of Highway 79. Reference point - bottom of pump base at ground surface, at elevation 2,321 feet. 5/5/53, 7.0; 11/17/53, 8.6; 5/5/53, 5.8.

7S/1E-20P1 - L. G. Robertson - In Lewis Valley; 0.25 mile east of Highway 79 (measured along dirt road) from intersection 3.4 miles southeast of Sage (measured along Highway 79); 150 feet southeast of dirt road; open casing. Reference point - top of casing 2.6 feet above ground surface at elevation 2,143 feet. 10/28/52, 35.8; 5/5/53, 35.4; 5/5/54, dry.

7S/1E-22B1 - Knecht - East of Lewis Valley; 2.05 miles northeast of Wilson Valley Road (measured along dirt road) from intersection 2.0 miles east of Highway 79 (measured along Wilson Valley Road); at windmill behind house 0.25 mile west of dirt road. Reference point - top of plank cover 1 foot above ground surface. 9/22/53, 7.5; 11/19/53, 7.9; 5/5/54, 5.9.

7S/1E-29E1 - Parks - In Lewis Valley; 4 miles southeast of Sage (measured along Highway 79), at windmill 15 feet west of Highway 79 and 15 feet south of house. Reference point - top of casing 2 feet above ground surface, at elevation 2,093 feet barometric level. 2/2/51, 13.0; 12/5/51, 16.0; 10/30/52, 17.2; 5/5/53, 16.5; 11/17/53, 18.8; 5/4/54, 17.5.

7S/1E-30H1 - P. B. Cross - In Lewis Valley; 1,100 feet southwest of Highway 79 (measured along dirt road) from intersection of stream and Highway 79, 3.9 miles southeast of Sage (measured along Highway 79); at windmill tower 100 feet south of house. Reference point - top of plank cover 1 foot above ground surface, at elevation 2,062 feet barometric level. 2/2/51, 10.8; 12/5/51, 14.7; 10/28/52, 15.4; 5/5/53, 15.7; 11/17/53, 13.8; 5/4/54, 12.8.

7S/1E-30J1 - A. J. and C. G. Bendler - In Lewis Valley; 2,000 feet southwest of Highway 79 (measured along dirt road) from intersection of stream and Highway 79, 3.9 miles southeast of Sage (measured along Highway 79); at windmill in open field, 400 feet northeast of house. Reference point - lower edge of 1-inch angle brace on windmill tower 2 feet above ground surface, at elevation 2,063 feet barometric level. 2/2/51, 3.8; 12/5/51, 5.2; 10/28/52, 5.3; 5/5/53, 4.9; 5/4/54, 5.9.

7S/1E-30J2 - A. J. and C. G. Bendler - In Lewis Valley; 2,000 feet southwest of Highway 79 (measured along dirt road) from intersection of Highway 79 and stream 3.9 miles southeast of Sage (measured along Highway 79); in cattle pen 125 feet west of house; equipped with a Dodge engine. Reference point - top of plank covering at ground surface, at elevation 2,046 feet barometric level. 2/2/51, 2.7; 12/5/51, 6.5; 10/28/52, 6.3; 5/5/53, 9.2; 11/17/53, 7.8; 5/4/54, 4.1.

7S/1E-32C1 - In Lewis Valley; 4.6 miles southeast of Sage (measured along Highway 79), 0.5 mile west of intersection of Wilson Valley Road and Highway 79 (measured along Highway 79); at windmill in open field 500 feet south of Highway 79. Reference point - top of casing 1 foot above ground surface, at 2,182 feet. 5/5/53, 48.5; 11/17/53, 49.0; 5/4/54, 49.3.

7S/1E-33P1 - Tyler - Near Radec; 0.6 mile east of Highway 79 (measured along dirt road); 4.15 miles north of Radec (measured along Highway 79); at windmill tower in open field. Reference point - notch in casing 1.3 feet above ground surface, at elevation 2,180 feet. 5/5/53, 40.8; 9/16/53, 41.3; 11/16/53, 42.2; 5/4/54, 48.8.

7S/1E-34E1 - Near Radec; 1.6 miles west of Highway 79 (measured along Wilson Valley Road); 4.7 miles north of Radec (measured along Highway 79); northwest of house in fence corner. Reference point - top of plank covering 1 foot above ground surface. 9/16/53, 9.2; 11/19/53, 10.6; 5/5/54, 7.

7S/2E-1H1 - Near Anza; 3.0 miles northwest of Coahuila Road (measured along Riddle and Bautista Canyon Roads) from intersection 1.5 miles west of Anza (measured along Coahuila Road); 0.7 mile north of southeast corner of Section 1 (measured along Bautista Canyon Road) at windmill 150 feet northeast of Bautista Canyon Road and 25 feet east of house, outside watershed. Reference point - top of casing 0.9 foot above ground surface. 5/21/53, 99.9.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

7S/2E-2E1 - W. I. Smith - In Tripp Flat; 3.95 miles north of Coahuila Road (measured along Cary Road) from intersection 3.5 miles west of Anza; 200 feet east of Cary Road at windmill 25 feet east of house and 10 feet north of garage, outside watershed. Reference point - bolt hole in flange, 0.8 foot above ground surface. 5/7/53, 39.5; 11/10/53, 44.7.

7S/2E-3G1 - C. H. Tripp - In Tripp Flat; 4.5 miles north of Coahuila (measured along Cary Road); at windmill 100 feet northwest of house and 75 feet north of Cary Road, outside watershed. 5/7/53, 27 (owner).

7S/2E-6N1 - Ivan McKinley - In Reed Valley; 6.9 miles north of Wilson Valley Road (measured along Reed Valley Road) from intersection 3.1 miles east of Highway 79 (measured along Wilson Valley Road); in brick pump house; 300 feet east of Reed Valley Road and 150 feet northwest of main residence. Reference point - top of casing 2.2 feet above ground surface. 9/16/53, 16.8; 11/18/53, 17.1; 5/5/54, 13.7.

7S/2E-6N2 - Ivan McKinley - In Reed Valley; 6.9 miles north of Wilson Valley Road (measured along Reed Valley Road) from intersection 3.1 miles east of Highway 79 (measured along Wilson Valley Road); open casing in corrugated metal machine shop, 100 feet east of Ranch foreman's house. Reference point - top of casing 2 feet above ground surface. 9/16/53, 24.4; 11/18/53, 27.7; 5/5/54, 20.8.

7S/2E-11C1 - Frank Lane - Near Coahuila; 3.25 miles north of Coahuila (measured along Cary Road); at windmill 135 feet northeast of Cary Road and 45 feet north of house. Reference point - top of casing above ground surface. 11/21/51, dry; 11/10/53, 27.1.

7S/2E-11C2 - Frank Lane - Near Coahuila; open casing 115 feet west and 25 feet south of well 11C1. Reference point - top of casing 0.5 foot above ground surface. 5/7/53, 23.1; 11/10/53, 23.8.

7S/2E-11M1 - E. Hayes - Near Coahuila; 0.5 mile northwest of Cary Road (measured along dirt road) from intersection 2.45 miles north of Coahuila (measured along Cary Road); at windmill 100 feet northwest of house. Reference point - top of casing 1.5 feet above ground surface. 5/7/53, 24.6.

7S/2E-13D1 - George Hepburn - Near Coahuila; 1.7 miles north of Coahuila (measured along Cary Road); well equipped with engine driven pump, 200 feet south of house and 200 feet east of Cary Road. Reference point - top of casing 1.0 foot above ground surface, at elevation 3,773 feet. 11/29/51, 41.2; 11/21/52, 22.1; 5/7/53, 23.0; 11/9/53, 25.9; 5/10/54, 32.8.

7S/2E-13D2 - George Hepburn - Near Coahuila; at windmill 200 feet northeast of well 13D1. Reference point - top of casing 0.6 foot above ground surface, at elevation 3,766 feet. 12/6/50, 42.5; 11/21/51, 41.6; 5/7/53, 25.5; 11/9/53, 28.5.

7S/2E-13D3 - Holland - Near Coahuila; 1.8 miles north of Coahuila (measured along Cary Road); 500 feet north of house and 215 feet east of Cary Road. Reference point - top of casing 2.5 ft. above ground surface. 11/10/53, 44.8; 5/10/54, 40.7.

7S/2E-13N1 - L. W. Holcomb - Near Coahuila; 0.83 mile north of Coahuila (measured along Cary Road); at windmill 650 feet east of Cary Road and 135 feet west of house. Reference point - top of casing 1 foot above ground surface, at elevation 3,701 feet. 11/29/51, 51.1; 11/21/52, 41.1; 5/7/53, 40.1; 11/10/53, 43.3; 5/10/54, 43.8.

7S/2E-13R1 - C. A. Buchanan - Near Coahuila; 0.5 mile north of Coahuila Road (measured along Howard Road); at windmill 250 feet west of Howard Road and 40 feet west of house. Reference point - top of casing 1.4 feet above ground surface, at elevation 3,850 feet. 11/10/53, 26.0.

7S/2E-14H1 - G. H. Olds - In upper Coahuila Valley; 1.5 miles north of Coahuila Road (measured along Cary Road); at windmill 500 feet west of Cary Road and 100 feet southwest of house. Reference point - top of casing 1 foot above ground surface. 5/7/53, 50 (owner); 5/10/54, 50 (owner).

7S/2E-14H2 - G. H. Olds - In upper Coahuila Valley; 700 feet southwest of well 14H1. Reference point - top of casing 1 foot above ground surface, at elevation 3,750 feet. 11/10/53, 34.7; 5/10/54, 31.8.

7S/2E-22A1 - Head - Near Coahuila; 1.7 miles north of Coahuila Road (measured along dirt road) from intersection 1.3 miles west of Coahuila (measured along Coahuila Road); at windmill near house. Reference point - top of casing 1.5 foot above ground surface. 5/7/53, 25.0; 11/9/53, 33.5; 5/10/54, 29.4.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

7S/2E-22K1 - T. C. Pomeroy - Near Coahuila; 0.8 mile north of Coahuila Road (measured along dirt road) from intersection 1.3 miles west of Coahuila (measured along Coahuila Road); at windmill 50 feet southwest of house. Reference point - top of casing 1.5 feet above ground surface. 5/7/53, 13.4; 11/9/53, 15.6; 5/10/54, 13.2.

7S/2E-23K1 - Coahuila Indian Reservation - Near Coahuila; 0.4 mile north of Coahuila Road (measured along dirt road) from intersection opposite Coahuila School; at windmill 45 feet east and 35 feet north of house. Reference point - top of casing 2.4 feet above ground surface, at elevation 3,639 feet barometric level. 11/29/51, 29.4; 11/21/52, 23.9; 5/7/53, 21.6; 11/9/53, 22.3; 5/10/54, 22.2.

7S/2E-23M1 - Castillo - Near Coahuila; 0.3 mile west and 0.3 mile north of Coahuila; at windmill in pasture. Reference point - top of casing 0.7 foot above ground surface, at elevation 3,600 feet. 5/7/53, 3.4; 11/9/53, 6.7; 5/10/54, 4.2.

7S/2E-23P1 - Coahuila Indian Reservation - Near Coahuila; at windmill in pasture, 0.2 mile north of Coahuila Road and 0.1 mile west of Coahuila School. Reference point - top of casing 3.2 feet above ground surface. 5/10/54, 125.

7S/2E-24H1 - C. W. Ayers - Near Coahuila; 0.1 mile north and 0.1 mile west from intersection 1.0 mile northeast of Cary Road (measured along Coahuila Road); 50 feet west of house. Reference point - hole in pump base 1.3 feet above ground surface. 5/7/53, 66.1.

7S/2E-26B1 - Coahuila Indian Reservation - Near Coahuila; 200 feet southeast of Coahuila School. Reference point - ground surface. 8/29/40, 12 (log).

7S/2E-29P1 - Bradley - In lower Coahuila Valley; 1.5 miles northwest of Coahuila Road (measured along dirt road) from intersection 2.3 miles southwest of Coahuila (measured along Coahuila Road); open casing in group of trees 160 feet south of Parks tombstone. Reference point - top of casing 2.7 feet above ground surface, at elevation 3,424 feet barometric level. 12/7/50, 21.0; 12/4/51, 19.9; 11/21/52, 20.2; 5/6/53, 18.7; 11/9/53, 20.9; 5/10/54, 19.7.

7S/2E-29R1 - In lower Coahuila Valley; 1.25 miles northeast of Coahuila Road (measured along dirt road) from intersection 2.3 miles southwest of Coahuila (measured along Coahuila Road); 0.2 mile at windmill near water tank south of dirt road. Reference point - top of casing 2.9 feet above ground surface, at elevation 3,420 feet. 5/6/53, 14.9; 11/9/53, 17.6; 5/10/54, 16.0.

7S/2E-32A1 - Parks - In lower Coahuila Valley; 0.6 mile north of Coahuila Road (measured along east line of section 32) from intersection 3.3 miles southwest of Coahuila (measured along Coahuila Road); open casing in field 0.5 mile north of ranch house and 50 feet west of fence line (east line of Section 32). Reference point - top of casing 1 foot above ground surface, at elevation 3,420 feet. 12/4/53, 20.7; 5/10/54, 23.8.

7S/2E-32F1 - Betty B. Murcell - In lower Coahuila Valley; 1.3 miles north of Coahuila Road (measured along dirt road) from intersection 4.3 miles southwest of Coahuila (measured along Coahuila Road); in fenced enclosure in pasture 250 feet east of house; artesian well equipped with gasoline engine. Reference point - ground surface, at elevation 3,400 feet. Measurement of 12/2/53 represents pressure head in feet above reference point. 11/9/53, flowing; 12/2/53, -1.5; 5/10/54, flowing.

7S/2E-32J1 - Parks - In lower Coahuila Valley; 0.1 mile north of Coahuila Road from intersection 3.3 miles southwest of Coahuila (measured along Coahuila Road); an artesian well at windmill 10 feet east and 25 feet north of ranch house. Reference point - top of casing 2.3 feet above ground surface, at elevation 3,430 feet. 11/9/53, flowing; 12/2/53, flowing; 5/10/54, flowing.

7S/2E-32J2 - Parks - In lower Coahuila Valley; 0.2 mile northwest of Coahuila Road from intersection 3.3 miles southwest of Coahuila (measured along Coahuila Road); at windmill 750 feet west of house and 10 feet north of water tank. Reference point - top of casing 2.7 feet above ground surface. 5/6/53, 6.4; 5/10/54, 6.6.

S/2E-33C1 - Coahuila Indian Reservation - In lower Coahuila Valley; 0.25 miles northwest of Coahuila Road (measured along dirt road) from intersection 2.3 miles southwest of Coahuila (measured along Coahuila Road); at windmill 500 feet west of dirt road and 200 feet south of channel of Coahuila Creek. Reference point - top of cover below pipe clamps 1 foot above ground surface, at elevation 3,438 feet barometric level. 7/11/40, 22 (log); 12/7/50, 40.9; 4/17/51, 42.9; 12/4/51, 43.2; 11/21/52, 34.5; 5/6/53, 34.7; 11/9/53, 37.7; 5/10/54, 35.5.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

7S/3E-4J1 - J. E. Cartier - Near Anza; 1.5 miles north of Mitchell Road (measured along dirt road) from intersection 0.1 mile east of Hill Road (measured along Mitchell Road); 500 feet north of house and 50 feet north of clump of oak trees; equipped with jack pump powered by gasoline engine. Reference point - top of planking over casing 1.5 feet above ground surface; 11/22/53, 22.3; 4/22/54, 21.7.

7S/3E-6E1 - Near Anza; 3.6 miles northwest of Coahuila Road (measured along Riddle and Bautista Canyon Roads); 275 feet east and 125 feet north of west quarter corner of section 6; at windmill 130 feet northeast of house. Reference point - top of casing 1.1 feet above ground surface. 11/10/53, 119.2; 5/7/54, 122.3.

7S/3E-7R1 - A. T. Thompson - Near Anza; 200 feet northwest of intersection of Riddle and Mitchell Roads; at windmill 10 feet south of tank and 40 feet east of house. Reference point - top of casing 1 foot above ground surface, at elevation 4,086 feet (barometric level). 11/30/50, 185; 7/9/51, 170; 11/15/51, 178; 5/21/53, 176.4; 11/12/53, 171.4; 5/7/54, 173.0; 9/2/54, 180.3; 9/5/54, 171.3; 10/13/54, 194.2; 10/19/54, 172.

7S/3E-8E1 - Marjorie and Edward F. Roalfe - Near Anza; at windmill 0.6 mile north and 200 feet east of intersection of Riddle and Mitchell Roads. Reference point - top of casing 2.0 feet above ground surface, at elevation 4,193 feet (barometric level). 11/15/51, 107.2; 11/10/53, 110.3; 5/7/54, 123.4.

7S/3E-8Q1 - C. Hornback - Near Anza; 0.5 mile west and 400 feet north of intersection of Mitchell and Barham Roads; at windmill 100 feet north of house. Reference point - (a) top of casing 1.9 feet above ground surface, at elevation 4,096.68; (b) top of 2 x 4 inch board at center pipe 2.1 feet above ground surface, at elevation 4,096.9 (11/10/52 and 5/21/53). 8/16, 57 (U.S.G.S., W.S.P. 429); 11/30/50, 58.8; 11/21/51, 70.1; 11/10/52, 59.8; 5/21/53, 59.5; 11/12/53, 59.0; 5/7/54, 59.0.

7S/3E-9P1 - Dickson Bros. - Near Anza; at windmill 0.7 mile west and 0.4 mile northeast of intersection of Hill and Mitchell Roads. Reference point - top of casing 2 feet above ground surface. 1952, 80 (log).

7S/3E-10L1 - George M. Schmoll - Near Anza; at windmill 600 feet northeast of well 10M1. Reference point - top of casing 2.5 feet above ground surface, at elevation 4,213 feet (barometric level). 11/15/51, 217.0.

7S/3E-10M1 - Near Anza; 0.4 mile north and 0.25 mile east of intersection of Hill and Mitchell Roads; at windmill 75 feet west and 60 feet north of house. Reference point - slot under casing cover 0.9 feet above ground surface, at elevation 4,211 feet (barometric level). 11/15/51, 221.9; 11/10/52, 243.8; 5/22/53, 240.6; 11/12/53, 225.3; 4/21/54, 226.4.

7S/3E-11Q1 - J. D. Sherman - Near Anza; 0.9 mile east of intersection of Kirby and Mitchell Roads; at mouth of small canyon, 10 feet north of fence line (south line of section 11) and 110 feet east of fire road; open casing. Reference point - top of casing 2 feet above ground surface. 12/1/50, 12.7; 11/10/52, 14.0; 5/22/53, 11.7; 11/12/53, 12.4; 4/21/54, 11.6.

7S/3E-13D1 - Elmer E. Everett - Near Anza; 1.0 mile northeast of Coahuila Road (measured along dirt road) from intersection 2 miles east of Anza (measured along Coahuila Road); 200 feet southeast of house and 20 feet west of well 13D2. Reference point - top of casing, 1.4 feet above ground surface. 11/13/53, 9.2; 4/20/54, 11.6.

7S/3E-13D2 - Elmer E. Everett - Near Anza; at windmill 20 feet east of well 13D1. Reference point - top of plank cover, 1.1 feet above ground surface. 11/13/53, 7.2; 4/20/54, 10.3.

7S/3E-13D3 - Elmer E. Everett - Near Anza; 50 feet east of well 13D1. Reference point - top of casing 0.9 foot above ground surface. 11/13/53, 7.6.

7S/3E-14C1 - J. D. Sherman - Near Anza; at windmill 0.5 mile east and 500 feet south of intersection of Kirby and Mitchell Roads. Reference point - top of casing 1 foot above ground surface, at elevation 4,088 feet (barometric level). 12/1/50, 106.9; 11/15/51, 106.5; 11/10/52, 108.5; 5/22/53, 111.6; 11/12/53, 109.2; 4/21/54, 111.6.

7S/3E-14P1 - Lappos - Near Anza; 1.95 miles east of Anza (measured along Coahuila Road); at windmill 400 feet northwest of Coahuila Road; open casing. Reference point - top of casing, 3.3 feet above ground surface, at elevation 4,019.25 feet. 5/27/53, 53.3; 11/13/53, 53.2; 4/20/54, 53.5.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

7S/3E-15J1 - Near Anza; at windmill 0.3 mile north and 0.19 mile west of intersection of Kirby and Coahuila Roads. Reference point - top of plank at pump base 0.6 foot above ground surface, at elevation 3,974.25 feet. 11/10/52, 20.6; 5/22/53, 21.9; 11/13/53, 21.1; 4/21/54, 21.0.

7S/3E-15N1 - Bob Holcomb - Near Anza; 0.6 mile east of Anza (measured along Coahuila Road); at windmill 300 feet east of house and 130 feet north of Coahuila Road. Reference point - top of casing, 0.7 foot above ground surface, at elevation 3,927.21 feet. 5/22/53, 37.3; 11/24/53, 18.3; 4/21/54, 16.4.

7S/3E-15N2 - Bob Holcomb - Near Anza; 125 feet northeast of well 15N1. Reference point - top of casing at ground surface. 11/24/53, 15.3; 4/21/54, 12.3.

7S/3E-15P1 - John Bohlen - Near Anza; 1.1 mile east of Anza (measured along Coahuila Road); at windmill 200 feet north of Coahuila Road and 75 feet northeast of house. Reference point - top of casing 7.0 feet above ground surface, at elevation 3,942.86 feet. 11/24/53, 4.2.

7S/3E-15Q1 - John Bohlen - Near Anza; at windmill 300 feet west of well 15P1. Reference point - top of casing 2.6 feet above ground surface, at elevation 3,942.33 feet. 11/24/53, 4.9.

7S/3E-15Q3 - John Bohlen - Near Anza; 600 feet northeast of well 15Q1. Reference point - top of casing 1.2 feet above ground surface, at elevation 3,949.28 feet. 5/22/53, 8.9; 11/24/53, 6.6; 4/21/54, 6.6.

7S/3E-16K2 - Lichwald - Near Anza; 0.5 mile north and 0.5 mile east of intersection of Coahuila and Barham Roads; at windmill 250 feet east of well 16K1. Reference point - top of casing 1.3 feet above ground surface, at elevation 3,977.66 feet. 1942, 31(log); 5/21/53, 38.0; 11/25/53, 49.4; 4/21/54, 47.3.

7S/3E-16N1 - E. G. Register - Near Anza; 400 feet east and 400 feet north of intersection of Coahuila and Barham Roads. Reference point - (a) top of casing 0.9 foot above ground surface, at elevation 3,945.17 feet (12/1/50 and 11/29/51); (b) hole in side of casing at ground surface, at elevation 3,944.3 feet. 12/1/50, 88.9; 11/29/51, 94.3; 11/11/52, 90.5; 5/8/53, 90.1; 11/25/53, 89.5; 4/21/54, 96.9.

7S/3E-16P1 - H. A. Bergman - In Anza; at windmill 200 feet north and 170 feet west of intersection of Coahuila and Contreras Roads. Reference point - top of iron cover 1.2 feet above ground surface, at elevation 3,926.56 feet. 11/7/40, 69; 12/1/50, 70.8; 1/30/51, 75.1; 3/8/51, 71.5; 4/5/51, 82.9; 5/8/51, 74.5; 6/13/51, 72.5; 7/9/51, 86.2; 8/7/51, 84.4; 9/6/51, 83.9; 10/3/51, 80.6; 11/7/51, 79.4; 1/3/52, 74.0; 1/14/52, 77.4; 11/11/52, 87.8; 5/8/53, 84.5; 11/24/53, 89.8; 4/21/54, 89.2.

7S/3E-16P2 - Robert L. Register - Near Anza; 0.12 mile west and 200 feet north of intersection of Contreras and Coahuila Roads; 50 feet north of house. Reference point - top of 4 x 4 inch block support 2.5 feet above ground surface, at elevation 3,934.77 feet. 11/25/53, 85.8; 4/21/54, 88.04.

7S/3E-17B1 - Near Anza; 0.35 mile west and 165 feet south of intersection of Barham and Mitchell Roads; at windmill 65 feet south of house. Reference point - surface of concrete slab 0.7 foot above ground surface, at elevation 4,083.99 feet. 8/16, 84 (U.S.G.S., W.S.P. 429); 11/30/50, 76.5; 1/30/51, 74.5; 3/8/51, 76.3; 4/5/51, 76.3; 5/8/51, 76.3; 6/13/51, 76.4; 7/9/51, 79.9; 8/7/51, 83.0; 9/6/51, 81.8; 11/7/51, 81.3; 1/3/52, 78.0; 2/5/52, 76.1; 3/4/52, 76.3; 4/4/52, 76.1; 5/13/52, 77.7; 6/10/52, 76.3; 7/8/52, 77.0; 7/30/52, 77.9; 8/25/52, 76.5; 1/16/53, 75.9; 2/27/53, 76.0; 3/27/53, 75.7; 5/21/53, 76.4; 7/3/53, 76.1; 11/12/53, 86.8; 1/6/54, 84.9; 2/4/54, 76.0; 4/1/54, 76.8; 5/7/54, 84.0.

7S/3E-17C1 - Lincoln Barham - Near Anza; 0.63 mile west and 0.11 mile south of intersection of Mitchell and Barham Roads; 60 feet south and 70 feet east of house; at windmill 10 feet east of elevated tank. Reference point - top of casing 1.5 feet above ground surface, at elevation 4,064.17 feet. 11/30/50, 82.0; 11/21/51, 85.5; 11/10/52, 82.6; 11/12/53, 82.1; 5/7/54, 82.2; 9/2/54, 83.2; 9/5/54, 82.4; 10/19/54, 83.3.

7S/3E-17J1 - G. Lee Ison - Near Anza; 0.4 mile north and 90 feet west of intersection of Barham and Coahuila Roads; open casing. Reference point - top of casing 1.5 feet above ground surface, at elevation 3,989.56. 3/53, 105(log); 5/8/53, 109.2; 11/25/53, 119.5; 4/21/54, 109.9; 4/30/54, 110.0.

7S/3E-17R1 - G. Lee Ison - Near Anza; at windmill 0.18 mile north and 325 feet west of intersection of Barham and Coahuila Roads. Reference point - top of casing 3.0 feet above ground surface, at elevation 3,961.71. 6/16, 100 (U.S.G.S., W.S.P. 429); 11/30/50, 90.5; 1/30/51, 90.8; 3/8/51, 90.8; 4/5/51, 91.0; 5/8/51, 91.0; 6/13/51, 91.2; 7/9/51, 91.4; 8/7/51, 92.0; 9/6/51, 91.5; 10/3/51, 92.0; 11/7/51, 91.6; 1/3/52, 86.0; 11/11/52, 97.3; 5/8/53, 94.6; 11/25/53, 92.7; 4/21/54, 97.4; 9/2/54, 93.3; 9/5/54, 93.4; 9/28/54, 93.4; 10/19/54, 93.5.

7S/3E-18A1 - Lydia King - Near Anza; 0.25 mile south and 110 feet west of intersection of Mitchell and Riddle Roads; 75 feet east and 35 feet north of house; well equipped with jack pump. Reference point - (a) Top of casing 0.5 foot above ground surface, at elevation 4,053 feet (barometric level) (11/12/53 through 9/3/54); (b) recorder house floor 0.9 foot above ground surface, at elevation 4,053 feet (barometric level) (9/5/54 through 10/19/54). 11/12/53, 137.1; 4/29/54, 137.4; 9/2/54, 141.7; 9/3/54, 137.9; 9/5/54, 138.4; 9/7/54, 138.4; 9/14/54, 138.4; 9/21/54, 138.5; 9/28/54, 138.6; 10/5/54, 138.7; 10/13/54, 138.8; 10/19/54, 139.0.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

7S/3E-18N1 - Florence Stonebreaker - Near Anza; 0.5 mile north and 350 feet east of intersection of Howard and Coahuila Roads; at windmill 150 feet southeast of house. Reference point - top of casing 0.8 foot above ground surface. 5/7/53, 29.6; 11/10/53, 39.6; 5/7/54, 41.6.

7S/3E-20A1 - H. A. Pursche - Near Anza; at windmill 30 feet south and 115 feet west of intersection of Coahuila and Burham Roads. Reference point - top of casing at ground surface, at elevation 3,937.70 feet. 11/11/52, 69.5; 9/2/54, 125.7; 9/5/54, 103.3; 10/19/54, 118.3.

7S/3E-20B1 - H. A. Pursche - Near Anza; at windmill 0.4 mile west and 850 feet south of intersection of Barham and Coahuila Roads. Reference point - top of casing 0.4 foot above ground surface, at elevation 3,918.05 feet. 8/16, 60(U.S.G.S., W.S.P. 429); 11/30/50, 45.6; 11/21/51, 46.7; 11/11/52, 57.4; 5/8/53, 52.5; 11/23/53, 58.5; 4/22/54, 56.9; 9/2/54, 46.0; 9/5/54, 41.5; 10/19/54, 14.5.

7S/3E-20B2 - H. A. Pursche - Near Anza; 100 feet east of well 20B1. Reference point - top of concrete slab 0.1 foot above ground surface, at elevation 3,928.23 feet. 11/11/52, 40.1.

7S/3E-20C1 - H. A. Pursche - Near Anza; 0.7 mile west and 0.15 mile south at intersection of Barham and Coahuila Roads at windmill near reservoir. Reference point - top of pipe section welded to steel plates 0.5 foot above ground surface, at elevation 3,904.78. 5/8/53, 80; 4/22/54, 88.7; 9/3/54, 88.5; 9/5/54, 70.0.

7S/3E-20C2 - H. A. Pursche - Near Anza; 0.55 mile west and 100 feet south of intersection of Barham and Coahuila Roads. Reference point - top of casing 0.2 foot above ground surface, at elevation 3,958 feet (barometric level). 8/9/54, 80; 9/2/54, 102.3; 9/5/54, 192 (pumping); 9/6/54, 82(log).

7S/3E-20G1 - H. A. Pursche - Near Anza; at windmill 650 feet east and 200 feet north of center of section 20; 60 feet east of well 20G2. Reference point - top of pipe welded to base plate 0.5 foot above ground surface, at elevation 3,883.09 feet. 9/2/54, 95.1; 9/5/54, 77.4; 10/19/54, 79.2.

7S/3E-20H1 - H. A. Pursche - Near Anza; at windmill 0.25 mile south and 0.15 mile west of intersection of Barham and Coahuila Roads. Reference point - top of pipe above plate 0.4 foot above ground surface, at elevation 3,915.40 feet. 4/22/54, 66.9; 9/2/54, 108.8 (pumping); 10/19/54, 96.9.

7S/3E-20J2 - H. A. Pursche - Near Anza; 0.5 mile south and 300 feet west of intersection of Barham and Coahuila Roads; at windmill 120 feet east of house. Reference point - top of pipe support 1.9 feet above ground surface, at elevation 3,884.35 feet. 6/48, 8 (log); 11/11/52, 55.8; 5/8/53, 55.7; 11/23/53, 57.4; 4/22/54, 58.3; 9/2/54, 55.3; 10/19/54, 56.4.

7S/3E-20J3 - H. A. Pursche - Near Anza; 200 feet northeast of well 20J2. Reference point - (a) top of casing 0.4 foot above ground surface, at elevation 3,879.72 feet (11/30/50 and 11/11/52); (b) pump base 0.8 foot above ground surface, at elevation 3,880.08 feet. 11/30/50, 51.1; 11/11/52, 53.7; 11/23/53, 59.1; 4/22/54, 52.8.

7S/3E-20J5 - H. A. Pursche - Near Anza; 0.7 mile south and 640 feet west of intersection of Barham and Coahuila Roads. Reference point - top of pipe welded to plate 0.2 foot above ground surface, at elevation 3,867.97 feet. 11/11/52, 48.6; 11/25/53, 51.2.

7S/3E-20M1 - Near Anza; at windmill 0.55 mile south and 40 feet east of intersection of Cravens and Coahuila Roads. Reference point - pump base, 1.3 feet above ground surface, at elevation 3,910 feet. 5/27/53, 85.0; 11/23/53, 85.5; 5/7/54, 86.0.

7S/3E-20Q2 - H. A. Pursche - Near Anza; open casing 0.35 mile west and 40 feet north of southeast corner of Section 20. Reference point - top of casing 0.3 foot above ground surface. 11/25/53, 29.2; 4/22/54, 29.4.

7S/3E-20Q3 - H. A. Pursche - Near Anza; 30 feet southwest of well 20Q2. Reference point - top of casing 1 foot above ground surface. 11/23/53, 29.9; 4/22/54, 30.2.

7S/3E-20R1 - H. A. Pursche - Near Anza; 550 feet west and 40 feet north of southeast corner of Section 20. Reference point - top of casing 0.5 foot above ground surface, at elevation 3,837.22 feet. 11/30/50, 27.4; 11/21/51, 27.3; 11/10/52, 26.0; 11/25/53, 28.2; 4/22/54, 29.0.

7S/3E-20R2 - H. A. Pursche - Near Anza; 500 feet north and 250 feet west of southeast corner of Section 20. Reference point - top of pipe coupling 0.5 foot above ground surface, at elevation 3,848 feet (barometric level). 11/30/50, 27.7; 11/21/51, 29.2.

7S/3E-20R3 - H. A. Pursche - Near Anza; capped casing 500 feet north and 30 feet west of southeast corner of section 20; 200 feet east of well 20R2. Reference point - hole in casing at ground surface. 10/20/54, 34.0.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

7S/3E-21B1 - Hugo G. Westphalen - Near Anza; at windmill 500 feet east and 400 feet south of intersection of Contreras and Coahuila Roads. Reference point - top of clamp 1.6 feet above ground surface, at elevation 3,908.25 feet. 5/6/53, 61.4. 11/24/53, 60.5; 4/21/54, 61.1.

7S/3E-21C1 - Hamilton School - In Anza; 200 feet west and 50 feet south of intersection of Coahuila and Contreras Roads; at windmill 100 feet west of school. Reference point - top of casing 1.3 feet above ground surface, at elevation 3,930.25 feet. 11/7/49, 88. 5/6/53, 73.5. 4/22/54, 89.2.

7S/3E-21F1 - Near Anza; at windmill 0.45 miles south and 500 feet west of intersection of Coahuila and Contreras Roads. Reference point - top of casing 1.6 feet above ground surface, at elevation 3,876.88 feet. 5/6/53, 53.8; 4/22/54, 49.7.

7S/3E-21G1 - Hugo G. Westphalen - Near Anza; 0.12 mile east and 50 feet north of intersection of Contreras and Johnson Roads; in corrugated metal pump house. Reference point - hole for air line 0.6 foot above ground surface, at elevation 3,869.2 feet. 11/29/50, 22.0; 1/20/51, 30.5; 5/8/51, 46.1; 8/7/51, 45.7; 9/6/51, 29.3; 10/3/51, 29.7; 12/10/51, 29.7; 1/3/52, 25.3; 11/11/52, 31.8; 5/26/53, 44.7; 4/22/54, 46.7; 10/19/54, 40.3.

7S/3E-21J1 - C. T. Johnson - Near Anza; 0.32 mile south and 150 feet west of intersection of Johnson and Hill Roads; at windmill 50 feet south of house. Reference point - top of pipe clamps 1 foot above ground surface, at elevation 3,861.45 feet. 6/16, 20 (U.S.G.S., W.S.P. 429); 11/29/50, 21.3; 1/29/51, 21.0; 3/8/51, 20.9; 4/5/51, 27.7; 5/8/51, 27.4; 6/13/51, 27.9; 7/9/51, 27.2; 8/7/51, 20.1; 9/6/51, 23.5; 10/31/51, 22.2; 11/7/51, 22.0; 1/3/52, 17.3; 2/4/52, 19.2; 3/4/52, 19.6; 5/13/52, 16.5; 7/30/52, 27.7; 8/25/52, 26.0; 10/21/52, 20.2; 1/16/53, 18.0; 2/27/53, 20.3; 3/27/53, 18.1; 5/26/53, 22.9; 7/3/53, 25.1; 8/10/53, 26.3; 9/1/53, 25.9; 10/8/53, 25.0; 11/24/53, 27.5; 1/6/54, 26.4; 2/4/54, 22.9; 4/1/54, 22.2; 4/21/54, 26.2; 10/19/54, 27.05.

7S/3E-21J2 - C. T. Johnson - Near Anza; 0.25 mile east and 0.25 mile south of intersection of Contreras and Johnson Roads; 0.25 mile west of well 21J1. Reference point - top of casing 1.7 feet above ground surface, at elevation 3,850.95 feet. 11/30/50, 10.2; 11/29/51, 32.9; 11/18/52, 14.7; 5/26/53, 27.7; 4/22/54, 33.6; 10/19/54, 27.0.

7S/3E-21J3 - C. T. Johnson - Near Anza; at windmill 300 feet south and 70 feet west of intersection of Johnson and Hill Roads. Reference point - top of pipe clamps 0.7 foot above ground surface; at elevation 3,868.30 feet. 11/30/50, 15.3; 11/20/51, 21.6; 11/11/52, 16.0; 5/26/53, 20.9; 11/24/53, 23.5; 4/22/54, 23.3.

7S/3E-21K1 - C. S. Contreras - Near Anza; at windmill 60 feet south and 50 feet east of intersection of Johnson and Contreras Roads. Reference point - hole in drum around casing 2.6 feet above ground surface; at elevation 3,867.92 feet. 11/30/50, 28.3.

7S/3E-21K2 - C. S. Contreras - Near Anza; 0.14 mile east and 150 feet south of intersection of Contreras and Johnson Roads; open casing. Reference point - top of casing 3 feet below ground surface. 11/24/53, 4.7; 4/30/54, 4.5.

7S/3E-21L1 - L. J. Hamilton - Near Anza; 0.2 mile south and 400 feet west of intersection of Contreras and Johnson Roads; at windmill 115 feet south and 15 feet west of house. Reference point - top of pipe clamp 1.0 foot above ground surface, at elevation 3,843.51 feet. 11/13/52, 18.5.

7S/3E-21L2 - L. J. Hamilton - Near Anza; at windmill 100 feet northeast of well 21L1; 25 feet east of house. Reference point - top of casing 1 foot above ground surface. 11/24/53, 30.1; 4/22/54, 31.3.

7S/3E-21L3 - L. J. Hamilton - Near Anza; 200 feet southwest of well 21L1; 50 feet south of barn. Reference point - top of casing. 2.0 feet above ground surface, at elevation 3,849.05 feet. 5/26/53, 28.5; 11/24/53, 30.3; 4/22/54, 31.9.

7S/3E-21P1 - L. J. Hamilton - Near Anza; 0.3 mile south and 25 feet west of intersection of Contreras and Johnson Roads. Reference point - top of measuring pipe 0.1 foot above ground surface, at elevation 3,844.77 feet. 10/49, 7(log); 11/29/50, 8.7; 1/23/51, 8.7; 9/6/51, 17.0; 10/3/51, 17.3; 11/18/52, 13.0;

7S/3E-21R1 - C. T. Johnson - Near Anza; 300 feet south of well 21J1, at windmill 150 feet south of barn. Reference point - top of casing, 0.5 foot above ground surface, at elevation 3,855.90 feet. 11/30/50, 15.23; 11/20/51, 26.2; 11/11/52, 16.2, 5/26/53, 22.4.

7S/3E-21R2 - C. T. Johnson - Near Anza; 60 feet south and 50 feet west of well 21R1; open casing. Reference point - top of casing, 0.8 foot above ground surface, at elevation 3,855.67 feet. 11/30/50, [illegible].5; 11/20/51, 17.0; 11/11/52, 16.[illegible]; 5/26/53, 21.9; 11/24/53, 27.1; 4/22/54, 25.3.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

7S/3E-22B1 - L. J. Hamilton - Near Anza; 0.55 mile east and 500 feet south of intersection of Hill and Coahuila Roads; 300 feet east of house. Reference point - top of concrete slab 0.6 foot above ground surface, at elevation 3,930.10 feet. 11/23/53, 9; 4/21/54, 7.4.

7S/3E-22B3 - L. J. Hamilton - Near Anza; 90 feet west and 50 feet south of well 22B4. Reference point - top of casing, 4.3 feet above ground surface, at elevation 3,951.31 feet. 5/26/53, 28.6; 11/13/53, 15.1; 4/21/54, 14.0.

7S/3E-22B4 - L. J. Hamilton - Near Anza; 0.25 mile west and 45 feet south of intersection of Coahuila and Kirby Roads; open casing 65 feet west of fence line. Reference point - top of casing 1.7 feet above ground surface, at elevation 3,950.69 feet. 5/26/53, 27.3; 11/13/53, 12.5; 4/21/54, 11.5.

7S/3E-22C1 - L. J. Hamilton - Near Anza; at windmill 0.5 mile east and 700 feet south of intersection of Coahuila and Hill Roads. Reference point - (a) Top of pipe clamp 0.7 foot above ground surface, at elevation 3,925.20 feet (11/30/50 through 5/13/52); (b) top of casing 0.2 foot above ground surface, at elevation 3,924.7 feet (10/21/52 to present). 11/30/50, 6.6; 1/30/51, 5.8; 3/8/51, 5.5; 4/5/51, 5.0; 5/8/51, 4.9; 7/9/51, 8.0; 8/7/51, 7.9; 9/6/51, 8.4; 10/3/51, 10.0; 11/7/51, 8.8; 1/3/52, 6.2; 2/4/52, 7.5; 3/4/52, 4.2; 4/14/52, 3.3; 5/13/52, 3.8; 10/21/52, 9.3; 1/16/53, 7.7; 2/27/53, 8.8; 3/27/53, 6.8; 5/26/53, 13.2; 7/3/53, 10.3; 8/10/53, 9.0; 10/8/53, 9.2; 11/23/53, 8.4; 1/6/54, 7.6; 2/4/54, 7.4; 4/1/54, 6.3; 4/21/54, 6.4.

7S/3E-22D1 - E. G. Herring - Near Anza; at windmill 0.15 mile east and 100 feet south of intersection of Hill and Coahuila Roads. Reference point - top of casing 1.0 foot above ground surface, at elevation 3,912.79 feet. 11/20/51, 29.5; 11/18/52, 20.3; 5/26/53, 11.5; 11/23/53, 17.5; 4/21/54, 14.9.

7S/3E-22D2 - H. R. Lichwald - Near Anza; at windmill 200 feet southeast of well 22D1. Reference point - top of wood cover 2.3 feet above ground surface, at elevation 3,905.36 feet. 11/30/50, 6.9; 11/15/51, 7.2; 11/18/52, 4.2; 5/26/53, 5.7; 11/23/53, 6.7; 4/21/54, 4.9.

7S/3E-22D3 - H. R. Lichwald - Near Anza; at windmill 180 feet southeast of well 22D2. Reference point - top of casing 1.9 feet above ground surface, at elevation 3,903.94. 11/30/50, 15.1; 11/20/51, 20.0; 11/18/52, 19.5; 5/26/53, 15.2; 11/12/53, 14.4; 4/21/54, 12.2.

7S/3E-22D4 - H. R. Lichwald - Near Anza; 400 feet southeast of well 22D2. Reference point - top of casing 1.0 foot above ground surface, at elevation 3,897.86 feet. 11/30/50, 13.4; 11/20/51, 15.2; 11/18/52, 14.7; 5/26/53, 13.4; 11/23/53, 15.6; 4/21/54, 14.5.

7S/3E-22D6 - H. R. Lichwald - Near Anza; 0.2 mile south and 400 feet east of intersection of Hill and Coahuila Roads; open casing 600 feet southwest of barn. Reference point - top of casing 1.7 feet above ground surface, at elevation 3,885.74 feet. 5/26/53, 26.4; 11/23/53, 28.0; 4/21/54, 28.6.

7S/3E-22J1 - Near Anza; at windmill 0.63 mile south and 100 feet west of intersection of Kirby and Coahuila Roads. Reference point - top of casing 0.25 foot above ground surface, at elevation 3,946 feet (barometric level). 12/1/50, 12.5; 11/20/51, 21.5; 11/18/52, 17.2; 5/26/53, 16.1; 11/18/53, 15.1.

7S/3E-22N1 - O. T. Johnson - Near Anza; 200 feet southeast of well 21J1. Reference point - top of casing 2.3 feet above ground surface, at elevation 3,863.59 feet. 11/30/50, 18.5; 11/20/51, 20.3; 11/18/52, 20.9; 5/26/53, 24.5; 11/24/53, 28.5; 4/22/54, 27.3; 10/19/54, 28.1.

7S/3E-23D1 - Evert Ranch - Near Anza; 0.1 mile south and 200 feet east of intersection of Kirby and Coahuila Roads. Reference point - top of casing 0.6 foot above ground surface, at elevation 3,975.18 feet. 5/26/53, 23.7; 11/23/53, 23.0; 4/20/54, 22.9.

7S/3E-23R1 - D. Raisis - Near Anza; 0.2 mile north and 400 feet west of southeast corner of section 23; at windmill 300 feet northeast of house. Reference point - top of casing 1 foot above ground surface. 11/18/53, 46.4; 4/21/54, 43.4.

7S/3E-23R2 - A. Lappos - Near Anza; at windmill 0.3 mile west and 300 feet north of southeast corner of section 23. Reference point - top of casing 0.9 foot above ground surface. 5/27/53, 81.5; 11/23/53, 84.8; 4/21/54, 83.4.

7S/3E-27C1 - Coahuila Indian Reservation - Near Anza; at windmill 0.3 mile east and 0.25 mile south of northwest corner of section 27. Reference point - top of casing 0.2 foot above ground surface, at elevation 3,840 feet. 5/7/54, 17.1.

7S/3E-27M1 - Coahuila Indian Reservation - Near Anza; at windmill 0.6 mile south and 300 feet east of northwest corner of section 27. Reference point - top of casing 1.4 feet above ground surface, at elevation 3,840.08 feet. 6/22/40, 13(log); 12/1/50, 7.4; 1/30/51, 3.2; 3/8/51, 4.8; 4/5/51, 7.3; 5/8/51, 7.4; 6/13/51, 9.0; 7/31/51, 8.8; 9/6/51, 7.5; 10/1/51, 8.9; 11/7/51, 8.4; 1/3/52, 6.7; 5/26/53, 8.0; 11/24/53, 9.9; 5/7/54, 12.0.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

7S/3E-31L1 - Coahuila Indian Reservation - Durasno Valley; at windmill 0.4 mile north and 0.35 mile east of southwest corner of section 31; 50 feet west of road through Durasno Valley. Reference point - ground surface. 8/5/40, 10(log).

7S/3E-34E1 - Coahuila Indian Reservation - In Terwilliger Valley; 0.7 mile north and 0.2 mile east of southwest corner of section 34; in fenced enclosure 0.3 mile northeast of road through Terwilliger Valley; equipped with gasoline engine. Reference point - top of casing 0.6 foot above ground surface, at elevation 3,877.11 feet. 4/19/40, 40(log); 1/31/51, 35.1; 3/8/51, 35.3; 4/5/51, 37.5; 5/8/51, 36.8; 6/13/51, 38.5; 7/9/51, 38.5; 7/31/51, 37.6; 9/6/51, 37.3; 10/3/51, 36.9; 11/7/51, 36.5; 11/15/51, 37.9; 1/3/52, 35.3; 11/24/53, 38.2; 5/7/54, 38.8.

7S/4E-19B1 - In Burnt Valley; 1.1 miles southeast of intersection of Coahuila Road and Hamilton Creek; on south bank of stream. Reference point - top of plank 1 foot above ground surface. 8/14/53, 19.5; 11/23/53, 19.3; 4/20/54, 16.1.

7S/4E-19G1 - In Burnt Valley; 1.1 miles south and west of Coahuila Road (measured along dirt road) from intersection 4.6 miles east of Anza; at windmill 300 feet south of dirt road. Reference point - top of metal cover 1.1 feet above ground surface. 11/23/53, 22.6; 4/20/54, 23.1.

7S/4E-19H1 - L. Figaro - In Burnt Valley; 0.15 mile east of well 19G1. Reference point - top of plank cover 3 feet above ground surface. 8/14/53, 11.2; 4/20/54, 11.6.

7S/4E-20B1 - Lockwood - In Burnt Valley; 0.25 mile south and 0.4 mile east of Coahuila Road from intersection 4.6 miles east of Anza; at windmill near house. Reference point - top of casing at ground surface. 8/14/53, 121.4.

8S/1E-2E1 - In Wilson Valley; 2.6 miles northwest of Coahuila Road (measured along Wilson Valley Road); open casing 200 feet east of Wilson Valley Road and 150 feet north of house. Reference point - hole in plank cover 1 foot above ground surface. 8/31/53, 40; 11/16/53, 40.5; 5/5/54, 52.2.

8S/1E-2P1 - Mrs. Farrand - In Wilson Valley; 1.8 miles northwest of Coahuila Road (measured along Wilson Valley Road) and 500 feet southeast of Coahuila Creek (measured along Wilson Valley Road); near house 60 feet southwest of road; equipped with pitcher pump. Reference point - hole in concrete base at ground surface. 11/16/53, dry; 5/5/54, 7.1.

8S/1E-5H1 - C. J. Clark - Near Radec; 0.3 mile north of Highway 79 (measured along dirt road) 3.6 miles north of Radec (measured along Highway 79); 100 feet north of house and 15 feet south of water tower; equipped with jack pump. Reference point - top of casing at ground surface. 5/5/53, 32.8; 11/16/53, 33.6; 5/5/54, 32.9.

8S/1E-6B1 - J. E. Shanko - In Lewis Valley; 1.9 miles south of Highway 79 (measured along dirt road) from intersection 6.05 miles north of Radec, measured along Highway 79; at windmill. Reference point - top of casing at ground surface, at elevation 1,810 feet. 5/5/53, 35.4; 11/16/53, 38.2; 5/5/54, 39.9.

8S/1E-6B2 - J. E. Shanko - In Lewis Valley; 1.9 miles southwest of Highway 79 (measured along dirt road) from intersection 6.05 miles north of Radec (measured along Highway 79); at windmill, 0.15 mile east of gate. Reference point - ground surface, at elevation 1,897 feet. 10/28/52, 57.2; 5/5/53, 57.7; 11/16/53, 61.8; 5/5/54, 59.7.

8S/1E-6M1 - Bert Sharp - Lewis Valley; 2.65 miles south of Highway 79 (measured along dirt road); from intersection 6.05 miles north of Radec (measured along Highway 79); at windmill 300 feet southwest of house. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,730 feet. 5/5/53, 12.7; 11/16/53, 16.8; 5/5/54, 15.1.

8S/1E-7N1 - James Oviatt - In lower Lancaster Valley; 0.35 mile west of Rancho Ramona house; 10 feet west of metal pump house. Reference point - hole in casing 0.3 foot above ground surface, at elevation 1,554.7 feet. 2/28/48, 35.3(log); 11/16/50, 63.2; 2/5/51, 61.4; 3/7/51, 64.7; 4/4/51, 67.2; 5/7/51, 66.3; 6/13/51, 67.4; 7/3/51, 67.9; 1/3/52, 64.2; 2/5/52, 68.1; 3/12/52, 71.8; 4/15/52, 66.8; 9/25/52, 73; 10/21/52, 76.6; 1/16/53, 72.6; 2/27/53, 70.1; 3/27/53, 68.3; 7/3/53, 72.1; 8/6/53, 73.2; 11/13/53, 74.7; 1/6/54, 79.2; 2/5/54, 75.2; 4/2/54, 70.9; 4/20/54, 70.9.

8S/1E-7P1 - James Oviatt - In lower Lancaster Valley; 300 feet southwest of well 7Q1. Reference point - top of casing 1.1 feet above ground surface, at elevation 1,573.54. 11/48, 67(log); 11/28/51, 87.3; 5/1/53, 86.0; 11/13/53, 91.7; 4/20/54, 85.4.

8S/1E-7Q1 - James Oviatt - In lower Lancaster Valley; 150 feet southwest of Rancho Ramona house. Reference point - top of casing 1.3 feet above ground surface, at elevation 1,578.01 feet. 11/16/50, 83.3; 11/28/51, 86.5.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

8S/1E-7Q2 - James Oviatt - In lower Lancaster Valley; 60 feet north of Ramona Ranch house; open casing in white pump house. Reference point - top of casing 1.7 feet above ground surface, at elevation 1,582.47 feet. 4/6/47, 59.5; 5/1/53, dry; 11/13/53, dry; 4/20/54, dry.

8S/1E-7Q4 - James Oviatt - In lower Lancaster Valley; 400 feet north of well 7Q2; on north bank of Lancaster Creek. Reference point - hole in inner casing 2.5 feet above ground surface; at elevation 1,588.35 feet. 2/5/51, 70.5; 3/7/51, 71.0; 11/28/51, 64.9; 5/1/53, 62.0; 11/13/53, 60.4; 4/20/54, 59.8.

8S/1E-8E1 - H. R. Wood - Near Radec; 2.35 miles north of Radec (measured along Highway 79); at windmill 550 feet west of Highway 79 and 400 feet southwest of house. Reference point - top of casing at ground surface. 5/5/53, 31.4; 11/13/53, 29.1; 4/22/54, 28.1.

8S/1E-8K1 - Martin - Near Radec; 0.3 mile south of Highway 79 (measured along dirt road) from intersection 2.6 miles north of Radec (measured along Highway 79); in stock pens 150 feet northwest of house. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,800 feet (barometric level). 2/16/51, 24; 11/28/51, 24.3; 10/27/52, 23.9; 5/5/53, 22.8.

8S/1E-12N1 - Near Aguanga; 0.3 mile northwest of Coahuila Road (measured along Wilson Valley Road) from intersection 3.1 miles north of Aguanga (measured along Coahuila Road); open casing 500 feet southwest of Wilson Valley Road and 300 feet southeast of house. Reference point - top of casing 2.5 feet above ground surface. 8/3/53, 23.3; 4/21/54, 50.0.

8S/1E-17A1 - J. C. Tyler - In upper Lancaster Valley; 1.0 mile east of Highway 79 (measured along dirt road) from intersection 1.3 miles north of Radec (measured along Highway 79); open casing on Stardust Ranch 500 feet north of machine shed. Reference point - top of casing 0.8 foot above ground surface, at 1,717.47 feet. 5/48, 23 (log); 11/16/50, 81.2; 2/5/51, 81.9; 3/7/51, 81.2; 3/29/51, 82.2; 6/13/51, 82.7; 7/30/51, 83.0; 9/4/51, 83.2; 10/1/51, 83.4; 11/6/51, 83.7; 1/4/52, 81.2; 1/14/52, 83.0; 2/5/52, 81.6; 3/12/52, 80.6; 4/15/52, 76.5; 5/15/52, 78.5; 6/10/52, 79.0; 7/8/52, 78.6; 7/30/52, 79.8; 8/27/52, 78.5; 10/21/52, 76.3; 1/16/53, 79.6; 2/27/53, 77.9; 3/27/53, 78.0; 5/1/53, 78.6; 7/3/53, 79.2; 8/6/53, 79.8; 9/1/53, 80.2; 10/8/53, 80.7; 11/13/53, 81.1; 1/7/54, 82.0; 2/5/54, 82.0; 4/2/54, 82.4; 4/20/54, 82.3.

8S/1E-17A2 - J. C. Tyler - In upper Lancaster Valley; in pump house 220 feet southwest of well 17A1. Reference point - lower lip of measuring pipe 2 feet above ground surface, at elevation 1,719.09 feet. 11/16/50, 84.0; 11/28/51, 84.6.

8S/1E-17C1 - J. C. Tyler - In upper Lancaster Valley; 0.4 mile east of Highway 79 (measured along dirt road); from intersection 1.3 miles north of Radec (measured along Highway 79); open casing on Stardust Ranch 700 feet north of dirt road and 210 feet east of fence line. Reference point - top of casing 1.7 feet above ground surface, at elevation 1,660.99 feet. 11/16/50, 33.3; 3/29/51, 34.2; 5/7/51, 34.5; 6/13/51, 34.8; 7/3/51, 34.9; 7/31/51, 35.1; 9/4/51, 35.2; 10/1/51, 38.3; 11/6/51, 35.8; 1/3/52, 32.6; 10/27/52, 36.1; 5/1/53, 33.4; 11/13/53, 31.1; 4/20/54, 34.8.

8S/1E-17E2 - Cottonwood School - In upper Lancaster Valley; 1.3 miles north of Radec (measured along Highway 79); in wood pump house 75 feet northeast of school. Reference point - top of casing 1.2 feet above ground surface. 11/12/53, 29.5; 4/20/54, 29.7.

8S/1E-18B1 - James Oviatt - In lower Lancaster Valley; Rancho Ramona; 400 feet southwest of foreman's house; open casing 20 feet west of machine shop. Reference point - top of casing 4 feet above ground surface, at elevation 1,580.18 feet. 2/26/51, 60.6; 4/4/51, 60.6; 11/28/51, 64.8; 2/5/52, 64.2; 3/12/52, 63.4; 4/15/52, 62.5; 5/13/52, 62.3; 6/10/52, 62.8; 7/8/52, 63.5; 7/30/52, 64.2; 8/27/52, 64.9; 10/21/52, 64.7; 1/16/53, 64.1; 2/27/53, 64.0; 3/27/53, 64.0; 5/1/53, 64.5; 7/3/53, 65.6; 8/6/53, 66.1; 9/1/53, 65.3; 10/8/53, 66.6; 11/13/53, 66.6; 1/6/54, 66.1; 2/5/54, 62.5; 4/2/54, 63.4; 4/20/54, 63.4.

8S/1E-18H1 - In upper Lancaster Valley; 500 feet southwest of well 17E2; at windmill 50 feet southeast of house. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,657.61 feet. 11/28/51, 40.0; 11/12/53, 38.4; 4/20/54, 38.3.

8S/1E-18K1 - Joe Costellis - Near Radec; 0.87 mile north of Radec (measured along Highway 79); at windmill 500 feet west of Highway 79 and 100 feet east of house. Reference point - top of concrete slab 0.2 foot above ground surface, at elevation 1,754 feet. 9/39, 127 (log); 11/30/50, 130.6; 11/16/51, 154.3; 10/27/52, 145.8; 5/1/53, 132.3; 11/12/53, 133.8; 4/20/54, 130.9.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 2

(Depths to water in feet measured from reference point)
(continued)

8S/2E-5A1 - In lower Coahuila Valley; 0.35 mile south of well 7S/2E-32J1; at windmill 300 feet west and 250 feet south of northeast corner of Section 5. Reference point - top of casing 2.1 feet above ground surface. 5/6/53, 10.2; 11/9/53, 11.0.

8S/2E-5C1 - Betty B. Murcell - In lower Coahuila Valley; 0.5 mile north of Coahuila Road (measured along dirt road) from intersection 6.65 miles north of Aguanga (measured along Coahuila Road); 85 feet east of dirt road and 15 feet west of elevated tank near stock corral. Reference point - top of casing 0.4 foot above ground surface. 5/6/53, 13.1; 11/9/53, 13.9.

8S/3E-2E1 - Coahuila Indian Reservation - In Terwilliger Valley; 0.7 mile north and 0.8 mile west of intersection of Bailey and Terwilliger Roads; at windmill 500 feet east of house; outside watershed. Reference point - top of casing 2 feet above ground surface, at elevation 3,867 feet (barometric level). 12/6/50, 34.1; 1/31/51, 34.5; 3/8/51, 37.8; 4/5/51, 35.9; 5/8/51, 36.4; 6/13/51, 38.3; 7/9/51, 36.2; 7/31/51, 36.2; 9/6/51, 36.2; 10/3/51, 36.1; 11/7/51, 36.0; 11/15/51, 35.9; 1/3/52, 34.2; 2/4/52, 35.0; 3/4/52, 36.8; 4/14/52, 34.7; 5/13/52, 37.5; 6/10/52, 36.0; 7/8/52, 36.4; 7/30/52, 38.0; 8/25/52, 37.4; 10/21/52, 37.4; 1/16/53, 35.3; 2/27/53, 35.5; 3/27/53, 35.1; 5/27/53, 35.9; 7/3/53, 36.3; 8/10/53, 36.8; 9/1/53, 37.5; 10/8/53, 37.5; 11/23/53, 36.4; 1/6/54, 36.5; 2/4/54, 36.5; 4/1/54, 36.0.

8S/3E-2J1 - Coahuila Indian Reservation - In Terwilliger Valley; at windmill 0.3 mile north and 300 feet west of intersection of Bailey and Terwilliger Roads; outside watershed. Reference point - top of casing 2.5 feet above ground surface, at elevation 3,843 feet. 11/15/51, 16.5; 11/18/52, 15.2; 11/23/53, 15.6; 4/21/54, 16.2.

8S/3E-8C1 - Howard Bailey - In Durasno Valley; 3.7 miles west of intersection of Bailey and Terwilliger Roads; at windmill 300 feet west of house. Reference point - top of casing 1.8 feet above ground surface. 11/18/52, 16.5; 5/27/53, 16.3.

8S/3E-8Q1 - Woods - In Durasno Valley; 0.65 mile south of well 8C1; 35 feet southwest of house and 30 feet west of well 8Q2. Reference point - top of casing 1.3 feet above ground surface. 12/6/50, 63.4; 11/21/51, 66.6; 11/18/52, 62.5; 5/27/53, 62.1; 11/23/53, 61.3; 5/7/54, 61.6.

8S/1W-12K1 - James Oviatt - In lower Lancaster Valley; 0.95 mile west of Rancho Ramona house; open casing 300 feet south of Lancaster Creek. Reference point - (a) hole in pump base 0.8 foot above ground surface at elevation 1,510.76 feet (1-49 through 11/13/53); (b) top of casing 1 foot below ground surface, at elevation 1,509.0 feet (1/6/54 to present). 11/16/50, 34.4; 2/5/51, 34.5; 3/7/51, 32.2; 4/4/51, 33.6; 7/3/51, 35.4; 10/2/51, 37.3; 11/6/51, 36.0; 1/3/52, 35.0; 1/14/52, 37.5; 2/5/52, 36.1; 4/15/52, 37.0; 7/30/52, 37.9; 8/27/52, 38.1; 1/16/53, 42.5; 2/27/53, 39.8; 3/27/53, 40.0; 5/1/53, 39.6; 7/3/53, 40.4; 8/6/53, 46.5; 9/1/53, 40.1; 10/8/53, 41.5; 11/13/53, 41.2; 1/6/54, 41.7; 2/5/54, 41.9; 4/2/54, 41.9; 4/20/54, 36.8.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 3

(Depths to water in feet measured from reference point)

8S/1E-19E1 - Near Radec; 0.6 mile east of Highway 71 and Temecula Creek crossing; 100 feet east of Highway 71 and 50 feet north of house. Reference point - top of casing 2.7 feet above ground surface, at elevation 1,665 feet (barometric level). 11/15/50, 61.6; 11/27/51, 64.3; 11/7/52, 39.6; 5/1/53, 28.4; 11/10/53, 40.2, 4/20/54, 36.7.

8S/1E-19F1 - S. T. Anderson - Near Radec; 0.5 mile west of Radec (measured along Highway 71); 300 feet north of highway and 50 feet northeast of house. Reference point - top of casing 1.5 feet above ground surface. 11/10/53, 71.9; 4/20/54, 73.7.

8S/1E-19F2 - C. W. Haggard - Near Radec; 0.45 mile west of Radec (measured along Highway 71); in house with metal roof 200 feet north of highway. Reference point - ground surface. About 12/48, 67 (owner).

8S/1E-19H1 - O. L. Coffer - Radec; at windmill 160 feet north and 220 feet west of intersection of Highways 71 and 79. Reference point - top of casing 1.8 feet above ground surface, at elevation 1,689.71 feet. 11/15/50, 39.6; 2/5/51, 35.5; 3/6/51, 25.9; 4/4/51, 43.8; 5/7/51, 48.6; 6/13/51, 41.4; 7/31/51, 43.4; 9/6/51, 48.0; 10/2/51, 49.6; 11/6/51, 41.0; 1/3/52, 40.2; 2/5/52, 40.8; 3/12/52, 41.0; 4/15/52, 41.2; 5/13/52, 42.3; 6/10/52, 43.2; 7/8/52, 44.9; 1/16/53, 44.5; 5/1/53, 43.9; 7/3/53, 43.5; 8/6/53, 43.7; 10/8/53, 43.1; 11/10/53, 41.9; 1/7/54, 41.1; 2/4/54, 48.9; 4/2/54, 43.3; 4/20/54, 41.2.

8S/1E-19H2 - Lulu Miller - Radec; at windmill 100 feet north and 227 feet east of intersection of Highways 71 and 79. Reference point - top of casing collar 2 feet above ground surface, at elevation 1,709 feet (barometric level). 11/15/50, 62.7; 11/28/51, 64.8; 10/27/52, 63.4; 5/1/53, 61.9; 11/10/53, 62.6; 4/20/54, 64.2.

8S/1E-19H3 - Irene Barton - Radec; 50 feet north of Highway 79 and 50 feet east of Barton's store. Reference point - top of casing, at elevation 1,725 feet (barometric level). 11/27/51, 73.4.

8S/1E-19H4 - Irene Barton - Radec; 3 feet east of well 19H3. Reference point - top of casing 1.5 feet above ground surface. 11/10/53, 75.7; 4/20/54, 76.0.

8S/1E-19J1 - Clinton C. Davidson - Radec; 60 feet south of intersection of Highways 71 and 79; 15 feet west of house. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,692 feet (barometric level). 11/15/50, 43.2; 2/5/51, 41.0; 3/7/51, 41.3; 4/4/51, 41.9.

8S/1E-19K1 - W. W. Cottle - Near Radec; 0.17 mile west of intersection of Highways 71 and 79 (measured along Highway 71); at windmill in pasture 700 feet south of Highway 71. Reference point - top of pipe clamp 1.85 feet above ground surface, at elevation 1,649.97 feet. 11/15/50, 8.0; 10/27/52, 10.2; 5/1/53, 9.2; 11/10/53, 9.0; 4/20/54, 10.1.

8S/1E-19Q1 - W. R. Gibbon - Radec; 0.3 mile south of intersection of Highways 71 and 79; at windmill 600 feet west of house; 53 feet northeast of well 19Q2. Reference point - pump base 1.3 feet above ground surface, at elevation 1,666.44 feet. Spring, 1942, 15 (log); 11/15/50, 17.0; 2/5/51, 15.5; 3/7/51, 18.1; 4/4/51, 14.8; 5/7/51, 18.6; 6/13/51, 18.5; 8/7/51, 18.1; 9/17/51, 17.0; 10/2/51, 20.2; 1/2/52, 18.3; 1/15/52, 17.6; 2/4/52, 17.9; 3/4/52, 19.3; 4/14/52, 20.7; 6/10/52, 23.4; 7/30/52, 30.8; 10/22/52, 21.3; 1/16/53, 19.0; 2/27/53, 21.0; 4/30/53, 15.9; 1/7/54, 20.4; 2/4/54, 20.0; 4/2/54, 16.9.

8S/1E-20M1 - G. A. Spaniol - Near Radec; 0.35 mile southeast of Radec (measured along Highway 79) and 250 feet north of Highway 79; at windmill 200 feet northeast of house. Reference point - top of casing 1 foot above ground surface. 4/30/53, 53.2; 11/12/53, 65.6; 4/20/54, 80.3; (owner reported drop in water level following earthquake in March, 1954).

8S/1E-20M2 - G. A. Spaniol - Near Radec; 0.3 mile southeast of Radec (measured along Highway 79); at windmill 50 feet southwest of Highway 79, 125 feet south of house. Reference point - top of plank cover 0.33 foot above ground surface, at elevation 1,753.26 feet. 4/30/53, 29.3; 11/12/53, 32.5; 4/20/54, 30.8.

8S/1E-20P1 - Near Radec; 0.85 mile southeast of Radec (measured along Highway 79); at windmill in canyon 400 feet southwest of Highway 79 and 30 feet east of telephone line. Reference point - top of casing 1.5 feet above ground surface. 4/30/53, 7.6; 11/12/53, 8.8; 4/20/54, 7.6.

8S/1E-20P2 - L. W. Hagman - Near Radec; 0.8 mile southeast of Radec (measured along Highway 79) and 30 feet north of Highway 79; 50 feet west of driveway. Reference point - top of casing cover 1 foot above ground surface. 4/2/54, 27 (log); 4/21/54, 36.7.

8S/1E-27J1 - P. Bergman - Near Aguanga; 50 feet north of well 27J2. Reference point - hole in pump base 1.6 feet above ground surface, at elevation 2,040 feet. 4/30/53, 16.2; 4/21/54, 16.1.

8S/1E-27J2 - P. Bergman - Near Aguanga; 0.5 mile northeast of Aguanga from intersection of Highway 79 and Coahuila Road (measured along Coahuila Road); at windmill 25 feet west of road and 100 feet north of barn. Reference point - top of casing at ground surface. 11/17/53, 12.0.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 3

(Depths to water in feet measured from reference point)
(continued)

8S/1E-27Q1 - P. Bergman - Aguanga; 200 feet north of Highway 79 and 150 feet northwest of store. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,939.84 feet. 4/30/53, 60.0; 11/17/53, 60.0; 4/21/54, 86.2. (drop in water level may have been caused by earthquake in March, 1954; see note on well 20M1).

8S/1E-28B1 - G. Holmes - Near Aguanga; at windmill on hill 250 feet north of well 28B2. Reference point - hole in casing 0.5 foot above ground surface, at elevation 2,020 feet. 4/29/53, 96.7; 11/17/53, 99.8; 4/21/54, 99.6.

8S/1E-28B2 - G. Holmes - Near Aguanga; 0.9 mile north of Highway 79 (measured along dirt road) from intersection 0.85 mile west of Aguanga; open casing 20 feet southeast of house. Reference point - top of casing 2 feet below ground surface. 4/29/53, 71.1; 11/17/53, 67.9; 4/21/54, 68.5.

8S/1E-29A1 - D. B. Trunnell - Near Aguanga; 0.45 mile north of Highway 79 (measured along dirt road) from intersection 2.1 miles northwest of Aguanga (measured along Highway 79); at windmill 100 feet north of house. Reference point - top of casing 1.6 feet above ground surface, at elevation 1,960 feet. 4/30/53, 68.4; 4/20/54, 68.5.

8S/1E-29H1 - Robert L. Burchett - Near Aguanga; 2.1 miles northwest of Aguanga (measured along Highway 79); 200 feet south of "Halfway House" Service Station. Reference point - ground surface. 1937, 45 (owner); 3/49, 40 (owner).

8S/1E-29J1 - J. F. Bergman - Near Aguanga; 0.35 mile south of Highway 79 (measured along dirt road) from intersection 2.1 miles northwest of Aguanga (measured along Highway 79); at windmill 300 feet southeast of house. Reference point - top of casing 2 feet above ground surface, at elevation 1,811 feet (barometric level). 11/16/50, 11.8; 2/5/51, 15.3; 3/7/51, 13.3; 4/4/51, 12.2; 5/7/51, 11.2; 6/13/51, 11.8; 7/13/51, 12.0; 7/31/51, 12.3; 9/5/51, 12.3; 10/2/51, 13.4; 11/6/51, 12.2; 1/3/52, 10.7; 1/14/52, 11.5; 2/4/52, 11.2; 4/13/52, 11.3; 5/13/52, 12.0; 6/10/52, 12.0; 7/8/52, 12.2; 7/30/52, 12.4; 10/22/52, 12.8; 1/16/53, 11.7; 2/27/53, 11.4; 3/27/53, 11.7; 4/29/53, 11.3; 7/3/53, 12.3; 8/6/53, 12.3; 9/1/53, 12.5; 10/8/53, 12.9; 11/17/53, 12.2; 1/6/54, 11.6; 2/4/54, 11.6; 4/2/54, 11.4; 4/20/54, 11.9.

8S/1E-33F1 - D. B. Trunnell - Near Aguanga; 0.85 mile south of Highway 79 (measured along dirt road) from intersection 1.0 mile northwest of Aguanga; 200 feet north of house. Reference point - top of concrete pump base 0.5 feet above ground surface, at elevation 1,872 feet (barometric level). 11/16/50, 29.2; 2/5/51, 32.5.

8S/1E-33G1 - D. B. Trunnell - Near Aguanga; 0.5 mile east of well 33F1. Reference point - hole in pump base 1.5 feet above ground surface, at elevation 1,900 feet. 4/30/53, 47.2; 11/17/53, 48.6; 1/6/54, 56.8; 2/4/54, 48.9; 4/2/54, 49.2; 4/21/54, 50.3.

8S/1E-34L1 - E. W. Deter - Near Aguanga; 0.75 mile south of Highway 79 (measured along dirt road) from intersection at Aguanga; 150 feet southwest of house. Reference point - top of casing 0.87 foot above ground surface, at elevation 1,954.11 feet. 12/7/50, 30.9; 11/28/51, 31.9; 10/31/52, 28.5; 4/29/53, 28.7; 11/17/53, 31.4; 1/6/54, 32.7; 2/4/54, 33.5; 4/2/54, 28.6; 4/21/54, 28.8.

8S/1E-34L2 - E. W. Deter - Near Aguanga; 200 feet northeast of well 34L1. Reference point - top of casing 1.3 feet above ground surface, at elevation 1,972 feet (barometric level). 12/7/50, 42.7; 11/28/51, 44.3; 1/4/52, 43.3; 2/5/52, 41.8; 3/4/52, 40.1; 4/15/52, 32.1.

8S/1E-34P1 - F. A. Payne - Near Aguanga; 1 mile south of Highway 79 (measured along dirt road) from intersection at Aguanga; under wooden derrick 500 feet northwest of house and 50 feet southwest of dirt road. Reference point - hole in wood cover 0.5 foot above ground surface, at elevation 1,979.60 feet. 12/7/50, 74.5; 11/28/51, 74.7; 4/29/53, 74.3; 11/17/53, 74.4; 4/21/54, 73.6.

8S/1E-36P1 - P. Bergman - Near Aguanga; 2.3 miles southeast of Aguanga (measured along Highway 79) and 0.2 mile north of Highway 79; at windmill 0.15 mile north of house. Reference point - top of casing at ground surface, at elevation 2,560 feet. 4/29/53, 42.0; 11/17/53, 58.8; 4/21/54, 58.9.

8S/2E-31C1 - James Oviatt - In Culp Valley; at windmill. Reference point - 3 feet above ground surface. 4/22/54, 77.9.

8S/1W-13K1 - G. L. Knox - Near Radec; on Sunnybrook Ranch, at windmill 500 feet northeast of house. Reference point - (a) top of casing 4.5 feet below ground surface, at elevation 1,577.9 feet (12/1/50 through 5/1 /53); (b) top of casing 1.0 foot above ground surface, at elevation 1,583.26 feet (4/29/54). 12/1/50, 0.9; 11/27/51, 4.0; 11/7/52, 8.9; 5/1/53, 4.2; 4/29/54, 4.6.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. [illegible]

(Depths to water in feet measured from reference point)
(continued)

8S/1W-13Q1 - G. L. Knox - Near Radec; on Sunnybrook Ranch, 1.5 mile north and 200 feet east of intersection of Highway 79 and Temecula Creek. Reference point - (a) top of casing 1.10 feet above ground surface, at elevation 1,535.37 feet (11/16/50 through 5/7/50); (b) hole in casing 1.07 feet above ground surface, at elevation 1,535.84 feet (6/19/51 to present). 11/16/50, 45.1; 2/5/51, 44.3; 3/7/51, 41.5; 4/4/51, [illegible]; 5/7/51, 40.8; 6/13/51, 37.1; 7/30/51, 53.2; 9/4/51, 52.0; 11/6/51, 5[illegible].6; 1/8/52, 47.7; 2/[illegible]/52, 32.6; 3/12/52, 28.2; 4/14/52, 24.7; 5/13/52, 24.6; 6/10/52, 24.9; 7/3/52, 28.5; 7/30/52, 32.0; 11/7/52, 43.8; 1/16/53, 41.1; 2/27/53, 37.8; 3/27/53, 36.5; 5/1/53, 35.8; 10/5/53, 52.9; 11/10/53, 54.3; 1/7/54, 52.9; 2/4/54, 46.6; 4/2/54, 31.0; 4/29/54, 31.1.

8S/1W-20K1 - U. S. A. - Near Radec; 0.5 mile south of Highway 79 on Dripping Springs Public Camp grounds. Reference point - top of concrete casing, at elevation 1,605 feet (barometric level). 12/25/51, 11.5; 11/7/52, 15.8; 5/5/53, 10.2; 11/10/53, 14.4; 4/29/54, 9.6.

8S/1W-25Q1 - Bernard Appel - Near Radec; in Devils Hole. Reference point - not reported. 1/25/51, 25.4.

9S/1E-1B1 - H. Walker - Near Aguanga; 0.3 mile northeast of Highway 79 (measured along dirt road); from intersection 2.7 miles southeast of Aguanga (measured along Highway 79); 300 feet northwest of house. Reference point - top of casing 2.1 feet above ground surface, at elevation 2,567 feet. 4/29/53, 155.5; 11/17/53, 158.4; 4/21/54, 155.0.

9S/1E-1B2 - H. Walker - Near Aguanga; at windmill 350 feet south of well 1B1 and 100 feet southwest of house. Reference point - top of casing 2 feet above ground surface, at elevation 2,554 feet. 4/29/53, 98.0; 11/17/53, 98.3; 4/21/54, 96.7.

9S/1E-1Q1 - A. A. Ward - Near Aguanga; 20 feet southeast of well 1Q2. Reference point - top of casing 1.4 feet above ground surface, at elevation 2,419.12 feet. 11/27/50, 28.3; 1/29/51, 26.3; 3/7/51, 26.4; 4/4/51, 25.3; 6/13/51, 25.2; 8/3/51, 27.9; 9/4/51, 27.8; 10/7/51, 26.6; 11/6/51, 29.0; 1/4/52, 27.2; 10/31/52, 25.1; 4/28/53, 23.8; 11/18/53, 26.4; 4/21/54, 22.8.

9S/1E-1Q2 - A. A. Ward - Near Aguanga; 3.5 miles southeast of Aguanga (measured along Highway 79; at windmill 360 feet south of Highway 79 and 300 feet east of house. Reference point - top of casing 0.5 foot above ground surface, at elevation 2,418.[illegible] feet. 10/31/52, 25.0; 4/28/53, 22.6; 11/18/53, 28.5; 4/21/54, 22.7.

9S/1E-12A1 - A. A. Ward - Near Aguanga; at windmill 0.3 mile east of well 1Q2. Reference point - top of casing 0.6 foot above ground surface, at elevation 2,439.92 feet. 11/27/50, 44.0; 1/29/51, 33.9; 3/7/51, 41.9; 4/4/51, 36.5; 5/7/51, 36.7; 6/15/51, 38.6; 8/8/51, 39.5; 9/4/51, 42.5; 10/1/51, 42.4; 11/6/51, 47.2; 1/4/52, 45.0; 2/5/52, 38.8; 3/3/52, [illegible].1; 4/15/52, 39.7; 5/15/52, 29.2; 6/10/52, 30.4; 7/8/52, 31.0; 7/30/52, 32.2; 8/25/52, 40.5; 10/22/52, 37.5; 1/16/53, 3[illegible].8; 2/27/53, 35.7; 3/27/53, 37.2; 4/28/53, 42.0; 7/3/53, 37.2; 8/5/53, 39.2; 9/1/53, 40.6; 10/8/53, 40.8; 11/18/53, [illegible]; 1/6/54, 40.9; 4/1/54, 34.9; 4/21/54, 32.8.

9S/1E-12H1 - A. A. Ward - Near Aguanga; 0.5 mile south of well 12A1; open casing on north bank of Temecula Creek. Reference point - top of casing 3 feet above ground surface, at elevation 2,457.75 feet. 10/25/50, 27.9; 11/17/50, 20.4; 1/29/51, 17.0; 3/7/51, 16.3; 4/4/51, 19.3; 5/7/51, 19.2; 8/7/51, 27.7; 9/4/51, 25.8; 10/2/51, 26.0; 11/5/51, 21.6; 1/3/52, 19.0; 1/15/52, 14.4; 10/31/52, 27.9; 4/28/53, 23.1; 11/18/53, 16.0; 4/21/54, 13.1.

9S/2E-6D1 - Near Aguanga; 0.7 mile north of Highway 79 (measured along dirt road) from intersection 3.5 miles southeast of Aguanga (measured along Highway 79); open casing 150 feet east of dirt road. 11/18/53, dry.

9S/2E-6L1 - W. R. Scott - Near Aguanga; 0.5 mile northeast of well 7D1; at windmill 300 feet northeast of house. Reference point - ground surface. 12/27/51, 77.5 (log).

9S/2E-7D1 - A. Christino - Near Aguanga; 3.8 miles southeast of Aguanga (measured along Highway 79); open casing at large pressure tank 250 feet north of store (Tony's Place). Reference point - (a) hole in pump base 0.7 foot above ground surface, at elevation 2,478.4 feet (4/28/53 and 11/18/53); (b) top of casing 0.6 foot above ground surface, at elevation 2,478.3 feet (4/21/54). 4/28/53, 47.0; 11/18/53, 51.2; 4/21/54, 42.4.

9S/2E-7D2 - A. Christine - Near Aguanga; 300 feet south of well 7D1. Reference point - (a) top of casing 2.2 feet above ground surface, at elevation 2,48[illegible] feet (11/18/53); (b) hole in pump base 2.2 feet above ground surface, at elevation 2,480 feet. 11/18/53, 94.4; 4/21/54, 85.0.

9S/2E-8Q1 - James Cwiatt - In Oakgrove Valley; 50 feet northwest of well 8Q2; at windmill. Reference point - top of casing at ground surface, at elevation 2,755.32 feet. 4/14/53, 20.1; 11/18/53, 24.2; 4/22/54, 19.2.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 3

(Depths to water in feet measured from reference point)
(continued)

9S/2E-8Q2 - James Oviatt - In Oakgrove Valley; 0.5 mile northeast of Highway 79 (measured along dirt road); 0.9 mile northwest of ranger station (measured along Highway 79); at windmill 5 feet east of concrete block tank. Reference point - top of casing 1.0 foot above ground surface, at elevation 2,756.90 feet. 11/30/51, 21.8; 10/31/52, 22.4; 4/24/53, 24.3; 11/18/53, 23.4; 4/22/54, 20.7.

9S/2E-9P1 - James Oviatt - In Oakgrove Valley; at windmill 0.5 mile east of well 8Q1. Reference point - top of casing 2.3 feet above ground surface, at elevation 2,829 feet (barometric level). 11/30/51, 86.5; 10/31/52, 108.1; 4/24/53, 109; 11/18/53, 87.6; 4/22/54, 81.9.

9S/2E-15F1 - James Oviatt - In Oakgrove Valley, 1.4 miles northeast of Highway 79 (measured along dirt road) from intersection 0.65 mile east of Ranger Station (measured along Highway 79); at windmill 155 feet west and 165 feet north of center of section 15. Reference point - top of casing 1 foot above ground surface, at elevation 2,893 feet (barometric level). 11/18/53, 120.0; 4/22/54, 120.3.

9S/2E-15R1 - James Oviatt - Near Oakgrove Valley; at windmill in canyon 0.75 mile southeast of well 15F1. Reference point - top of casing 4 feet above ground surface, at elevation 3,044 feet. 4/24/53, 28.0; 11/18/53, 26.5; 4/22/54, 26.6.

9S/2E-16E1 - P. Bergman - In Oakgrove Valley; 0.25 mile west and 800 feet north of center of section 16; open casing. Reference point - top of casing 1.7 feet above ground surface, at elevation 2,790 feet (barometric level). 4/30/53, 49.0; 11/18/53, 49.1; 4/22/54, 49.3.

9S/2E-16F1 - James Oviatt - In Oakgrove Valley; 0.25 mile north of center of section 16; open casing. Reference point - top of casing 0.5 foot above ground surface, at elevation 2,800 feet (barometric level). 1/17/51, 71.7; 3/7/51, 72.1; 4/4/51, 72.9; 5/7/51, 72.6; 8/7/51, 73.4; 10/2/51, 73.5; 11/6/51, 74.6; 1/4/52, 71.2; 2/5/52, 74.9; 3/3/52, 75.2; 4/15/52, 75.3; 5/14/52, 75.4; 6/10/52, 75.5; 7/8/52, 75.6; 10/31/52, 75.3; 1/16/53, 74.2; 2/27/53, 73.6; 3/27/53, 73.5; 4/24/53, 72.5; 7/3/53, 72.6; 8/6/53, 73.0; 9/1/53, 73.0; 9/29/53, 73.1; 11/18/53, 73.3; 1/6/54, 73.7; 2/4/54, 73.9; 4/1/54, 74.1; 4/22/54, 74.1.

9S/2E-16G1 - Bergman - In Oakgrove Valley; at windmill 500 feet east of center of section 16. Reference point - top of casing 1.3 feet above ground surface, at elevation 2,802 feet (barometric level). 1/17/51, 75.5; 1/17/51, 75.5; 4/4/51, 77.5; 5/7/51, 77.8; 8/17/51, dry; 9/6/51, 79.1; 10/2/51, dry; 1/4/52, 77.9; 10/31/52, dry; 4/24/53, 78.5.

9S/2E-17K1 - Bergman - In Oakgrove Valley; 170 feet northeast of Highway 79; at windmill 50 feet northeast of barn east of Oakgrove Cafe; 20 feet southwest of well 17K4. Reference point - top of casing 1.7 feet above ground surface, at elevation 2,732.49 feet. 4/23/53, 16.1.

9S/2E-17K2 - E. Hattebuhr - In Oakgrove Valley; 200 feet north of Highway 79; at pressure tank behind house 0.1 mile east of Oakgrove Cafe. Reference point - top of casing 0.3 foot above ground surface, at elevation 2,737.37 feet. 4/29/53, 17.3; 11/23/53, 18.0; 4/23/54, 16.2.

9S/2E-17K3 - Anna Bergman - In Oakgrove Valley; 200 feet northwest of well 17K1. Reference point - top of casing 2.9 feet above ground surface, at elevation 2,724 feet. 3/10/53, 12 (log); 11/23/53, 12.7.

9S/2E-17R1 - United States Forestry Service - In Oakgrove Valley; 400 feet southwest of Highway 79, at Oakgrove Ranger Station. Reference point - top of concrete floor 2 feet above ground surface, at elevation 2,750 feet (barometric level). 11/16/50, 23.5; 11/30/51, 25.6; 10/30/52, 23.4; 4/24/53, 24.5; 11/18/53, 25.6.

9S/2E-20A1 - Painter, McAlpine and Knox - In Oakgrove Valley; see location of wells plate. Reference point - top of casing 1.77 feet above ground surface, at elevation 2,772.37 feet. 4/28/53, 29.1; 4/23/53, 32.3; 1/23/54, 24.2.

9S/2E-20A2 - D. L. Martin - In Oakgrove Valley; 0.1 mile south of Highway 79 (measured along dirt road) from intersection 0.19 mile southeast of Oakgrove Ranger Station (measured along Highway 79); 150 feet south of house. Reference point - top of casing 0.9 foot above ground surface, at elevation 2,796.40 feet. 4/28/53, 45.0; 11/23/53, 50.5; 1/6/54, 52.5; 2/4/54, 51.0; 4/1/54, 48.5; 4/23/54, 45.6.

9S/2E-20A4 - Harry A. Christman - In Oakgrove Valley; 0.12 mile south of Highway 79 (measured along dirt road); from intersection 0.18 mile southeast of Oakgrove Ranger Station (measured along Highway 79); 100 feet south of house. Reference point - top of casing 2.5 feet above ground surface, at elevation 2,783 feet. 11/23/53, 49.8; 4/23/54, 39.2.

9S/2E-20B1 - M. M. Lloyd - In Oakgrove Valley, see location of wells plate; at pressure tank 100 feet south of house. Reference point - top of casing, at elevation 2,801 feet. 11/23/53, 64; 4/23/54, 57.5.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 5

(Depths to water in feet measured from reference point)
(continued)

9S/2E-21E1 - James Oviatt - In Oakgrove Valley; 1.4 mile south of Highway 79 (measured along Oakgrove Truck Trail) from intersection 0.19 mile southeast of Oakgrove Ranger Station; open casing 50 feet southwest of Truck Trail. Reference point - hole in casing 1 foot above ground surface, at elevation 2,809 feet (barometric level). 11/16/50, 44.0; 1/17/51, 43.6; 3/7/51, 42.5; 4/4/51, 40.2; 5/7/51, 39.3; 6/12/51, 40.3; 11/30/51, 45.6; 2/5/52, 36.8; 3/3/52, 32.3; 4/15/52, 29.3; 5/14/52, 30.2.

9S/2E-22G1 - H. Taylor - In Oakgrove Valley; 1.9 miles southeast of Oakgrove Ranger Station (measured along Highway 79) and 100 feet north of Highway 79; 200 feet southwest of house. Reference point - edge of 2 x 7 inch pump support at ground surface, at elevation 2,910 feet. 4/23/53, 91.0; 4/23/54, 91.9.

9S/2E-22J1 - James Oviatt - In Oakgrove Valley; 0.35 mile southeast of well 22G1; at windmill 300 feet south of Highway 79. Reference point - top of casing 2.0 feet above ground surface, at elevation 2,936 feet (barometric level). 1/4/52, 136; 10/30/52, 126.4; 4/23/53, 128.5; 11/24/53, 130.6; 4/23/54, 131.3.

9S/2E-22N1 - C. H. and M. A. Snavely, Jr. - In Dodge Valley; 1.1 mile northwest of well 27H1; 20 feet north of cabin. Reference point - top of concrete pump base 2.0 feet above ground surface, at elevation 3,015 feet. 11/24/53, 17.0; 4/22/54, 14.9.

9S/2E-23K1 - Dorothy Veazey - Near Oakgrove Valley; at Dodge Valley Cafe 2.3 miles southeast of Oakgrove Ranger Station. Reference point - ground surface. 12/8/50, dry.

9S/2E-26E1 - Herman Silveria - In Dodge Valley; 0.3 mile west of Highway 79 (measured along dirt road to Paradise Ranch); 7.5 feet southwest of house; 19 feet south of well 26E2. Reference point - top of casing at ground surface, at elevation 3,148 feet. 11/27/53, 29.2; 4/22/54, 20.1.

9S/2E-26E3 - Ralph D. Buzard - In Dodge Valley; 300 feet east of well 26E1; in pump house 50 feet east of house. Reference point - top of casing 0.6 foot above ground surface, at elevation 3,153 feet. 11/24/53, 20.9; 4/22/54, 16.5.

9S/2E-26E5 - H. C. Scranton - In Dodge Valley; 500 feet north and 200 feet west of well 26E1. Reference point - hole in casing cover 0.6 foot above ground surface. 11/24/53, 18.4; 4/22/54, 10.7.

9S/2E-26L2 - B. E. Ward - In Dodge Valley; 1.14 mile south of Dodge Valley Cafe (measured along Highway 79) and 0.1 mile west of Highway 79. Reference point - top of casing at ground surface, at elevation 3,180 feet. 11/27/53, 46.7; 4/22/54, 44.6.

9S/2E-27H1 - C. W. and R. B. Burr - In Dodge Valley; 0.51 mile west of Highway 79 (measured along dirt road to Paradise Ranch); at pressure tank 80 feet north of dirt road. Reference point - top of casing 0.9 foot above ground surface, at elevation 3,136.00 feet. 12/8/50, 39.7; 1/17/51, 40.0; 3/7/51, 40.7; 4/4/51, 40.3; 5/7/51, 45.9; 6/13/51, 40.0; 8/7/51, 39.3; 10/3/51, 40.8; 11/6/51, 41.2; 1/3/52, 39.6; 2/5/52, 39.4; 3/3/52, 39.9; 4/15/52, 35.8; 5/14/52, 36.4; 6/10/52, 35.8; 7/8/52, 37.2; 7/30/52, 37.3; 10/28/52, 39.4; 1/16/53, 38.7; 2/27/53, 39.0; 3/27/53, 39.2; 4/28/53, 39.5; 7/3/53, 39.6; 8/6/53, 41.6; 9/1/53, 39.8; 9/29/53, 39.9; 11/24/53, 40.2; 1/6/54, 40.4; 2/4/54, 40.4; 4/1/54, 37.8; 4/22/54, 36.4.

9S/2E-27J1 - P. C. Morrissey - In Dodge Valley; 0.6 mile west of Highway 79 (measured along dirt road to Paradise Ranch); at windmill 50 feet north of house. Reference point - top of casing 0.8 foot above ground surface, at elevation 3,129.46 feet. 12/27/51, dry; 11/24/51, dry.

9S/2E-27K1 - Michael and Clara Kanan - In Dodge Valley; 520 feet west and 150 feet south of well 27J1; open casing. Reference point - top of casing 0.5 foot above ground surface, at elevation 3,126.51 feet. 12/8/50, 32.9; 1/17/50, 32.9; 3/7/51, 33.8; 4/4/51, 36.0; 5/5/51, 35.0; 6/13/51, 35.2; 8/7/51, 32.4; 9/5/51, 36.5; 10/2/51, 35.1; 11/6/51, 37.1; 1/3/52, 35.8; 1/15/52, 36.9; 10/28/52, 33.2; 4/22/53, 34.5; 11/24/53, 33.8; 4/22/54, 33.9.

9S/2E-27K3 - P. C. Morrissey - In Dodge Valley; 250 feet south and 150 feet west of well 27J1; open casing. Reference point - surface of brick pump base 1 foot above ground surface, at elevation 3,130.20 feet. 12/8/50, 34.4; 1/17/51, 32.8; 3/7/51, 32.5; 4/4/51, 34.3; 5/7/51, 33.5; 6/13/51, 33.5; 8/7/51, 38.0; 9/5/51, 38.0; 10/2/51, 37.9; 11/6/51, 38.9; 1/3/52, 37.4; 10/28/52, 33.2; 4/22/53, 33.0; 11/24/53, 33.2; 4/22/54, 33.5.

9S/2E-35J1 - William R. Hartly - In Dodge Valley; 300 feet west of Emery store; outside watershed. Reference point - pump base 1.0 foot above ground surface, at elevation 3,290 feet (barometric level) 12/3/51, 28.1; 10/28/52, 33.5.

9S/2E-35J2 - Holcomb Estates - In Dodge Valley; 250 feet southeast of Emery store and 30 feet northeast of Highway 79. Reference point - top of pit at ground surface. 11/27/53, dry.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 3

(Depths to water in feet measured from reference point)
(continued)

9S/3E-3M1 - Lloyd Mitchell - In Chihuahua Valley; 0.6 mile east and 0.9 mile north of well 17L1; cribbed pit under iron pipe tripod. Reference point - top of cribbing at ground surface, at elevation 4,222 feet. 12/8/50, 12.3; 12/4/51, 4.8; 10/28/52, 10.9; 4/23/53, 10.5; 4/23/54, 10.3.

9S/3E-15J1 - S. J. Curtis - In Chihuahua Valley; 2.2 miles east of intersection of Chihuahua Valley Road and Puerta La Cruz Truck Trail (measured along Chihuahua Valley Road); 450 feet east of dirt road and 250 feet south of power line; open casing. Reference point - top of casing 0.5 foot above ground surface, at elevation 4,435 feet. 4/23/53, 43.1; 11/9/53, 44.4; 4/23/54, 43.6.

9S/3E-15Q1 - S. J. Curtis - In Chihuahua Valley; 0.3 mile south of well 15J1 and 350 feet west of dirt road; open casing; outside watershed. Reference point - top of concrete casing 1.5 foot above ground surface, at elevation 4,370 feet. 4/23/53, 29.8; 11/9/53, 31.4; 4/23/53, 29.7.

9S/3E-15R1 - S. J. Curtis - In Chihuahua Valley; 150 feet east and 50 feet north of well 15R2; outside watershed. Reference point - (a) pump base 2.5 feet above ground surface, at elevation 4,391.5 feet (4/23/53 and 11/9/53); (b) top of casing at ground surface, at elevation 4,389 feet (4/23/54). 4/23/53, 19.4; 11/9/53, 19.4; 4/23/54, 16.0.

9S/3E-15R2 - S. J. Curtis - In Chihuahua Valley; 2.6 miles east of intersection of Chihuahua Valley Road and Puerta La Cruz Truck Trail (measured along Chihuahua Valley Road); 450 feet northwest of house outside watershed. Reference point - pump base 2.5 feet above ground surface. 4/23/53, 17.5.

9S/3E-16A1 - Roy C. Jackson - In Chihuahua Valley; at windmill 800 feet north and 100 feet west of well 16A2. Reference point - top of pipe clamps 2 feet above ground surface, at elevation 4,276 feet. 11/9/53, 32.4; 4/23/54, 32.8.

9S/3E-16A2 - Roy C. Jackson - In Chihuahua Valley; 1.2 miles east of intersection of Chihuahua Valley Road and Puerta La Cruz Truck Trail (measured along Chihuahua Valley Road) and 0.35 mile north of Chihuahua Valley Road; 150 feet southwest of house. Reference point - top of casing 0.5 foot above ground surface, at elevation 4,288 feet. 10/28/52, 25.0; 4/23/53, 27.3; 11/9/53, 28.4; 4/23/54, 27.8.

9S/3E-16B1 - Harriet B. Carr - In Chihuahua Valley; 1.0 mile east and 0.35 mile north of intersection of Chihuahua Valley Road and Puerta La Cruz Truck Trail; 400 feet east and 30 feet north of house. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,646 feet. 12/8/50, 5.0; 12/4/51, 6.0; 10/28/52, 5.1; 4/23/53, 3.5; 11/9/53, 5.8; 4/23/54, 4.4.

9S/3E-16B2 - Harriet B. Carr - In Chihuahua Valley; 50 feet southeast of well 16B1. Reference point - top of metal cover 1 foot above ground surface, at elevation 4,242 feet. 12/4/51, 6; 10/28/52, 6.9; 4/23/53, 4.7; 11/9/53, 6.8; 4/23/54, 4.9.

9S/3E-16J1 - L. Zimmerman - In Chihuahua Valley; 0.85 mile east and 0.15 mile north of intersection of Chihuahua Valley Road and Puerta La Cruz Truck Trail; 50 feet west of house. Reference point - top of casing 1 foot above ground surface. 4/23/53, 10.5 (owner); 11/9/53, 11.5 (owner).

9S/3E-16K1 - J. E. Tobin - In Chihuahua Valley; 1.1 miles east and 0.15 mile south of intersection of Chihuahua Valley Road and Puerta La Cruz Truck Trail; 50 feet east of house. Reference point - ground surface. 11/9/53, 25 (owner).

9S/3E-17G1 - L. M. Oxley - In Chihuahua Valley; 0.4 mile north and 200 feet west of intersection of Chihuahua Valley Road and Puerta La Cruz Truck Trail; 150 feet north of house. Reference point - top of casing 0.8 foot above ground surface, at elevation 4,206 feet. 4/23/53, 36.1; 4/23/54, 27.4.

9S/3E-17L1 - Snider - In Chihuahua Valley; 500 feet west and 200 feet south of intersection of Chihuahua Valley Road and Puerta La Cruz Truck Trail; 10 feet west of house. Reference point - top of casing 0.4 foot above ground surface. 4/23/53, 14.2.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 4

(Depths to water in feet measured from reference point)

8S/1W-6B1 - Vail Company - In Pauba Valley; map location only, see location of wells plate. Reference point - top of pipe at ground surface, at elevation 1,293.03 feet. Note: Measurements from Vail Company records. 12/30/26, 46.7; 1/1/27, 67.6; 1/31,27, 71.6; 3/8/27, 64.2; 4/4/27, 58.6; 4/30/27, 56.2; 5/28/27, 55.1; 7/2/27, 55.5; 7/28/27, 56.5; 8/27/27, 58.1; 10/6/27, 60.6.

8S/2W-2J1 - Vail Company - Near Temecula; map location only, see location of wells plate; test hole. Reference point - (a) top of pipe at ground surface, at elevation 1,247.92 feet (1/7/27 through 1/20/27); (b) new reference point not described 0.1 foot above ground surface, at elevation 1,248.05 feet (2/3/27 to end of record). Note: Measurements from Vail Company records. 1/7/27, 94.1; 1/20/27, 95.8; 1/20/27, 101.6 (bailed out), 2/3/27, 101.7; 3/9/27, 101.5; 4/5/27, 101.5; 5/7/27, 101.6; 6/4/27, 101.6; 7/4/27, 101.6; 8/6/27, 101.5; 9/9/27, 101.3;

8S/2W-3K1 - Vail Company - Near Temecula; map location only, see location of wells plate; test hole. Reference point - top of pipe at ground surface, at elevation 1,263.12 feet. Note: Measurements from Vail Company records. 1/5/27, 125 (log); 1/9/27, 123.5; 2/10/27, 123.4; 3/5/27, 123.2; 4/5/27, 123.2; 5/7/27, 123.2; 6/4/27, 123.3; 7/4/27, 123.3; 8/6/27, 123.2; 9/19/27, 123.3.

8S/2W-11H1 - Vail Company - In Pauba Valley; 0.2 mile northwest of well 11J1; at windmill 60 feet northeast of fence. Reference point - top of casing 1.5 feet above ground surface, at elevation 1,182 feet. 1/15/52, 36.2; 5/15/53, 35.9; 7/3/53, 31.8; 8/6/53, 31.0; 1/3/53, 29.4; 10/8/53, 29.5; 11/20/53, 25.4; 1/7/54, 27.7; 1/24/54, 27.6; 3/30/54, 28.1; 4/23/54, 28.1.

8S/2W-11J1 - Vail Company - In Pauba Valley; 0.5 mile northeast of Highway 71 (measured along dirt road extension of Highway 71); 500 feet northwest of dirt road and 50 feet southwest of fence line. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,181 feet. Note: Measurements from Vail Company records, except as indicated. 6/7/41, 13.6; 6/28/41, 14.7; 7/30/41, 14.6; 8/31/41, 14.9; 9/27/41, 15.0; 10/31/41, 14.9; 11/29/41, 14.7; 1/1/42, 14.2; 1/28/42, 13.7; 2/28/42, 13.5; 3/30/42, 13.3; 4/29/42, 13.2; 6/16/42, 13.9; 7/20/42, 14.5; 8/31/42, 14.8; 9/30/42, 15.0; 10/29/42, 15.0; 11/30/42, 15.2; 12/31/42, 15.3; 2/1/43, 14.3; 2/27/43, 13.4; 3/30/43, 12.8; 4/29/43, 12.9; 5/31/43, 13.6; 6/15/43, 13.8; 7/31/43, 14.2; 8/31/43, 14.5; 9/30/43, 14.9; 10/30/43, 14.6; 11/30/43, 15.0; 12/30/43, 15.0; 1/31/44, 15.1; 2/29/44, 14.8; 3/31/44, 14.0; 4/28/44, 14.0; 5/31/44, 14.2; 6/7/44, 14.2; 7/31/44, 14.6; 8/31/44, 15.0; 9/27/44, 15.1; 11/30/44, 15.2; 12/30/44, 15.2; 1/31/45, 15.1; 2/27/45, 15.2; 3/31/45, 14.7; 4/16/45, 14.6; 8/31/45, 15.9; 9/12/45, 15.9; 10/25/45, 15.7; 11/26/45, 15.8; 12/31/45, 15.7; 1/30/46, 15.6; 2/27/46, 15.6; 4/24/46, 15.5; 5/17/46, 16.0; 7/31/46, 16.6; 8/30/46, 16.6; 9/30/46, 17.0; 10/12/46, 17.1; 11/30/46, 16.6; 12/31/46, 16.4; 1/31/47, 16.4; 2/28/47, 16.5; 3/31/47, 16.6; 4/30/47, 17.0; 5/19/47, 17.1; 6/30/47, 18.3; 7/23/47, 18.0; 8/25/47, 18.1; 10/22/47, 18.2; 11/20/47, 18.3; 1/31/48, 18.8; 2/27/48, 18.7; 3/31/48, 18.8; 4/30/48, 19.1; 5/31/48, 19.4; 7/31/48, 20.0; 8/30/48, 20.3; 9/30/48, 20.8; 10/30/48, 20.7; 11/20/48, 21.1; 12/31/48, 21.0; 1/31/49, 20.9; 2/28/49, 20.9; 3/30/49, 21.0; 4/30/49, 21.2; 5/31/49, 21.5; 6/30/49, 21.2; 7/30/49, 22.0; 8/31/49, 22.2; 9/30/49, 22.4; 10/31/49, 22.7; 11/30/49, 22.8; 12/31/49, 23.0; 1/31/50, 23.0; 2/27/50, 23.4; 4/4/50, 23.5; 5/3/50, 24.2; 6/1/50, 24.1; 7/1/50, 24.3; 8/1/50, 24.7; 9/1/50, 25.0; 10/4/50, 25.8; 11/13/50, 26.4; 12/1/50, 26.1; 1/8/51, 26.7; 2/1/51, 26.5; 3/1/51, 27.1; 4/26/51, 27.9; 5/1/51, 27.6; 6/13/51, 28.2; 7/3/51, 28.5; 8/1/51, 28.5; 9/4/51, 29.1; 10/2/51, 29.3; 10/31/51, 29.9; 12/1/51, 29.7; 1/2/52, 29.4; 2/1/52, 29.1; 3/3/52, 29.3; 3/29/52, 28.8; 5/1/52, 29.0; 6/30/52, 30.2; 7/1/52, 30.1; 8/1/52, 32.2; 9/2/52, 33.0; 11/17/52, 33.4; 12/1/52, 32.7; 1/2/53, 32.0; 2/3/53, 32.5; 2/26/53, 33.0 (DWR); 3/2/53, 32.2; 4/17/53, 32.9; 5/1/53, 33.5; 7/13/53, 33.3; 8/1/53, 33.5; 9/1/53, 30.3; 10/1/53, 29.4; 11/2/53, 27.8; 11/20/53, 28.1 (DWR); 12/1/53, 29.4; 1/2/54, 29.8; 1/14/54, 31.2 (DWR); 2/1/54, 30.0; 3/1/54, 30.4; 3/30/54, 29.9 (DWR); 4/1/54, 30.1; 4/23/54, 30.6; 5/25/54, 31.2; 6/1/54, 30.6; 7/10/54, 31.0; 8/31/54, 30.8; 9/30/54, 30.0; 10/30/54, 30.5; 11/30/54, 30.1; 12/31/54, 31.0; 1/31/55, 30.2; 2/12/55, 30.3; 3/5/55; 30.9.

8S/2W-11J2 - Vail Company - In Pauba Valley; 1,000 feet southeast of well 11J1; open casing. Reference point - top of casing at ground surface, at elevation 1,182.32 feet. Note: Measurements from Vail Company records, except as indicated. 7/28/25, 17.5, 9/3/25, 19.1; 10/1/25, 19.3; 12/4/25, 16.8; 1/2/26, 16.7; 1/29/26, 17.2; 2/27/26, 18.3; 3/31/26, 19.4; 4/30/26, 17.6; 6/2/26, 18.2; 6/30/26, 18.3; 7/28/26, 18.7; 9/2/26, 18.9; 9/30/26, 19.0; 11/1/26, 18.5; 11/29/26, 16.9; 1/2/27, 16.4; 2/2/27, 16.5; 3/3/27, 14.5; 4/4/27, 13.8; 4/30/27, 14.6; 5/28/27, 15.7; 7/2/27, 16.2; 7/30/27, 16.7; 9/3/27, 17.1; 10/8/27, 17.4; 4/8/48, 19.3; 4/29/48, 19.4; 5/20/48, 19.5; 1/3/53, 31.7; 2/3/53, 31.5; 3/2/53, 32.0; 4/1/53, 32.4; 5/1/53, 32.6; 11/20/53, dry (DWR); 1/14/54, dry (DWR); 4/23/54, dry (DWR).

8S/2W-11J4 - Vail Company - In Pauba Valley; 50 feet east of well 11J1. Reference point - ground surface. 5/40, 12.4 (log).

8S/2W-11L1 - Vail Company - In Pauba Valley; 0.3 mile northwest of Highway 71 and Temecula Creek crossing (measured along Highway 71); 20 feet northwest of intersection of Highway 71 and dirt road extension of Highway 71. Reference point - top of casing 1 foot above ground surface, at elevation 1,163 feet. Note: Measurements from Vail Company records. 7/23/52, 25.3; 9/2/52, 26.8; 11/13/52, 27.2; 12/1/52, 26.4; 1/2/53, 25.7; 2/9/53, 26.2; 3/2/53, 26.2; 4/17/53, 26.9; 7/21/53, 27.8; 8/5/53, 27.6; 9/1/53, 25.4; 10/1/53, 25.7; 11/2/53, 23.2; 12/4/53, 24.6; 1/2/54, 25.4; 2/1/54, 26.0; 3/20/54, 24.8; 4/1/54, 24.1; 5/31/54, 24.9; 6/15/54, 24.7; 7/17/54, 24.8; 8/31/54, 24.6; 9/30/54, 24.2; 10/30/54, 25.3; 11/30/54, 23.6; 12/18/54, 23.5; 1/31/55, 23.6; 2/12/55, 23.8; 3/5/55, 24.3.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 4

(Depths to water in feet measured from reference point)
(continued)

8S/2W-12F1 - Vail Company - In Pauba Valley; map location only, see location of wells plate. Reference point - top of pipe at ground surface, at elevation 1,201.46 feet. Note: Measurements from Vail Company records. 3/5/27, 14.7; 4/4/27, 14.8; 5/7/27, 14.6; 6/4/27, 15.3; 7/4/27, 16.2; 8/6/27, 17.0. 9/10/27, 17.8; 10/6/27, 18.3.

8S/2W-12H1 - Vail Company - In Pauba Valley; 1.4 miles northeast of well 11L1, at windmill 0.25 mile southeast of reservoir. Reference point - top of slot in concrete casing 1.22 feet above ground surface, at elevation 1,216.22 feet. Note: Measurements from Vail Company records, except as indicated. 8/9/20, 3.9; 9/6/20, 4.8; 10/12/20, 6.0; 11/26/20, 7.4 12/16/20, 8.1; 1/2/21, 8.6; 2/20/21, 9.4; 10/22/21, 11.8; 3/6/22, flowing; 5/28/22, flowing; 8/6/22, 2.2; 9/3/22, 2.9; 11/14/22, 4.4; 1/20/23, 3.9; 2/19/23, 0.9; 3/21/23, 0.8; 3/30/23, flowing; 5/9/23, flowing; 6/3/23, 1.2; 7/12/23, 1.9; 8/4/23, 2.6; 9/23/24, 8.4; 11/8/24, 9.7; 12/7/24, 10.5; 1/15/25, 11.4; 2/9/25, 11.8; 2/12/25, 12.5; 4/9/25, 12.5; 5/1/25, 12.5; 6/10/25, 12.5; 7/7/25, 12.7; 8/5/25, 13.1; 9/2/25, 13.6; 10/1/25, 14.2; 11/6/25, 14.9; 12/3/25, 15.3; 1/2/26, 15.8; 2/16/26, 16.3; 3/1/26, 16.2; 4/2/26, 15.9; 4/12/26, 10.8; 5/6/26, 6.9; 5/26/26, 6.7; 6/30/26, 7.0; 8/6/26, 7.8; 9/2/26, 8.5; 10/7/26, 9.5; 11/1/26, 10.4; 12/6/26, 11.4; 1/2/27, 12.1; 2/11/27, 12.9; 3/3/27, 3.0; 4/9/27, 0.7; 4/30/27, flowing; 5/28/26, flowing; 6/4/27, 0.9; 7/2/27, 1.8; 8/6/27, 3.0; 9/10/27, 4.3; 10/11/27, 5.4; 10/12/27 to 6/29/41, see plate of "Fluctuation of Water Levels at Selected Wells"; 6/30/41, 0.4; 7/31/41, 0.8; 8/30/41, 1.7; 9/30/41, 2.3; 10/31/41, 3.0; 11/30/41, 1.5; 12/27/41, 0.4; 1/31/42, 0.3; 2/28/42, 0.2; 3/31/42, 0.2; 4/30/42, 0.2; 5/30/42, 0.6; 6/30/42, 1.5; 7/31/42, 1.6; 8/31/42, 2.7; 9/30/42, 3.6; 10/31/42, 4.4; 11/30/42, 5.7; 12/31/42, 5.8; 1/21/43, 6.5; 2/27/43, 0.5; 3/31/43, 0.3; 4/30/43, 0.3; 5/31/43, 0.4; 6/30/43, 1.5; 7/31/43, 2.2; 8/31/43, 3.1; 9/30/43, 3.9; 10/30/43, 5.1; 11/30/43, 5.8; 12/30/43, 6.1; 1/31/44, 6.5; 2/29/44, 2.6; 3/31/44, 0.3; 4/28/44, 0.4; 5/31/44, 0.9; 6/30/44, 1.9; 7/31/44, 4.0; 8/31/44, 4.2; 9/30/44, 5.3; 10/31/44, 6.3; 11/30/44, 6.7; 12/30/44, 6.9; 1/31/45, 7.2; 2/28/45, 6.3; 3/31/45, 1.4; 4/30/45, 1.7; 5/31/45, 2.2; 6/30/45, 3.1; 7/31/45, 4.4; 8/31/45, 4.7; 9/29/45, 5.6; 10/30/45, 6.9; 11/30/45, 7.4; 12/31/45, 6.5; 1/30/46, 7.0; 2/1/46, 6.4; 3/1/46, 6.6; 4/1/46, 5.8; 5/1/46, 3.9; 6/1/46, 5.1; 8/1/46, 6.6; 9/3/46, 7.3; 10/1/46, 9.3; 11/1/46, 9.6; 12/1/46, 9.7; 1/1/47, 10.1; 2/1/47, 11.9; 3/1/47, 10.6; 4/47, 10.7; 5/47, 11.1; 6/47, 12.6; 7/47, 13.4; 8/47, 14.2; 9/47, 14.9; 10/47, 15.3; 11/47, 16.2; 12/47, 17.0; 1/48, 17.8; 2/48, 18.6; 3/48, 19.0; 4/48, 19.4; 5/48, 19.7; 6/48, 20.6; 7/48, 20.7; 8/48, 21.8; 9/48, 21.7; 10/48, 22.4; 11/48, 22.9; 4/49, 25.3; 6/49, 27.2; 7/49, 27.7; 8/49, 28.7; 9/49, 29.6; 10/49, 29.4; 11/49, 30.0; 12/49, 30.5; 1/50, 31.2; 2/50, 31.6; 3/50, 32.4; 4/50, 33.1; 5/50, 33.4; 10/24/50, 37.2 (DWR); 1/2/51, 38.4; 2/1/51, 38.9; 3/1/51, 39.3; 4/2/51, 40.0; 5/1/51, 40.5; 6/1/51, 41.2; 8/1/51, 42.2, 9/1/51, 42.9; 10/1/51, 43.4; 11/1/51, 43.8; 11/30/51, 44.0 (DWR); 12/1/51, 44.2; 1/1/52, 44.4; 2/1/52, 44.7; 3/3/52, 45.2; 4/1/52, 44.7; 5/1/52, 44.7; 6/2/52, 45.7; 7/1/52, 45.2; 8/1/52, 45.5; 9/2/52, 45.6; 10/1/52, 46.1; 11/1/52, 46.7; 12/1/52, 47.1, 1/2/53, 46.8; 2/3/53, 46.4; 2/26/53, 44.2 (DWR); 3/2/53, 46.1; 4/1/53, 46.3; 5/1/53, 46.3; 5/15/53, 47.2 (DWR); 6/1/53, 46.2; 7/1/53, 43.6; 8/1/53, 41.3; 9/1/53, 42.0; 10/1/53, 42.2; 11/2/53, 42.1; 11/20/53, 42.0 (DWR); 12/1/53, 42.2; 1/2/54, 43.0; 1/14/54, 42.5 (DWR); 2/2/54, 43.3; 3/1/54, 43.5; 3/31/54, 44.0; 4/2/54, 43.9 (DWR); 4/23/54, 44.1 (DWR); 5/1/54, 44.5; 5/29/54, 44.6; 6/26/54, 44.3; 7/31/54, 44.6; 8/28/54, 44.5; 9/25/54, 44.8; 10/30/54, 45.0; 11/27/54, 45.2; 12/30/54, 45.3; 1/31/55, 45.3; 2/12/55, 45.4; 3/5/55, 45.8.

8S/2W-12H2 - Vail Company - In Pauba Valley; 50 feet east of well 12H1. Reference point - top of casing 1.1 feet above ground surface, at elevation 1,217.02 feet. Note: Measurements from Vail Company records. 8/9/20, 13.3; 9/6/20, 14.1; 10/12/20, 15.0; 11/26/20, 16.0; 12/16/20, 16.5; 1/2/21, 16.9; 3/20/21, 17.8; 10/22/21, dry; 3/6/22, 8.4; 5/28/22, 8.2; 8/6/22, 10.6; 9/3/22, 11.6; 11/14/22, 13.6; 1/20/23, 13.4; 2/19/23, 10.9; 3/16/23, 9.1; 4/7/23, 9.5; 5/3/23, 9.6; 6/3/23, 10.5; 7/12/23, 11.7; 8/4/23, 12.2; 9/23/24, dry; 11/19/24, dry; 11/28/24, dry; 12/13/24, dry; 1/15/25, 19.6; 2/6/25, 19.8; 3/12/25, 20.3; 4/9/25, 20.6; 5/1/25, 20.8; 6/10/25, 21.0; 6/15/25, dry; 7/7/25, dry; 8/5/25, dry; 9/24/25, dry; 10/1/25, 22.4; 11/6/25, 22.6; 12/2/25, 22.9; 1/2/26, 23.2; 2/5/26, 23.6; 3/1/26, 23.8; 4/7/26, 23.4; 4/12/26, 20.0; 5/7/26, 16.0; 6/3/26, 16.1; 6/30/26, 16.4; 8/6/26, 17.0; 9/2/26, 17.6; 10/7/26, 18.4; 11/1/26, 19.0; 12/6/26, 19.6; 1/1/27, 20.3; 2/1/27, 20.7; 2/18/27, 15.5; 3/3/27, 10.3; 4/4/27, 8.8; 4/23/27, 8.8; 5/7/27, 9.4; 6/4/27, 10.4; 7/2/27, 11.3, 8/5/27, 12.4, 9/10/27, 13.6, 10/11/27, 14.7; 6/1/41, 8.7; 6/30/41, 10.2; 7/31/41, 11.7, 8/30/41, 10.1; 9/30/41, 12.8, 10/31/41, 12.8, 11/29/41, 11.9, 1/1/42, 9.2; 1/31/42, 8.7; 2/28/42, 8.2; 3/31/42, 8.4; 4/30/42, 8.4, 5/30/42, 10.1; 6/30/42, 11.3; 7/31/42, 12.4; 8/31/42, 13.4; 9/30/42, 14.0; 10/31/42, 14.3, 11/30/42, 14.6, 12/31/42, 15.5; 2/1/43, 11.8, 2/27/43, 8.9; 3/31/43, 8.2; 4/30/43, 8.5; 5/31/43, 10.3; 6/30/43, 11.7; 7/31/43, 12.8, 8/31/43, 13.6; 9/30/43, 13.8, 10/30/43, 14.9, 11/30/43, 15.2; 12/30/43, 15.3, 1/31/44, 15.3; 2/29/44, 12.8; 3/31/44, 9.7; 4/28/44, 10.1; 5/31/44, 11.1; 6/30/44, 12.5; 7/31/44, 13.9; 8/31/44, 14.8, 9/30/44, 15.4; 10/31/44, 16.0; 11/30/44, 15.8; 12/30/44, 16.0; 1/31/45, 16.5; 2/27/45, 15.9; 3/31/45, 11.2, 4/30/45, 11.9, 5/31/45, 12.8; 6/30/45, 13.9; 7/31/45, 14.8; 8/31/45, 14.5; 9/29/45, 15.6; 10/30/45, 16.3; 11/30/45, 16.6; 12/31/45, 16.1; 1/30/46, 15.7; 2/27/46, 15.9; 3/30/46, 17.1; 4/30/46, 13.8; 5/31/46, 14.9, 6/29/46, 15.7; 7/31/46, 16.4; 8/31/46, 16.8; 9/30/46, 18.0; 10/31/46, 19.0; 11/30/46, 18.5; 12/31/46, 18.5, 1/31/47, 18.7. 2/28/47, 19.2; 3/31/47, 19.1; 4/30/47, 20.0; 5/31/47, 20.9; 6/30/47, 21.8; 7/31/47, 22.4; 8/30/47, 23.1; 9/30/47, 24.2; 10/31/47, 24.6; 11/29/47, 25.3; 12/2/47, 25.4; 12/3/47, 25.0; 12/4/47, mud; 1/48 to 12/54, dry.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 4

(Depths to water in feet measured from reference point)
(continued)

8S/2W-12K1 - Vail Company - In Pauba Valley; 1,200 feet southwest of well 12E1. Reference point - top of casing 0.6 foot above ground surface, at elevation 1,227 feet. Note: Measurements from Vail Company records, except as indicated. 4/20/19, 23.5 (log); 6/7/41, 14.0; 6/30/41, 16.2; 7/31/41, 16.2; 8/30/41, 15.6; 9/30/41, 16.9; 10/31/41, 15.5; 11/29/41, 14.9; 1/1/42, 12.0; 1/27/42, 11.2; 2/28/42, 10.8; 3/30/42, 11.3; 4/22/42, 10.4; 10/31/42, 16.3; 11/30/42, 16.7; 12/31/42, 17.5; 2/1/43, 13.7; 2/27/43, 11.7; 3/31/43, 10.7; 4/23/43, 10.6; 8/24/43, 16.0; 9/30/43, 16.6; 10/18/43, 16.4; 11/30/43, 17.4; 12/30/43, 16.6; 1/31/44, 16.9; 2/29/44, 14.2; 3/25/44, 12.5; 4/28/44, 13.5; 5/16/44, 13.8; 9/30/44, 18.0; 10/17/44, 18.0; 11/30/44, 17.5; 12/30/44, 17.4; 1/25/45, 17.7; 2/26/45, 17.6; 3/30/45, 13.8; 4/17/45, 13.9; 8/31/45, 16.9; 9/29/45, 19.0; 10/23/45, 17.9; 11/16/45, 18.4; 12/31/45, 17.9; 1/30/46, 17.6; 2/23/46, 17.6; 4/24/46, 16.5; 8/14/46, 18.4; 11/30/46, 19.8; 11/31/46, 19.6; 1/31/47, 19.8; 2/25/47, 20.3; 3/31/47, 20.0; 4/30/47, 21.6; 5/19/47, 22.1; 6/30/47, 23.2; 10/17/47, 25.1; 1/31/48, 27.0; 2/21/48, 26.9; 3/31/48, 26.6; 4/17/48, 26.9; 5/14/48, 28.5; 7/31/48, 28.1; 8/31/48, 29.3; 9/16/48, 28.4; 10/23/48, 29.0; 12/31/48, 29.5; 1/31/49, 29.3; 2/28/49, 29.4; 3/30/49, 30.0; 4/28/49, 30.7; 5/31/49, 33.3; 6/30/49, 31.9; 7/30/49, 34.4; 8/31/49, 33.6; 9/30/49, 34.6; 10/31/49, 35.1; 11/30/49, 33.6; 12/31/49, 34.3; 2/1/50, 34.2; 2/25/50, 35.5; 4/6/50, 35.8; 5/4/50, 36.9; 6/1/50, 36.2; 7/1/50, 36.4; 8/11/50, 39.2; 8/30/50, 38.2; 10/4/50, 40.8; 11/16/50, 39.8; 12/1/50, 39.5; 1/12/51, 40.5; 2/1/51, 40.3; 3/1/51, 42.2; 4/23/51, 42.7; 5/1/51, 42.4; 6/9/51, 43.6; 6/27/51, 42.8; 7/31/51, 44.9; 9/10/51, 44.9; 10/5/51, 46.7; 11/1/51, 43.7; 12/1/51, 45.4; 1/2/52, 44.4; 2/1/52, 44.6; 3/3/52, 44.7; 4/1/52, 44.5; 5/2/52, 45.9; 6/10/52, 47.0; 7/1/52, 47.5; 8/1/52, 47.6; 9/2/52, 47.5; 11/18/52, 48.4; 12/1/52, 48.8; 1/2/53, 47.9; 2/3/53, 46.9; 2/26/53, 48.3 (DWR); 3/2/53, 48.3; 4/13/53, 49.2; 5/1/53, 48.3; 6/6/53, 49.2; 7/21/53, 47.0; 8/3/53, 46.6; 9/1/53, 44.8; 10/1/53, 49.5; 11/1/53, 42.7; 11/20/53, 43.0 (DWR); 12/5/53, 43.9; 1/13/54, 46.2; 1/14/54, 45.9 (DWR); 2/1/54, 44.7; 3/20/54, 45.8; 4/1/54, 45.0; 5/25/54, 45.9; 6/4/54, 45.2; 7/24/54, 47.4; 8/31/54, 45.4; 9/30/54, 46.2; 10/20/54, 45.5; 11/30/54, 45.7; 11/27/54, 45.4; 1/3/55, 46.2; 1/31/55, 45.3; 2/12/55, 45.4; 3/5/55, 46.4.

8S/2W-15C1 - Vail Company - In Pauba Valley; 0.3 mile northeast of well 15D1; artesian well 300 feet northwest of Highway 71. Reference point - (a) pressure gage 0.83 foot above ground surface, at elevation 1,116.83 feet. (b) pressure gage 2.0 feet above ground surface, at elevation 1,118.0 feet (1/14/54 only). Note: Measurements from Vail Company records, except as indicated. Measurements represent pressure heads in feet above reference point. 12/15, flowing (U.S.G.S., W.S.P. 429); 1/19/26, -6.2; 3/18/26, -6.1; 4/19/26, - 7.9; 10/11/27, -10.[illegible]; 1/14/54, -1 (DWR).

8S/2W-15D1 - Vail Company - In Pauba Valley; 0.9 mile northeast of intersection of Highway 71 and road to ranch headquarters; 50 feet west of Highway 71. Reference point - (a) top of casing at 1,093 feet (5/15/53 only); (b) Not reported. Note: Measurements from Vail Company records, except as indicated. 5/15/53, 2.1 (DWR) 8/4/53, 6.2; 9/2/53, 5.8; 10/1/53, 3.6; 11/2/53, 3.4; 12/4/53, 5.3; 2/1/54, 6; 3/20/54, 8; 4/1/54, 6; 6/22/54, 7.[illegible]

8S/2W-16A1 - Vail Company - In Pauba Valley; 0.2 mile northwest of well 15D1; artesian well 300 feet southwest of feed mill. Reference point - (a) pressure gage 3.5 feet above ground surface, at elevation 1,105.55 feet; (b) pressure gage 4 feet above ground surface, at elevation 1,101.6 feet (1/14/54 only). Note: Measurements from Vail Company records, except as indicated. Measurements represent pressure heads in feet above the reference point. 1/19/26, -12.0; 3/18/26, -13.2; 4/17/26, -13.0; 10/11/27, -15.4; 1/14/54, -17 (DWR).

8S/2W-16G1 - Vail Company - In Pauba Valley; 0.45 mile southwest of well 15D1, artesian well 600 feet southeast of Highway 71. Reference point - (a) pressure gage 9.8 feet above ground surface at elevation 1,087.80 feet; (b) pressure gage 1 foot above ground surface, at elevation 1,079.0 feet (1/14/54 only). Note: Measurements from Vail Company records, except as indicated. Measurements represent pressure heads in feet above reference point. 1/18/26, -5.5; 3/18/26, -15.2; 4/19/26, -16.9; 10/11/27, -9.3; 1/14/54, -8 (DWR).

8S/2W-17P1 - Vail Company - In Pauba Valley; map location only, see location of wells plate. Reference point - top of pipe at ground surface, at elevation 1,066.70 feet. 1/21/27, 42 (log); 1/25/27, 35.9; 1/27/27, 36.3; 1/27/27, 39.7 (bailed out); 2/1/27, [illegible]; 2/18/27, 36.8; 3/24/27, 30.7; 3/28/27, 31.5; 4/23/27, 31.6; 5/21/27, 31.9; 6/27/27, 33.[illegible]; 7/25/27, 33.1; 8/30/27, 3[illegible]; 9/13/27, 3[illegible].

8S/2W-17G1 - Vail Company - In Pauba Valley; 0.4 mile northeast of ranch headquarters; artesian well at north corner of reservoir. Reference point - (a) pressure gage, at elevation 1,062.43 feet; (b) pressure gage 1 foot above ground surface, at elevation 1,066 feet (1/14/54 only). Note: Measurements from Vail Company records, except as indicated. Measurements represent pressure heads in feet above reference point. 3/31/26, -11.9; 1/14/54, -1 (DWR).

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 4

(Depths to water in feet measured from reference point)
(continued)

8S/2W-17M1 - Vail Company - In Pauba Valley; 0.8 mile southwest of intersection of Highway 71 and road to ranch headquarters; artesian well 500 feet northwest of Highway 71 at north end of reservoir. Reference point - pressure gage 2 feet above ground surface, at elevation 1,052 feet. Measurement represents pressure head in feet above reference point. 5/15/53, -7; 1/14/54, flowing; 4/23/54, flowing.

8S/2W-17Q1 - Vail Company - In Pauba Valley; map location only; see location of wells plate. Reference point - top of casing 1.60 feet above ground surface, at elevation 1,041.30 feet. Note: Measurements from Vail Company records. 8/16/25, 7.4; 9/3/25, 8.0; 10/1/25, 8.0; 11/6/25, 6.7; 12/4/25, 6.1; 1/2/26, 6.5; 2/5/26, 6.0; 3/5/26, 6.4; 3/31/26, 6.5; 5/15/26, 6.3; 6/10/26, 6.7; 7/8/26, 7.7; 8/13/26, 8.4; 9/7/26, 8.5; 10/7/26, 7.4; 11/1, 6.8; 12/7/26, 6.2; 1/2/27, 6.1; 2/10/27, 6.0; 3/8/27, 7.5; 4/9/27, 8.2 4/30/27, 8.3; 6/4/27, 8.6; 7/2/27, 9.2; 7/30/27, 9.3; 9/3/27, 9.6; 10/1/27, 9.2.

8S/2W-18M1 - Vail Company - In Pauba Valley; map location only; see location of wells plate. Reference point - top of pipe at ground surface, at elevation 1,028.24 feet. Note: Measurements from Vail Company records. 1/19/27, 34 (log); 1/20/27, 30.8; 3/8/27, 31.5; 4/4/27, 31.4; 4/30/27, 31.4.

8S/2W-18N1 - Vail Company - In Pauba Valley; map location only; see location of wells plate. Reference point - top of pipe at ground surface, at elevation 1,023.84 feet. Note: Measurements from Vail Company records. 1/14/27, 45 (log); 4/4/27, 44.4; 4/30/27, 44.7.

8S/2W-18N2 - Vail Company - In Pauba Valley; map location only; see location of wells plate. Reference point - top of pipe at ground surface, at elevation 988.11 feet. 3/16/27, 7.0; 4/4/27, 8.2; 4/30/27, 9.2.

8S/2W-18R1 - Vail Company - In Pauba Valley; map location only; see location of wells plate. Reference point - top of pipe at ground surface, at elevation 1,029.88 feet. 2/24/27, 19.4; 3/29/27, 19.6; 4/30/27, 19.8.

8S/2W-19J1 - Little Temecula School District - In Wolf Valley; map location only; see location of wells plate. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,032.91 feet. Note: Measurements from Vail Company records. 5/17/21, 24.2 (log); 1/21/25, 23.7; 2/2/25, 23.9; 2/28/25, 23.6; 3/26/25, 23.5; 5/3/25, 23.6; 5/29/25, 23.3; 7/2/25, 26.2; 7/30/25, 24.4; 9/3/25, 24.5; 10/1/25, 24.4; 10/31/25, 24.0; 12/4/25, 24.0; 1/2/26, 24.2; 1/29/26, 24.5; 3/5/26, 24.5; 3/31/26, 24.7; 4/30/26, 24.8; 5/30/26, 24.3; 6/30/26, 24.6; 7/28/26, 24.8; 9/2/26, 24.9; 9/29/26, 24.5; 11/1/26, 24.8; 12/7/26, 24.7; 1/2/27, 24.7; 2/4/27, 24.9; 2/24/27, 23.8; 3/28/27, 24.2; 5/3/27, 24.3; 6/21/27, 24.5; 7/8/27, 24.6; 7/28/27, 24.7; 8/26/27, 24.6; 9/26/27, 24.2.

8S/2W-20B1 - Vail Company - In Pauba Valley; 0.7 mile northeast of Pala-Temecula Road (measured along dirt road) from intersection 0.8 mile southeast of intersection of Highway 79 and Pala - Temecula Road (measured along Pala - Temecula Road); at base of cliff in pit containing three wells. Reference point - top of casing, at elevation 1,040 feet. 3/3/53, 8.50; 5/15/53, 9.64 (pumping).

8S/2W-20B2 - Vail Company - In Pauba Valley; 2 feet southerly of well 20B1. Reference point - top of casing, at elevation 1,040 feet. 4/17/19, flowing (log); 5/15/53, 9.56; 4/23/54, 6.76.

8S/2W-20B3 - Vail Company - In Pauba Valley; 4 feet southerly of well 20B1. Reference point - top of casing, at elevation 1,040 feet. 3/3/53, 8.1; 5/15/53, 9.32.

8S/2W-20B4 - Vail Company - In Pauba Valley; 60 feet southeast of well 20B1. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,042 feet. 4/23/54, 9.8.

8S/2W-20C1 - Vail Company - In Pauba Valley; 600 feet southwest of well 20B1. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,032 feet. 11/20/53, 8.5; 1/4/54, 12 (log); 4/23/54, 8.8.

8S/2W-20C2 - Vail Company - In Pauba Valley; 150 feet southeast of well 20C1. Reference point - top of casing 2 feet above ground surface, at elevation 1,032 feet. 11/20/53, 9.8.

8S/2W-20E1 - Vail Company - In Wolf Valley; 0.3 mile southwest of well 20C1; 200 feet northwest and 150 feet northeast of intersection of ranch roads. Reference point - top of casing 0.82 foot above ground surface, at elevation 1,027.82 feet. Note: Measurements from Vail Company records, except as indicated. 12/23/24, 11.4; 1/8/25, 11.0; 1/21/25, 11.6; 2/9/25, 11.8; 3/26/25, 16.9; 5/3/25, 11.6; 7/11/25, 10.8; 8/12/25, 12.1; 9/11/25, 12.2; 10/21/25, 11.8; 11/28/25, 11.8; 12/27/25, 12.0; 2/5/26, 12.4; 2/27/26, 13.6; 3/31/26, 12.4; 4/30/26, 11.9; 5/30/26, 12.5; 6/30/26, 14.0; 7/28/26, 13.1; 9/9/26, 13.9; 10/8/26, 13.1; 11/1/26, 13.0; 12/22/26, 13.0; 2/4/27, 13.1; 3/9/27, 11.8; 4/6/27, 12.3; 5/1/27, 12.5; 6/21/27, 12.7; 7/28/27, 12.9; 8/26/27, 12.9; 9/26/27, 12.7; 6/2/41, 8.2; 6/30/41, 9.5; 7/31/41, 13.1; 8/31/41, 10.1; 9/30/41, 9.6; 10/31/41, 8.4; 11/29/41, 9.9; 1/1/42, 8.1, 1/31/42, 9.9, 2/28/42, 9.1; 3/27/42, 8.2; 4/29/42, 8.5; 5/29/42, 9.1; 6/29/42, 8.4; 7/31/42, 13.8; 8/31/42, 10.4; 9/30/42, 12.1; 10/31/42, 8.8; 11/30/42, 9.1; 12/31/42, 8.7, 2/1/43, 7.8; 2/27/43, 8.0; 3/31/43, 8.[illegible]

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 4

(Depths to water in feet measured from reference point)
(continued)

8S/2W-20E1 (continued) - 4/30/43, 8.0; 5/31/43, 8.1; 6/30/43, 11.2; 7/31/43, 13.0; 8/31/43, 9.5; 9/30/43, 10.1; 10/30/43, 8.5; 11/30/43, 8.4; 12/30/43, 8.1; 1/31/44, 8.4; 2/29/44, 7.7; 3/30/44, 8.2; 4/28/44, 8.4; 5/31/44, 8.6; 6/30/44, 9.8; 7/31/44, 8.9; 8/31/44, 8.9; 9/30/44, 8.9; 10/31/44, 8.2; 11/30/44, 8.8; 12/30/44, 9.0; 1/31/45, 9.2; 2/27/45, 9.2; 3/31/45, 9.1; 4/30/45, 9.4; 5/31/45, 9.6; 6/30/45, 9.7; 7/31/45, 9.9; 8/31/45, 9.9; 9/31/45, 10.1; 10/30/45, 10.1; 11/30/45, 10.0; 12/31/45, 9.7; 1/30/46, 10.1; 2/27/46, 10.2; 3/30/46, 10.2; 4/30/46, 10.3; 5/31/46, 10.5; 6/29/46, 10.7; 7/29/46, 10.5; 8/31/46, 11.0; 9/30/46, 10.7; 10/31/46, 10.6; 11/30/46, 10.5; 12/31/46, 10.6; 1/31/47, 10.7; 2/28/47, 11.0; 3/31/47, 10.7; 4/30/47, 11.0; 5/31/47, 11.4; 6/30/47, 11.8; 7/31/47, 10.6; 8/26/47, 10.1; 9/30/47, 4.9; 10/31/47, 5.1; 11/29/47, 8.8; 1/31/48, 7.3; 2/28/48, 14.3; 3/31/48, 13.7; 4/30/48, 13.4; 5/24/48, 13.5; 5/31/48, 5.8; 6/28/48, 5.0; 7/26/48, 5.3; 8/31/48, 9.0; 9/30/48, 5.3; 10/30/48, 6.3; 11/30/48, 6.2; 12/31/48, 5.1; 1/31/49, 5.1; 2/28/49, 5.4; 3/31/49, 6.0; 4/30/49, 6.7; 5/31/49, 5.0; 6/30/49, 6.1; 7/30/49, 6.2; 8/31/49, 6.5; 9/30/49, 5.4; 10/31/49, 6.0; 11/28/49, 6.3; 11/30/49, 10.4; 12/31/49, 10.2; 1/31/50, 10.4; 2/28/50, 10.6; 3/31/50, 14.6; 4/29/50, 8.5; 5/31/50, 15.3; 6/30/50, 15.2; 7/31/50, 15.4; 8/30/50, 17.3; 9/30/50, 15.2; 10/31/50, 14.7; 11/30/50, 15.3; 12/30/50, 15.8; 1/24/51, 16.6 (DWR); 2/28/51, 15.5; 3/6/51, 14.6 (DWR); 3/31/51, 15.3; 4/4/51, 15.7 (DWR); 4/30/51, 15.0; 5/7/51, 15.7 (DWR); 5/31/51, 15.9; 7/3/51, 16.0 (DWR); 7/30/51, 16.0 (DWR); 8/31/51, 16.0; 9/29/51, 16.2; 10/31/51, 16.2; 11/5/51, 17.2 (DWR); 11/30/51, 16.4; 12/29/51, 16.4; 1/2/52, 15.0 (DWR); 1/31/52, 15.3; 2/29/52, 15.5; 3/31/52, 14.8; 4/30/52, 15.4; 5/31/52, 16.3; 6/30/52, 14.9; 7/3/52, 15.2; 7/5/52, 6.0; 7/30/52, 8.6; 8/30/52, 7.9; 9/30/52, 7.2; 10/31/52, 7.7; 11/29/52, 7.6; 12/30/52, 6.4; 1/31/53, 7.2; 2/26/53, 6.9 (DWR); 3/30/53, 7.2; 4/30/53, 5.8; 5/15/53, 6.6 (DWR); 6/30/53, 6.4; 7/31/53, 5.7; 9/3/53, 7.0 (DWR); 9/30/53, 5.1; 10/8/53, 5.8 (DWR); 11/4/53, 7.2 (DWR); 11/30/53, 7.9; 12/31/53, 7.8; 1/30/54, 5.0; 2/27/54, 5.8; 3/20/54, 6.7; 4/1/54, 6.2 (DWR); 4/24/54, 7.0 (DWR); 5/1/54, 7.1; 5/31/54, 4.7; 6/30/54, 6.2; 7/31/54, 5.0; 8/31/54, 6.0; 9/30/54, 6.7; 10/30/54, 7.3; 11/30/54, 10.4; 12/31/54, 10.8; 1/31/55, 11.1; 2/28/55, 11.3; 3/31/55, 11.6.

8S/2W-20L1 - Vail Company - In Wolf Valley; 800 feet northeast of Pala-Temecula Road and 1.2 miles southeast of intersection of Highway 71 and Pala-Temecula Road; in field at old windmill frame; open casing covered by barrel. Reference point - top of casing at ground surface, at elevation 1,053 feet. Note: Measurements from Vail Company records, except as indicated. 6/2/41, 30.6; 6/28/41, 30.7; 7/17/41, 31.2; 8/31/41, 31.4; 9/30/41, 31.3; 10/31/41, 30.7; 11/29/41, 30.6; 1/1/42, 30.1; 1/31/42, 30.4; 2/28/42, 30.4; 3/31/42, 30.4; 4/30/42, 30.5; 5/30/42, 31.4; 6/30/42, 30.9; 7/21/42, 33.2; 8/31/42, 32.6; 9/30/42, 32.4; 10/31/42, 31.4; 11/30/42, 31.4; 12/31/42, 31.2; 2/1/43, 30.0; 2/27/43, 30.3; 3/31/43, 30.4; 4/30/43, 30.4; 5/31/43, 30.5; 6/30/43, 33.1; 7/20/43, 32.3; 8/31/43, 32.0; 9/30/43, 32.3; 10/30/43, 32.0; 11/30/43, 30.8; 12/30/43, 30.4; 1/31/44, 30.4; 2/29/44, 29.9; 3/31/44, 30.6; 4/26/44, 31.8; 5/31/44, 31.0; 6/22/44, 31.3; 7/29/44, 31.0; 8/31/44, 31.0; 9/28/44, 31.1; 10/26/44, 30.8; 12/2/44, 30.8; 12/21/44, 31.0; 1/24/51, 38.5 (DWR); 11/4/53, 39.8 (DWR); 4/23/54, 38.3 (DWR).

8S/2W-21C1 - Vail Company - Near Pauba Valley; map location only, see location of wells plate. Reference point - top of pipe at ground surface, at elevation 1,099.57 feet. Note: Measurements from Vail Company records. 1/9/27, 52.2; 2/2/27, 62.3; 2/25/27, 62.0; 4/6/27, 60.8; 5/1/27, 60.3; 6/4/27, 60.5; 7/2/27, 60.6; 7/30/27, 61.3; 8/30/27, 62.2; 9/19/27, 62.6.

8S/2W-22L1 - E. S. Gardner - Southeast of Pauba Valley; 2.05 miles northerly of surfaced road (measured along dirt road) from intersection 0.1 mile west of San Gabriel (Pechanga Indian Reservation) Church; at windmill 300 feet north of dirt road. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,190 feet. 3/53, 103.9; 5/20/53, 99.9; 11/20/53, 96.6; 4/23/54, 96.2.

8S/2W-26N1 - Pechanga Indian Reservation - On Pechanga Indian Reservation; 0.9 mile east of San Gabriel Church; at windmill 50 feet west of road. Reference point - top of casing 2.5 feet above ground surface, at elevation 1,297 feet (barometric level). 11/20/39, 70 (log); 1/29/51, 66.8; 3/7/51, 60.3; 4/4/51, 58; 5/7/51, 55; 7/3/51, 64; 7/30/51, 55; 9/4/51, 60; 10/2/51, 61; 11/5/51, 62.0; 1/2/52, 59; 11/20/53, 41.8; 4/23/54, 39.9.

8S/2W-27E1 - F. A. Cascara - On Pechanga Indian Reservation; 0.8 mile northerly of surfaced road (measured along dirt road) from intersection 0.1 mile west of San Gabriel Church; 200 feet east of dirt road. Reference point - top of casing 1 foot above ground surface, at elevation 1,260 feet. 5/20/53, 41.5.

8S/2W-28C1 - Vail Company - In Wolf Valley; 2.1 miles southeast of intersection of Highway 71 and Pala-Temecula Road and 0.3 mile northeast of Pala-Temecula Road; in clump of trees in open field. Reference point - hole in casing cover 1.3 feet above ground surface, at elevation 1,130.31 feet. Note: Measurements from Vail Company records, except as indicated. 1/16/25, 81.3; 2/2/25, 81.4; 3/13/25, 82.2; 4/10/25, 81.4; 5/1/25, 82.6; 6/16/25, 82.9; 7/9/25, 83.1; 8/13/25, 83.4; 9/10/25, 83.7; 10/9/25, 84.0; 11/14/25, 84.4; 12/12/25, 84.7; 1/9/26, 85.0; 2/5/26, 85.4; 3/12/26, 85.8; 4/15/26, 86.1; 5/15/26, 86.4; 6/17/26, 86.6; 7/28/26, 87.0; 8/26/26, 87.1; 9/29/26, 87.3; 11/1/26, 87.5; 12/7/26, 87.7; 1/10/27, 88.0; 2/4/27, 88.2; 3/11/27, 88.2;

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 4

(Depths to water in feet measured from reference point)
(continued)

8S/2W-28C1 (continued) - 4/6/27, 87.5; 5/9/27, 86.6; 6/22/27, 85.9; 7/28/27, 85.5; 8/26/27, 85.2; 9/26/27, 85.0; 12/10/36, 97.9; 12/23/39, 70.6; 3/15/42, 71.2; 10/31/42, 71.4; 12/5/42, 71.6; 1/2/43, 71.8; 3/11/43, 72.0; 3/30/43, 72.8; 5/26/43, 71.4; 7/2/43, 71.4; 8/3/43, 71.4; 8/31/43, 71.4; 10/6/43, 71.5; 11/10/43, 71.5; 12/23/43, 71.2; 2/2/44, 72.0; 5/23/44, 72.8; 7/11/44, 73.2; 7/26/44, 73.3; 8/11/44, 73.3; 8/31/44, 73.6; 9/28/44, 73.8; 10/26/44, 74.0; 12/2/44, 74.4; 12/21/44, 74.6; 6/11/48, 88.1; 8/25/48, 89.2; 9/21/48, 89.7; 10/26/48, 90.2; 11/23/48, 90.7; 12/30/48, 91.5; 2/8/49, 91.8; 3/11/49, 92.3; 4/7/49, 92.7; 5/18/49, 93.4; 6/28/49, 94.0; 8/10/49, 94.6; 9/28/49, 95.3; 11/2/49, 95.8; 12/29/49, 96.5; 1/31/50, 96.9; 2/28/50, 97.2; 3/30/50, 97.6; 4/28/50, 97.8; 6/9/50, 98.2; 7/21/50, 98.7; 8/29/50, 99.1; 9/29/50, 99.3; 10/31/50, 99.6; 11/29/50, 99.9; 12/30/50, 100.1; 1/31/51, 100.4; 2/28/51, 100.6; 3/31/51, 100.8; 4/30/51, 101.1; 5/31/51, 101.3; 6/29/51, 101.5; 7/31/51, 101.6; 8/30/51, 101.7; 9/28/51, 101.9; 10/31/51, 102.1; 11/30/51, 102.4; 1/4/52, 102.6; 1/31/52, 102.8; 2/29/52, 103.0; 4/1/52, 103.1; 5/1/52, 103.2; 5/29/52, 103.0; 6/30/52, 102.7; 7/30/52, 102.4; 9/3/52, 102.1; 9/30/52, 102.0; 10/31/52, 101.7; 12/6/62, 101.4; 12/30/52, 101.2; 1/31/53, 101.0; 3/5/53, 100.7; 4/2/53, 100.6; 4/28/53, 100.5; 6/2/53, 100.2; 7/2/53, 99.9; 7/31/53, 99.7; 9/1/53, 99.6; 10/2/53, 99.6; 11/3/53, 99.1; 11/20/53, 99.0 (DWR); 12/2/53, 98.9; 12/30/53, 98.8; 2/3/54, 98.7; 3/3/54, 98.5; 3/31/54, 98.4; 4/23/54, 98.3 (DWR); 6/3/54, 98.0; 6/30/54, 97.8; 7/29/54, 97.6; 8/31/54, 97.3; 9/30/54, 96.6; 11/4/54, 96.0; 11/30/54, 95.7; 12/30/54, 95.4; 2/3/55, 95.0; 3/3/55, 94.8.

8S/2W-28K1 - Vail Company - In Wolf Valley; map location only, see location of wells plate. Reference point - top of pipe at ground surface, at elevation 1,154.37 feet. Note: Measurements from Vail Company records. 2/2/27, 76.6; 3/9/27, 93.9; 4/6/27, 90.6; 4/25/27, 89.3; 5/1/27, 89.3.

8S/2W-28M1 - E. S. Gardner - In Wolf Valley; 0.1 mile southwest of Pala-Temecula Road (measured along dirt road) from intersection 2.7 miles southeast of intersection of Highway 71 and Pala-Temecula Road; 200 feet northwest of dirt road. Reference point - top of casing 4 feet above ground surface, at elevation 1,130 feet. 6/5/53, 76.5; 11/20/53, 79.5; 4/23/54, 79.2.

8S/2W-29C1 - Simonelli - In Wolf Valley; 1.7 miles southeast of intersection of Pala-Temecula Road and Highway 71, 550 feet southwest of Pala-Temecula Road; 120 feet northwest of northwestern boundary of Pechanga Indian Reservation. Reference point - top of casing 0.9 foot above ground surface at elevation 1,070.87 feet. 5/27/53, 4.0; 11/20/53, 6.8; 4/23/54, 7.0.

8S/2W-29F1 - Pechanga Indian Reservation - On Pechanga Indian Reservation; map location only, see location of wells plate; open casing. Reference point - ground surface, at elevation 1,092 feet. 1/29/40, 24 (log).

8S/2W-29G1 - Pechanga Indian Reservation - On Pechanga Indian Reservation; 2.0 miles southeast of intersection of Highway 71 and Pala-Temecula Road and 0.1 mile southwest of Pala-Temecula Road; at windmill near water tank. Reference point - (a) description not reported 1.28 feet above ground surface, at elevation 1,092.08 feet (11/28/24 through 6/30/26), (b) description not reported 1.52 feet above ground surface, at elevation 1,092.32 feet (7/28/26 through 9/29/26); (c) top of casing 1.15 feet above ground surface, at elevation 1,091.95 feet (10/8/26 to present). Note: Measurements from Vail Company records, except as indicated. 1/26/25, 38.9; 2/28/25, 39.5; 3/30/25, 39.4; 4/25/25, 40.0; 5/29/25, 40.2; 6/24/25, 41.6; 7/24/25, 41.2; 8/28/25, 42.0; 9/26/25, 42.7; 10/23/25, 42.1; 11/28/25, 42.4; 12/27/25, 42.6; 1/23/26, 42.8; 2/27/26, 43.0; 3/25/26, 43.2; 4/23/26, 41.5; 5/15/26, 41.0; 6/17/26, 41.6; 7/8/26, 40.8; 8/13/26, 41.3; 9/9/26, 40.8; 10/8/26, 40.8; 11/1/26, 41.0; 12/22/26, 41.4; 1/26/27, 41.6; 2/19/27, 40.0; 3/28/27, 34.4; 5/1/27, 31.9; 6/21/27, 29.7; 7/28/27, 29.3; 8/16/27, 29.6; 9/26/26, 29.6; 1/29/51, 49.3 (DWR); 3/7/51, 49.5 (DWR); 4/4/51, 49.6 (DWR); 5/7/51, 50.2 (DWR); 6/13/51, 50.0 (DWR); 7/3/51, 50.1 (DWR); 7/30/51, 53.0 (DWR); 9/1/51, 56.4 (DWR); 10/1/51, 50.6 (DWR); 11/5/51, 49.8 (DWR); 1/2/52, 47.3 (DWR); 2/4/52, 50.5 (DWR); 3/1/52, 49.8 (DWR); 4/22/52, 48.0 (DWR); 5/13/52, 45.2 (DWR); 6/10/52, 44.7 (DWR); 7/8/52, 42.1 (DWR); 7/30/52, 41.2 (DWR); 8/25/52, 40.4 (DWR); 10/21/52, 39.0 (DWR); 1/16/53, 38.4 (DWR); 2/27/53, 38.2 (DWR); 3/17/53, 38.1 (DWR); 5/20/53, 38.2 (DWR); 7/3/53, 38.5 (DWR); 8/6/53, 38.9 (DWR); 9/9/53, 39.5 (DWR); 10/8/53, 42.6 (DWR); 11/20/53, 40.9 (DWR); 1/7/54, 42.7 (DWR); 4/2/54, 41.8 (DWR); 4/23/54, 41.2 (DWR).

8S/2W-33G1 - Southeast of Wolf Valley; 0.8 mile south of intersection of Pala-Temecula Road and surfaced road leading to Pechanga Indian Reservation; and 60 feet east of Pala-Temecula Road. Reference point - hole in pump base 1 foot above ground surface, at elevation 1,160 feet. 5/20/53, 18; 11/20/53, 19.8; 4/23/54, 16.9.

8S/2W-33G2 - Van Johnson - Southeast of Wolf Valley; 300 feet northwest of well 33G1; 60 feet west of Pala-Temecula Road and 100 feet south of house. Reference point - top of casing at ground surface, at elevation 1,160 feet. 5/20/53, 16.5; 4/23/54, 14.7

8S/2W-33K3 - Paulson - Southeast of Wolf Valley, 0.9 mile southeast of intersection of Pala-Temecula Road and surfaced road heading to Pechanga Indian Reservation; in shed 140 feet east of Pala-Temecula Road. Reference point - top of plank cover 1 foot above ground surface, at elevation 1,160 feet 11/20/53, 12.5; 4/23/54, 5.8.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 4

(Depths to water in feet measured from reference point)
(continued)

8S/2W-34B1 - Pechanga Indian Reservation - In Wolf Valley; map location only, see location of wells plate. Reference point - ground surface, at elevation 1,240 feet. 9/25/40, 45 (log).

8S/2W-34F1 - W. E. Moore - In Wolf Valley; 0.5 mile south of surfaced road (measured along dirt road) from intersection 0.2 mile east of San Gabriel Church; in woodshed at base of hill, 100 feet east of dirt road. Reference point - pump base 1 foot above ground surface, at elevation 1,259 feet. 5/21/53, 69.0.

8S/2W-34M1 - Dave Garcia - On Pechanga Indian Reservation; 0.3 mile south and 0.3 mile west of well 34F1; at windmill 300 feet south of house. Reference point - pump base 1 foot above ground surface, at elevation 1,285 feet. 5/20/53, 48.

8S/2W-35C1 - Pechanga Indian Reservation - On Pechanga Indian Reservation; 500 feet southeast of well 26N1; at windmill 100 feet west of house. Reference point - top of plank cover at ground surface, at 1,328 feet (barometric level). 1/24/51, 4.7; 11/27/51, 5.5; 11/7/52, 5.6; 5/20/53, 4.7; 11/20/53, 5.5; 4/23/54, 4.1.

8S/3W-24A1 - Vail Company - Near Temecula; map location only; see location of wells plate. Reference point - top of hole by discharge pipe 4.5 feet above ground surface, at elevation 984.7 feet. 5/6/53, 5.3; 11/10/53, 5.6.

8S/3W-24H1 - Near Temecula; map location only; see location of wells plate. Reference point - top of board cover 1.3 feet above ground surface, at elevation 1,018.70 feet. 5/6/53, 20.7; 11/10/53, 21.8; 4/20/54, 21.0.

DEPTHS [illegible] GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 5

(Depths to water in feet measured from reference point)

8S/2W-30P1 - Near Rainbow; 0.6 mile northeast of intersection of Rainbow Canyon Road and Highway 395, 100 feet east of Rainbow Canyon Road. Reference point - ground surface, at elevation 1,280 feet. 7/16/53, 10.6.

8S/2W-31D1 - O. L. Crabtree - Near Rainbow; 250 feet northwest of well 31D2. Reference point - top of casing 0.4 foot above ground surface, at elevation 1,201.85 feet. 11/13/52, 15.2; 2/10/53, 12.2; 3/6/53, 12.2; 4/7/53, 12.3; 4/22/53, 12.6; 4/20/54, 5.0.

8S/2W-31D2 - O. L. Crabtree - Near Rainbow; 0.3 mile northeast of intersection of Rainbow Canyon Road and Highway 395 and 250 feet west of Rainbow Canyon Road; 100 feet west and 90 feet south of house. Reference point - top of plank cover 0.5 foot above ground surface, at elevation 1,200.36 feet. 6/27/52, 7.3; 4/22/53, 11.8.

8S/2W-31E1 - O. L. Crabtree - Near Rainbow; 0.13 mile north of intersection of Highway 395 and Rainbow Canyon Road and 100 feet east of Highway 395. Reference point - top of concrete casing 1.6 feet above ground surface, at elevation 1,185.98 feet. 2/10/53, flowing; 3/6/53, 1.4; 4/7/53, 1.5; 4/22/53, 1.5; 7/9/53, 3.3; 8/6/53, 3.6; 9/8/53, 4.0; 11/14/53, 4.3; 1/7/54, 5.1; 2/8/54, 3.4; 4/2/54, 1.0.

8S/3W-7D1 - Vail Company - Northeast of De Luz; see location of wells plate; at windmill, 60 feet southerly of De Luz Road. Reference point - top of wood cover at ground surface, at elevation 1,260 feet. 6/18/54, 10.1.

8S/3W-7D2 - Vail Company - Near Murrieta; 320 feet southwest of well 7D1; 250 feet south of house and 6 feet south of wood shed. Reference point - top of concrete pit at ground surface, at elevation 1,240 feet. 6/18/54, 4.2.

8S/3W-8D1 - W. H. Saxman - Northeast of De Luz; see location of wells plate; 280 feet northwest of metal shed. Reference point - top of casing at ground surface, at elevation 1,420 feet. 6/18/54, 9.8.

8S/3W-31M1 - Charles Sawday - North of Fallbrook; see location of wells plate; 150 feet northwest of house. Reference point - top of casing 4 feet above ground surface, at elevation 680 feet. 11/13/52, 30.7; 2/10/53, 15.6; 3/6/53, 11.6; 4/7/53, 10.5; 5/5/53, 10.2; 7/8/53, 19.1; 9/3/53, 14.8; 11/6/53, 13.0; 2/4/54, 9.9.

8S/3W-32N1 - Gavilan Development Company - North of Fallbrook; see location of wells plate; 1,000 feet upstream from King Ranch buildings, and 25 feet east of dirt road. Reference point - top of casing 1.7 feet above ground surface. 12/4/53, 9 (owner); 12/11/53, 9.2; 12/17/53, 8.9; 3/11/54, 8.2; 4/19/54, 6.4.

8S/3W-32N2 - Gavilan Development Company - North of Fallbrook; 30 feet northeast of well 32N1. Reference point - top of casing 2 feet above ground surface. 12/11/53, 8; 3/11/54, 7.9; 4/19/54, 6.9.

8S/3W-32N3 - Gavilan Development Company - North of Fallbrook; 120 feet northwest of well 32N2. Reference point - (a) top of casing 0.9 foot above ground surface (3/11/54; (b) hole in casing 0.3 foot above ground surface (4/19/54). 3/11/54, 5.1; 4/19/54, 4.8.

8S/3W-36H1 - North of Rainbow; 4 mile south of First Street (measured along Highway 395) and 170 feet west of old Highway 395; 40 feet south of driveway. Reference point - top of wood cover 1.6 feet above ground surface, at elevation 1,173.79 feet. 4/22/53, 3.2.

8S/3W-36J1 - V. D. Simpson - North of Rainbow; 300 feet south of well 36H1. Reference point - top of casing 0.8 foot above ground surface, at elevation 1,168.55 feet. 4/22/53, 2.2.

8S/3W-36J2 - J. M. McKathnie - North of Rainbow; 0.15 mile south of well 36H1; 100 feet south of house. Reference point - top of casing 2.15 feet above ground surface, at elevation 1,165.12 feet. 4/22/53, 7.5; 11/10/53, 14.7; 4/20/54, 3.9.

8S/3W-36J3 - J. M. McKathnie - North of Rainbow; 100 feet south of well 36J2. Reference point - top of casing 1.85 feet above ground surface, at elevation 1,164.17 feet. 4/22/53, 6.8; 7/9/53, 10.0; 11/10/53, 13.8; 4/20/54, 3.9.

8S/3W-36J4 - D. B. Chamness - Reference point - top of casing 1.8 foot above ground surface, at elevation 1,157.36 feet. 4/22/53, 3.7; 7/9/53, 6.0; 11/10/53, 8.8; 4/20/54, 2.6, "North of Rainbow; 650 feet south of well 36J3; 25 feet southeast of house."

8S/3W-36R2 - Mrs. J. R. Beck - North of Rainbow; 660 feet south of well 36J4; in pump house. Reference point - top of concrete floor. 8/28/52, 10 (Metropolitan Water District); 7/14/53, 9.7.

8S/3W-36R3 - Mrs. J. R. Beck - North of Rainbow; 150 feet west of well 36R2; 50 feet east of house. Reference point - top of concrete floor. 7/14/53, 4.6.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 5

(Depths to water in feet measured from reference point)
(continued)

8S/4W-20A1 - R. F. Mathews - North of De Luz; see location of wells plate; 60 feet southeast of dirt road; and 90 feet westerly from gate. Reference point - top of wood cover 3 feet above ground surface, at elevation 560 feet. 6/18/54, 4.4.

8S/4W-20A2 - R. F. Mathews - North of De Luz; 130 feet northeast of well 20A1; 50 feet northeast of gate and 10 feet southeast of road. Reference point - top of casing 1 foot above ground surface, at elevation 560 feet. 6/18/54, 3.8.

8S/4W-20B1 - Anna Doerrer - North of De Luz; see location of wells plate; 100 feet west of house. Reference point - east corner of wood frame 1.5 feet above ground surface, at elevation 580 feet. 6/18/54, 14.2.

8S/4W-20L1 - Kinney - North of De Luz; see location of wells plate; 60 feet westerly of road, and 45 feet northeast of house. Reference point - top of concrete pit 2.5 feet above ground surface, at elevation 490 feet. 6/18/54, 5.7.

8S/4W-20P1 - Shaver - North of De Luz; see location of wells plate; 100 feet northeast of De Luz Creek and 40 feet southeast from driveway. Reference point - top of concrete pit 1 foot above ground surface, at elevation 490 feet. 6/18/54, 8.3.

8S/4W-22Q1 - John Parker - Northeast of De Luz; see location of wells plate; 150 feet southeast of De Luz Road. Reference point - top of wood cover at ground surface, at elevation 565 feet. 6/18/54, 12.1.

8S/4W-28L1 - Mrs. Harris - Northeast of De Luz; see location of wells plate; 80 feet north of well 28L2. Reference point - top of wood support 1 foot above ground surface, at elevation 460 feet. 6/18/54, 12.2.

8S/4W-28M1 - Northeast of De Luz; see location of wells plate; 160 feet east of house and 30 feet south of road. Reference point - top of concrete pit at ground surface, at elevation 455 feet. 6/18/54, 20.7.

8S/4W-29J1 - R. W. Bleecker - Northeast of De Luz; see location of wells plate; at windmill 1.4 mile northeasterly from De Luz Post Office (measured along De Luz Road). Reference point - top of casing at ground surface, at elevation 450 feet. 6/18/54, 16.9.

8S/4W-29M1 - F. R. Garnsey - North of De Luz; see location of wells plate; 530 feet east and 125 feet north of road. Reference point - top of concrete slab under pump base at ground surface, at elevation 450 feet. 6/18/54, 42.8.

8S/4W-29Q1 - Northeast of De Luz; see location of wells plate; 30 feet north of Murrieta De Luz Road. Reference point - top of wood cover at ground surface, at elevation 460 feet. 6/18/54, 29.9.

8S/4W-32B1 - Mrs. Finest - Northeast of De Luz; see location of wells plate; in embankment, west of Murrieta De Luz Road. Reference point - top of wood cover at ground surface, at elevation 410 feet. 6/18/54, 20.9.

8S/4W-32B2 - De Luz School - Northeast of De Luz; 0.04 mile east of well 32B1; 35 feet east of Murrieta De Luz Road. Reference point - top of casing 3.3 feet above ground surface, at elevation 400 feet. 6/18/54, 8.9.

8S/4W-32C1 - Homer C. McDowell - Near De Luz; 300 feet southwest of well 32B2; west of Murrieta De Luz Road. Reference point - top of casing 1.5 feet above ground surface, at elevation 400 feet. 6/18/54, 7.4.

8S/4W-34F1 - Rivers Ranch - East of De Luz; see location of wells plate; at windmill 120 feet south of gravel road. Reference point - top of wood cover at ground surface. 8/25/54, 9.7.

8S/5W-23Q1 - G. C. Snow - Northwest of De Luz; see locatio of wells plate; 25 feet east and 200 feet north of house at Sky Ranch. Reference point - top of casing 0.6 foot above ground surface. 9/16/53, 8.2.

8S/5W-23Q2 - G. C. Snow - Northwest of De Luz; 120 feet southeast of well 23Q1; 100 feet east and 75 feet north of house. Reference point - top of casing 1.5 feet above ground surface. 9/16/53, 12.7.

8S/5W-23Q3 - G. C. Snow - Northwest of De Luz; 150 feet southeast of well 23Q2; 200 feet southeast of house. Reference point - top of casing 0.5 foot above ground surface. 9/16/53, 11.2.

8S/5W-23Q4 - G. C. Snow - Northwest of De Luz; 800 feet south of well 23Q1; 600 feet south of house and 50 feet east of water tank. Reference point - top of casing 2.8 feet above ground surface. 9/16/53, 23.7.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 5

(Depths to water in feet measured from reference point)
(continued)

8S/5W-23Q5 - G. C. Snow - Northwest of De Luz; 500 feet south of well 23Q1, 25 feet north of house. Reference point - top of casing 1 foot above ground surface. 9/16/53, 16.8.

8S/5W-23Q6 - G. C. Snow - Northwest of De Luz; 60 feet south of well 25Q5, 25 feet south of house. Reference point - top of casing 1.5 feet above ground surface. 9/16/53, 21.3.

9S/2W-6N1 - W. N. Davis - Near Rainbow; see location of wells plate. Reference point - ground surface. 3/21/51, 18.2 (log).

9S/3W-1A1 - G. R. Reynolds - Near Rainbow; 0.15 mile southeast of intersection of old and new highway 395 (measured along new highway 395); northwest of highway 395. Reference point - top of casing 2 feet above ground surface. 6/25/52, 3.9; 7/16/53, 6.9.

9S/3W-1F1 - Charles E. Stubblefield - Near Rainbow; 650 feet northeast of well 1M1. Reference point - top of casing at ground surface, at elevation 1,073.09 feet. 4/22/53, 12.6; 7/9/53, 13.7; 7/13/53, 14.5; 8/6/53, 14.2; 9/8/53, 15.0; 11/10/53, 20.6; 1/7/54, 18.0; 2/8/54, 15.9; 4/2/54, 7.9; 4/20/54, 7.7.

9S/3W-1F2 - Charles E. Stubblefield - Near Rainbow; 500 feet east of well 1F1; 200 feet east of Highway 395. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,065.26 feet. 4/22/53, 6.3; 11/10/53, 10.1; 4/20/54, 4.3.

9S/3W-1F3 - Charles E. Stubblefield - Near Rainbow; 60 feet south of well 1F2. Reference point - top of casing 0.5 foot above ground surface, at elevation 1,064.08 feet. 4/23/53, 5.1; 11/10/53, 8.9; 4/20/54, 3.1.

9S/3W-1F4 - Charles E. Stubblefield - Near Rainbow; 4 feet south of well 1F1; at windmill. Reference point - top of casing 1.0 foot above ground surface. 7/13/53, 15.6.

9S/3W-1H1 - H. H. Cummins - Near Rainbow; 0.65 mile south of intersection of old and new Highways 395; 120 feet east of old Highway 395. Reference point - top of casing at ground surface, at elevation 1,093.31 feet. 4/24/53, 9.3; 11/9/53, 13.5; 4/20/54, 2.5.

9S/3W-1H2 - H. H. Cummins - Near Rainbow; 600 feet north of well 1H1; at windmill 90 feet east of old Highway 395. Reference point - top of casing 0.7 foot above ground surface, at elevation 1,105.88 feet. 4/24/53, 8.1; 7/9/53, 9.7; 8/6/53, 10.1; 9/8/53, 10.4; 11/9/53, 11.2; 1/7/54, 12.8; 2/8/54, 9.0; 4/2/54, 1.2; 4/20/54, 1.3.

9S/3W-1H3 - H. H. Cummins - Near Rainbow; 650 feet east of well 1H2; north of house. Reference point - top of casing 1.0 foot above ground surface, at elevation 1,132.11 feet. 4/24/53, 25.9; 11/9/53, 49.1; 4/20/54, 7.8.

9S/3W-1J1 - Vernon L. Beattie - Near Rainbow; 0.2 mile east and 180 feet north of intersection of Highway 395 and First Street. Reference point - top of 2 x 6 inch board under pump 0.75 feet above ground surface, at elevation 1,068.82 feet. 4/20/54, 3.4.

9S/3W-1J2 - Vernon L. Beattie - Near Rainbow; 760 feet north of well 1J1 and 200 feet southwest of well 1J3, in shed. Reference point - top of wood cover 0.5 foot above ground surface, at elevation 1,083.25 feet. 4/24/53, 4.4; 11/9/53, 24.7; 4/20/54, 2.3.

9S/3W-1J3 - Vernon L. Beattie - Near Rainbow; 850 feet north of well 1J1 and 200 feet northeast of well 1J2, in shed. Reference point - top of wood cover at ground surface, at elevation 1,086.13 feet. 4/24/53, 25.8; 11/9/53, 38.9; 4/20/54, 33.7.

9S/3W-1J4 - Vernon L. Beattie - Near Rainbow; 200 feet north of well 1J3; 15 feet south of road. Reference point - top of casing 0.4 foot above ground surface, at elevation 1,091.84 feet. 4/20/54, 8.9.

9S/3W-1J5 - Vernon L. Beattie - Near Rainbow; 420 feet north of well 1J1. Reference point - top of casing at ground surface, at elevation 1,078.09 feet. 11/9/53, 3.2; 4/20/54, 4.6.

9S/3W-1L1 - Greer - Near Rainbow; 0.1 mile east of intersection of Huffstutler Street. Reference point - top of cover 0.5 foot above ground surface, at elevation 1,057.2 feet. 4/23/53, 6.3.

9S/3W-1L2 - Clare McDonald - Near Rainbow; 0.2 mile north and 60 feet west of intersection of First Street and old Highway 395, extended; northwest of house. Reference point - top of casing 0.9 foot above ground surface, at elevation 1,080.54 feet. 4/23/53, 38.8.

9S/3W-1M1 - C. E. Stubblefield - Near Rainbow, 0.5 mile northeast of Second Street (measured along Highway 395); 200 feet northwest of intersection of Highway 395; at windmill. Reference point - top of wood cover at ground surface, at elevation 1,080.31 feet. 4/23/53, 11.5; 11/10/53, 15.4; 4/20/54, 3.7.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 5

(Depths to water in feet measured from reference point)
(continued)

9S/3W-1P1 - Zana Royal - Near Rainbow; 360 feet east and 270 feet north of intersection of Second and Huffstutler Streets. Reference point - top of wood cover at ground surface, at elevation 1,046.40 feet. 3/6/53, 7.4; 4/7/53, 8.0; 4/22/53, 7.9; 11/10/53, 14.0; 4/20/54, 8.4.

9S/3W-1P2 - J. S. Boren - Near Rainbow; 480 feet east and 20 feet south of intersection of First and Huffstutler Streets. Reference point - top of casing 0.3 foot above ground surface, at elevation 1,054.63 feet. 6/27/52, 5.5; 3/6/53, 5.7; 4/7/53, 7.1; 4/23/53, 7.1; 11/10/53, 9.6; 4/20/54, 4.2.

9S/3W-1P3 - J. S. Boren - Near Rainbow; 650 feet south and 140 feet west of intersection of old Highway 395 and First Street. Reference point - top of casing 0.7 foot above ground surface, at elevation 1,052.36 feet. 6/27/52, 9; 3/6/53, 9.3; 4/20/54, 8.6.

9S/3W-1P4 - Near Rainbow; 0.1 mile south of well 1P3; at windmill 60 feet west of old highway 395. Reference point - top of wood cover 1.7 feet above ground surface, at elevation 1,050.38 feet. 4/23/53, 8.5; 11/9/53, 14.5; 4/20/54, 5.4.

9S/3W-1P5 - J. S. Boren - Near Rainbow; 460 feet southeast of well 1P2. Reference point - top of concrete pit at ground surface, at elevation 1,045 feet. 11/10/53, 14.5; 4/20/54, 3.4.

9S/3W-1Q1 - Robert Steinberg - Near Rainbow; 0.14 mile south and 110 feet east of intersection of First Street and old Highway 395, extended; 100 feet north of driveway. Reference point - wood cover 0.8 foot above ground surface, at elevation 1,052.68 feet. 6/7/52, 11.0; 11/23/52, 16.0; 2/9/53, 11.2; 3/6/53, 10.6; 4/7/53, 11.7; 4/23/53, 12.0; 7/9/53, 14.1; 8/6/53, 17.6; 9/8/53, 16.4; 11/9/53, 17.6; 1/7/54, 17.7; 2/8/54, 16.2; 4/2/54, 10.9; 4/20/54, 9.3.

9S/3W-1Q2 - Robert Steinberg - Near Rainbow; 650 feet east of well 1Q1; 20 feet north of house. Reference point - top of wood cover 0.6 foot above ground surface, at elevation 1,057.71 feet. 6/25/52, 17; 3/6/53, 11.6; 4/23/53, 11.4; 11/9/53, 14.9; 4/20/54, 11.0.

9S/3W-1R1 - George E. Shoudy - Near Rainbow; 0.29 mile east and 35 feet south of intersection of First Street and old Highway 395. Reference point - top of metal cover 0.9 foot above ground surface, at elevation 1,062.16 feet. 3/6/53, 10.6; 4/7/53, 11.5; 4/24/53, 12.0; 11/9/53, 16.1; 8/6/53, 18.0; 9/8/53, 12.8.

9S/3W-1R2 - George E. Shoudy - Near Rainbow; 850 feet south of well 1R1 and 90 feet east of well 1R3. Reference point - top of 2 x 6 inch board at ground surface, at elevation 1,062.61 feet. 6/25/52, 5.1; 11/13/52, 8.6; 2/9/53, 5.8; 3/6/53, 5.5; 4/7/53, 6.3; 4/24/53, 6.4; 4/2/54, 4.9.

9S/3W-1R3 - George E. Shoudy - Near Rainbow; 850 feet south of well 1R1 and 90 feet west of well 1R2. Reference point - top of plank cover 1.0 foot above ground surface, at elevation 1,062.85 feet. 11/13/52, 8.6; 3/6/53, 6.5; 4/24/53, 7.1.

9S/3W-1R4 - George E. Shoudy - Near Rainbow; 108 feet west of well 1R2 and 50 feet northwest of well 1R3. Reference point - top of casing 1 foot above ground surface. 11/9/53, 24.0.

9S/3W-1R5 - George E. Shoudy - Near Rainbow; 750 feet southeast of well 1R1 and 350 feet northeast of well 1R2; at windmill. Reference point - top of wood cover 1.4 feet above ground surface, at elevation 1,067.74 feet. 3/6/53, 7.1, 4/7/53, 7.6; 4/24/53, 8.8; 11/9/53, 13.9.

9S/3W-6A1 - D. H. Bullock - North of Fallbrook; see location of wells plate; in ravine. Reference point - top of casing 2 feet above ground surface. 6/23/52, 40.7; 11/13/52, 56.8; 2/10/53, 43.0; 3/6/53, 42.5; 4/7/53, 43.4; 5/5/53, 41.2; 7/7/53, 41.5; 11/6/53, 47.4; 4/28/54, 43.4.

9S/3W-6A2 - D. H. Bullock - North of Fallbrook; see location of wells plate; 450 feet east of well 6A1. Reference point - top of beam 2 feet above ground surface. 6/23/52, 54.1; 2/10/53, 49.7; 3/6/53, 47.6; 4/7/53, 46.5; 5/5/53, 48.0; 7/8/53, 46.6; 8/6/53, 47.0; 9/3/53, 46.0; 11/6/53, 45.4; 1/7/54, 45.2; 2/4/54, 45.0; 4/5/54, 44.5; 4/28/54, 44.4.

9S/3W-6A3 - D. H. Bullock - North of Fallbrook; see location of wells plate; 450 feet south of well 6A1. Reference point - top of beam 2 feet above ground surface. 6/23/52, 33.4; 2/10/53, 33.1; 3/6/53, 31.8; 4/7/53, 30.1; 5/4/53, 30.4; 11/6/53, 48.8; 4/28/54, 30.3.

9S/3W-6B1 - Charles Sawday - North of Fallbrook; see location of wells plate; 700 feet south of well 6A1. Reference point - top of casing at ground surface. 6/18/52, 58.0; 11/6/53, 66.0; 4/28/54, 49.1.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 5

(Depths to water in feet measured from reference point)
(continued)

9S/3W-6D1 - E. H. Tipton - North of Fallbrook; see location of wells plate; in ravine 300 feet south of house. Reference point - top of wood cover 2 feet above ground surface. 12/13/52, 34; 2/10/53, 22.8; 3/6/53, 22.0; 4/7/53, 22.6; 5/5/53, 21.6; 7/7/53, 23.0; 8/6/53, 22.4; 9/3/53, 25.8; 11/6/53, 33.4; 1/7/54, 28.2; 2/4/54, 21.1; 4/28/54, 13.6.

9S/3W-6D2 - E. H. Tipton - North of Fallbrook; see location of wells plate; 0.1 mile southeast of house. Reference point - top of 4 x 6 inch board at ground surface. 5/5/53, 56.8; 11/6/53, 57.4; 4/28/54, 47.6.

9S/3W-7C2 - Calloway - North of Fallbrook; see location of wells plate; 20 feet northeast of well 7C1 and 160 feet north of well 7F1. Reference point - top of concrete pit at ground surface. 1/7/54, 12.5; 2/4/54, 10.8; 4/5/54, 11.0.

9S/3W-7F1 - A. R. Merickle - North of Fallbrook; 160 feet south of well 7C1; 100 feet west of house. Reference point - top of 2 x 6 inch plank at ground surface. 12/13/52, 11.7; 2/10/53, 10.3; 3/6/53, 8.8; 4/7/53, 8.6; 5/5/53, 8.5; 7/3/53, dry; 8/6/53, 11.8; 9/3/53, dry; 11/6/53, dry; 2/4/54, 8.7; 4/5/54, 9.2; 4/28/54, 10.0.

9S/3W-11A1 - O. Lester Riggle - Near Rainbow; 0.35 mile west and 30 feet north of intersection of Huffstrutler and Fifth Streets. Reference point - top of wood cover 1.0 foot above ground surface, at elevation 1,032.61 feet. 11/10/53, 13.2; 4/20/54, 6.7.

9S/3W-11A2 - O. Lester Riggle - Near Rainbow; 0.25 mile west and 140 feet north of intersection of Huffstrutler and Fifth Streets. Reference point - top of wood cover at ground surface, at elevation 1,033.49 feet. 11/10/53, 13.7; 4/20/54, 4.1.

9S/3W-11G1 - C. C. Chandler - Near Rainbow; 800 feet northeast of well 11L1 and 45 feet east of well 11G2; in ravine 90 feet southeast of gravel road. Reference point - top of concrete pit 3 feet above ground surface. 4/24/53, 6.2; 11/10/53, 10.6; 4/20/54, 1.

9S/3W-11K1 - C. C. Chandler - Near Rainbow; 0.7 mile southwest of Second Street (measured along Highway 395) and 400 feet southeast of Highway 395; outside watershed. Reference point - top of wood cover 2.7 feet above ground surface. 4/24/53, 12.7.

9S/3W-11K2 - C. C. Chandler - Near Rainbow; 330 feet south of well 11K1; outside watershed. Reference point - pump base 1 foot above ground surface. 4/24/53, 7.8; 11/10/53, 16.7.

9S/3W-11L1 - Joseph H. Feuerborn - Near Rainbow; 0.45 mile southwest of Highway 395 (measured along gravel road) from intersection 0.45 mile southwest of Second Street (measured along Highway 395); 110 feet south of gravel road. Reference point - top of wood cover at ground surface. 4/24/53, 11.3; 11/10/53, 20.5; 4/20/54, 8.7.

9S/3W-11L2 - Joseph H. Feuerborn - Near Rainbow; 75 feet northeast of well 11L1. Reference point - pump base at ground surface. 4/24/53, 16.2.

9S/3W-11L3 - Joseph H. Feuerborn - Near Rainbow; 900 feet west of well 11L1; 75 feet south of Turrey Shelters. Reference point - top of beam at ground surface. 4/24/53, 21.4; 11/10/53, 18.6.

9S/3W-11M1 - James Macres - Near Rainbow; 0.25 mile southwest of well 11L1 and 500 feet west of well 11L3. Reference point - top of 2 x 6 inch frame 3.3 feet above ground surface. 11/10/55, 15.5.

9S/3W-12B1 - Dean Ramay - Near Rainbow; 800 feet north and 400 feet east of intersection of Fifth Street and old Highway 395; 60 feet west of house. Reference point - top of wood cover 1.7 feet above ground surface, at elevation 1,052.50 feet. 4/23/53, 11.6; 11/9/53, 14.3; 4/20/54, 10.6.

9S/3W-12B2 - C. H. Ramay - Near Rainbow; 0.1 mile south and 60 feet east of intersection of Second Street and old Highway 395. Reference point - top of wood cover 0.75 foot below ground surface, at elevation 1,046.61 feet. 4/23/53, 6.8.

9S/3W-12C1 - Conally - Near Rainbow; 0.1 mile north and 400 feet east of intersection of Fifth and old Highway 395. Reference point - top of cover, at elevation 1,0[illegible]5 feet. 6/27/52, 8.1; 4/7/53, 5.2; 4/23/53, 10.0.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 5

(Depths to water in feet measured from reference point)
(continued)

9S/3W-12D1 - Rollin Brown - Near Rainbow; 480 feet west and 400 feet north of intersection of Huffstutler and Fifth Streets; 205 feet southerly of house. Reference point - top of cover 1 foot above ground surface, at elevation 1,059.49 feet. 7/1/52, 7.3; 11/13/52, 15.0; 2/10/53, 6.9; 3/6/53, 7.1; 4/7/53, 7.5; 4/22/53, 7.9; 11/10/53, 12.0; 4/20/54, 4.7.

9S/3W-12D2 - Rollin Brown - Near Rainbow; 650 feet north and 310 feet west of intersection of Huffstutler and Fifth Streets; open casing 400 feet east of house. Reference point - top of concrete pit 1.2 feet above ground surface, at elevation 1,040.78 feet. 7/1/52, 6.4; 2/10/53, 8.0; 3/6/53, 7.9; 4/7/53, 8.0; 4/22/53, 8.2; 7/9/53, 9.5; 8/6/53, 10.1; 9/8/53, 10.6; 11/10/53, 11.4; 1/7/54, 11.6; 2/8/54, 10.1; 4/2/54, 4.8; 4/20/54, 5.2.

9S/3W-12D3 - Rollin Brown - Near Rainbow; 210 feet south and 70 feet west side of intersection of Second and Huffstutler Streets. Reference point - top of wood cover 0.8 foot above ground surface, at elevation 1,044.30 feet. 7/1/52, 8.9; 3/6/53, 9.4; 4/22/53, 9.0; 4/20/54, 6.8.

9S/3W-12D4 - V. Johnson - Near Rainbow; 0.21 mile east and 500 feet north of intersection of Highway 395 and Fifth Street. Reference point - top of casing at ground surface, at elevation 1,032 feet. 4/22/53, 3.1.

9S/3W-12E1 - W. H. Hitt - Near Rainbow; 350 feet west and 100 feet south of intersection of Huffstatler and Fifth Streets. Reference point - top of concrete pit 0.75 foot above ground surface, at elevation 1,057.52 feet. 7/1/52, 7.5; 3/6/53, 6.9; 4/23/53, 8.3; 11/10/53, 14.4; 4/20/54, 5.1.

9S/3W-12F1 - S. E. Rafter - Near Rainbow; 0.21 mile south and 120 feet west of intersection of Fifth Street and old Highway 395; outside watershed. Reference point - top of concrete pit at ground surface, at elevation 1,039.7 feet. 4/23/53, 12.3; 11/9/53, 19.2.

9S/3W-12F2 - Rainbow Valley Grange - Near Rainbow; 320 feet north of well 12F1; outisde watershed. Reference point - top of cover 2.6 feet above ground surface, at elevation 1,044.84 feet. 4/23/53, 15.6; 11/9/53, 22.0; 4/20/54, 12.2.

9S/3W-12F3 - L. S. Brownell - Near Rainbow; 550 feet east of well 12F1; outside watershed. Reference point - top of concrete pit, at elevation 1,042.20 feet. 7/16/53, 46.3.

9S/3W-12F4 - E. H. Hitt - Near Rainbow; 90 feet east and 500 feet south of intersection of Huffstutler and Fifth Streets; outside watershed. Reference point - top of concrete pit at ground surface, at elevation 1,045.47 feet. 7/1/52, 10.3; 4/23/53, 6.2; 11/9/53, 21.5.

9S/3W-12F5 - S. E. Rafter - Near Rainbow; 150 feet south of well 12F4; outside watershed. Reference point - top of 4 x 4 inch wood support over pit at ground surface, at elevation 1,047.96 feet. 4/23/53, 8.2; 11/9/53, 13.4; 4/20/54, 11.3.

9S/3W-12F6 - Fallbrook School District - Near Rainbow; 600 feet west and 150 feet south of intersection of Fifth Street and old Highway 395; in pump house; outside watershed. Reference point - not reported, at elevation 1,045 feet. 7/16/53, 10.4.

9S/3W-12G1 - Near Rainbow; 400 feet east and 80 feet south of intersection of Fifth Street and old Highway 395; 15 feet southeast of house. Reference point - top of pump support 0.5 foot above ground surface, at elevation 1,052.40 feet. 7/1/52, 20.0; 4/23/53, 10.7; 11/9/53, 25.4; 4/20/54, 22.2.

9S/3W-17K1 - R. [illegible] Gray - Northeast of Fallbrook; 0.3 mile north of Mission Road (measured along dirt road) from intersection 0.75 mile westerly of Riverview Drive measured along Mission Road. Reference point - top of concrete pit [illegible] above ground surface. 9/15/54, 54.7.

9S/3W-17K2 - R. [illegible] Gray - Northeast of Fallbrook; 250 feet northwest of well 17K1. Reference point - top of wood cover 1 foot above ground surface. 9/15/54, 10.0.

9S/3W-18E1 - [illegible] - Northeast of Fallbrook; 0.32 mile north and 0.15 mile west of intersection of Santa Margarita Drive and Hillcrest Lane. Reference point - top of concrete pit 4 feet above ground surface. 9/15/54, 36.[illegible]

9S/4W-1[illegible] - [illegible] - Near Fallbrook; see location of wells plate; at windmill 100 feet east of Sandia Creek. Reference point - not reported. 6/24/52, 15 (caretaker).

9S/4W-[illegible] - Northwest of Fallbrook; 1.5 miles [illegible] of intersection of De Luz Road and Santa Margarita River along De Luz Road; at windmill 90 feet [illegible] of De Luz Road. Reference point - top of casing at ground surface. 8/25/54, [illegible]

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 5

(Depths to water in feet measured from reference point)
(continued)

9S/4W-13L1 - Costello-Barrymore - North of Fallbrook; 0.45 mile north of Kalmia Street (measured along De Luz Road) and 50 feet west of De Luz Road; in metal shed. Reference point - top of concrete casing at ground surface. 9/15/54, 10.9.

9S/4W-13L2 - Costello-Barrymore - North of Fallbrook; 100 feet south of well 13L1. Reference point - top of concrete pit 2 feet above ground surface. 9/15/54, 11.8.

9S/4W-13P1 - Bruce Sikkings - In Fallbrook; north of Fallbrook; 0.27 mile north and 0.15 mile west of intersection of De Luz Road and Kalmia Street; 3 feet south of building. Reference point - top of 6 x 6 inch timber at ground surface. 5/5/53, 28.0; 7/8/53, 39.4; 8/6/53, 39.7; 9/3/53, 42.3; 11/6/53, 42.7; 2/4/54, 23.4; 4/2/54, 17.9; 4/28/54, 16.0.

9S/4W-13P2 - Johnston - North of Fallbrook; 0.3 mile westerly of well 13Q1; 60 feet east of fence. Reference point - top of beam at ground surface. 9/15/54, 47.7.

9S/4W-13Q1 - Harry E. Held - North of Fallbrook; 0.3 mile north and 25 feet west of intersection of De Luz Road and Kalmia Street. Reference point - top of concrete casing 0.5 foot above ground surface. 8/25/54, 53.2.

9S/4W-29C1 - U. S. Navy - 4,225 feet north and 2,900 feet west of southeast corner of section 29; 30 feet east of well 29C2; Camp Pendleton. Reference point - top of casing. Note: Measurements from U. S. Navy records, except as indicated. 7/23/52, 14.1 (DWR); 8/5/52, 14.6; 9/5/52, 15.4; 9/30/52, 15.8; 10/17/52, 15.9 (DWR); 11/3/52, 16.0 (DWR); 12/4/52, 14.6 (DWR); 12/18/52, 14.8 (DWR).

9S/4W-29C2 - U. S. Navy - 4,225 feet north and 2,930 feet west of southeast corner of section 29; 30 feet west of well 29C1; Camp Pendleton. Note: Measurements from U. S. Navy records, except as indicated. 7/23/52, 14.4 (DWR); 8/5/52, 14.8; 1/27/53, 13.0; 2/17/53, 13.0; 6/9/53, 14.5; 7/17/53, 16.7. Reference point - top of casing.

9S/4W-29L1 - U. S. Navy - 2,025 feet north and 2,775 feet west of southeast corner of section 29; Camp Pendelton. Reference point-hole in casing, 4.0 ft. above ground surface. Note: Measurements from U. S. Navy records, except as indicated. 9/45, 6 (log); 9/12/50, 11.5; 10/12/50, 10.8; 11/6/50, 10.1; 12/4/50, 9.7; 1/3/51, 7.5; 2/12/51, 9.6; 3/20/51, 7.7; 5/16/51, 9.9; 6/20/51, 11.2; 7/16/51, 11.6; 8/20/51, 12.0; 9/17/51, 12.3; 10/10/51, 12.3; 11/19/51, 12.4; 12/18/51, 9.9; 8/5/52, 9.6; 9/30/52, 7.9; 10/17/52, 10.1; 11/3/52, 9.3; 12/4/52, 8.7; 1/27/53, 7.9; 2/17/53, 8.0; 6/9/53, 9.6.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 6

(Depths to water in feet measured from reference point)

9S/3W-18P1 - L. C. Stokes - Northeast of Fallbrook; 0.2 mile east and 95 feet north of intersection of Mission Road and Santa Margarita Drive; 75 feet northeast of garage. Reference point - top of 4 x 6 inch timber at ground surface, at elevation 770 feet. 4/7/53, 34.4; 5/5/53, 34.8; 7/8/53, 35.2; 8/6/53, 35.5; 9/3/53, 36.6; 11/6/53, 36.8; 1/7/54, 37.0; 2/4/54, 36.7; 4/2/54, 33.7; 4/28/54, 32.2.

9S/3W-19C1 - S. C. Myers - West of Fallbrook; 300 feet east and 360 feet south of intersection of Mission Road and Santa Margarita Drive; in shed. Reference point - top of concrete pit at ground surface. 7/54, 20 (owner); 8/25/54, 24.0.

9S/3W-19C3 - Alta M. Terrier - West of Fallbrook; 0.12 mile east and 0.07 mile south of intersection of Mission Road and Santa Margarita Drive; in shed 20 feet east of road. Reference point - top of beams 4 inches above top of concrete pit at ground surface. 9/15/54, 27.6.

9S/3W-19M1 - Robert J. Marks - In Fallbrook; 0.26 mile east and 400 feet north of intersection of Fallbrook and old Stage Roads. Reference point - top of concrete casing at ground surface. 8/25/54, 49.1.

9S/4W-24H1 - A.T. & S.F. Railroad - In Fallbrook; 0.26 mile east and 30 feet north of intersection of Main and Alvarado Streets; 427 feet east of Fallbrook Railroad Station. Reference point - ground surface. 5/17, 6.

9S/4W-24N1 - Mark McCahan - In Fallbrook; 360 feet south and 12 feet west of intersection of Alturas and Fallbrook Streets. Reference point - top of wood cover at ground surface. 8/24/54, 13.2.

9S/4W-24P2 - Frank Pucelli - In Fallbrook; 0.13 mile /WEST and 10 feet north of intersection of Aviation Road and Main Street. Reference point - top of 4 x 6 inch timber 1 foot above ground surface. 3/24/54, 10.0.

9S/4W-24Q1 - William T. Scott - In Fallbrook; 0.09 mile west and 75 feet south of intersection of Main Street and Aviation Road. Reference point - top of wood cover at ground surface. 5/5/53, 4.1; 7/8/53, 4.9; 8/6/53, 5.2; 9/3/53, 5.8; 11/6/53, 5.8; 1/7/54, 6.0; 2/4/54, 3.9; 4/2/54, 3.0; 4/28/54, 3.6.

9S/4W-24Q2 - Wernecke - In Fallbrook; 0.08 mile north and 280 feet west of intersection of Aviation Road and Main Street; 55 feet west of house. Reference point - top of concrete casing 1.4 feet above ground surface. 8/24/54, 6.7.

9S/4W-24R1 - William Waltz - In Fallbrook; 230 feet east and 90 feet north of intersection of old Stage and Aviation Roads. Reference point - top of 4 x 6 inch timber at ground surface. 8/25/54, 21.3.

9S/4W-25E1 - John T. Owens - In Fallbrook; 0.33 mile south and 0.4 mile west of intersection of Main Street and Aviation Road; west of Fallbrook Creek. Reference point - top of 4 x 4 inch timbers at ground surface. 5/5/53, 9.4; 9/3/53, 10.8; 11/6/53, 6.3; 4/28/54, 4.9.

9S/4W-25E2 - Pratt Mutual Water Company - In Fallbrook; 0.07 mile south and 0.05 mile west of intersection of Clemens Lane and Aviation Road; in open field. Reference point - top of concrete pit 1 foot above ground surface. 8/24/54, 4.

9S/4W-25E5 - T. B. Rogers - In Fallbrook; 900 feet southwest of well 25E2 and 300 feet south of well 25E4; in shed 60 feet east of fence. Reference point - top of concrete lip 1 foot above ground surface. 8/24/54, 19.3.

Measurements for the following wells are from U. S. Navy records, except as indicated

9S/4W-32C1 - U. S. Navy - 4,400 feet north, 3,900 feet west of southeast corner of section 32; Camp Pendleton. Reference point - ground surface, at elevation 125 feet. 4/34, 2 (log).

9S/4W-32C2 - U. S. Navy - 4,400 feet north, 3,800 feet west of southeast corner of section 32; Camp Pendleton. Reference point - ground surface, at elevation 124 feet. 5/34, 2 (log).

9S/4W-32C8 - U. S. Navy - 4,400 feet north, 3,750 feet west of southeast corner of section 32; Camp Pendleton. Reference point - ground surface, at elevation 130.2 feet. 5/51, 1.7 (log).

9S/4W-32C9 - U. S. Navy - 4,400 feet north, 3,720 feet west of southeast corner of section 32; Camp Pendleton. Reference point - ground surface, at elevation 130.4 feet. 5/51, 1.9 (log).

9S/4W-32C10 - U. S. Navy - 4,400 feet north, 3,680 feet west of southeast corner of section 32; Camp Pendleton. Reference point - ground surface, at elevation 131.5 feet. 5/51, 3.0 (log).

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 6

(Depths to water in feet measured from reference point)
(continued)

Measurements for the following wells are from U. S. Navy records, except as indicated

9S/4W-32C11 - U. S. Navy - 4,400 feet north, 3,670 feet west of southeast corner of section 32; Camp Pendleton. Reference point - ground surface, at elevation 132.2 feet. 5/51, 3.7 (log).

9S/4W-32C12 - U. S. Navy - 4,400 feet north, 3,620 feet west of southeast corner of section 32; Camp Pendleton. Reference point - ground surface, at elevation 132.0 feet. 5/51, 3.4 (log).

9S/4W-32C13 - U. S. Navy - 4,400 feet north, 3,570 feet west of southeast corner of section 32; Camp Pendleton. Reference point - ground surface, at elevation 131.4 feet. 5/51, 2.8 (log).

9S/4W-32C14 - U. S. Navy - 4,400 feet north, 3,520 feet west of southeast corner of section 32; Camp Pendleton. Reference point - ground surface, at elevation 129.1 feet. 5/51, 0.4 (log).

9S/4W-35L1 - U. S. Navy - 2,000 feet north, 2,625 feet west of southeast corner of section 35; Camp Pendleton. Reference point - ground surface, at elevation 575 feet. 6/34, 16 (log).

10S/4W-5D1 - U. S. Navy - 5,000 feet north, 5,300 feet west of southeast corner of section 5; Camp Pendleton. Reference point - lower lip of measuring pipe 4.6 feet above ground surface, at elevation 115 feet. 12/43, 5.5 (log); 10/25/50, 9.9; 11/28/50, 5.8; 1/3/51, 5.8; 3/20/51, 5.9; 4/17/51, 6.1; 5/16/51, 6.1; 10/10/51, 11.3; 11/19/51, 11.3; 12/18/51, 6.1; 3/27/52, 8.9; 7/23/52, 9.7 (DWR); 8/5/52, 9.8; 8/28/52, 9.8; 9/30/52, 10.1; 11/3/52, 8.8; 12/4/52, 8.1; 12/31/52, 7.4; 1/27/53, 6.6; 9/24/53, 11.9; 11/4/53, 11.8.

10S/4W-7A1 - U. S. Navy - 5,200 feet north, 400 feet west of southeast corner of section 7; Camp Pendleton. Reference point - ground surface, at elevation 103 feet. 9/42, 7 (log).

10S/4W-7H1 - U. S. Navy - 3,240 feet north, 270 feet west of southeast corner of section 7; Camp Pendleton. Reference point - top of casing 0.75 foot above ground surface, at elevation 99 feet. 8/20/51, 9.2; 9/12/51, 9.6; 10/10/51, 10.1; 11/19/51, 10.7; 12/18/51, 10.8; 3/27/52, 5.5; 4/22/52, 6.2; 5/19/52, 6.5; 6/17/52, 6.8; 7/29/52, 8.1 (DWR); 8/20/52, 8.7; 10/14/52, 10.0; 11/18/52, 10.3; 12/23/52, 6.9; 1/20/53, 6.5; 2/17/53, 6.6; 3/24/53, 6.7; 5/25/53, 7.5; 6/30/53, 8.4; 10/26/53, 10.0.

10S/4W-7J1 - U. S. Navy - 1,825 feet north, 300 feet west of southeast corner of section 7; Camp Pendleton. Reference point - (a) top of recorder floor 1.4 feet above ground surface, at elevation 94.5 feet (10/19/50 through 11/3/52); (b) top of casing 1.3 feet above ground surface, at elevation 94.4 feet (11/28/52 to present). 10/19/50, 7.3; 11/1/50, 7.3; 12/1/50, 7.4; 1/2/51, 7.1; 2/1/51, 5.2; 3/1/51, 4.8; 4/1/51, 5.1; 5/1/51, 4.8; 6/1/51, 5.5; 7/1/51, 6.0; 8/1/51, 6.5; 9/1/51, 6.9; 10/1/51, 7.2; 11/12/51, 7.7; 12/12/51, 7.9; 1/1/52, 6.3; 2/6/52, 4.8; 3/1/52, 4.1; 4/1/52, 4.8; 5/19/52, 5.7; 6/1/52, 5.7; 7/15/52, 6.7; 8/20/52, 7.2; 9/20/52, 7.6; 11/3/52, 7.8; 11/28/52, 7.4; 6/9/53, 6.6; 7/17/53, 7.2.

10S/4W-7J2 - U. S. Navy - 1,625 feet north, 100 feet west of southeast corner of section 7; Camp Pendleton. Reference point - notch in broken casing at ground surface, at elevation 931 feet. 7/42, 7 (log); 9/12/50, 8.7; 10/12/50, 8.9; 11/6/50, 9.1; 12/4/50, 9.2; 7/23/52, 7.2 (DWR); 8/5/52, 7.3.

10S/4W-7Q1 - U. S. Navy - 1,025 feet north, 1,275 feet west of southeast corner of section 7; Camp Pendleton. Reference point - top of 1.5 inch pipe 2.1 feet above ground surface, at elevation 92 feet. 7/23/52, 10.0 (DWR); 8/20/52, 10.0; 9/22/52, 10.1; 10/27/52, 10.2; 11/3/52, 10.3; 12/4/52, 9.5; 1/27/53, 8.3; 2/17/53, 8.2; 6/9/53, 9.7; 7/17/53, 10.1; 9/24/53, 9.5; 10/28/53, 9.9; 11/4/53, 9.1.

10S/4W-7R1 - U. S. Navy - 975 feet north, 1,275 feet west of southeast corner of section 7; Camp Pendleton. Reference point - pump base 0.67 foot above ground surface, at elevation 100 feet. 7/29/52, 17.5 (DWR); 3/27/50, 19.

10S/4W-7R3 - U. S. Navy - 700 feet north, 1,100 feet west of southeast corner of section 7; Camp Pendleton. Reference point - 1.5-inch pipe in auger hole 2.25 feet above ground surface, at elevation 92 feet. 7/23/52, 10.0 (DWR); 8/5/52, 9.9; 9/5/52, 10.3; 10/17/52, 10.4; 11/3/52, 10.5; 12/4/52, 9.7; 1/27/53, 8.4; 2/17/53, 8.5; 7/17/53, 10.2; 9/24/53, 9.5; 10/28/53, 10.0; 11/4/53, 9.3.

10S/4W-7R4 - U. S. Navy - 500 feet north, 900 feet west of southeast corner of section 7; Camp Pendleton. Reference point - 1.5-inch pipe in auger hole 2.7 feet above ground surface, at elevation 93 feet. 7/23/52, 8.4 (DWR); 7/29/52, 8.4 (DWR); 6/9/53, 8.2 (DWR).

10S/4W-8E2 - U. S. Navy - 3,200 feet north, 4,400 feet west of southeast corner of section 8; Camp Pendleton. Reference point - ground surface. 6/42, 9 (log).

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 6

(Depths to water in feet measured from reference point)
(continued)

Measurements for the following wells are from U. S. Navy records, except as indicated

10S/4W-18E1 - U. S. Navy - 3,450 feet north, 4,300 feet west of southeast corner of section 18; Camp Pendleton. Reference point - not reported, at elevation 75 feet. 1/29/37, 8 (log); 2/20/47, 6; 1/15/48, 4.5; 2/12/48, 6; 9/23/49, 4.

10S/4W-18L1 - U. S. Navy - 2,350 feet north, 3,875 feet west of southeast corner of section 18; Camp Pendleton. Reference point - (a) top of recorder floor 3.5 feet above ground surface, at elevation 76.3 feet (10/18/50 through 3/5/51); (b) top of casing 3.0 feet above ground surface, at elevation 75.78 feet (4/17/54 to present). 2/9/46, 11 (log); 10/18/50, 15.3; 11/6/50, 15.9; 12/4/50, 17.9; 1/2/51, 19.0; 2/5/51, 19.7; 3/5/51, 19.8; 4/17/51, 19.4; 5/16/51, 19.0; 7/16/51, 19.1; 8/17/51, 19.4; 9/17/51, 19.6; 10/10/51, 19.8; 11/19/51, 20.2; 12/18/51, 20.5; 4/22/52, 10.2; 5/19/52, 9.9; 6/17/52, 10.0; 7/23/52, 10.6 (DWR); 8/5/52, 10.9; 9/5/52, 11.9; 10/7/52, 13.4; 11/3/52, 14.5; 12/4/52, 14.8; 1/27/53, 13.7; 2/17/53, 13.1; 6/9/53, 12.1; 7/17/53, 12.6; 9/24/53, 12.4; 10/28/53, 13.7; 11/4/53, 13.8.

10S/4W-18M1 - U. S. Navy - 1,850 feet north, 4,725 feet west of southeast corner of section 18; Camp Pendleton. Reference point - top of measuring pipe 4 feet below ground surface. 2/8/48, 9; 3/27/48, 5.2; 1/51, 17; 2/51, 17; 7/18/51, 20.

10S/4W-18M2 - U. S. Navy - 1,850 feet north, 4,825 feet west of southeast corner of section 18; Camp Pendleton. Reference point - lip of 1-inch pipe 0.5 foot above ground surface, at elevation 71.5 feet. 8/16/50, 17 (log); 10/12/50, 19.6; 11/6/50, 20.2; 12/4/50, 20.6; 1/3/51, 20.6; 2/12/51, 20.2; 3/20/51, 18.2; 4/17/51, 18.6; 5/16/51, 15.6; 7/16/51, 19.7; 8/17/51, 20.7; 9/17/51, 21.0; 10/10/51, 21.7; 11/19/51, 22.5; 12/18/51, 22.9; 3/25/52, 9.4; 4/22/52, 9.4; 5/19/52, 9.5; 6/16/52, 9.9; 7/23/52, 11.5; 8/5/52, 12.1; 9/5/52, 13.6; 10/17/52, 15.3; 11/3/52, 16.0; 12/3/52, 14.8; 6/9/53, 12.4; 10/21/53, 14.4.

10S/4W-19E2 - U. S. Navy - 2,875 feet north, 4,450 feet west of southeast corner of section 19; Camp Pendleton. Reference point - ground surface. Spring 1951, 10 (log).

10S/4W-19L1 - U. S. Navy - 2,525 feet north, 3,850 feet west of southeast corner of section 19; Camp Pendleton. Reference point - ground surface. Spring 1951, 25 (log).

10S/5W-12R1 - U. S. Navy - 1,050 feet north, 300 feet west of southeast corner of section 12; Camp Pendleton. Reference point - top of casing at ground surface. 2/17/20, 14 (log); 9/12/50, 21.9; 10/12/50, 22.4; 11/6/50, 22.7; 12/4/50, 23.7; 1/3/51, 23.6; 2/12/51, 24.0; 3/20/51, 23.9; 4/17/51, 23.8; 4/16/51, 24.[illegible]; 7/16/51, 24.4; 8/17/51, 24.8.

10S/5W-13G1 - U. S. Navy - 3,460 feet north and 2,200 feet west of southeast corner of section 13; Camp Pendleton. Reference point - top of casing 1.4 feet above ground surface, at elevation 116.4 feet. 8/17/51, 66.4; 9/12/51, 66.7; 10/10/51, 67.1; 11/19/51, 67.7; 12/17/51, 68.0; 3/25/52, 64.4; 4/22/52, 56.3; 5/19/52, 56.3; 6/17/52, 56.6; 7/15/52, 57.3; 8/20/52, 58.5; 9/8/52, 59.2; 10/14/52, 60.4; 11/18/52, 61.7; 12/23/52, 61.2; 1/20/53, 57.8; 2/17/53, 56.8; 3/24/53, 56.5; 5/26/53, 58.1; 6/30/53, 59.0; 10/26/53, 59.9.

10S/5W-13J1 - U. S. Navy - 2,050 feet north, 1,160 feet west of southeast corner of section 13; Camp Pendleton. Reference point - (a) top of casing 1.6 feet above ground surface, at elevation 70.60 feet (8/17/51 and 9/12/51); (b) not described 1.85 feet above ground surface, at elevation 70.85 feet (10/23/27 to present). 8/17/51, 19.3; 9/12/51, 15.7; 10/23/51, 16.7; 11/1/51, 16.8; 12/1/51, 17.3; 12/17/51, 17.5; 6/16/52, 4.9; 7/1/52, 5.5; 8/5/52, 6.6; 9/5/52, 7.9; 10/17/52, 9.6; 11/3/52, 10.3; 7/15/53, 5.8; 8/20/53, 7.3; 9/2/53, 8.0; 9/22/53, 8.4.

10S/5W-13R1 - U. S. Navy - 275 feet north, 1,050 feet west of southeast corner of section 13; Camp Pendleton. Reference point - lower lip of measuring pipe 4.0 feet above ground surface, at elevation 62 feet. 2/18/47, 8; 12/10/47, 5.5; 1/1/48, 12; 2/7/48, 9; 9/14/49, 8; 10/2/49, 8; 3/27/50, 9; 7/23/52, 3.5 (DWR).

10S/5W-14P1 - U. S. Navy - 525 feet north, 2,700 feet west of southeast corner of section 14; Camp Pendleton. Reference point - pump base 6 feet above ground surface, at elevation 64 feet. 5/34, 2 (log); 7/23/52, 8.5 (DWR).

10S/5W-14Q1 - U. S. Navy - 1,125 feet north, 1,925 feet west of southeast corner of section 14; Camp Pendleton. Reference point - top of casing 2 feet below ground surface, at elevation 57 feet. 3/5/50, 3.5 (log); 9/14/50, 5.6; 10/12/50, 5.9; 11/6/50, 6.2; 12/4/50, 6.1; 1/3/51, 6.4; 2/12/51, 6.4; 3/20/51, 6.5; 4/17/51, 6.5; 5/16/51, 6.6; 7/16/51, 7.2; 9/3/51, 8.6; 10/10/51, 8.0; 12/17/51, 8.3; 3/25/52, 1.9; 4/22/52, 2.4; 5/19/52, 2.8; 6/17/52, 3.2; 7/23/52, 3.8 (DWR); 8/5/52, 4.1; 9/5/52, 4.7; 10/17/52, 5.1; 11/3/52, 5.3; 12/4/52, 5.0; 2/17/53, 3.0 (DWR); 6/9/53, 3.9 (DWR); 7/27/53, 5.8 (DWR).

10S/5W-23J1 - U. S. Navy - 2,550 feet north, 900 feet west of southeast corner of section 23; Camp Pendleton. Reference point - top of casing 3.0 feet above ground surface, at elevation 54.8 feet. 9/19/50, 9.5; 10/25/50, 9.6; 11/20/50, 9.6; 12/11/50, 9.6; 1/15/51, 9.4; 2/12/51, 9.2; 3/20/51, 9.0.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 6

(Depths to water in feet measured from reference point)
(continued)

10S/5W-23J3 - U. S. Navy - 2,060 feet north, 550 feet west of southeast corner of section 23; Camp Pendleton. Reference point - top of casing 1.8 feet above ground surface, at elevation 55 feet. 8/20/51, 9.1; 5/17/51, 9.3; 10/3/51, 9.5; 11/13/51, 10.0; 12/18/51, 10.0; 3/25/52, 4.6; 4/22/52, 4.7; 5/19/52, 5.3; 6/17/52, 5.8; 7/14/52, 6.2; 8/4/52, 6.7; 9/8/52, 7.3; 10/14/52, 7.7; 11/18/52, 7.1; 12/23/52, 5.9; 1/20/53, 5.0; 2/17/53, 5.1; 3/24/53, 5.1; 5/26/53, 7.7; 6/30/53, 6.5; 7/24/53, 7.7; 8/24/53, 9.3; 9/28/53, 8.3; 10/26/53, 10.4; 11/30/53, 7.9; 12/28/53, 8.0.

10S/5W-23J4 - U. S. Navy - 2,550 feet north, 500 feet west of southeast corner of section 23; Camp Pendleton. Reference point - 2-inch pipe STANDING in 40 x 40 feet pond, at elevation 3.0 feet above ground surface, at elevation 55 feet. 10/3/51, 10.1; 11/19/51, 10.7; 12/18/51, 10.6; 3/25/52, 6.4; 4/22/52, 6.7; 5/19/52, 7.1; 7/17/52, 7.5; 8/27/52, 9.0; 9/5/52, 9.6.

10S/5W-23L1 - U. S. Navy - 2,610 feet north, 2,845 feet west of southeast corner of section 23; Camp Pendleton. Reference point - (a) top of recorder floor 2.09 feet above ground surface, at elevation 53.59 feet (12/17/51 through 2/1/52); (b) top of casing 1.4 feet above ground surface, at elevation 52.4 feet (3/15/52 to present). 12/17/51, 11.2; 1/1/52, 9.8; 2/1/52, 7.5; 3/25/52, 6.4; 4/22/52, 6.6; 5/19/52, 7.1; 6/17/52, 7.6; 7/15/52, 7.9; 8/20/52, 17.8; 9/8/52, 9.0; 10/14/52, 9.2; 11/18/52, 8.4; 12/23/52, 6.8; 1/20/53, 6.1; 2/17/53, 6.2; 3/24/53, 6.3; 5/26/53, 8.5; 6/20/53, 7.9; 7/24/53, 9.1; 8/24/53, 10.5; 9/28/53, 9.6; 10/26/53, 9.1; 11/30/53, 8.9; 12/28/53, 8.6.

10S/5W-23Q1 - U. S. Navy - 280 feet north, 1,510 feet west of southeast corner of section 23; Camp Pendleton. Reference point - top of casing 1.9 feet above ground surface at elevation 51.9 (8/17/51 through 6/11/52); (b) not described 2.14 feet above ground surface, at elevation 52.1 feet (7/7/52 to present). 8/17/51, 8.3; 9/12/51, 9.5; 10/10/51, 8.9; 11/19/51, 8.8; 12/18/51, 8.5; 3/25/52, 6.6; 4/22/52, 7.3; 5/19/52, 7.2; 6/17/52, 7.4; 7/7/52, 7.7; 7/14/52, 7.7; 8/5/52, 7.8; 9/5/52, 7.8; 10/17/52, 7.9; 11/3/52, 7.9; 12/4/52, 7.6; 1/27/53, 7.0; 2/17/53, 7.1; 3/24/53, 7.2 (U.S.G.S.); 5/26/53, 7.5 (U.S.G.S.); 6/9/53, 7.5.

10S/5W-24G1 - U. S. Navy - 5,225 feet north, 3,400 feet west of southeast corner of section 24; Camp Pendleton. Reference point - ground surface, 6/54, 5 (log).

10S/5W-24G2 - U. S. Navy - 4,100 feet north, 3,300 feet west of southeast corner of section 24; Camp Pendleton. Reference point - ground surface. 7/52, 8 (log).

10S/5W-24H1 - U. S. Navy - 4,775 feet north, 4,150 feet west of southeast corner of section 24; Camp Pendleton. Reference point - ground surface. 7/34, 7 (log).

10S/5W-24J1 - U. S. Navy - 3,125 feet north, 2,575 feet west of southeast corner of section 24; Camp Pendleton. Reference point - ground surface. Fall 1932, 8 (log).

10S/5W-24K1 - U. S. Navy - 3,700 feet north, 650 feet west of southeast corner of section 24; Camp Pendleton. Reference point (a) top of 2-inch plug, 2.0 feet above ground surface, at elevation 65.5 feet (9/12/50 through 12/4/50); (b) not described 2.3 feet above ground surface, at elevation 65.8 feet (12/4/50 to present). 6/[illegible]/50, 9.5 (log); 9/12/50, 13.3; 10/17/50, 14.4; 11/6/50, 14.7; 12/4/50, 14.9; 1/3/51, 15.0; 1/15/51, 14.7; 3/20/51, [illegible]; 5/16/51, 14.6; 11/26/51, 17.5; 12/18/51, 17.5; 3/25/52, 5.9; 4/22/52, 8.3; 5/19/52, 8.8; 6/17/52, 9.3; 8/5/52, 10.4; 9/5/52, 11.4; 10/17/52, 12.2; 11/3/52, 12.4; 12/4/52, 12.2; 1/27/53, 9.5; 2/17/53, 9.3; 6/9/53, 10.8; 7/17/53, 14.1; 10/21/53, 14.2; 11/4/53, 14.0.

10S/5W-24K2 - U. S. Navy - 3,650 feet north, 900 feet west of southeast corner of section 24; Camp Pendleton. Reference point - ground surface. 7/34, 6 (log).

10S/5W-24N1 - U. S. Navy - 2,025 feet north, 4,600 feet west of southeast corner of section 24; Camp Pendleton. Reference point - top of casing 1.4 feet above ground surface, at elevation 52.4 feet. 9/12/50, 5.1; 10/12/50, 5.5; 11/6/50, 5.5; 12/4/50, 5.8; 1/3/51, 5.7; 2/17/51, 5.3; 3/20/51, 5.1; 4/17/51, 5.5; 5/16/51, 5.3; 7/16/51, 6.3; 8/17/51, 7.5; 9/17/51, 7.1; 10/10/51, 8.2; 11/19/51, 7.9; 12/18/51, 7.9; 8/27/52, 13.9; 9/5/52, 13.8; 10/17/52, 14.0; 11/3/52, 13.7; 12/4/52, 12.8; 1/27/53, 12.3; 2/17/53, 12.9.

10S/5W-26C1 - U. S. Navy - 1,785 feet north, 3,010 feet west of southeast corner of section 26; Camp Pendleton. Reference point - top of casing 0.7 feet above ground surface, at elevation 34.7 feet. 8/17/51, 14.0; 9/12/51, 14.4; 10/3/51, 15.0; 11/5/51, 14.8; 12/4/51, 14.8; 1/7/52, 12.4; 2/14/52, 7.9; 3/4/52, 7.7; 4/7/52, 7.1; 5/19/52, 7.5; 6/23/52, 8.4; 7/7/52, 8.8; 8/4/52, 9.2; 9/2/52, 10.0; 10/7/52, 10.[illegible]; 11/3/52, 10.3; 12/1/52, 9.[illegible]; 1/5/53, [illegible]; 2/9/53, [illegible]; 3/[illegible]/53, 6.8; 4/6/53, 7.0; 5/4/53, 7.1; 6/[illegible]/53, 7.7; 8/10/53, 8.3; 7/24/53, 9.1; 8/24/53, [illegible]; 9/[illegible]/53, [illegible]; 10/26/53, 10.3; 11/30/[illegible], 10.5; 12/28/53, 10.5.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 6

(Depths to water in feet measured from reference point)
(continued)

Measurements for the following wells are from U. S. Navy records, except as indicated

10S/5W-26L2 - U. S. Navy - 1,785 feet north, 3,010 feet west of southeast corner of section 26; 2 feet west of well 26L1; Camp Pendleton. Reference point - top of casing 0.78 foot above ground surface, at elevation 34.78 feet. 10/3/51, 14.7; 11/5/51, 14.7; 12/4/51, 14.9; 1/7/52, 12.6; 8/5/52, 8.7; 9/5/52, 9.0; 10/17/52, 9.4; 11/3/52, 9.4; 12/4/52, 8.8; 1/27/53, 7.4; 2/17/53, 6.2; 6/9/53, 7.8; 9/22/53, 10.2; 10/27/53, 10.6; 11/4/53, 10.6.

10S/5W-26L3 - U. S. Navy - 1,625 feet north, 3,025 feet west of southeast corner of section 26; Camp Pendleton. Reference point - top of casing 1.5 feet above ground surface. 5/51, 10 (log); 5/4/52, 11.5; 5/16/52, 11.6, 7/16/52, 12.2; 8/20/52, 12.8; 9/12/52, 12.8

10S/5W-35J1 - U. S. Navy - 2,300 feet north, 1,000 feet west of southeast corner of section 35; Camp Pendleton. Reference point - top of casing at ground surface, at elevation 28 feet. 7/29/52, 13.1 (DWR), 8/5/52, 13.2; 9/5/52, 14.2; 9/15/52, 15.1; 10/17/52, 14.4; 11/3/52, 14.9; 12/4/52, 15.6; 12/18/52, 15.9, 11/4/53, 13.9.

10S/5W-35K1 - U. S. Navy - 2,500 feet north, 2,450 feet west of southeast corner of section 35; Camp Pendleton. Reference point - pump base 0.5 foot above ground surface, at elevation 28.1 feet. 11/36, 12 (log); 3/27/51, 22.5; 4/17/51, 23.1; 5/16/51, 23.3; 6/20/51, 26.3; 7/16/51, 25.3; 8/12/51, 27.7; 11/26/51, 22.6; 12/28/51, 22.0; 1/7/52, 21.2; 2/14/52, 14.5; 3/4/52, 11.8; 4/7/52, 11.5, 5/5/52, 12.0; 6/2/52, 12.2; 6/30/52, 14.6; Spring 1953, 11.9; fall 1953, 16.3; Spring 1954, 10.4.

10S/5W-35K4 - U. S. Navy - 2,525 feet north, 2,400 feet west of southeast corner of section 35; Camp Pendleton. Reference point - top of casing 3.0 feet above ground surface, at elevation 30.56 feet. 5/51, 22 (log); 5/4/51, 24.7; 5/16/51, 25.1, 7/16/51, 26.0; 8/20/51, 27.1; 9/12/51, 26.4; 10/3/51, 27.7; 11/5/51, 27.7; 12/4/51, 26.3; 1/7/52, 24.7, 2/28/52, 14.9; 3/4/52, 14.8; 4/7/52, 13.2; 5/5/52, 13.2; 6/2/52, 13.7; 8/5/52, 17.5; 9/15/52, 19.2; 10/17/52, 20.0; 11/3/52, 20.9, 12/4/52, 19.5; 1/27/53, 15.7; 2/17/53, 14.8; 6/9/53, 15.6; 7/17/53, 17.7; 9/22/53, 21.4; 10/27/53, 20.9; 11/4/53, 20.1.

10S/5W-35K5 - U. S. Navy - 2,045 feet north, 2,350 feet west of southeast corner of section 35; Camp Pendleton. Reference point - top of casing 1.8 feet above ground surface, at elevation 26.80 feet. 8/17/51, 27.4; 9/12/51, 25.5; 10/3/51, 29.6; 11/5/51, 27.4; 12/4/51, 24.7; 1/7/51, 22.3; 2/14/52, 16.0; 3/4/52, 12.7; 4/7/52, 12.4; 5/5/52, 12.9; 6/2/52, 13.0; 6/30/52, 16.0; 8/5/52, 17.5; 9/5/52, 21.0; 10/17/52, 19.8; 11/3/52, 19.4; 12/4/52, 18.2; 1/20/53, 14.0; 2/17/53, 14.0; 3/24/53, 12.8; 5/26/53, 14.9; 6/30/53, 19.3; 9/28/53, 20.3; 10/26/53, 22.1.

10S/5W-35R1 - U. S. Navy - 525 feet north, 1,050 feet west of southeast corner of section 35; Camp Pendleton. Reference point - (a) top of casing 1.5 feet above ground surface, at elevation 24.5 feet (9/13/50 and 10/12/50); (b) not described 2.0 feet above ground surface, at elevation 25.0 feet (11/6/50 through 8/4/51). 5/37, 6 (log); 9/13/50, 31.3; 10/12/50, 29.6; 11/6/50, 32.3; 12/4/50, 26.8; 1/2/51, 29.0; 2/5/51, 25.6; 3/5/51, 24.6; 4/2/51, 27.4; 5/7/51, 26.6; 6/4/51, 28.1; 7/2/51, 28.5; 8/6/51, 33.8; 9/4/51, 26.8; 10/3/51, 30.0; 11/5/51, 25.3; 12/4/51, 27.7; 12/28/51, 23.3; 1/7/52, 23.2; 3/18/52, 14.1; 4/7/52, 13.4; 5/5/52, 15.3; 6/2/52, 14.1; 8/5/52, 20.2; 9/5/52, 25.5; 10/17/52, 23.3; 11/3/52, 22.0; 12/4/52, 19.3; 1/27/53, 15.5; 2/17/53, 16.9; 6/9/53, 16.1; 7/17/53, 18.5; 9/22/53, 22.5; 10/27/53, 20.1; 11/4/53, 18.2.

10S/5W-35R2 - U. S. Navy - 500 feet north, 900 feet west of southeast corner of section 35; Camp Pendleton. Reference point - top of casing 1.25 feet above ground surface, at elevation 25.19 feet. 9/13/50, 31.2; 10/12/50, 29.4; 11/6/50, 31.8; 12/4/50, 26.5; 3/18/52, 21.4; 7/29/52, 20.1 (DWR); 6/9/53, 17.0 (DWR); 11/4/53, 18.0.

10S/5W-35R3 - U. S. Navy - 450 feet north, 1,050 feet west of southeast corner of section 35; 4 feet northeast of well 35R1; Camp Pendleton. Reference point - top of casing 3.0 feet above ground surface, at elevation 26.6 feet. 5/51, 21.5 (log); 5/4/51, 22.5; 6/4/51, 22.6; 7/16/51, 22.9; 8/20/51, 23.1; 9/4/51, 23.1; 10/3/51, 23.2; 11/5/51, 23.0; 12/4/51, 23.1; 1/7/52, 22.9; 3/25/52, 21.3; 4/7/52, 21.1; 5/5/52, 20.7; 6/2/52, 20.4; 6/30/52, 20.2; 7/29/52, 20.2 (DWR); 8/12/52, 20.2; 9/5/52, 20.3; 2/17/53, 17.9; 6/9/53, 16.1, 7/17/53, 16.5; 9/22/53, 16.2; 10/27/53, 15.7; 11/4/53, 15.7.

11S/5W-1E1 - U. S. Navy - 3,600 feet north, 5,250 feet west of southeast corner of section 1; Camp Pendleton. Reference point - top of casing 2.5 feet above ground surface, at elevation 23.5 feet. 9/13/50, 30.3, 10/12/50, 29.8; 11/6/50, 35.6; 12/4/50, 26.2; 1/3/51, 25.9; 2/12/51, 22.7; 3/20/51, 24.6; 5/16/51, 28.4; 6/20/51, 40.0; 8/17/51, 30.2; 9/12/51, 27.3; 10/10/51, 28.1; 12/18/51, 24.2; 3/4/52, 10.8; 4/7/52, 13.1; 5/5/52, 14.0, 6/2/52, 15.6; 6/30/52, 19.1; 7/29/52, 23.2 (DWR), 8/5/52, 20.7; 9/5/52, 26.7, 10/17/52, 23.4; 11/3/52, 20.8; 12/11/52, 20.0; 1/27/53, 13.6 (DWR); 2/17/53, 16.0 (DWR); 6/9/53, 19.1 (DWR); 10/21/53, 19.8 (DWR); 11/4/53, 17.4.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 6

(Depths to water in feet measured from reference point)
(continued)

Measurements for the following wells are from U. S. Navy records, except as indicated

11S/5W-2A1 - U. S. Navy - 5,100 foot north, 850 feet west of southeast corner of section 2; Camp Pendleton. Reference point - hole in pump base 2.6 feet above ground surface, at elevation 24.61 feet. 4/37, 5 (log); 2/18/47, 23; 12/10/47, 22; 1/9/48, 21; 2/7/48, 18; 2/22/48, 23; 8/15/49, 27; 10/2/49, 30; 11/29/49, 30; 3/2750, 24; 12/15/50, 33; 1/51, 32; 2/51, 33; 5/21/51, 25.1; 9/12/51, 27.0; 10/1/51, 27.8; 11/5/51, 24.4; 11/27/51, 24.6; 12/28/51, 22.9; 1/7/52, 22.9; 3/4/52, 11.4; 4/7/52, 13.2; 4/28/52, 22; 5/19/52, 12.1; 6/2/52, 14.0.

11S/5W-2A4 - U. S. Navy - 4,550 feet north, 650 feet west of southeast corner of section 2; Camp Pendleton. Reference point - ground surface. 4/12, 6 (log).

11S/5W-2A5 - U. S. Navy - 5,050 feet north, 800 feet west of southeast corner of section 2; 25 feet northeast of well 2A1; Camp Pendleton. Reference point - (a) top of pipe 3.0 feet above ground surface, at elevation 25.0 (5/16/51 through 10/1/51); (b) not described 4.4 feet above ground surface, at elevation 26.4 feet (11/5/51 to present). 5/51, 16 (log); 5/16/51, 18.9; 6/20/51, 18.9; 7/16/51, 18.9; 8/17/51, 19.1; 9/12/51, 19.1; 10/1/51, 19.1; 11/5/51, 20.0; 12/4/51, 20.2; 1/7/52, 20.2; 3/18/52, 19.3; 4/7/52, 19.1; 5/5/52, 18.8; 6/2/52, 18.7; 6/30/52, 18.6; 7/23/54, 18.6 (DWR); 8/5/52, 18.5; 9/5/52, 18.4; 10/17/52, 18.4; 11/14/52, 18.2; 12/4/52, 17.8; 1/27/53, 16.2 (DWR); 2/17/53, 15.6; 6/9/53, 13.5 (DWR); 7/17/53, 13.1; 9/22/53, 13.4; 10/27/53, 13.0; 11/4/53, 12.9.

11S/5W-2B1 - U. S. Navy - 4,750 foot north, 1,675 feet west of southeast corner of section 2; Camp Pendleton. Reference point - top of casing 2.33 feet above ground surface, at elevation 24.3 feet. 4/12, 8 (log); 7/29/52, 20.9 (DWR); 8/5/52, 21.5; 9/5/52, 23.3; 10/17/52, 23.8; 11/3/52, 22.4; 12/4/52, 20.0; 12/31/52; 19.2; 1/27/53, 15.7; 2/17/53, 16.7; 6/9/53, 19.1; 7/17/53, 20.3.

11S/5W-2B2 - U. S. Navy - 4,750 feet north, 1,675 feet west of southeast corner of section 2; west of well 2B1; Camp Pendleton. Reference point - top of casing 2.0 feet below ground surface, at elevation 20.0 feet. 5/16/51, 23.9; 6/20/51, 24.3; 7/16/51, 26.1; 8/17/51, 27.3; 9/12/51, 23.9; 10/10/51, 24.9; 11/19/51, 22.5; 12/18/51, 20.7; 3/18/52, 11.0; 4/22/52, 11.9; 5/19/52, 12.8; 6/17/52, 16.1; 7/29/52, 19.2; 8/5/52, 18.2; 9/5/52, 20.4; 10/17/52, 21.6; 11/3/52, 21.4; 12/4/52, 18.1; 1/27/53, 14.2; 2/17/53, 14.4; 6/9/53, 17.6; 7/17/53, 19.2; 9/22/53, 20.7; 10/27/53, 18.7; 11/4/53, 18.4.

11S/5W-2D1 - U. S. Navy - 4,850 feet north, 3,950 feet west of southeast corner of section 2; Camp Pendleton. Reference point - not reported, at elevation 28.21 feet. 2/18/47, 22; 12/10/47, 27; 1/9/48, 26; 2/6/48, 30; 2/14/48; 25; 3/27/50, 27.

11S/5W-2D2 - U. S. Navy - 4,500 feet north, 4,000 feet west of southeast corner of section 2; Camp Pendleton. Reference point - ground surface. 1/38, 8 (log).

11S/5W-2E1 - U. S. Navy - 3,375 foot north, 4,300 feet west of southeast corner of section 2; Camp Pendleton. Reference point - notch in casing 1.0 foot above ground surface, at elevation 2.1 feet. 12/38, 8 (log); 2/6/48, 25; 3/27/50, 25; 9/13/50, 26.6; 10/12/50, 29.2; 11/20/50, 24.2; 12/4/50, 24.6; 1/15/51, 25.1; 4/17/51, 27.6; 5/16/51, 26.1; 6/20/51, 29.7; 7/16/51, 30.2; 8/17/51, 29.0; 9/12/51, 26.8; 10/3/51, 26.1; 11/5/51, 24.1; 12/4/51, 24.6; 1/7/52, 21.9; 2/14/52, 17.3; 3/4/52, 10.3; 4/7/52, 13.2; 5/5/52, 12.4; 5/19/52, 12.8; 6/17/52, 14.8; 6/30/52, 16.4; 7/29/52, 21.3 (DWR); 8/5/52, 20.7; 9/5/52, 22.1; 10/11/52, 22.6; 11/3/52, 20.2; 12/4/52, 19.1; 1/27/53, 15.0; 2/17/53, 16.2; 7/17/53, 18.7; 9/22/53, 16.8; 10/27/53, 17.4; 11/4/53, 17.3.

11S/5W-2E2 - U. S. Navy - 3,950 feet north, 4,300 feet west of southeast corner of section 2; Camp Pendleton. Reference point - not reported. 2/18/47, 26; 12/10/47, 23; 1/9/48, 28.

11S/5W-2E3 - U. S. Navy - 2,750 feet north, 4,925 feet west of southeast corner of section 2; Camp Pendleton. Reference point - top of casing 2.5 feet above ground surface, at elevation 20.9 feet. 5/16/51, 24.5; 7/16/51, 27.1; 8/17/51, 27.9; 9/12/51, 26.6; 10/3/51, 26.5; 11/5/51, 25.7; 12/4/51, 25.0; 1/7/52, 24.0; 3/25/52, 9.0; 4/7/52, 9.0; 5/5/52, 9.0; 6/30/52, 10.0; 7/29/52, 13.8; 8/5/52, 14.0; 9/5/52, 15.5; 10/17/52, 17.2; 11/3/52, 17.6; 12/4/52, 17.6; 1/27/53, 14.5; 2/17/53, 10.5; 6/9/53, 13.0; 7/17/53, 14.8; 10/27/53, 13.2; 11/4/53, 13.3.

11S/5W-2E4 - U. S. Navy - 3,375 feet north, 4,300 feet west of southeast corner of section 2; Camp Pendleton. Reference point - ground surface. 5/51, 24 (log).

11S/5W-2F1 - U. S. Navy - 2,700 feet north, 2,975 feet west of southeast corner of section 2; Camp Pendleton. Reference point - not reported, at elevation 26.6 feet. 9/14/49, 28; 10/2/49, 28; 11/29/49, 29; 3/27/50, 20; 12/15/50, 26; 1/51, 28; 2/51, 26; 7/18/51, 30.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 6

(Depths to water in feet measured from reference point)
(continued)

Measurements for the following wells are from U. S. Navy records, except as indicated

11S/5W-2F3 - U. S. Navy - 2,700 feet north, 2,975 feet west of southeast corner of section 2; Camp Pendleton. Reference point - top of pipe in auger hole 2.2 feet above ground surface, at elevation 21.2 feet. 10/10/51, 12.7; 11/5/51, 12.6; 12/10/51, 12.9; 1/7/52, 12.7; 3/13/52, 3.4; 4/7/52, 5.2; 5/5/52, 5.4; 6/2/52, 5.7; 6/30/52, 6.0; 7/23/52, 6.4; 8/5/52, 6.4; 9/5/52, 6.9; 10/17/52, 6.9; 11/3/52, 7.0; 12/4/52, 6.9; 1/27/53, 3.8; 2/17/53, 3.4; 6/9/53, 3.7 (DWR); 7/17/53, 3.9; 9/22/53, 5.5; 10/27/53, 5.0; 11/4/53, 4.4.

11S/5W-2K1 - U. S. Navy - 2,325 feet north, 2,625 feet west of southeast corner of section 2; Camp Pendleton. Reference point - top of casing 5.2 feet above ground surface, at elevation 23.21 feet. 4/21, 4 (log); 12/10/47, 26.5; 1/4/48, 33; 1/25/48, 32; 2/25/48, 23; 11/27/51, 23.4; 12/3/51, 26.5; 1/7/52, 21.2; 3/13/52, 10.5; 4/14/52, 5.7; 5/5/52, 11.6; 6/2/52, 15.9; 6/30/52, 16.6; 7/23/52, 21.8; 8/12/52, 15.3; 6/9/53, 19.0.

11S/5W-2K2 - U. S. Navy - 1,900 feet north, 1,755 feet west of southeast corner of section 2; Camp Pendleton. Reference point - (a) top of casing 2.0 feet above ground surface, at elevation 26.0 (8/17/51 and 9/3/51); (b) not described 2.4 feet above ground surface, at elevation 26.4 feet (9/1/51 to present). 8/17/51, 27.5; 9/3/51, 24.5; 10/1/51, 24.6; 11/5/51, 23.5; 12/3/51, 23.5; 1/4/52, 22.2; 3/18/52, 15.5; 5/5/52, 15.0; 6/2/52, 15.6; 7/23/52, 17.4; 8/5/52, 17.6; 9/5/52, 18.9; 10/7/52, 19.2; 11/3/52, 18.9; 12/4/52, 17.9; 1/27/53, 15.6; 2/17/53, 15.7; 6/9/53, 16.0 (DWR); 7/17/53, 17.5; 10/26/53, 17.9.

11S/5W-2M1 - U. S. Navy - 2,500 feet north, 4,300 feet west of southeast corner of section 2; Camp Pendleton. Reference point - top of casing 2 feet above ground surface, at elevation 17.4 feet. 6/9/53, 8.7 (DWR).

11S/5W-2N1 - U. S. Navy - 600 feet north, 5,200 feet west of southeast corner of section 2; Camp Pendleton. Reference point - top of casing 4 feet above ground surface, at elevation 13.7 feet. 7/23/52, 5.8 (DWR); 8/5/52, 6.0; 6/9/53, 5.4 (DWR); 7/17/53, 5.6; 9/22/53, 8.2; 10/27/53, 8.8; 11/4/53, 8.8.

11S/5W-2N4 - U. S. Navy - 810 feet north, 4,775 feet west of southeast corner of section 2; Camp Pendleton. Reference point - (a) top of casing 1 foot above ground surface, at elevation 17.2 feet (8/11/51 through 10/1/51); (b) not described 1.2 feet above ground surface, at elevation 17.4 feet (10/9/51 to present). 8/17/51, 21.8; 9/12/51, 20.8; 10/1/51, 18.9; 10/9/51, 21.9; 11/5/51, 18.2; 12/3/51, 18.7; 1/4/52, 17.9; 3/11/52, 8.5; 4/7/52, 8.9; 5/5/52, 8.8; 6/2/52, 9.7; 7/7/52, 13.6; 8/5/52, 13.2; 9/5/52, 14.3; 10/17/52, 14.7; 11/3/52, 13.8; 12/1/52, 13.0; 1/5/53, 12.6; 2/9/53, 9.0; 3/6/53, 10.1; 4/6/53, 9.5; 5/4/53, 9.4; 6/2/53, 13.0; 7/13/53, 13.6; 8/10/53, 13.8; 9/8/53, 14.8; 10/12/53, 13.6; 11/9/53, 14.1; 12/15/53, 14.2.

11S/5W-2N5 - U. S. Navy - 800 feet north, 5,100 feet west of southeast corner of section 2; Camp Pendleton. Reference point - top of casing 9.5 feet above ground surface, at elevation 18.4 feet. 8/17/51, 20.8; 9/12/51, 20.7; 10/1/51, 20.7; 11/5/51, 20.5; 12/3/51, 20.8; 1/4/52, 20.0; 3/18/52, 7.2; 4/7/52, 8.5; 5/5/52, 8.7; 6/2/52, 9.5; 7/23/52, 10.7; 7/14/52, 10.5; 8/5/52, 11.0; 9/5/52, 11.7; 10/17/52, 12.5; 11/3/52, 12.8; 12/4/52, 13.1; 1/27/53, 7.7; 2/17/53, 8.6; 6/9/53, 10.1 (DWR); 7/17/53, 11.4; 9/22/53, 12.9; 10/27/53, 13.5; 11/4/53, 13.6.

11S/5W-2P1 - U. S. Navy - 270 feet north, 3,150 feet west of southeast corner of section 2; Camp Pendleton. Reference point - top of casing 2 feet above ground surface, at elevation 44 feet. 7/26/51, 44.9; 8/17/51, 45.0; 9/11/51, 44.1; 10/10/51, 44.3; 11/19/51, 44.0; 12/26/51, 43.6; 3/18/52, 38.2; 4/22/52, 37.0; 5/19/52, 36.7; 6/17/52, 36.7; 7/20/52, 37.1; 9/6/52, 37.3; 10/14/52, 37.7; 11/18/52, 38.0; 12/28/52, 37.7; 1/26/53, 35.8; 2/17/53, 35.4; 3/24/53, 35.1; 6/15/53, 35.6; 6/29/53, 35.7; 10/26/53, 35.4.

11S/5W-9J1 - U. S. Navy - 2,000 feet north, 1,135 feet west of southeast corner of section 9; Camp Pendleton. Reference point - top of casing 3.0 feet above ground surface, at elevation 9.3 feet. 8/17/51, 9.6; 9/11/51, 9.5; 10/2/51, 8.8; 11/5/51, 7.7; 12/3/51, 7.8; 3/27/52, 5.0; 4/22/52, 5.2; 5/19/52, 5.4; 6/16/52, 6.1; 7/14/52, 6.2; 8/19/52, 6.6; 10/14/52, 6.9; 11/18/52, 6.3; 1/20/53, 7.2; 2/17/53, 5.7; 3/23/53, 5.4; 5/26/53, 5.7; 3/23/53, 5.4; 5/26/53, 5.7; 6/29/53, 6.2; 10/26/53, 6.6.

11S/5W-9J2 - U. S. Navy - 2,000 feet north, 1,105 feet west of southeast corner of section 9; Camp Pendleton. Reference point - top of casing 1.5 feet above ground surface, at elevation 4.5 feet. 10/3/51, 7.6; 11/5/51, 7.4; 12/3/51, 7.3; 1/3/52, 6.2; 3/27/52, 4.1; 4/22/52, 4.7; 5/19/52, 5.3; 6/16/52, 5.9; 7/14/52, 6.2; 8/19/52, 6.6; 9/5/52, 6.7; 10/17/52, 6.8; 11/3/52, 6.9; 12/4/52, 5.8; 1/27/53, 5.0; 7/17/53, 6.7; 9/22/53, 6.9; 10/27/53, 7.2; 11/4/53, 7.1.

DEPTHS TO GROUND WATER AT WELLS IN HYDROGRAPHIC UNIT NO. 6

(Depths to water in feet measured from reference point)
(continued)

Measurements for the following wells are from U. S. Navy records, except as indicated

11S/5W-10A1 - U. S. Navy - 4,400 feet north, 300 feet west of southeast corner of section 10; Camp Pendleton. Reference point - top of casing 4 feet above ground surface, at elevation 13.4 feet. 7/23/52, 7.1 (DWR); 8/5/52, 7.3; 9/5/52, 7.7; 10/17/52, 8.3; 11/3/52, 8.4; 12/4/52, 8.3; 1/27/53, 6.4; 2/17/53, 6.8; 6/9/53, 7.0 (DWR); 7/17/53, 7.5; 9/22/53, 8.6; 10/27/53, 9.0; 11/4/53, 9.0.

11S/5W-10B1 - U. S. Navy - 4,025 feet north, 1,650 feet west of southeast corner of section 10; Camp Pendleton. Reference point - top of casing 1.5 feet above ground surface, at elevation 13.5 feet. 9/17/51, 15.0; 9/11/51, 15.5; 10/1/51, 13.2; 11/5/51, 12.6; 12/3/51, 13.1; 1/2/52, 11.8; 3/25/52, 6.4; 4/7/52, 6.4; 5/5/52, 6.7; 6/17/52, 8.0; 7/14/52, 9.0; 8/20/52, 9.2; 10/14/52, 10.5; 11/18/52, 9.4; 12/23/52, 8.7; 1/20/53, 6.3; 2/17/53, 7.4; 3/24/53, 6.9; 5/26/53, 8.2; 6/29/53, 8.7; 7/24/53, 9.7; 8/24/53, 9.4; 9/28/53, 10.1; 10/26/53, 10.0; 11/30/53, 9.4; 12/28/53, 9.6.

11S/5W-10C1 - U. S. Navy - 3,850 feet north, 1,450 feet west of southeast corner of section 10; Camp Pendleton. Reference point - top of casing 4.0 feet above ground surface, at elevation 12.8 feet. 8/17/51, 12.2; 9/11/51, 12.3; 10/1/51, 12.3; 11/5/51, 12.4; 12/3/51, 12.4; 1/7/52, 11.9; 3/25/52, 6.1; 4/7/52, 6.8; 5/7/52, 7.0; 6/17/52, 7.7; 7/14/52, 8.0; 8/5/52, 8.2; 9/5/52, 8.6; 10/17/52, 8.7; 11/3/52, 8.8; 12/4/52, 8.5; 1/27/53, 7.3; 2/17/53, 7.7; 6/9/53, 8.2 (DWR); 7/17/53, 8.7; 9/22/53, 9.3; 10/27/53, 9.4; 11/4/53, 9.3.

APPENDIX H

RECORDS OF MINERAL ANALYSES

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RECORDS OF MINERAL ANALYSES

APPENDIX H

TABLE H-1

MINERAL ANALYSES OF SPRING WATERS IN SANTA MARGARITA RIVER WATERSHED[a]

Spring number	Spring name	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
					Mineral constituents in parts per million / equivalents per million													
	Hydrographic Unit No. 1																	
7S/3W-14J2	Kidney Spring (Murrieta Hot Springs)	10-10-52	1,030	8.9	2/0.10	1/0.06	205/8.90	--	--	67/1.1	14/0.30	266/7.5	2/0.03	--	2.1	523[b]	8	98
14	Murrieta Hot Springs (Sampled downstream from resort)	1- 5-54	1,351	7.8	22/1.1	4/0.36	250/11.0	4.3/0.11	--	110/1.8	46/0.95	362/10.2	3.3/0.05	4.4	0.8	731	78	88
14	Murrieta Hot Springs (largest spring)	July[c] 1916	---	--	13/0.65	2/0.20	237/10.30	--	14/0.47	19/0.31	24/0.50	350/9.87	0/0	--	--	745	42	92
35K2		8-19-53	1,280	7.8	24/1.2	16/1.29	228/9.92	--	--	250/4.1	37/0.77	266/7.5	3/0.05	0.9	1.0	744	124	80
35K3		8-19-53	790	7.6	28/1.4	15/1.24	111/4.84	--	--	158/2.6	30/0.62	156/4.3	1/0.02	0.2	0.4	467	134	65
8S/3W- 1N2	Sheep Camp Spring	1939[d]	832	--	39/1.93	7/0.77	117/5.09	0/0	0/0	146/2.40	35/0.72	156/4.40	9/0.14	--	--	511	135	65

MINERAL ANALYSES OF SPRING WATERS IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Spring number	Spring name	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
					Mineral constituents in parts per million / equivalents per million													
					Hydrographic Unit No. 2													
6S/1E-25Q		9-23-53	323	7.8	33 / 1.65	9 / 0.72	25 / 1.08	6 / 0.16	--	159 / 2.6	7 / 0.14	21 / 0.6	1 / 0.02	0.2	0.02	242	118	30
7S/1E-20G1		2- 1-51	290	9.5	2 / 0.1	1 / 0.04	67 / 2.92	--	45 / 1.5	--	9 / 0.19	44 / 1.25	3 / 0.04	--	0.2	171[b]	7	95
20G2		2- 1-51	280	9.1	3 / 0.15	0 / 0.03	66 / 2.89	--	45 / 1.5	--	10 / 0.22	46 / 1.3	4 / 0.07	--	0.2	174[b]	9	94
24G		9-23-52	480	8.4	31 / 1.55	5 / 0.40	55 / 2.41	--	--	171 / 2.8	19 / 0.40	46 / 1.3	2 / 0.02	--	0.2	243[b]	92	55
24P		9-23-52	760	8.4	47 / 2.35	16 / 1.35	114 / 4.96	--	--	299 / 4.9	72 / 1.50	78 / 2.2	3 / 0.05	--	0.2	480[b]	185	57
25C		11-16-51	440	8.2	32 / 1.6	9 / 0.72	60 / 2.62	--	--	183 / 3.0	17 / 0.36	57 / 1.6	1 / 0.02	--	0.1	267[b]	116	53
30G		2- 2-51	---	--	82 / 4.1	31 / 2.54	59 / 2.56	--	--	140 / 2.3	235 / 4.88	64 / 1.8	5 / 0.08	--	0.01	546[b]	332	28
7S/2E- 6N2		9-23-53	370	7.7	29 / 1.45	10 / 0.86	36 / 1.56	4 / 0.10	--	137 / 2.25	30 / 0.63	28 / 0.8	0 / 0	0.3	0.3	272	116	39
6Q	Duval Spring	9-23-53	676	7.8	76 / 3.8	24 / 2.0	46 / 2.00	9 / 0.22	--	165 / 2.6	186 / 3.88	35 / 1.0	1 / 0.02	0.2	0.2	506	290	26
20H		3- 8-51	630	7.8	65 / 3.25	23 / 1.87	43 / 1.87	--	--	183 / 3.0	123 / 2.57	50 / 1.4	3 / 0.04	--	0.0	398[b]	256	27
26C	Coahuila Spring	11-15-51	310	9.8	2 / 0.10	1 / 0.06	38 / 1.67	--	18 / 0.6	--	27 / 0.57	25 / 0.7	2 / 0.02	--	0.2	113[b]	8	91
		8-18-53	330	8.8	2 / 0.1	0 / 0	67 / 2.89	--	--	101 / 1.65	24 / 0.51	28 / 0.8	1 / 0.02	1.2	0.4	242	5	97
8S/1E- 8G		2-16-51	450	9.0	4 / 0.2	1 / 0.05	108 / 4.70	--	60 / 2.0	--	19 / 0.39	89 / 2.5	3 / 0.04	--	0.2	283[b]	12	96
8K1		2-16-51	530	9.3	4 / 0.2	0 / 0.03	119 / 5.16	--	60 / 2.0	--	20 / 0.42	106 / 3.0	3 / 0.04	--	0.2	312[b]	11	95

MINERAL ANALYSES OF SPRING WATERS IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Spring number	Spring name	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
					Mineral constituents in parts per million / equivalents per million													
					Hydrographic Unit No. 2 (continued)													
8S/1E- 8Q		2-16-51	550	8.9	3 / 0.15	0 / 0.02	125 / 5.43	--	45 / 1.5	--	22 / 0.45	128 / 3.6	2 / 0.03	--	0.5	325[b]	8	98
8S/2E- 7D		8-20-53	430	7.5	10 / 0.5	5 / 0.42	72 / 3.13	--	--	85 / 1.4	36 / 0.76	57 / 1.6	3 / 0.04	2.1	0.4	281	46	77

MINERAL ANALYSES OF SPRING WATERS IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Spring number	Spring name	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
					Mineral constituents in parts per million / equivalents per million													
					Hydrographic Unit No. 3													
8S/1W-21C	Dripping Spring	2- 9-51	470	7.8	48/2.4	15/1.21	36/1.57	--	--	225/3.7	23/0.49	35/1.0	4/0.07	--	0.0	273[b]	180	30
25B		1-25-51	510	8.2	58/2.9	16/1.28	50/2.16	--	--	128/2.1	53/1.10	75/2.1	2/0.04	--	0.1	318[b]	209	34
25N		1-25-51	500	7.8	55/2.75	17/1.41	45/1.94	--	--	262/4.3	27/0.57	35/1.0	3/0.05	--	0.0	313[b]	208	32
36H	Sawyer Spring	1-25-51	300	9.6	0/0	2/0.19	73/3.19	--	60/2.0	--	29/0.61	14/0.40	3/0.04	--	0.4	181[b]	10	94
36K		1-25-51	280	10.2	1/0.05	2/0.13	74/3.21	--	63/2.1	--	19/0.39	2/0.05	2/0.03	--	0.4	163[b]	9	95
36Q		1-25-51	300	10.1	0/0	3/0.28	77/3.33	--	66/2.2	--	29/0.60	2/0.05	3/0.04	--	0.5	180[b]	14	92
8S/2E-19B		3-16-51	580	8.0	33/1.65	39/0.32	105/4.56	--	--	140/2.3	52/1.06	85/2.4	3/0.05	--	0.2	387[b]	98	70
22G1	Twin Oaks Spring	11- 2-53	627	8.0	72/3.6	15/1.25	51/2.21	7/0.18	--	122/2.0	174/3.63	43/1.2	2/0.04	0.3	0.1	510	242	31
Composite of 8S/3E-31G1 31G2		3-15-54	1,190	8.0	164/8.2	33/2.77	54/2.33	10/0.25	--	125/2.05	458/9.55	51/1.45	3/0.05	0.2	0.01	926	548	18
9S/1E- 3C		12- 7-50	960	7.6	111/5.55	31/2.55	111/4.82	--	--	214/3.5	295/6.15	71/2.0	6/0.10	--	0.03	732[b]	405	40
4A1	Fault Spring	12- 7-50	1,800	7.4	288/14.4	89/7.28	98/4.24	--	--	171/2.8	1000/20.85	78/2.2	5/0.08	--	0.0	1,643[b]	1,085	16
4A2	Tunnel Spring	12- 7-50	1,710	7.4	287/14.35	84/6.89	92/4.01	--	--	164/2.7	920/19.18	78/2.2	6/0.10	--	0.2	1,549[b]	1,063	16
12R		8-24-53	1,820	7.8	244/12.2	73/6.00	99/4.28	--	--	207/3.4	820/17.1	64/1.8	2/0.04	0.6	0.1	1,564	910	19
9S/2E-23K		2-16-51	340	7.6	33/1.65	10/0.78	37/1.60	--	--	201/3.3	7/0.14	20/0.55	3/0.04	--	0.1	210[b]	122	40

MINERAL ANALYSES OF SPRING WATERS IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Spring number	Spring name	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
					Mineral constituents in parts per million / equivalents per million													
					Hydrographic Unit No. 3 (continued)													
9S/2E-34L		3- 6-51	510	8.3	67 / 3.35	11 / 0.89	29 / 1.28	--	--	238 / 3.9	54 / 1.13	28 / 0.8	4 / 0.07	--	0.0	312[b]	212	23
		10- 8-53	520	7.7	64 / 3.2	13 / 1.05	23 / 0.98	--	--	226 / 3.7	48 / 1.0	27 / 0.75	3 / 0.05	0.1	0.04	349	212	19
					Hydrographic Unit No. 4													
8S/2W-18J	McSweeny Spring	1939	419	--	5 / 0.25	0 / 0.04	84 / 3.66	0 / 0	6 / 0.20	113 / 1.85	11 / 0.22	58 / 1.65	1 / 0.02	--	--	278	15	93
22N		3-12-53	510	9.0	10 / 0.5	2 / 0.20	103 / 4.46	--	--	116 / 1.9	10 / 0.20	99 / 2.8	8 / 0.13	--	0.2	290[b]	35	86
36F	Collier Spring	2-11-52	350	7.8	17 / 0.85	4 / 0.31	66 / 2.87	--	--	134 / 2.2	29 / 0.61	46 / 1.3	1 / 0.01	--	0.1	229[b]	58	71
8S/3W-24R		3-26-53	240	7.7	10 / 0.5	8 / 0.65	31 / 1.37	--	--	97 / 1.6	3 / 0.07	28 / 0.8	1 / 0.02	--	0.02	129[b]	58	54

MINERAL ANALYSES OF SPRING WATERS IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Spring number	Spring name	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
					Mineral constituents in parts per million / equivalents per million													
					Hydrographic Unit No. 5													
8S/4W-32M		5-24-54	358	9.6	1 / 0.05	0 / 0	70 / 3.03	1 / 0.01	10 / 0.32	94 / 1.58	4 / 0.09	43 / 1.2	2 / 0.03	1.5	0.3	238	2	98
8S/5W-13Q1		5-26-54	222	7.8	13 / 0.65	2 / 0.2	30 / 1.31	1 / 0.02	--	76 / 1.25	1 / 0.02	30 / 0.85	2 / 0.03	0.2	0.1	193	42	60
9S/3W- 4R		2-26-54	535	7.9	44 / 2.2	21 / 1.75	36 / 1.56	1 / 0.02	--	226 / 3.7	10 / 0.21	50 / 1.4	5 / 0.08	0.2	0.0	327	198	28
17F		7- 9-52	550	6.9	30 / 1.50	26 / 2.14	47 / 2.03	--	--	183 / 3.0	16 / 0.34	75 / 2.1	10 / 0.16	--	0.1	295[b]	182	36
9S/4W- 5P		8-25-54	373	7.5	48 / 2.4	6 / 0.47	41 / 1.77	3 / 0.08	--	171 / 2.8	17 / 0.35	50 / 1.4	6 / 0.10	0.2	0.1	288	144	37

a. All analyses by Division of Water Resources unless otherwise noted.
b. Total dissolved solids determined by summation.
c. United States Geological Survey, Water Supply Paper 429, 1919.
d. Analysis obtained from Vail Company.

TABLE H-2

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]

Stream	Stream mile	Date Time	Discharge, second-feet	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
Hydrographic Unit No 1																			
Cole Canyon Creek	93-30.1-9.0-0.1	1-25-54	23	149	7.6	10/0.5	6/0.50	10/0.5	2/0.06	--	43/0.7	15/0.32	14/0.4	7/0.12	0.3	0.01	132	50	30
		1-26-54	5.3	253	7.9	20/1.00	8/0.70	20/0.89	3/0.07	--	68/1.1	19/0.39	28/0.8	9/0.14	0.3	0.0	195	85	34
		3-23-54 0930	13	235	7.7	20/1.0	6/0.48	19/0.81	1/0.03	--	85/1.4	18/0.5	14/0.29	2/0.03	0.3	0.03	176	74	35
		3-24-54 0845	7.5	267	7.6	22/1.1	6/0.53	22/0.94	1/0.03	--	85/1.4	21/0.6	15/0.31	3/0.06	0.1	0.02	190	82	36
Murrieta Creek	93-30.1-0.2	1939[b]	---	1,370	---	60/3.02	23/1.90	194/8.42	0/0	12/0.40	217/3.55	127/2.65	238/6.70	0/0	--	--	871	--	63
		1939[b]	---	1,930	---	69/3.45	32/2.59	292/12.7	0/0	0/0	274/4.50	176/3.66	372/10.5	0/0	--	--	1,315	--	68
	-0.4	1939[b]	---	1,670	---	67/3.35	29/2.36	244/10.6	0/0	0/0	259/4.25	156/3.26	310/8.75	0/0	--	--	1,065	--	65
		6- 4-54	1[e]	1,266	7.6	44/2.2	15/1.22	196/8.53	15/0.38	--	256/4.2	76/1.58	223/6.3	4/0.06	0.6	0.4	743	171	69
	-1.4	8-19-53	1[e]	760	7.7	30/1.5	9/0.76	117/5.09	--	--	226/3.7	17/0.36	121/3.4	2/0.04	0.2	0.2	463	113	68
Tributary to Murrieta Creek (Borenstein's Canyon)	93-30.1-7.1-4.1	4-22-53	---	1,800	7.9	123/6.15	55/4.53	205/8.90	--	--	531/8.7	152/3.16	273/7.7	15/0.24	--	0.15	1,088	534	45
Santa Gertrudis Creek	93-30.1-3.9-0.6	1-25-54	55	96	7.0	8/0.4	3/0.25	5/0.23	2/0.06	--	31/0.5	10/0.20	7/0.2	6/0.09	0.0	0.01	103	32	24
		1-25-54	6	148	7.5	10/0.5	2/0.20	13/0.58	4/0.09	--	31/0.5	27/0.56	11/0.3	2/0.04	--	0.05	267	35	42
Warm Springs Creek	93-30.1-4.8-0.5	2-27-53	0.12	1,040	7.9	38/1.9	11/0.89	169/7.35	--	--	140/2.3	80/1.67	216/6.1	2/0.03	--	1.05	586[d]	140	73
		3- 2-53	3.3	1,780	8.3	100/5.0	48/3.93	226/9.83	--	--	287/4.7	209/4.35	344/9.7	4/0.06	--	0.8	1,074[d]	446	53

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge, second-feet	ECx10⁶ at 25°C	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Hydrographic Unit No. 1 (continued)													
Warm Springs Creek	93 30.1-4.8-0.5	1-25-54	81	749	7.5	38/1.9	14/1.13	98/4.25	4/0.11	--	110/1.8	86/1.80	142/4.0	7/0.12	0.9	0.3	487	152	55
		1-25-54	60	196	7.5	14/0.7	5/0.40	23/1.01	5/0.13	--	61/1.0	24/0.51	25/0.7	2/0.04	--	0.03	335	55	45
		1-27-54	0.9	905	7.8	46/2.3	15/1.28	130/5.56	4/0.09	--	140/2.3	96/2.00	177/5.0	5/0.08	0.9	0.6	578	179	61
		3-22-54	110	417	7.6	28/1.4	8/0.67	40/1.73	4/0.09	--	79/1.3	50/1.05	50/1.4	5/0.07	0.1	0.03	306	104	45
		3-23-54 / 1600	11	552	7.9	30/1.5	10/0.86	66/2.86	3/0.08	--	116/1.9	41/0.85	78/2.2	7/0.11	0.4	0.3	335	118	54

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge, second-feet	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
						Hydrographic Unit No. 2													
Coahuila Creek	93-41.6-7.6	1-31-51 / 1525	0.22	1,550	7.7	93/4.65	36/2.95	238/10.30	--	--	244/4.0	416/8.66	188/5.3	3/0.04	--	0.2	1,096[d]	380	58
		4- 8-54	--	885	8.3	76/3.8	27/2.2	217/9.42	9/0.23	--	323/5.3	226/4.72	206/5.8	4/0.06	1.2	0.4	962	300	60
	-11.3	12- 7-50 / 0900	--	520	8.0	40/2.0	13/1.06	69/3.02	--	--	146/2.4	70/1.46	57/1.6	9/0.14	--	0.0	331[d]	153	50
		12- 9-53 / 1515	0.17	600	8.0	40/2.0	13/1.10	73/3.19	4/0.11	--	165/2.7	83/1.72	67/1.9	4/0.07	0.4	0.1	419	155	50
Lancaster Creek	93 41.6-0.2	11-10-50	--	1,850	7.8	86/4.3	33/2.68	317/13.38	--	--	458/7.5	276/5.75	266/7.5	3/0.04	--	0.4	1,210[d]	349	66
		11-27-51	--	1,870	8.2	84/4.2	31/2.57	300/13.03	--	--	402/6.6	272/5.67	255/7.2	4/0.06	--	0.4	1,147[d]	338	66
	-3.4	11-10-50	--	1,900	8.1	101/5.05	43/3.55	298/12.95	--	--	290/6.4	322/6.72	305/8.6	7/0.12	--	0.3	1,221[d]	430	60
		11-19-51	--	1,790	7.8	95/4.75	37/3.03	285/12.40	--	--	397/6.5	284/8.0	296/6.16	4/0.07	--	0.3	1,200[d]	389	62
		4- 1-53	--	1,780	8.1	72/3.6	37/3.10	272/11.80	--	--	336/5.5	265/5.53	259/7.3	2/0.03	--	0.4	1,075[d]	335	64
	-5.5	11-21-50 / 1615	0.28	1,410	8.6	60/3.0	33/2.7	250/10.90	--	--	244/4.0	247/5.14	220/6.2	4/0.06	--	0.0	936[d]	285	67
		1-26-51	--	1,360	8.5	80/4.0	30/2.43	226/9.83	--	--	378/6.2	220/4.57	202/5.7	3/0.04	--	0.2	950[d]	322	61
		11-19-51	--	1,410	8.4	71/3.55	31/2.60	225/9.78	--	--	385/6.3	226/4.72	199/5.6	2/0.03	--	0.2	946[d]	308	51
		4-14-53	--	1,380	8.2	67/3.35	27/2.20	201/8.75	--	--	330/5.4	224/4.66	160/4.5	2/0.02	--	0.2	846[d]	278	61
	-5.8	1-26-51	--	1,360	8.2	78/3.9	30/2.44	214/9.26	--	--	366/6.0	192/5.4	220/4.57	4/0.06	--	0.2	921[d]	317	60

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge, second-feet	$EC \times 10^6$ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
						Hydrographic Unit No. 2 (continued)													
Wilson Creek	93-41.6-7.2-1.8	1-31-51 / 1645	0.01	1,490	7.8	147 / 7.35	51 / 4.18	161 / 7.00	--	--	470 / 7.7	323 / 6.73	145 / 4.1	4 / 0.06	--	0.1	1,066[d]	576	38
		11-16-51	0.002	1,560	8.4	151 / 7.55	54 / 4.45	183 / 7.93	--	--	513 / 8.4	340 / 7.08	160 / 4.5	2 / 0.03	--	0.2	1,146[d]	600	40
		9-23-52 / 1045	0.06	1,270	8.2	110 / 5.50	40 / 3.33	135 / 5.87	--	--	421 / 6.9	219 / 4.56	114 / 3.2	3 / 0.04	--	0.2	831[d]	442	40
		5-14-54 / 0855	0.19	1,321	8.3	126 / 6.3	39 / 3.25	125 / 5.43	7 / 0.17	--	396 / 6.5	257 / 5.35	119 / 3.35	3 / 0.04	0.6	0.1	957	478	36
	-2.4	11-16-51	0.02	1,050	8.3	106 / 5.30	37 / 3.07	112 / 4.85	--	--	446 / 7.3	159 / 3.31	82 / 2.3	2 / 0.02	--	0.11	721[d]	418	37
		9-23-52	--	1,300	8.5	102 / 5.10	41 / 3.36	143 / 6.22	--	--	470 / 7.7	143 / 2.97	124 / 3.5	2 / 0.04	--	0.2	790[d]	423	42
	-4.5	2- 1-51 / 1740	0.04	890	8.2	85 / 4.25	29 / 2.40	93 / 4.07	--	--	287 / 4.7	189 / 3.98	67 / 1.9	4 / 0.06	--	0.04	610[d]	332	38
		11-16-51	--	950	8.6	88 / 4.4	30 / 2.48	82 / 3.56	--	--	293 / 4.8	198 / 4.12	74 / 2.1	2 / 0.03	--	0.1	620[d]	344	34
		9-23-52 / 1340	0.20	1,180	8.4	100 / 5.00	37 / 3.10	109 / 4.72	--	--	293 / 4.8	264 / 5.55	82 / 2.3	2 / 0.04	--	0.1	740[d]	405	37
	-6.3	2- 1-51 / 1125	0.05	640	8.1	64 / 3.2	22 / 1.80	65 / 2.82	--	--	336 / 5.5	40 / 0.84	46 / 1.3	3 / 0.05	--	0.0	408[d]	250	36
	-6.5	2- 1-51	--	670	8.1	72 / 3.60	22 / 1.82	64 / 2.76	--	--	384 / 6.3	35 / 0.73	46 / 1.3	3 / 0.04	--	0.03	434[d]	271	34

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge second-foot	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
						Hydrographic Unit No. 3													
Arroyo Seco Creek	93-41.1-1.7	1939[b]	--	747	--	65/3.24	17/1.39	72/3.14	0/0	0/0	293/4.80	46/0.96	69/1.95	0/0	--	--	562	232	40
		11-10-50	--	620	7.8	63/3.15	17/1.39	80/2.95	--	--	244/4.0	81/1.7	57/1.6	2/0.04	--	0.04	422[d]	227	40
		4-8-54	5[c]	357	8.1	35/1.75	11/0.90	34/1.49	3/0.07	--	149/2.45	41/0.86	32/0.9	4/0.06	0.4	0.1	282	132	35
	7.8	3-29-51	--	330	8.2	26/1.3	9/0.75	37/1.60	--	--	153/2.5	17/0.36	25/0.7	1/0.01	--	0.0	191[d]	102	44
Chihuahua Creek	93-55.1-4.0	1-10-51 / 1730	0.02	2,130	8.1	234/11.7	92/7.50	230/10.0	--	--	390/6.4	802/16.7	195/5.5	3/0.05	--	0.1	1,751[d]	960	34
		11-15-51	0.01	3,080	8.1	326/16.3	118/9.80	316/13.45	--	--	458/7.5	1165/24.30	298/8.4	2/0.04	--	0.2	2,454[d]	1,305	34
	5.9	1-11-51 / 1000	0.05	1,220	8.2	142/7.1	39/3.20	123/5.35	--	--	457/7.5	250/5.26	82/2.3	3/0.06	--	0.0	867[d]	515	34
Unnamed tributary to Cooper Canyon, tributary to Chihuahua Creek	93-55.1-6.0-0.8-0.7	4-27-53[e] / 1200	0.02	1,085	7.9	156/7.79	32/2.67	53/2.30	9/0.23	0/0	131/2.14	456/9.50	54/1.53	5/0.08	--	0.1	921	523	18
Kohler Canyon	93-57.5-1.3	1-10-51 / 1645	0.19	390	8.0	49/2.45	10/0.78	37/1.60	--	--	164/2.7	45/0.93	25/0.7	1/0.01	--	0.0	249[d]	152	33
		2-9-51 / 930	0.19	450	8.3	53/2.65	10/0.84	29/1.25	--	--	189/3.1	52/1.08	32/0.9	4/0.06	--	0.0	274[d]	174	26
		11-19-51	--	420	8.6	49/2.45	10/0.80	36/1.57	--	--	182/3.0	44/0.91	28/0.8	1/0.02	--	--	259[d]	162	33
		4-1-53	--	480	8.4	46/2.3	16/1.35	38/1.64	--	--	195/3.2	46/0.96	28/0.8	1/0.02	--	0.1	272[d]	182	31
Rattlesnake Creek	93-57.3-0.4	5-13-54	0.13	707	8.0	91/4.55	24/2.02	55/2.41	10/0.25	--	265/4.35	162/3.38	39/1.1	3/0.05	0.4	0.1	585	328	26
Temecula Creek	93-41.3	1939[b]	--	949	--	80/4.01	24/1.98	95/4.13	0/0	6/0.20	265/4.35	185/3.86	60/1.70	0/0	--	--	715	[illegible]	41

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date Time	Discharge second-feet	ECx10^6 at 25°C	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as CaCO3, ppm	Per cent sodium
						Hydrographic Unit No. 3 (continued)													
Temecula Creek	93-42.5	11-10-50	--	1,200	7.7	121 / 6.05	34 / 2.73	103 / 5.80	--	--	342 / 5.6	281 / 5.85	106 / 3.0	4 / 0.07	--	0.2	820[d]	439	40
	93-42.8	1939[b]	5.4	938	--	80 / 4.01	24 / 1.96	93 / 4.03	--	0 / 0	272 / 4.45	183 / 3.82	60 / 1.70	--	--	--	712	---	40
		11-27-51 / 1000	0.56	1,070	8.0	101 / 5.05	29 / 2.38	114 / 4.95	--	--	305 / 5.0	239 / 4.98	89 / 2.5	2 / 0.03	--	0.2	726[d]	372	40
	93-45.0	1-21-52[e]	35	417	8.0	33 / 1.64	10 / 0.84	32 / 1.39	--	--	95 / 1.56	78 / 1.63	32 / 0.90	2 / 0.03	0.3	0.1	303	124	36
		3-17-52[e]	--	241	7.6	22 / 1.10	7 / 0.57	20 / 0.87	2 / 0.06	0 / 0	78 / 1.28	43 / 0.90	16 / 0.45	3 / 0.05	--	0.02	185	84	33
		3-22-54 / 1730	350	135	7.3	16 / 0.8	2 / 0.2	9 / 0.39	3 / 0.08	0 / 0	49 / 0.8	15 / 0.31	2 / 0.05	1 / 0.02	0.1	0.01	116	50	27
		3-23-54 / 1305	122	210	7.8	20 / 1.0	4 / 0.33	14 / 0.61	3 / 0.07	--	67 / 1.1	31 / 0.64	9 / 0.25	3 / 0.04	0.2	0.05	161	67	30
		3-24-54 / 1000	58	256	8.0	25 / 1.25	6 / 0.48	20 / 0.86	3 / 0.07	--	116 / 1.9	36 / 0.75	12 / 0.35	2 / 0.03	0.1	0.1	194	87	32
		4- 7-54 / 1210	14	430	8.1	43 / 2.15	12 / 1.00	35 / 1.51	4 / 0.10	--	140 / 2.30	71 / 1.58	28 / 0.8	3 / 0.04	0.3	0.03	317	158	32
	45.2	1-24-51	2[c]	1,190	8.4	129 / 6.45	37 / 3.03	140 / 6.08	--	--	384 / 6.3	296 / 6.17	103 / 2.9	4 / 0.06	--	0.09	901[d]	474	39
		1-31-51	5[c]	1,000	8.2	96 / 4.8	28 / 2.26	107 / 4.67	--	--	281 / 4.6	232 / 4.83	74 / 2.1	4 / 0.06	--	0.1	681[d]	353	41
		11-30-51	0.5[c]	1,920	8.3	250 / 12.5	2 / 0.2	210 / 9.12	--	--	486 / 7.8	470 / 9.80	160 / 4.5	2 / 0.03	--	0.2	1,337[d]	635	42
	45.3	1-26-54	31	400	8.1	34 / 1.7	10 / 0.86	35 / 1.53	3 / 0.08	--	110 / 1.8	73 / 1.52	25 / 0.7	3 / 0.04	0.3	0.03	259	128	37
	46.2	11-10-50	--	990	7.9	99 / 4.95	30 / 2.47	110 / 4.80	--	--	311 / 5.1	219 / 4.56	78 / 2.2	6 / 0.09	--	0.1	697[d]	371	39

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge second-feet	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
Hydrographic Unit No. 3 (continued)																			
Temecula Creek	93-46.3	11- 8-50 / 1525	0.42	1,540	8.0	152 / 7.6	40 / 3.17	153 / 6.65	--	--	458 / 7.5	348 / 7.26	131 / 3.7	3 / 0.04	--	0.2	1,056[d]	538	38
	47.8	4 1-53	--	1,110	8.4	100 / 5.0	32 / 2.62	118 / 5.11	--	--	323 / 5.3	225 / 4.69	89 / 2.5	1 / 0.02	--	0.1	726[d]	381	40
	48.1	11-27-51	--	1,000	8.0	99 / 4.95	14 / 1.15	111 / 4.85	--	--	317 / 5.2	208 / 4.33	78 / 2.2	2 / 0.03	--	0.2	670[d]	305	41
	48.3	7-14-53	--	1,090	7.7	114 / 5.7	18 / 1.53	109 / 4.74	--	--	311 / 5.1	208 / 4.32	85 / 2.4	2 / 0.03	0.5	0.2	691[d]	362	40
	48.5	11-10-50	--	930	8.2	87 / 4.35	22 / 1.81	113 / 4.93	--	--	305 / 5.0	174 / 3.63	85 / 2.4	3 / 0.05	--	0.1	636[d]	308	44
	51.2	11-27-51	--	1,010	8.1	98 / 4.9	31 / 2.6	116 / 5.05	--	--	342 / 5.6	217 / 4.51	78 / 2.2	1 / 0.02	--	0.1	712[d]	375	40
		4- 1-53	--	1,050	8.3	86 / 4.3	34 / 2.85	105 / 4.56	--	--	293 / 4.8	216 / 4.49	74 / 2.1	1 / 0.02	--	0.1	661[d]	358	39
	52.4	11-14-51	--	1,080	8.7	106 / 5.3	32 / 2.61	100 / 4.34	--	--	360 / 5.9	206 / 4.30	74 / 2.1	1 / 0.02	--	0.1	699[d]	396	35
		1-26-54	0.8	1,188	8.2	88 / 4.4	35 / 2.87	129 / 5.60	5 / 0.14	--	253 / 4.15	264 / 5.51	110 / 3.1	3 / 0.05	0.4	0.1	797	364	43
	53.2	11-10-50	--	900	7.8	92 / 4.6	30 / 2.47	91 / 3.96	--	--	317 / 5.2	187 / 3.90	57 / 1.6	3 / 0.04	--	0.1	618[d]	354	36
	53.7	1-19-51	--	810	8.3	84 / 4.2	25 / 2.04	78 / 3.61	--	--	287 / 4.7	162 / 3.38	50 / 1.5	4 / 0.06	--	0.02	547[d]	312	37
		11-14-51	--	870	8.4	90 / 4.5	25 / 2.04	91 / 3.94	--	--	317 / 5.2	186 / 3.88	60 / 1.7	1 / 0.02	--	0.06	611[d]	327	38
	54.0	1-26-54	1.1	1,010	8.3	84 / 4.2	33 / 2.7	101 / 4.4	4 / 0.11	--	238 / 3.9	231 / 4.81	78 / 2.2	3 / 0.05	0.5	0.02	685	345	39
	55.6	2- 9-51	0.19	700	7.9	72 / 3.6	19 / 1.59	60 / 2.61	--	--	256 / 4.2	121 / 2.52	43 / 1.2	4 / 0.06	--	0.04	447[d]	260	33
		11-19-51 / 1630	0.50	710	8.5	71 / 3.55	21 / 1.70	69 / 3.01	--	--	269 / 4.4	115 / 2.39	43 / 1.2	4 / 0.06	--	0.1	457[d]	262	37

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date Time	Discharge second-feet	$EC \times 10^6$ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
						Hydrographic Unit No. 3 (continued)													
Temecula Creek	93-55.7	2- 9-51	--	1,430	7.9	132/6.6	48/3.92	159/6.93	--/—	--/—	335/5.5	475/9.90	96/2.7	4/0.06	--	0.1	1,081[d]	526	40
	55.8	11-10-50	--	600	7.8	67/3.35	17/1.43	56/2.44	--/—	--/—	281/4.6	62/1.28	43/1.2	2/0.03	--	0.02	387[d]	239	34
	56.9	1-17-51	--	680	8.1	67/3.35	16/1.31	40/1.73	--/—	--/—	269/4.4	52/1.08	35/1.0	3/0.05	--	0.0	347[d]	233	27
		11-19-51	--	560	8.6	67/3.35	18/1.49	33/1.45	--/—	--/—	250/4.1	47/0.97	35/1.0	1/0.01	--	0.03	326[d]	242	23

MINERAL ANALYSES OF SURFACE WATERS IN SANTA MARGARITA RIVER WATERSHED[a] (continued)

Stream	Stream mile	Date / Time	Discharge second-feet	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
						Hydrographic Unit No. 4													
Pechanga Creek	93-31.0-6.3	1-24-51 / 1350	0.002	490	7.8	23/1.65	6/0.50	94/4.10	--	--	195/3.2	41/0.84	96/2.7	3/0.05	--	0	360[d]	108	66
		11-27-51	--	510	8.1	6/0.3	1/0.08	93/4.05	--	--	134/2.2	40/0.83	46/1.3	1/0.02	--	0.03	254[d]	19	91
Temecula Creek	93-30.3	1939[b]	--	1,020	--	75/3.73	22/1.81	117/5.08	0/0	9/0.30	265/4.35	148/3.08	101/2.85	2/0.03	--	--	739	--	48
		6- 4-54	--	971	8.1	84/4.2	19/1.60	100/4.36	3/0.08	--	296/4.85	117/2.43	96/2.7	4/0.06	0.4	0.2	557	290	43
	30.9	1939[b]	4.9	953	--	82/4.09	25/2.07	96/4.16	0/0	21/0.70	247/4.05	188/3.91	57/1.60	1/0.02	--	--	717	--	40
		1939[b]	5.2	923	--	81/4.05	24/1.99	91/3.94	0/0	12/0.40	256/4.20	180/3.74	57/1.60	0/0	--	--	701	--	40
		1939[b]	--	1,020	--	73/3.63	23/1.86	116/5.06	0/0	0/0	272/4.45	164/3.41	92/2.60	1/0.02	--	--	741	--	48
		11- 8-50	--	960	7.6	74/3.7	25/2.09	106/4.61	--	--	396/6.5	13/0.24	103/2.9	--	--	0.2	519[d]	290	44
		11-30-51	--	770	7.9	72/3.6	21/1.70	111/4.81	--	--	381/4.6	125/2.61	96/2.7	3/0.04	--	0.2	618[d]	265	48
		2-11-52 / 1030	4[c]	1,104	8.1	87/4.32	23/1.85	110/4.77	3/0.07	0/0	279/4.58	167/3.48	113/3.18	4/0.06	--	0.1	692	308	43
		5-12-52 / 1030	3[c]	985	7.3	86/4.29	21/1.73	108/4.70	9/0.22	0/0	317/5.20	148/3.09	112/3.16	6/0.09	--	0.2	673	301	43
		8-19-53	--	960	7.9	74/3.7	28/2.3	91/3.96	--	0/0	186/3.15	222/4.63	78/2.2	2/0.04	0.3	0.20	656	300	40
		4-12-54 / 1200	12[c]	1,058	7.9	87/4.34	21/1.73	120/5.22	3/0.07	0/0	307/5.04	144/3.00	108/3.05	0/0	--	0.1	620	304	46
		6- 4-54	--	1,076	7.6	87/4.35	22/1.83	104/4.50	4/0.10	0/0	305/5.0	129/2.69	106/3.0	6/0.10	0.4	0.2	667	309	42

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge second-feet	ECx10^6 at 25°C	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Hydrographic Unit No. 4 (continued)													
Temecula Creek	93-30.9	8-16-54 / 1030	2[c]	935	7.8	71 / 3.56	14 / 1.38	103 / 4.50	3 / 0.07	0 / 0	279 / 4.57	102 / 2.09	96 / 2.7	9 / 0.15	0.5	0.3	594	247	47
		1-17-55 / 1245	15[c]	1,036	7.8	87 / 4.34	24 / 1.97	120 / 5.22	12 / 0.31	0 / 0	290 / 4.76	157 / 3.28	122 / 3.44	7 / 0.12	--	0.16	670	316	44
	31.6	July[f] 1916	--	---	--	67 / 3.34	21 / 1.73	139 / 6.04	--	10 / 0.32	263 / 4.31	171 / 3.56	104 / 2.93	0 / 0	--	--	688	254	54
	31.7	4-19-54	1.5	1,152	8.3	94 / 4.7	27 / 2.20	135 / 5.88	4 / 0.09	--	299 / 4.9	193 / 4.02	131 / 3.7	4 / 0.06	0.6	0.3	778	345	46
	32.2	1939[b]	--	1,060	--	77 / 3.85	23 / 1.93	124 / 5.38	--	15 / 0.50	241 / 3.95	188 / 3.91	98 / 2.75	1 / 0.02	--	--	767	--	48
		4-19-54	0.71	1,178	7.9	102 / 5.1	29 / 2.40	138 / 6.00	3 / 0.07	--	317 / 5.2	226 / 4.70	124 / 3.5	1 / 0.01	0.5	0.2	823	375	44
		6- 4-54	--	1,295	8.0	100 / 5.0	28 / 2.35	147 / 6.38	5 / 0.13	--	333 / 5.45	223 / 4.65	124 / 3.5	3 / 0.06	0.6	0.45	818	368	46
	34.8	1939[b]	5.8	1,100	--	83 / 4.15	25 / 2.04	123 / 5.33	--	12 / 0.40	250 / 4.10	200 / 4.16	96 / 2.70	3 / 0.05	--	--	792	--	46
		1939[b]	4.6	1,000	--	74 / 3.73	23 / 1.89	110 / 4.80	0 / 0	9 / 0.30	244 / 4.00	164 / 3.41	90 / 2.55	3 / 0.05	--	--	717	--	46
		4-19-54	0.52	950	7.9	82 / 4.1	22 / 1.86	108 / 4.69	2 / 0.04	--	275 / 4.5	152 / 3.17	99 / 2.8	0 / 0	0.7	0.2	638	298	44
	35.6	1939[b]	3.8	982	--	69 / 3.47	21 / 1.75	112 / 4.87	0 / 0	Tr.	256 / 4.20	159 / 3.31	90 / 2.55	2 / 0.03	--	--	709	261	48
		1939[b]	--	1,020	--	74 / 3.72	23 / 1.85	117 / 5.08	0 / 0	9 / 0.3	259 / 4.25	151 / 3.04	101 / 2.85	2 / 0.03	--	--	736	278	48
		4-19-54	0.12	870	7.9	70 / 3.5	20 / 1.62	106 / 4.60	2 / 0.04	--	244 / 4.0	131 / 2.72	99 / 2.8	2 / 0.04	0.6	0.1	596	256	47

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge second-feet	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
					Hydrographic Unit No. 4 (continued)														
Temecula Creek	93-35.7	1939[b]	--	1,030	--	73/3.63	22/1.78	122/5.32	0/0	9/0.30	256/4.20	155/3.23	105/2.95	2/0.03	--	--	744	270	50
		1-24-51 / 1145	0.36	910	8.1	77/3.85	21/1.74	121/5.26	--	--	262/4.3	157/3.27	113/3.2	6/0.09	--	0.1	626[d]	280	47
		11-30-51	--	730	8.2	67/3.85	17/1.43	114/4.95	--	--	244/4.0	162/3.37	99/2.8	5/0.07	--	0.1	586[d]	264	48
		8-19-53	--	890	7.6	58/2.9	17/1.38	113/4.93	--	--	305/5.0	94/1.96	96/2.7	4/0.07	0.6	0.2	572	199	54
	39.0	1939[b]	--	1,710	--	100/4.98	37/3.01	226/9.85	--	24/0.80	317/5.20	293/6.10	202/5.70	--	--	--	1,200	--	55
	41.0	1939[b]	8.7	1,820	--	95/4.76	37/3.08	262/11.4	0/0	12/0.40	369/6.05	308/6.42	223/6.30	1/0.01	--	--	1,307	392	59

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge second-feet	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
						Hydrographic Unit No. 5													
Coleman Creek (Tributary to De Luz Creek)	93-12.2-7.6-14-1.7	8-31-53	--	420	8.1	30/1.5	10/0.81	30/1.30	--	--	146/2.4	4/0.08	28/0.8	1/0.02	0.2	0.01	233	116	36
		5-26-54	--	364	7.6	30/1.5	11/0.94	31/1.34	1/0.02	--	165/2.7	2/0.04	35/1.0	2/0.02	0.3	0.01	253	122	35
De Luz Creek	93-12.2-0.7	1-22-52[b]	47[c]	660	7.9	22/1.10	2/0.76	103/4.46	--	0/0	244/4.0	27/0.56	34/0.96	1/	0	0	---	---	70
	93-12.2-6.5	12-22-53	0.14	490	7.8	38/1.9	18/1.47	48/2.09	1/0.03	--	208/3.4	16/0.34	60/1.7	4/0.07	0.2	0.0	333	168	38
Fern Creek	93-12.2-6.2-0.2-0.4	5-24-54	--	259	7.8	18/0.9	5/0.4	29/1.24	1/0.03	--	113/1.85	Tr.	27/0.75	3/0.04	0.4	0.05	185	65	48
Rainbow Creek	93-23.1-0.6	2- 5-54	--	841	8.2	66/3.3	32/2.68	62/2.70	3/0.07	--	250/4.1	48/1.00	124/3.5	4/0.07	0.2	0.02	521	299	31
	4.7	4- 2-54	10[c]	307	7.9	16/0.8	6/0.50	37/1.62	2/0.06	--	58/0.95	22/0.46	53/1.50	8/0.13	0.1	0.05	227	65	54
Sandia Creek	93-20.7-0.2	3- 6-53	1.5[c]	620	6.6	46/2.3	24/1.96	55/2.38	--	--	195/3.2	66/1.37	64/1.8	2/0.04	--	0.1	354[d]	213	36
Santa Margarita River	93-20.0	2-14-51 / 0850	6[c]	1,090	8.4	76/3.79	23/1.89	120/5.22	6/0.14	7/0.23	291/4.77	121/2.52	134/3.78	1/0.01	--	0.1	663	284	47
		4- 2-51 / 1650	5.0	1,080	8.2	--	--	--	--	0/0	312/5.12	--	135/3.81	--	--	--	---	267	--
		5- 7-51 / 1535	2.5[c]	1,109	8.2	75/3.74	24/1.94	130/5.67	--	0/0	324/5.32	94/1.96	142/4.00	0/0	--	0.2	676	286	50
		6- 4-51 / 1510	2.0	1,063	8.3	--	--	--	--	31/1.04	286/4.86	--	132/3.59	--	--	--	---	286	--
		7- 8-51 / 2015	2.5	1,124	7.7	--	--	--	--	0/0	359/5.88	--	131/3.70	--	--	--	---	284	--
		8- 6-51 / 1340	2.5	1,071	8.2	--	--	--	--	0/0	352/5.76	--	129/3.64	--	--	--	---	288	--

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge second-foot	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO₃	HCO₃	SO₄	Cl	NO₃	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as CaCO₃, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
Hydrographic Unit No. 5 (continued)																			
Santa Margarita River	93-20.0	9-10-51 / 1240	0.5	1,112	8.2	74 / 3.70	23 / 1.89	126 / 5.48	--	0 / 0	339 / 5.55	84 / 1.76	134 / 3.78	2 / 0.03	0.12	0.2	606	280	50
		10- 8-51 / 1200	0.7[c]	1,058	8.0	--	--	--	--	10 / 0.32	334 / 5.48	--	128 / 3.61	--	--	--	---	284	--
		11-13-51 / 1120	7.8[c]	1,036	8.2	--	--	--	--	0 / 0	339 / 5.55	--	123 / 3.47	--	--	--	---	288	--
		12-10-51 / 1410	14	1,133	8.1	--	--	--	--	0 / 0	317 / 5.19	--	140 / 3.95	--	--	--	---	297	--
		1-14-52 / 1230	40[c]	561	7.9	--	--	--	--	0 / 0	142 / 2.33	--	65 / 1.83	--	--	--	---	142	--
		2-11-52 / 1045	1.2[c]	1,543	8.1	--	--	--	--	0 / 0	278 / 4.55	--	298 / 8.40	--	--	--	---	296	--
		3-10-52 / 1130	100	769	7.9	--	--	--	--	0 / 0	178 / 2.92	--	100 / 2.82	--	--	--	---	200	--
		4- 7-52 / 1100	19	853	8.0	--	--	--	--	0 / 0	237 / 3.88	--	122 / 3.44	--	--	--	---	249	--
		5-12-52[h] / 1100	6	1,010	7.9	67 / 3.34	25 / 2.06	106 / 4.61	43 / 0.11	10 / 0.33	264 / 4.33	110 / 2.29	118 / 3.33	1 / 0.01	0.4	0.3	607[d]	270	46
		6- 9-52 / 1045	4.4	957	8.1	--	--	--	--	0 / 0	327 / 5.36	--	132 / 3.72	--	--	--	---	313	--
		7- 7-52 / 1115	1[c]	933	8.3	--	--	--	--	--	320 / 5.24	--	133 / 3.75	--	--	--	---	292	--
		8- 4-52 / 1110	0.3	1,068	8.0	--	--	--	--	0 / 0	344 / 5.64	--	152 / 4.28	--	--	--	---	307	--
		9- 2-52 / 1600	0.2	1,016	8.2	--	--	--	--	19 / 0.64	278 / 4.56	--	195 / 5.50	--	--	--	---	280	--
		10- 7-52[h] / 1230	1.5	1,093	8.1	89 / 4.45	5 / 0.41	130 / 5.65	4 / 0.11	0 / 0	334 / 5.16	96 / 1.99	142 / 4.00	1 / 0.01	0.6	0.1	655	243	53

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge second-feet	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
						Hydrographic Unit No. 5 (continued)													
Santa Margarita River	93-20.0	11-17-52 / 1150	20	1,230	7.8	--	--	--	--	--	207/3.40	--	162/4.57	--	--	--	---	237	--
		12-15-52 / 1120	6[e]	1,159	8.4	--	--	--	--	34/1.12	310/5.08	--	154/4.34	--	--	--	---	298	--
		1-12-53 / 1040	11	1,218	8.3	--	--	--	--	26/0.88	244/4.00	--	144/4.06	--	--	--	---	295	--
		2-16-53 / 1150	8.4	1,024	7.9	--	--	--	--	0/0	293/4.80	--	145/4.09	--	--	--	---	287	--
		3-16-53 / 1045	12[e]	1,053	8.1	--	--	--	--	0/0	303/4.96	--	145/4.09	--	--	--	---	281	--
		4-13-53 / 1115	1[e]	1,008	7.9	--	--	115/5.00	--	22/0.72	271/4.44	--	149/4.2	--	--	0.26	---	284	--
		5-11-53 / 1200	5[e]	1,030	8.2	76/3.79	21/1.73	130/5.66	3/0.08	19/0.64	283/4.64	110/2.29	135/3.80	2/0.02	0.6	0.3	660	276	50
		6-15-53 / 1100	0.5	1,098	7.6	--	--	--	--	--	339	--	144	--	--	0.2	---	298	47
		7-13-53 / 1200	0.1	1,074	7.9	--	--	--	--	0	342	--	162	--	--	0.2	---	294	51
		8-10-53 / 1115	1.9	981	8.0	--	--	--	--	0	342	--	123	--	--	0.2	---	288	50
		9-16-53 / 1525	1.2	1,100	7.8	79/3.94	24/1.97	125/5.44	4/0.10	0/0	300/4.92	158/3.29	115/3.24	0/0	0.6	0.2	680	296	48
		10-19-53 / 1305	1.1	1,076	8.1	--	--	--	--	0	310	--	113	--	--	0.1	---	300	49
		11-16-53 / 1330	5.3	1,012	8.0	--	--	--	--	0	310	--	125	--	--	0.1	---	288	50

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge second-feet	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
						Mineral constituents in parts per million / equivalents per million													
						Hydrographic Unit No. 5 (continued)													
Santa Margarita River	93-20.0	12-14-53 / 1300	4.0	1,184	8.1	--	--	--	--	26	264	--	151	--	--	0.2	---	296	53
		1-18-54 / 1300	6.6	1,251	8.0	--	--	--	--	0	312	--	159	--	--	0.2	---	298	54
		2-15-54 / 1215	50	766	8.2	--	--	--	--	0	178	--	97	--	--	0.2	---	175	50
		3-15-54 / 1330	21	1,095	8.3	--	--	--	--	14	268	--	138	--	--	0.2	---	296	53
		4-12-54 / 1225	9.8	990	8.2	--	--	--	--	19	244	--	127	--	--	0.2	---	256	50
		5-13-54 / 2000	0.8	1,108	8.0	75 / 3.74	25 / 2.05	115 / 5.00	4 / 0.11	0 / 0	322 / 5.28	105 / 2.18	123 / 3.47	0 / 0	0.5	0.2	637	290	46
		6-14-54 / 1200	12	1,141	7.8	--	--	--	--	12	310	--	121	--	--	0.2	---	292	46
		7- 7-54 / 1100	5.4	1,111	8.0	--	--	--	--	0	371	--	139	--	--	0.1	---	314	48
	20.8	3- 6-53	10[e]	1,160	8.6	77 / 3.85	29 / 2.34	150 / 6.52	--	--	305 / 5.0	138 / 2.88	163 / 4.6	3 / 0.05	--	0.2	712[d]	310	51
	21.0	6-18-52	--	1,090	8.0	77 / 3.85	25 / 2.10	133 / 5.80	--	--	335 / 5.5	103 / 2.14	135 / 3.8	1 / 0.03	--	0.2	641[d]	298	49
	30.0	1939[b]	13	1,030	--	75 / 3.77	23 / 1.86	117 / 5.11	0 / 0	0 / 0	287 / 4.70	147 / 3.06	103 / 2.90	2 / 0.04	--	--	754	---	47.6
Unnamed tributary to Santa Margarita River	93-21.2-2.0	11-20-53	0.01[e]	590	7.8	68 / 3.4	24 / 1.95	40 / 1.74	3 / 0.07	--	287 / 4.7	25 / 0.52	53 / 1.5	2 / 0.04	0.1	0.06	441	268	24

MINERAL ANALYSES OF SURFACE WATERS
IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Stream	Stream mile	Date / Time	Discharge second-feet	ECx10⁶ at 25°C	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent sodium
Hydrographic Unit No. 6																			
Fallbrock Creek	93-8.8-7.9	4-2-54 / 1130	--	1,710	8.3	107 / 5.35	50 / 4.15	173 / 7.54	1 / 0.02	--	275 / 4.5	264 / 5.51	238 / 6.7	27 / 0.44	0.7	0.34	1,138	475	44
Lake O'Neill	93-8.8-1.2	2-1-49[g]	--	---	8.2	53 / 2.65	22 / 1.81	136 / 5.91	--	3 / 0.10	222 / 3.64	112 / 2.33	140 / 3.95	--	--	--	592[d]	---	57
		1-9-52[g]	--	1,260	9.0	56 / 2.80	32 / 2.60	190 / 8.25	--	30 / 1.0	232 / 3.8	113 / 2.35	230 / 6.50	--	0	0.12	---	---	60
Santa Margarita River	93-0.6	1-9-52[g]	--	25,000	8.6	264 / 13.20	666 / 54.60	5442 / 236.62	--	12 / 0.40	244 / 4.00	1015 / 21.15	9900 / 278.87	--	0.1	2.06	17,558[d]	---	78
		3-26-54 / 1345	6[c]	925	7.9	43 / 2.15	21 / 1.73	120 / 5.22	6 / 0.15	0 / 0	203 / 3.32	80 / 1.66	146 / 4.12	2 / 0.04	--	0.1	546	194	57
		1-19-55 / 1455	0[c]	28,500	8.0	292 / 14.6	790 / 65.4	6992 / 304.0	227 / 5.80	--	601 / 9.85	1635 / 34.03	11880 / 335	8 / 0.12	1.0	3.00	23,621	4,000	78

a. All analyses by Division of Water Resources unless otherwise noted.
b. Analysis obtained from Vail Company.
c. Estimated.
d. Total dissolved solids determined by summation.
e. Analyzed by Pacific Chemical Consultants.
f. Analysis from United States Geological Survey Water Supply Paper 429.
g. Analysis obtained from United States Navy.
h. Analyzed by United States Geological Survey, Quality of Water Branch, unpublished records subject to revision.

TABLE H-3

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]

Well number	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
HYDROGRAPHIC UNIT NO. 1																	
Diamond Basin																	
5S/1W-33 (SW¼)	August[b] 1916	---	--	62/3.09	17/1.40	76/3.30	--	0/0	224/3.67	83/1.73	83/2.34	2/0.03	--	--	493	225	42
6S/1W- 4J1	4-13-54	547	7.5	44/2.2	11/0.94	57/2.49	3/0.08	--	210/3.45	21/0.43	46/1.30	20/0.32	0.4	0.2	349	157	34
5G1	5-12-53	1,180	7.5	110/5.50	38/3.18	101/4.41	--	--	335/5.5	134/2.79	146/4.1	13/0.20	--	0.1	709[c]	434	34
6S/2W- 1A1	11- 5-52	810	8.2	77/3.85	22/1.81	75/3.26	--	--	207/3.4	132/2.76	92/2.6	11/0.18	--	0.2	512[c]	283	37
	4- 7-53	820	8.1	52/2.6	29/2.40	76/3.30	--	--	153/2.5	140/2.91	89/2.5	10/0.16	--	0.1	472[c]	250	40
Domenigoni Basin																	
6S/2W- 2 (SW¼)	August[b] 1916	---	--	65/3.24	10/0.82	548/23.82	--	5/0.16	253/4.15	515/10.72	387/10.91	120/1.94	--	--	2,014	203	83
3 (SW¼)	November[b] 1915	---	--	--	--	--	--	0/0	349/5.72	100/2.08	172/4.99	--	--	--	760	75	--
11A1	8-19-52	560	7.9	67/3.35	24/1.98	69/2.98	--	--	134/2.2	143/2.97	96/2.7	4/0.07	--	0.1	470[c]	266	36
	11- 5-52	770	7.7	69/3.45	25/2.06	78/3.41	--	--	147/2.4	147/3.06	99/2.8	10/0.17	--	0.1	501[c]	275	38
French Basin																	
6S/2W-28G2	5-15-53	1,090	7.6	93/4.65	27/2.2	103/4.46	--	--	165/2.7	222/4.61	135/3.8	7/0.11	--	0.1	669[c]	342	39
28G3	5-15-53	1,100	7.3	93/4.65	27/2.20	108/4.69	--	--	195/3.2	205/4.27	142/4.0	1/0.02	--	0.13	674[c]	342	41
29R1	4- 7-53	790	8.2	42/2.1	23/1.87	99/4.30	--	--	238/3.9	53/1.11	92/2.6	14/0.23	--	0.1	442[c]	198	52

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a] (continued)

Well number	Date sampled	$EC \times 10^6$ at $25^\circ C$	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
						HYDROGRAPHIC UNIT NO. 1 (continued)											
						French Basin (continued)											
6S/2W-30C1	5-22-53	500	7.8	28/1.4	18/1.50	50/2.18	--	--	153/2.5	15/0.32	53/1.5	29/0.47	--	0.01	269[c]	145	43
31L1	5-19-53	960	7.8	78/3.9	34/2.80	66/2.85	--	--	287/4.7	30/0.63	124/3.5	18/0.30	--	0.0	494[c]	335	30
32A1	5-15-53	1,350	7.9	104/5.20	37/3.04	132/5.75	--	--	250/4.1	234/4.78	163/4.6	9/0.15	--	0.0	804[c]	412	41
	1- 7-54	1,150	7.8	102/5.1	31/2.55	124/5.39	--	--	235/3.85	218/4.53	149/4.2	12/0.19	0.4	0.04	800	388	41
32H1	5-15-53	730	7.7	62/3.1	23/1.91	57/2.47	--	--	171/2.8	91/1.89	89/2.5	14/0.22	--	0.04	422[c]	250	33
33E1	5-15-53	610	7.8	55/2.75	20/1.64	44/1.91	--	--	165/2.7	65/1.36	67/1.9	13/0.21	--	0.03	346[c]	225	30
						Los Alamos Basin											
6S/1W-31N1	9-18-52	1,540	8.4	102/5.10	50/4.16	152/6.61	--	--	244/4.0	292/6.09	227/6.4	17/0.28	--	0.1	962[c]	463	40
7S/2W- 2P2	5-20-53	1,360	8.2	94/4.7	41/3.36	135/5.87	--	--	348/5.7	118/2.46	192/5.4	7/0.12	--	0.1	761[c]	403	42
4J2	8-26-52	720	6.5	58/2.9	17/1.39	46/2.01	--	--	208/3.4	55/1.14	71/2.0	12/0.20	--	0.1	363[c]	215	32
4K1	4- 7-53	1,090	7.5	95/4.75	25/2.10	96/4.15	--	--	374/4.5	111/2.31	149/4.2	10/0.16	--	0.1	673[c]	342	38
						Murrieta Basin											
7S/3W- 7R2	11- 3-52	650	7.8	28/1.4	8/0.66	109/4.75	--	--	183/3.0	40/0.83	96/2.7	2/0.04	--	0.2	349[c]	103	70
	5- 6-53	690	8.6	22/1.10	8/0.70	116/5.04	--	--	177/2.9	34/0.70	115/3.25	1/0.01	--	0.1	384[c]	90	74

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a] (continued)

Mineral constituents in parts per million / equivalents per million (each value given as ppm/epm)

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
HYDROGRAPHIC UNIT NO. 1 (continued)																	
Murrieta Basin (continued)																	
7S/3W-16N2	5-12-53	960	8.6	101/5.05	31/2.57	69/3.00	--/	--/	329/5.4	20/0.40	112/3.15	58/0.94	--	0.1	556[c]	381	28
16N3	8-15-52	870	7.6	89/4.45	24/1.98	62/2.68	--/	--/	293/4.8	29/0.60	99/2.8	55/0.89	--	0.1	504[c]	321	29
16N5	10-14-52	810	8.2	70/3.50	20/1.68	68/2.97	--/	--/	262/4.3	25/0.53	99/2.8	19/0.30	--	0.1	432[c]	259	36
	3-19-53	830	8.3	84/4.2	23/1.87	66/2.87	--/	--/	293/4.8	21/0.44	106/3.0	23/0.37	--	0.17	469[c]	304	32
	5-20-53	770	8.5	76/3.8	29/2.39	68/2.94	--/	--/	275/4.5	27/0.56	106/3.0	23/0.38	--	0.1	467[c]	310	32
17	December 1915[b]	---	--	68/3.39	22/1.81	106/4.61	--/	0/0	273/4.47	64/1.33	134/3.78	12/0.2	--	--	576	260	47
17D1	7-22-52	630	8.5	26/1.30	8/0.64	106/4.63	--/	--/	177/2.9	38/0.79	96/2.8	2/0.03	--	0.3	364[c]	97	71
17E3	7-22-52	610	7.7	55/2.75	21/1.76	65/2.82	--/	--/	256/4.2	21/0.43	60/1.7	23/0.37	--	0.1	373[c]	226	39
17E4	10-14-53	538	7.3	25/1.25	10/0.8	70/3.06	7/0.19	--/	128/2.1	40/0.83	71/2.0	19/0.31	0.5	0.01	307	102	58
17G1	5- 7-53	510	7.9	18/0.90	4/0.33	91/3.96	--/	--/	165/2.7	16/0.33	74/2.1	7/0.11	--	0.03	292[c]	61	76
17H1	5- 7-53	710	8.0	64/3.20	18/1.45	69/3.01	--/	--/	256/4.2	27/0.56	96/2.7	8/0.12	--	0.03	410[c]	232	39
18A1	7-16-52	820	7.8	72/3.6	21/1.73	65/2.84	--/	--/	256/4.2	25/0.53	92/2.6	35/0.56	--	0.1	438[c]	266	34
	5- 6-53	530	8.0	44/2.20	17/1.40	50/2.16	--/	--/	214/3.5	16/0.33	53/1.5	21/0.34	--	0.05	308[c]	180	37
18M1	7-17-52	470	7.4	39/1.95	17/1.42	43/1.85	--/	--/	195/3.2	17/0.36	43/1.2	14/0.22	--	0.1	270[c]	168	35

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
HYDROGRAPHIC UNIT NO. 1 (continued)																	
Murrieta Basin (continued)																	
7S/3W-18M1	5- 6-53	620	7.5	39 / 1.95	28 / 2.35	61 / 2.63	--	--	220 / 3.6	67 / 1.37	60 / 1.7	1 / 0.02	--	0.2	368[c]	215	39
19A1	7-17-52	700	8.2	52 / 2.60	21 / 1.70	58 / 2.51	--	--	226 / 3.7	36 / 0.75	78 / 2.2	7 / 0.11	--	0.1	364[c]	215	37
19A2	7-17-52	510	8.5	44 / 2.20	18 / 1.46	36 / 1.59	--	--	189 / 3.1	20 / 0.41	46 / 1.3	12 / 0.19	--	0.1	271[c]	183	30
20C4	4- 9-54	1,481	8.2	102 / 5.1	35 / 2.86	162 / 7.06	1 / 0.03	--	336 / 5.4	103 / 2.14	234 / 6.6	39 / 0.62	0.1	0.0	880	398	47
20D1	5-21-53	1,670	7.9	196 / 9.8	14 / 1.12	155 / 6.73	--	--	500 / 8.2	111 / 2.31	234 / 6.6	2 / 0.03	--	0.1	962[c]	546	38
21	December 1915[b]	---	--	--	--	--	--	0 / 0	185 / 3.03	36 / 0.75	188 / 5.30	--	--	--	380	144	--
21F2	9- 2-53	654	8.5	58 / 2.9	16 / 1.33	54 / 2.26	--	--	232 / 3.8	16 / 0.33	67 / 1.9	8 / 0.14	0.3	0.04	374	212	36
21P1	11- 3-52	750	7.9	68 / 3.4	26 / 2.13	94 / 4.07	--	--	268 / 4.4	83 / 1.72	114 / 3.2	4 / 0.06	--	0.1	523[c]	276	42
21Q1	7-11-52	560	7.9	56 / 2.80	11 / 0.93	61 / 2.63	--	--	201 / 3.3	22 / 0.46	64 / 1.8	12 / 0.19	--	0.1	326[c]	186	41
27H2	7-10-52	1,500	8.1	59 / 2.95	17 / 1.39	244 / 10.62	--	--	177 / 2.9	77 / 1.60	369 / 10.4	4 / 0.07	--	2.5	859[c]	217	71
27N2	4-23-54	980	7.7	76 / 3.8	22 / 1.81	109 / 4.72	1 / 0.03	--	287 / 4.7	70 / 1.46	149 / 4.2	5 / 0.09	0.5	0.1	608	270	46
27P1	5-26-53	800	7.8	39 / 1.95	24 / 1.96	102 / 4.42	--	--	220 / 3.6	55 / 1.14	128 / 3.6	4 / 0.06	--	0.1	462	195	53
29A1	4-21-53	500	7.7	26 / 1.3	11 / 0.89	47 / 2.03	--	--	165 / 2.7	52 / 1.09	11 / 0.3	2 / 0.03	--	0.1	231[c]	110	48
8S/3W- 1P2	5-19-53	410	7.7	14 / 0.70	7 / 0.56	59 / 2.55	--	--	122 / 2.0	7 / 0.15	60 / 1.7	15 / 0.24	--	0.03	223[c]	63	67

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	$ECx10^6$ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
								HYDROGRAPHIC UNIT NO. 1 (continued)									
								Murrieta Basin (continued)									
8S/3W- 2 (NE¼)	December 1915[b]	---	--	--	--	--	--	0/0	117/1.91	33/0.69	128/3.60	--	--	--	390	112	--
12 (NW¼)	December 1915[b]	---	--	26/1.30	8/0.63	32/1.39	--	0/0	102/1.67	8/0.16	45/1.27	14/0.22	--	--	234	96	42
12 (nr. S¼ cor.)	December 1915[b]	---	--	--	--	--	--	0/0	254/4.16	36/0.75	158/4.46	--	--	--	560	97	--
12N5	2- 8-54	1,276	7.9	63/3.15	24/1.95	164/7.15	2/0.05	--	253/4.15	94/1.96	220/6.2	4/0.07	0.3	0.1	711	255	58
12N13	November 1953	1,500	8.3	74/3.7	32/2.64	242/10.53	1/0.04	--	433/7.1	109/2.27	238/6.7	15/0.24	0.4	0.4	984	317	62
13K1	5- 6-53	410	8.1	11/0.55	6/0.51	62/2.70	--	--	116/1.9	12/0.26	50/1.4	21/0.34	--	--	220[c]	53	72
								Santa Gertrudis Basin									
7S/3W-35B1	3- 3-38[d]	430	--	--	--	71/3.07	--	3/0.10	95/1.55	16/0.33	71/2.0	--	--	0.2	---	--	77
35B2	1939[d]	630	--	12/0.62	1/0.09	112/4.86	--	--	88/1.45	23/0.47	128/3.60	4/0.07	--	--	369	36	87
								Wildomar Basin									
6S/4W-34J2	4-28-53	430	8.0	24/1.2	12/1.03	52/2.28	--	--	183/3.0	7/0.14	25/0.7	10/0.17	--	0.1	221[c]	112	51
34J6	4-28-53	620	7.6	55/2.75	18/1.45	53/2.31	--	--	244/4.0	9/0.18	53/1.5	28/0.44	--	0.1	338[c]	210	36
34J9	4-28-53	480	8.3	30/1.5	14/1.17	53/2.31	--	--	189/3.1	8/0.17	43/1.2	8/0.13	--	0.1	251[c]	133	46
35M2	10-29-52	540	8.3	44/2.2	25/2.08	58/2.52	--	--	238/3.9	34/0.70	53/1.5	18/0.29	--	0.1	351[c]	214	38
35 (SW¼)	December 1915[b]	---	--	73/3.64	24/1.97	43/1.87	--	--	273/4.47	19/0.39	86/2.43	12/0.19	--	--	467	281	25

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Mineral constituents in parts per million / equivalents per million

Well number	Date sampled	$ECx10^6$ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
HYDROGRAPHIC UNIT NO. 1 (continued)																	
Wildomar Basin (continued)																	
6S/4W-35N1	4-30-53	510	8.3	28/1.4	16/1.35	56/2.43	--/	--/	183/3.0	14/0.30	57/1.6	4/0.06	--	0.03	266[c]	87	47
7S/4W- 1E1	4-30-53	640	8.5	50/2.5	20/1.68	57/2.46	--/	--/	232/3.8	12/0.26	64/1.8	28/0.45	--	0.04	347[c]	209	37
1P2	4-30-53	1,640	8.5	132/6.6	50/4.10	160/6.94	--/	--/	366/6.0	179/3.72	256/7.2	17/0.27	--	0.1	977[c]	535	39
1Q2	7- 4-52	630	7.8	44/2.20	17/1.41	71/3.06	--/	--/	226/3.7	21/0.44	57/1.6	23/0.38	--	0.1	346[c]	180	46
1Q5	5- 1-53	1,430	8.6	80/4.0	32/2.62	178/7.75	--/	--/	305/5.0	74/1.54	263/7.4	10/0.16	--	0.1	789[c]	331	54
11A1	2-11-53	730	7.7	58/2.9	18/1.45	69/2.99	--/	--/	201/3.3	71/1.48	89/2.5	2/0.04	--	0.1	407[c]	217	41
12G1	4-30-53	700	8.6	50/2.50	25/2.06	66/2.88	--/	--/	238/3.9	55/1.14	75/2.1	7/0.11	--	0.01	397[c]	228	39
Remainder of Unit																	
6S/2W-17N1	5-19-53	13,050	8.2	248/12.4	349/28.9	2485/108.05	--/	--/	738/12.1	2822/58.8	2730/77.2	--/	--	0.3	9,003[c]	2,065	72
18 (nr. E¼ cor.)	November 1915[b]	---	--	--/	--/	--/	--/	0/0	159/2.60	37/0.77	258/7.30	--/	--	--	640	127	--
27N1	5-14-53	690	7.7	71/3.55	22/1.87	45/1.96	--/	--/	214/3.5	58/1.21	78/2.2	12/0.20	--	0.1	393[c]	271	27
6S/3W-31P1	8-19-52	610	7.7	34/1.70	25/2.06	75/3.28	--/	--/	177/2.9	116/2.42	71/2.0	37/0.59	--	0.0	446[c]	188	41
31R1	8-17-52	730	7.7	51/2.55	30/2.47	70/3.03	--/	--/	232/3.8	29/0.61	117/3.3	2/0.03	--	0.1	415[c]	256	38
6S/4W-26Q1	10-21-52	350	8.4	5/0.25	1/0.05	82/3.58	--/	--/	98/1.6	24/0.50	50/1.4	1/0.02	--	0.1	212[c]	15	92

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25 C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
							HYDROGRAPHIC UNIT NO. 1 (continued)										
							Remainder of Unit (continued)										
6S/4W-34L1	4-27-53	620	8.0	38/1.9	23/1.87	58/2.51	--	--	232/3.8	23/0.48	67/1.9	10/0.15	--	0.1	335[e]	188	40
34M1	4-28-53	580	8.2	32/1.6	18/1.45	65/2.82	--	--	207/3.4	16/0.34	67/1.9	18/0.28	--	0.04	319[e]	152	48
34Q2	10-29-52	480	8.0	36/1.80	15/1.25	57/2.47	--	--	171/2.8	53/1.10	28/0.8	47/0.75	--	0.2	321[e]	152	45
	4-27-53	470	7.8	30/1.5	20/1.68	38/1.66	--	--	171/2.8	13/0.28	25/0.7	53/0.85	--	0.1	264[e]	159	34
34R1	4-27-53	600	8.4	40/2.0	26/2.15	49/2.11	--	--	238/3.9	20/0.41	43/1.2	48/0.76	--	0.1	345[e]	208	34
34R3	2-19-53	510	8.1	40/2.0	19/1.59	49/2.14	--	--	214/3.5	15/0.31	46/1.3	13/0.22	--	0.2	289[e]	180	37
	4-27-53	660	7.8	48/2.4	26/2.15	53/2.29	--	--	226/3.7	20/0.42	60/1.7	39/0.63	--	0.02	359[e]	228	34
35F1	4-22-53	940	8.3	66/3.3	27/2.20	90/3.92	--	--	232/3.8	51/1.07	149/4.2	13/0.21	--	0.01	512[e]	275	42
35Q1	2-20-53	690	8.4	52/2.6	19/1.59	69/3.01	--	--	201/3.3	42/0.88	92/2.6	15/0.24	--	0.03	389[e]	210	42
36D1	4-22-53	560	7.6	34/1.7	18/1.45	53/2.32	--	--	146/2.4	15/0.32	82/2.3	45/0.72	--	0.1	320[e]	158	42
7S/1W-10R1	5-26-53	1,160	8.5	58/2.9	35/2.90	162/7.03	--	--	433/7.1	86/1.80	128/3.6	6/0.10	--	0.1	691[e]	290	55
14A1	5-13-54	873	7.6	55/2.75	26/2.16	89/3.85	5/0.12	--	308/5.05	16/0.33	110/3.1	28/0.45	0.4	0.1	567	246	43
18J1	5-26-53	670	7.7	37/1.85	23/1.87	74/3.20	--	--	201/3.3	25/0.51	92/2.6	21/0.34	--	0.0	372	186	46
18Q2	5-13-54	978	7.4	70/3.5	27/2.26	91/3.96	4/0.10	--	317/5.2	41/0.85	142/4.0	6/0.09	0.6	0.2	622	286	41

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	$EC \times 10^6$ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
								HYDROGRAPHIC UNIT NO. 1 (continued)									
								Remainder of Unit (continued)									
7S/1W-30N1	3- 4-53	850	8.4	58 / 2.9	20 / 1.64	105 / 4.55	--	--	250 / 4.1	14 / 0.29	142 / 4.0	12 / 0.19	--	0.1	476[e]	227	50
	5-19-53	910	7.8	57 / 2.85	20 / 1.68	99 / 4.29	--	--	250 / 4.1	15 / 0.31	146 / 4.1	12 / 0.18	--	0.1	474[e]	226	49
7S/2W- 4D1	5-19-53	1,240	8.0	96 / 4.80	33 / 2.70	101 / 4.38	--	--	262 / 4.3	92 / 1.92	192 / 5.4	15 / 0.24	--	0.1	660[e]	375	37
8H1	4- 7-53	2,660	8.2	160 / 8.0	91 / 7.5	306 / 13.28	--	--	360 / 5.9	423 / 8.81	482 / 13.6	11 / 0.18	--	0.1	1,654[e]	775	46
8M1	8-22-52	2,630	8.1	121 / 6.05	83 / 6.90	329 / 14.30	--	--	232 / 3.9	437 / 9.11	517 / 14.6	4 / 0.06	--	0.1	1,606[e]	647	53
20P1	8-26-52	400	8.1	31 / 1.55	7 / 0.61	38 / 1.66	--	--	134 / 2.2	7 / 0.15	25 / 0.7	26 / 0.41	--	0.6	201[e]	108	44
7S/3W- 2G1	8-19-52	380	7.9	29 / 1.45	10 / 0.80	37 / 1.63	--	--	153 / 2.5	25 / 0.52	35 / 1.0	4 / 0.06	--	0.1	216[e]	112	42
5L1	7-30-52	1,250	7.6	85 / 4.25	36 / 2.97	139 / 6.06	--	--	281 / 4.6	145 / 3.03	206 / 5.8	2 / 0.02	--	0.4	753[e]	361	46
12J1	5-25-53	470	7.7	36 / 1.80	18 / 1.50	37 / 1.59	--	--	134 / 2.2	13 / 0.28	39 / 1.1	54 / 0.87	--	0.1	264[e]	165	33
20H1	7-11-52	740	7.5	66 / 3.30	21 / 1.75	71 / 3.09	--	--	256 / 4.2	31 / 0.64	89 / 2.5	38 / 0.62	--	0.3	444[e]	252	38
21D1	11- 5-52	660	8.2	58 / 2.9	18 / 1.49	75 / 3.27	--	--	256 / 4.2	29 / 0.61	82 / 2.3	19 / 0.30	--	0.1	409[e]	220	43
24A1	5-20-53	1,510	8.0	81 / 4.05	36 / 3.00	196 / 8.53	--	--	220 / 3.6	189 / 3.94	262 / 7.4	15 / 0.24	--	0.2	891[e]	360	55
25M1	3- 3-38[d]	348	--	--	--	69 / 2.98	--	21 / 0.70	85 / 1.40	15 / 0.31	39 / 1.10	--	--	0.2	---	---	84

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
				HYDROGRAPHIC UNIT NO. 1 (continued)													
				Remainder of Unit (continued)													
7S/3W-29J1	4-21-53	630	7.5	36 / 1.8	19 / 1.59	58 / 2.51	--	--	183 / 3.0	62 / 1.29	64 / 1.8	2 / 0.03	--	0.01	332[c]	165	42
30 (in or near Sec. 30)	December 1915[b]	---	--	69 / 3.44	22 / 1.80	85 / 3.70	--	0 / 0	273 / 4.47	63 / 1.31	112 / 3.16	--	--	--	524	262	41
7S/4W- 1A1	9- 2-52	650	7.5	36 / 1.8	17 / 1.37	72 / 3.14	--	--	201 / 3.3	18 / 0.38	82 / 2.3	10 / 0.16	--	0.1	335[c]	158	50
3A3	4-30-53	670	8.3	54 / 2.7	26 / 2.15	47 / 2.05	--	--	262 / 4.3	20 / 0.42	71 / 2.0	10 / 0.16	--	0.01	359[c]	242	30
8S/2W- 7A1	1939[d]	340	--	3 / 0.15	1 / 0.05	67 / 2.90	--	18 / 0.60	52 / 0.85	10 / 0.20	50 / 1.40	1 / 0.02	--	--	202	10	93
8S/3W-12Q2	1-11-53	500	8.3	36 / 1.8	18 / 1.45	60 / 2.59	--	--	177 / 2.9	3 / 0.06	71 / 2.0	19 / 0.31	--	0.01	295[c]	162	44
				Outside Santa Margarita River Watershed, Adjacent to Hydrographic Unit No. 1													
5S/1W-34N1	11- 5-52	610	7.9	52 / 2.6	16 / 1.34	62 / 2.70	--	--	183 / 3.0	86 / 1.79	53 / 1.5	20 / 0.32	--	0.1	381[c]	197	41
34P1	11- 5-52	680	8.1	64 / 3.2	18 / 1.52	70 / 3.04	--	--	183 / 3.0	102 / 2.11	74 / 2.1	14 / 0.23	--	0.2	433[c]	236	39
5S/2W-34P1	5-12-53	1,080	7.2	89 / 4.45	33 / 2.71	81 / 3.52	--	--	153 / 2.5	47 / 0.97	227 / 6.4	37 / 0.59	--	0.1	590[c]	358	33
6S/1W- 3E1	5-13-53	600	7.5	47 / 2.35	17 / 1.40	58 / 2.52	--	--	183 / 3.0	73 / 1.52	50 / 1.4	18 / 0.29	--	0.1	354[c]	188	40
6S/4W-28D1	2-19-53	650	8.0	48 / 2.4	24 / 1.96	59 / 2.58	--	--	244 / 4.0	28 / 0.58	74 / 2.1	9 / 0.15	--	0.1	364[c]	218	37
28H1	4-21-53	1,740	7.5	20 / 1.0	16 / 1.31	309 / 13.42	--	--	134 / 2.2	8 / 0.17	468 / 13.2	10 / 0.16	--	0.1	898[c]	116	85

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Mineral constituents in parts per million / equivalents per million

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
								HYDROGRAPHIC UNIT NO. 2									
								Anza Basin									
7S/3E- 7R1	11-15-51	1,140	8.1	156/7.8	36/3.02	47/2.02	--	--	110/1.8	391/8.15	135/3.8	44/0.70	--	0.1	864	541	16
	3- 4-52	940	7.8	154/7.7	36/2.98	52/2.24	--	--	116/1.9	311/6.48	135/3.8	18/0.28	--	0.1	764[c]	534	17
	9- 2-54	1,217	7.1	162/8.1	36/2.96	35/1.50	10/0.25	--	104/1.7	307/6.40	135/3.8	23/0.38	--	0.02	969	553	12
14C1	11-15-51	780	7.8	98/4.9	23/1.93	83/3.58	--	--	336/5.5	178/3.70	46/1.3	4/0.07	--	0.1	600[c]	342	34
15P1	5-22-53	620	8.0	46/2.30	12/0.98	68/2.95	--	--	214/3.5	56/1.17	50/1.4	2/0.03	--	0.1	341[c]	164	47
16P1	11-20-51	470	7.2	31/1.55	20/1.63	52/2.26	--	--	67/1.1	99/2.07	57/1.6	12/0.19	--	--	304[c]	159	42
	5-20-53	550	7.0	30/1.50	17/1.40	52/2.28	--	--	72/1.2	101/2.11	67/1.9	10/0.16	--	0.1	313[c]	145	44
17C1	5-21-53	790	7.6	60/3.0	23/1.92	68/2.94	--	--	208/3.4	89/1.86	60/1.7	23/0.38	--	0.1	427[c]	246	37
20A1	11-20-51	710	8.3	58/2.9	13/1.03	100/4.35	--	--	134/2.2	186/3.88	78/2.2	5/0.08	--	0.1	507[c]	197	53
	9- 2-54	917	7.2	90/4.5	16/1.30	77/3.34	6/0.15	--	152/2.5	161/3.35	106/3.0	12/0.19	0.2	0.2	583	290	37
20H1	9- 2-54	572	7.3	60/3.0	12/1.03	37/1.62	6/0.14	--	149/2.45	102/2.13	39/1.1	2/0.04	0.45	0.12	369	202	28
20J2	9- 2-54	748	7.1	80/4.0	14/1.20	48/2.12	6/0.15	--	159/2.6	131/2.74	67/1.9	15/0.24	0.1	0.2	504	260	28
21K1	11-29-51	760	8.0	58/2.9	17/1.38	78/3.37	--	--	183/3.0	110/2.29	71/2.0	15/0.24	--	0.0	397[c]	214	44
21L1	5-27-53	750	7.6	66/3.3	20/1.63	70/3.05	--	--	213/3.5	96/2.00	67/1.9	20/0.33	--	0.05	445[c]	247	38

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as CaCO3, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
							HYDROGRAPHIC UNIT NO. 2 (continued)										
							Anza Basin (continued)										
7S/3E-27M1	12- 1-50	970	7.7	104/5.2	25/2.02	90/3.91	--	--	140/2.3	306/6.38	82/2.3	5/0.08	--	0.2	682[c]	361	35
	11-20-51	790	8.3	86/4.3	22/1.85	83/3.60	--	--	140/2.3	240/4.99	82/2.3	2/0.03	--	0.2	585[c]	308	37
							Lower Coahuila Basin										
7S/2E-32F1	12- 9-53	1,163	7.9	66/3.3	20/1.68	171/7.44	6/0.16	--	232/3.8	182/3.79	160/4.5	3/0.05	0.5	0.2	783	249	60
32J1	12- 9-53	358	7.8	16/0.8	2/0.14	71/3.07	4/0.10	--	88/1.45	37/0.77	53/1.5	2/0.04	0.3	0.03	227	47	75
33C1	4-17-51	570	8.0	45/2.25	12/0.98	70/3.06	--	--	266/3.7	33/0.68	74/2.1	7/0.12	--	0.01	374[c]	162	49
							Lower Lancaster Basin										
8S/1W-12K1	6-10-52	1,800	7.7	103/5.15	39/3.25	275/11.95	--	--	427/7.0	285/5.93	277/7.8	12/0.19	--	0.2	1,205[c]	420	59
8S/1E- 7N1	6-10-52	1,560	7.7	84/4.20	31/2.55	244/10.60	--	--	366/6.0	222/4.63	234/6.6	8/0.12	--	0.3	1,005[c]	338	61
7Q1	3-12-52	1,250	7.5	73/3.65	27/2.22	257/11.20	--	--	311/5.1	241/5.02	241/6.8	1/0.02	--	0.2	996[c]	294	64
7Q4	3-12-52	1,270	7.9	77/3.85	29/2.41	256/11.14	--	--	354/5.8	235/4.89	234/6.6	1/0.01	--	0.3	1,008[c]	313	64
							Upper Coahuila Basin										
7S/2E-13D2	11-21-51	210	7.7	23/1.15	5/0.40	19/0.84	--	--	85/1.4	10/0.20	7/0.2	29/0.47	--	0.0	135[c]	78	35

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
						HYDROGRAPHIC UNIT NO. 2 (continued)											
						Upper Lancaster Basin											
8S/1E-17A2	3-12-52	600	7.9	28/1.4	11/0.89	130/5.64	--	--	226/3.7	72/1.51	92/2.6	1/0.01	--	0.2	447[c]	115	71
17E2	8-17-53	1,740	7.8	82/4.1	33/2.76	261/11.36	--	--	348/5.7	255/5.32	248/7.0	2/0.02	--	0.4	1,083	343	62
18H1	11-28-51	2,820	7.9	178/7.9	32/2.67	450/19.55	--	--	269/4.4	490/10.20	613/17.3	2/0.03	--	0.6	1,899[c]	528	63
						Remainder of Unit											
7S/1E-20Q1	2- 1-51	430	8.3	38/1.9	9/0.77	55/2.38	--	--	201/3.3	9/0.19	48/1.35	11/0.18	--	0.04	270[c]	134	47
29E1	2- 2-51	520	8.0	36/1.8	13/1.05	67/2.90	--	--	213/3.5	33/0.68	60/1.7	16/0.26	--	0.03	332[c]	142	50
30H1	2- 2-51	720	7.8	42/2.1	20/1.61	107/4.66	--	--	287/4.7	51/1.06	85/2.4	6/0.10	--	0.1	454[c]	186	56
30J2	2- 2-51	1,000	7.7	62/3.1	33/2.72	129/5.63	--	--	268/4.4	130/2.72	153/4.3	3/0.05	--	0.1	643[c]	291	49
7S/3E-20B1	9- 2-54	748	7.1	76/3.8	20/1.70	47/2.05	7/0.18	--	229/3.75	82/1.70	64/1.8	12/0.20	0.55	0.1	480	275	27
20C1	9- 3-54	610	7.3	74/3.7	8/0.66	42/1.83	5/0.14	--	235/3.85	16/0.32	71/2.0	18/0.29	--	0.1	394	218	29
20C2 (pmpg. 1¼ hrs.)	9- 5-54	755	7.2	88/4.4	18/1.46	46/2.02	8/0.2	--	101/1.65	191/3.98	78/2.20	3/0.06	--	0.1	589	293	25
(pmpg. 4½ hrs.)	9- 5-54	750	7.1	--	--	--	--	--	101/1.65	--	80/2.25	--	--	--	---	---	--
	10-19-54[e]	810	7.8	81/4.06	17/1.43	50/2.18	8/0.21	0/0	96/1.57	184/3.84	83/2.33	5/0.08	0.2	0.0	557	274	28
8S/1E-18K1	11-29-50	1,550	8.2	9/0.45	1/0.12	343/14.88	--	--	226/3.7	206/4.30	264/7.45	4/0.07	--	0.1	936[c]	28	96

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10⁶ at 25° C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
HYDROGRAPHIC UNIT NO. 2 (continued)																	
Remainder of Unit (continued)																	
8S/1E-18K1	11-16-51	1,370	8.8	8 / 0.4	1 / 0.1	337 / 14.64	--	--	244 / 4.0	188 / 3.91	255 / 7.2	1 / 0.02	--	0.2	562[e]	20	97
8S/3E- 8C1	12- 6-50	270	7.7	23 / 1.15	6 / 0.47	27 / 1.19	--	--	110 / 1.8	6 / 0.12	18 / 0.5	24 / 0.39	--	0.04	159[c]	81	42
	11-21-51	240	8.3	22 / 1.1	6 / 0.46	27 / 1.17	--	--	110 / 1.8	2 / 0.04	12 / 0.35	23 / 0.38	--	0.1	147[e]	78	43
Outside Santa Margarita River Watershed, Adjacent to Hydrographic Unit No. 2																	
8S/3E- 2E1	12- 7-50	430	8.2	30 / 1.5	10 / 0.81	53 / 2.30	--	--	152 / 2.5	14 / 0.29	50 / 1.4	11 / 0.17	--	0.1	244[c]	116	50
	11-15-51	390	8.2	38 / 1.9	8 / 0.65	43 / 1.87	--	--	146 / 2.4	6 / 0.13	50 / 1.4	12 / 0.19	--	0.04	230[e]	128	42
2J1	11-15-51	1,000	8.0	88 / 4.4	25 / 2.05	86 / 3.72	--	--	238 / 3.9	43 / 0.90	195 / 5.5	10 / 0.17	--	0.04	566	322	37

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Mineral constituents in parts per million / equivalents per million (Ca through NO_3 columns)

Well number	Date sampled	ECx10[6] at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
HYDROGRAPHIC UNIT 3																	
Aguanga Basin																	
8S/1E-29J1	11-10-50	530	8.0	32/1.6	6/0.47	85/3.70	--	--	146/2.4	50/1.05	75/2.1	4/0.07	--	0.3	325[c]	104	64
	3-25-52	300	7.4	25/1.25	13/1.07	23/1.02	--	--	165/2.7	1/0.02	18/0.5	2/0.02	--	0.1	164[c]	116	31
33F1	1-26-51	510	8.3	60/3.0	14/1.15	49/2.12	--	--	189/3.1	120/2.50	21/0.6	3/0.05	--	0.01	361[c]	208	34
	11-27-51	640	7.8	71/3.55	17/1.38	54/2.34	--	--	207/3.4	147/3.07	28/0.8	3/0.05	--	0.1	423[c]	246	32
33G2	7-18-52	1,020	7.5	113/5.65	24/2.00	66/2.85	--	--	220/3.6	254/5.49	44/1.25	4/0.06	--	0.1	618[c]	382	27
Dodge Basin																	
9S/2E-27J1	12- 1-50	400	7.7	41/2.05	15/1.24	33/1.42	--	--	201/3.3	21/0.43	18/0.5	4/0.07	--	0.1	232[c]	164	30
	11-21-51	370	8.5	50/2.5	10/0.86	32/1.37	--	--	201/3.3	18/0.37	18/0.5	4/0.06	--	0.1	295[c]	168	39
Lower Culp Basin																	
9S/1E- 1Q1	3- 3-52	900	7.8	110/5.5	24/1.98	137/5.95	--	--	329/5.4	230/4.80	85/2.4	4/0.60	--	0.2	755[c]	374	44
12A1	3- 4-52	830	7.7	106/5.3	18/1.48	140/6.09	--	--	366/6.0	200/4.17	64/1.8	11/0.18	--	0.1	722[c]	339	48
Nigger Basin																	
8S/1W-13Q1	3-12-52	600	8.7	9/0.45	1/0.07	164/7.12	--	--	128/2.1	76/1.58	121/3.4	1/0.01	--	2.9	436[c]	26	93
Radec Basin																	
8S/1E-19J1	11-16-50	2,300	7.9	304/15.2	25/2.06	175/7.58	--	--	232/3.8	254/5.29	560/15.8	5/0.09	--	0.1	1,439[c]	863	30

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as CaCO3, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
HYDROGRAPHIC UNIT 3 (continued)																	
Radec Basin (continued)																	
8S/1E-19K1	11-17-50	1,370	7.5	159/7.95	31/2.56	139/6.05	--/	--/	482/7.9	276/5.76	103/2.9	4/0.06	--	0.2	953[c]	525	37
19Q1	11-17-50	1,650	8.0	138/6.9	30/2.46	203/8.82	--/	--/	351/5.75	252/5.25	255/7.2	4/0.07	--	0.2	1,057[c]	468	49
	11-19-51	1,440	8.3	133/6.65	34/2.79	175/7.57	--/	--/	403/6.6	269/5.60	160/4.5	2/0.04	--	0.3	975[c]	480	45
Remainder of Unit																	
8S/1E-19F1	11-16-50	2,530	7.5	323/16.15	37/3.11	165/7.20	--/	--/	268/4.4	138/2.76	692/19.5	5/0.08	--	0.1	1,494[c]	963	27
	11-12-53	2,450	7.7	298/14.9	10/0.8	201/8.75	4/0.10	--/	168/2.75	97/2.02	706/19.9	8/0.13	0.4	0.1	1,805	785	36
19F3	11-16-50	1,180	8.0	155/7.75	9/0.74	69/2.98	--/	--/	177/2.9	27/0.56	277/7.8	12/0.19	--	0.1	637[c]	424	26
19H1	11-16-50	1,460	8.1	159/7.95	12/1.02	140/6.06	--/	--/	140/2.3	118/2.47	359/10.1	5/0.08	--	0.3	863[c]	448	40
19H2	11-16-50	2,150	8.1	244/12.2	20/1.64	171/7.42	--/	--/	159/2.6	81/1.68	595/16.75	16/0.26	--	0.2	1,207[c]	692	35
19H3	1-16-51	3,220	7.5	363/18.15	29/2.40	277/12.07	--/	--/	146/2.3	124/2.59	975/27.5	13/0.20	--	0.4	1,854[c]	1,028	37
19H4	11-12-53	848	8.4	18/0.9	4/0.3	175/7.60	2/0.04	--/	122/2.0	76/1.58	174/4.9	2/0.03	0.9	0.4	530	60	86
20M1	11-16-50	710	8.1	41/2.05	6/0.48	118/5.11	--/	--/	171/2.8	78/1.66	106/3.0	4/0.06	--	0.6	438[c]	126	67
20M2	11-16-50	530	8.3	11/0.55	1/0.09	114/4.98	--/	--/	134/2.2	34/0.70	89/2.5	2/0.04	--	0.6	318[c]	32	89
20P2	4-15-54	362	9.4	3/0.15	1/0.05	93/4.05	0.4/0.01	7/0.22	118/1.93	15/0.32	64/1.8	2/0.02	1.8	0.7	269	10	95

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	$EC \times 10^6$ at 25° C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
								HYDROGRAPHIC UNIT NO. 3 (continued)									
								Remainder of Unit (continued)									
8S/1W-13K1 (Bailed)	12- 1-50	1,920	11.6	103 / 5.15	3 / 0.25	169 / 7.36	--	213 / 7.1	--	40 / 0.83	170 / 4.8	3 / 0.04	--	1.1	702[c]	270	58
(Hand pumped)	11-27-51	1,130	7.9	44 / 2.2	50 / 4.18	109 / 4.75	--	--	409 / 6.7	1 / 0.02	170 / 4.8	1 / 0.02	--	2.7	580[c]	319	43
22K1	11- 8-50	570	7.9	60 / 3.0	15 / 1.26	47 / 2.03	--	--	293 / 4.8	68 / 1.41	39 / 1.1	3 / 0.05	--	0.04	378[c]	213	32
	11-27-51	540	7.7	54 / 2.7	14 / 1.19	54 / 2.34	--	--	238 / 3.9	63 / 1.32	39 / 1.1	2 / 0.03	--	0.0	345[c]	194	38
25Q1	1-25-51	670	7.8	66 / 3.3	39 / 3.18	50 / 2.16	--	--	323 / 5.3	91 / 1.90	39 / 1.1	4 / 0.07	--	0.1	450[c]	324	25
9S/2E-15R1	11-30-51	540	7.6	44 / 2.2	15 / 1.22	55 / 2.37	--	--	293 / 4.8	6 / 0.19	27 / 0.75	2 / 0.04	--	0.0	295[c]	171	41
9S/3E-16A1	12- 8-50	560	7.8	60 / 3.0	15 / 1.24	58 / 2.53	--	--	305 / 5.0	14 / 0.30	39 / 1.1	7 / 0.12	--	0.0	345[c]	212	37

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
								HYDROGRAPHIC UNIT NO. 4									
								Pauba Basin									
8S/2W-11J1	1939[d]	1,040	--	101/5.03	24/1.98	90/3.90	0/0	0/0	274/4.50	178/3.71	87/2.45	9/0.14	--	--	763	350	36
11L1	5-26-54	1,053	7.9	92/4.6	12/1.0	115/4.99	5/0.14	--	272/4.45	161/3.36	117/3.3	5/0.09	0.4	0.3	702	280	47
11P1	8- 5-52[d]	450	9.2	2	1	111	--	24	104	50	50	--	--	0.8	354	6	98
12H1	1939[d]	831	--	65/3.24	20/1.62	86/3.72	0/0	0/0	250/4.10	110/2.30	73/2.05	2/0.05	--	--	607	242	43
	5-26-54	923	7.9	74/3.7	20/1.65	89/3.82	2/0.06	--	256/4.2	126/2.61	96/2.7	7/0.11	0.4	0.2	607	268	41
12K1	1939[d]	703	--	50/2.52	15/1.24	82/3.56	0/0	0/0	220/3.60	99/2.07	53/1.50	0/--	--	--	519	188	49
	1939[d]	716	--	56/2.80	15/1.23	77/3.36	0/0	0/0	232/3.80	101/2.10	50/1.40	0/0	--	--	531	202	46
	2- 9-51	980	8.0	71/3.55	8/0.70	129/5.60	--	--	268/4.4	163/3.39	106/3.0	5/0.08	--	0.0	658[e]	212	57
15C1	December 1915[b]	---	--	20/1.00	7/0.55	91/3.96	--	0/0	168/2.76	18/0.37	83/2.33	3/0.05	--	--	340	78	72
	1939	521	--	3/0.13	0/0.04	111/4.82	0/0	18/0.60	131/2.15	14/0.30	67/1.90	0/0	--	--	344	8	97
	2- 9-51	480	8.8	3/0.15	0/0.02	115/5.03	--	84/2.7	--	15/0.31	69/1.95	4/0.07	--	0.3	287[e]	8	97
	11-14-51	480	8.6	10/0.5	2/0.15	109/4.75	--	--	164/2.7	11/0.22	74/2.1	4/0.06	--	0.5	292[e]	33	90
	5-26-54	500	8.9	3/0.15	2/0.15	107/4.64	1/0.02	3/0.1	159/2.6	4/0.09	69/1.95	4/0.07	1.5	0.7	301	15	94
16A1	1939[d]	633	--	28/1.40	7/0.60	95/4.12	0/0	0/0	171/2.80	13/0.27	103/2.90	7/0.11	--	--	424	100	67

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
								HYDROGRAPHIC UNIT NO. 4 (continued)									
								Pauba Basin (continued)									
8S/2W-16A1	2- 9-51	600	8.0	34/1.70	8/0.61	92/4.01	--	--	171/2.8	16/0.33	103/2.9	13/0.21	--	0.1	350[c]	116	64
	11-30-51	520	7.9	32/1.6	8/0.68	91/3.97	--	--	165/2.7	10/0.21	106/3.0	4/0.06	--	0.2	333[c]	114	64
	5-26-54	643	8.2	34/1.7	8/0.66	88/3.82	2/0.05	--	171/2.8	7/0.14	103/2.9	15/0.24	0.55	0.2	376	118	61
16G1	1939[d]	646	--	9/0.47	1/0.11	124/5.41	0/0	12/0.40	107/1.75	36/0.74	103/2.90	9/0.14	--	--	401	29	90
	2- 9-51	600	8.5	11/0.55	1/0.05	124/5.40	--	63/2.1	--	42/0.87	103/2.9	14/0.22	--	0.01	359[c]	30	90
	11-30-51	520	8.3	11/0.55	1/0.11	126/5.49	--	--	134/2.2	38/0.80	103/2.9	11/0.18	--	0.2	357[c]	33	97
	5-26-54	652	8.3	15/0.75	1/0.1	112/4.88	2/0.06	--	134/2.2	31/0.64	103/2.9	16/0.25	0.6	0.2	378	43	84
17G1	1939[d]	532	--	3/0.13	1/0.11	107/4.66	0/0	15/0.59	82/1.35	19/0.39	89/2.50	8/0.13	--	--	324	12	95
	2- 9-51	530	8.6	5/0.25	1/0.06	113/4.93	--	57/1.9	--	28/0.58	92/2.6	14/0.23	--	0.3	321[c]	16	94
20B2 and B3 (composite)	1939[d]	805	--	57/2.84	16/1.28	95/4.13	0/0	6/0.20	232/3.85	92/1.91	80/2.25	3/0.05	--	--	581	206	50
20B4	6- 4-54	943	7.4	70/3.5	16/1.31	110/4.76	3/0.08	--	241/3.95	124/2.58	99/2.8	6/0.10	0.3	0.1	469	240	49
								Pechanga Basin									
8S/2W-19J1	July 1916[b]	---	--	52	16	43	--	12	193	17	50	28	--	--	369	196	--
20L1	1939[d]	475	--	47/2.33	9/0.72	42/1.83	0/0	0/0	207/3.40	17/0.35	35/1.0	6/0.09	--	--	363	152	38
29G1	3-25-52	630	7.9	38/1.90	13/1.10	75/3.28	--	--	177/2.9	50/1.04	85/2.4	3/0.04	--	--	352[c]	150	52

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
				HYDROGRAPHIC UNIT NO. 4 (continued)													
				Remainder of unit													
8S/2W-17M1	8- 6-51	460	8.7	9 / 0.45	3 / 0.22	91 / 3.93	--	--	134 / 2.2	12 / 0.26	64 / 1.8	9 / 0.15	--	0.4	255[c]	34	85
	5-26-54	442	9.3	3 / 0.15	0 / 0	91 / 3.96	1 / 0.02	14 / 0.45	122 / 2.0	11 / 0.22	48 / 1.35	4 / 0.07	3.8	1.0	263	8	96
22L1	3-12-53	340	8.2	14 / 0.70	8 / 0.65	48 / 2.10	--	--	116 / 1.9	3 / 0.06	50 / 1.4	1 / 0.02	--	0.01	182[c]	68	61

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
HYDROGRAPHIC UNIT NO. 5																	
Rainbow Basin																	
9S/3W-1P3	11-10-53	952	7.7	58 / 2.9	35 / 2.9	80 / 3.48	4 / 0.10	--	104 / 1.7	35 / 0.73	199 / 5.6	35 / 0.57	0.6	0.0	647	290	38
1P5	11-10-53	458	7.5	24 / 1.2	12 / 1.00	53 / 2.32	1 / 0.03	--	110 / 1.8	28 / 0.59	71 / 2.0	11 / 0.18	0.4	0.1	332	110	51
1Q2	4-20-54	1,116	7.5	80 / 4.0	50 / 4.1	131 / 5.69	4 / 0.10	--	116 / 1.90	72 / 1.49	330 / 9.3	48 / 0.78	0.6	0.1	897	405	41
Remainder of Unit																	
8S/3W-32N1	12-28-53	588	7.8	66 / 3.3	20 / 1.62	44 / 1.91	5 / 0.14	--	272 / 4.45	23 / 0.47	57 / 1.6	2 / 0.04	0.0	0.02	409	248	28
32N2	12-28-53	516	8.3	42 / 2.1	15 / 1.23	57 / 2.46	3 / 0.09	--	195 / 3.2	26 / 0.54	67 / 1.9	3 / 0.05	0.0	0.02	368	167	42
32N3 (Bailed at 4 ft.)	2- 1-54	633	8.1	70 / 3.5	17 / 1.44	40 / 1.76	5 / 0.12	--	250 / 4.1	42 / 0.88	51 / 1.45	3 / 0.05	0.2	0.1	384	247	26
	4-20-54	568	7.6	72 / 3.6	21 / 1.72	39 / 1.68	3 / 0.08	--	262 / 4.3	34 / 0.71	53 / 1.5	2 / 0.04	0.2	0.04	415	266	24
8S/4W-29J1	7-27-54	510	7.4	42 / 2.1	17 / 1.4	45 / 1.96	1 / 0.01	--	192 / 3.15	27 / 0.56	57 / 1.6	6 / 0.10	0.4	0.1	339	175	36
32B2	7-27-54	445	7.4	34 / 1.7	9 / 0.75	52 / 2.24	1 / 0.02	--	168 / 2.75	24 / 0.49	46 / 1.3	5 / 0.08	0.5	0.1	314	122	48
34F1 (Bailed)	8-25-54	288	7.2	23 / 1.15	4 / 0.33	32 / 1.37	1 / 0.03	--	70 / 1.15	23 / 0.47	32 / 0.9	34 / 0.55	0.1	0.2	270	74	48
9S/3W-17C1	7- 9-52	820	7.2	53 / 2.65	41 / 3.38	66 / 2.87	--	--	256 / 4.2	71 / 1.47	110 / 3.1	2 / 0.04	--	0.1	471[c]	302	32
9S/4W- 5Q2	8-25-54	425	7.3	52 / 2.6	7 / 0.56	30 / 1.29	3 / 0.08	--	195 / 3.2	9 / 0.18	35 / 1.0	4 / 0.06	0.1	0.1	275	158	28
13P1	4- 2-54	1,026	7.8	74 / 3.70	36 / 3.0	65 / 2.83	3 / 0.07	--	134 / 2.2	67 / 1.39	135 / 3.8	128 / 2.07	0.2	0.04	730	335	30

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
				HYDROGRAPHIC UNIT NO. 5 (continued)													
				Remainder of Unit (continued)													
9S/4W-13Q1	8-25-54	1,500	6.8	102/5.1	65/5.4	129/5.60	2/0.04	--	134/2.2	250/5.20	261/7.35	67/1.08	0.6	0.2	1,067	525	35
29C1	11-29-51[fg]	---	7.9	86	64	--	--	--	--	21	50	--	--	--	220	---	--
	11-29-51[fg]	---	7.6	102	44	--	--	--	--	4	76	--	--	--	230	---	--
29L1	8-10-48[fg]	---	7.9	70	15	--	--	--	--	169	52	--	--	--	---	---	--
	3- 1-49[fg]	---	7.7	25/1.24	18/1.52	59/2.56	--	0/0	161/2.64	21/0.44	44/1.24	--	--	--	286[e]	---	48
	11-29-51[g]	---	7.2	76	50	--	--	--	--	24	48	--	--	--	210	---	--
	1-29-52[g]	530	7.9	31/1.56	11/0.92	69/3.02	--	0/0	159/2.6	24/0.5	50/1.4	0/0	0.3	0.1	373	---	55
	6- 9-53	480	7.7	31/1.55	12/1.02	49/2.14	--	--	164/2.7	23/0.47	53/1.5	3/0.05	--	0.1	253[e]	128	45
				Outside Santa Margarita River Watershed, Adjacent to Hydrographic Unit No. 5													
9S/3W-12F3	11- 9-53	793	8.6	46/2.3	28/2.30	83/3.61	3/0.08	--	171/2.8	42/0.88	149/4.2	16/0.26	0.9	0.1	525	230	44

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
									HYDROGRAPHIC UNIT NO. 6								
									Santa Margarita Coastal Basin								
									Upper Sub-basin								
10S/4W-5D1	3-1-49[fg]	---	7.8	38/1.92	23/1.91	151/6.55	--	0/0	256/4.20	118/2.46	106/2.99	--	--	--	589[c]	---	63
	11-29-51[g]	---	7.6	152	88	--	--	--	--	95	112	--	--	--	450	---	--
	1-25-52[g]	990	7.8	62/3.1	22/1.8	120/5.2	--	0/0	263/4.3	93/1.9	110/3.1	--	0.4	0.05	694	---	52
7H1	6-12-51[gh]	---	7.7	130	125	--	--	--	--	66	124	--	--	--	720	---	--
7R1	3-1-49[fg]	---	7.8	80	23	128	--	0	212	100	186	--	--	--	754	---	--
	10-25-51[gi]	985	7.5	65/3.25	22/1.81	116/5.04	8/0.22	0/0	280/4.59	108/2.25	125/3.52	1/0.02	0.2	--	605[c]	252	49
	11-29-51[g]	---	7.7	166	98	--	--	--	--	112	128	--	--	--	490	---	--
	1-10-52[g]	1,100	7.5	62/3.12	26/2.12	141/6.13	--	0/0	285/4.68	112/2.34	126/3.55	0/0	0.5	0.2	776	---	54
									Chappo Sub-basin								
10S/4W-18E1	8-10-48[fg]	---	8.4	152	42	--	--	--	--	102	120	--	--	--	---	---	--
	3-1-49[fg]	---	8.0	34	24	--	--	0	264	88	116	--	--	--	698	---	--
	11-29-51[g]	---	7.6	154	92	--	--	--	--	121	128	--	--	--	520	---	--
	1-10-52[g]	1,030	8.1	62/2.92	20/1.92	126/5.5	--	0/0	264/4.3	109/2.3	122/3.4	0/0	0.4	0.3	727	---	53
18M1	8-10-48[fg]	---	8.1	150	43	--	--	--	--	90	120	--	--	--	---	---	--

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
				HYDROGRAPHIC UNIT NO. 6 (continued)													
				Santa Margarita Coastal Basin (continued)													
				Chappo Sub-basin (continued)													
10S/4W-18M1	3- 1-49[f,g]	---	8.3	34/1.70	24/1.98	157/6.82	--	3/0.10	252/4.13	88/1.83	122/3.44	--	--	--	705	---	--
	11-29-51[g]	---	7.8	64	76	--	--	--	--	56	124	--	--	--	390	---	--
18M2	11-29-51[g]	---	7.6	152	92	--	--	--	--	98	124	--	--	--	440	---	--
	1-25-52[g]	1,150	7.8	62/3.1	19/1.6	161/7.0	--	0/0	286/4.7	130/2.7	124/3.5	--	0.5	0.4	806	---	60
10S/5W-13J1	8-31-50[f,g]	---	7.6	268	352	--	--	--	--	30	390	--	--	--	1,241	---	--
	7- 6-51[g,h]	---	7.6	124	79	--	--	--	--	98	120	--	--	--	598	---	--
13R1	8-10-48[f,g]	---	8.2	130	40	--	--	--	--	81	110	--	--	--	---	---	--
	3- 1-49[f,g]	---	8.1	35	23	--	--	3	238	63	120	--	--	--	638	---	--
14P1	8-10-48[f,g]	---	7.7	209	46	--	--	--	--	69	236	--	--	--	---	---	--
	3- 1-49[f,g]	---	8.1	78	22	--	--	0	134	33	246	--	--	--	564[c]	---	--
	10-25-51[g,i]	1,240	7.3	81/4.05	23/1.89	145/6.30	10/0.15	--	270/4.42	67/1.40	232/6.53	4/0.06	0.3	--	722[c]	296	51
	11-29-51[g]	---	--	188	104	--	--	--	--	95	244	--	--	--	650	---	--
	1-11-52[g]	1,270	7.4	83/4.2	24/2.0	172/7.5	--	0/0	268/4.4	69/1.4	250/7.1	1	0.5	0.1	890	---	55
23J1	9-26-50[f,g]	---	7.6	135	80	--	--	--	--	88	144	--	--	--	547	---	--
	10-23-51[g,i]	985	7.6	60/3.00	21/1.73	123/5.35	8/0.13	--	295/4.83	93/1.94	125/3.52	0/0	0.4	--	607[c]	236	52

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
HYDROGRAPHIC UNIT NO. 6 (continued)																	
Santa Margarita Coastal Basin (continued)																	
Chappo Sub-basin (continued)																	
10S/5W-23J1	11-29-51[g]	---	7.7	148	94	--	--	--	--	90	128	--	--	--	480	---	--
	1-25-52[g]	1,060	7.9	58 2.92	23 1.92	144 6.25	--	0 0	295 4.85	98 2.04	128 3.60	0	0.1	0.2	746	---	56
23J2	9- 1-50[fg]	---	7.6	142	83	--	--	--	--	105	138	--	--	--	612	---	--
23J3	6-22-51[g]	---	7.8	128	85	--	--	--	--	82	116	--	--	--	564	---	--
23L1	6-22-51[gj]	---	7.8	142	109	--	--	--	--	90	116	--	--	--	644	---	--
	1-22-52[g]	1,470	8.1	87 4.34	31 2.50	212 9.21	--	0 0	308 5.05	112 2.30	280 7.90	--	0.4	0.2	1,030	---	57
23Q1	7-12-51[gi]	---	7.8	106	55	--	--	--	--	80	440	--	--	--	1,334	---	--
	1-11-52[gk]	2,220	8.1	31 1.47	4 0.33	444 19.30	2 0.05	--	140 2.30	90 1.88	600 16.90	1 0.02	0.5	0.4	1,250[c]	94	90
24H1	8-21-50[fg]	---	7.4	135	75	--	--	--	--	51	126	--	--	--	785	---	--
24H3	12-18-26[dm]	---	--	49	17	122	--	--	259	60	131	--	--	--	651	---	--
Ysidora Sub-basin																	
10S/5W-26L1	6-18-51[gh]	---	7.5	124	139	--	--	--	--	94	168	--	--	--	750	---	--
35J1	11-19-26[d]	---	--	134	54	479	--	--	424	198	745	--	--	--	2,066	---	--
35K1	3- 1-49[fg]	---	8.0	71	22	178	--	3	391	48	175	--	--	--	914	---	--
	10-24-51[gi]	1,210	7.5	73 3.65	27 2.22	149 6.48	9 0.23	--	338 5.54	107 2.23	173 4.87	1 0.02	0.2	0.0	735[c]	293	52
	11-29-51[g]	---	7.7	178	110	--	--	--	--	110	168	--	--	--	550	---	--

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
				HYDROGRAPHIC UNIT NO. 6 (continued)													
				Santa Margarita Coastal Basin (continued)													
				Ysidora Sub-basin (continued)													
10S/5W-35K1	1-11-52[g]	1,300	7.5	73 / 3.64	25 / 2.04	177 / 7.72	--	0 / 0	323 / 5.3	112 / 2.3	176 / 5.0	0 / 0	0.5	0.2	749[c]	---	58
35K5	6-13-51[g]	---	7.5	122	134	--	--	--	--	88	160	--	--	--	740	---	--
	11-18-52[gn]	1,100	7.9	63 / 3.14	20 / 1.64	140 / 6.09	3 / 0.07	--	300 / 4.92	102 / 2.12	146 / 4.12	1 / 0.01	--	0.2	625[c]	239	56
11S/5W- 2A1	8-10-48[fg]	---	8.1	178	55	--	--	--	--	103	190	--	--	--	---	---	--
	9- 3-48[fg]	---	7.6	280	119	--	--	--	--	140	196	--	--	--	---	---	--
	3- 1-49[fg]	---	7.7	43	24	209	--	0	308	122	176	--	--	--	907	---	--
	11-29-51[g]	---	7.8	186	118	--	--	--	--	119	184	--	--	--	610	---	--
	1- 8-52[g]	1,360	7.5	74 / 3.7	30 / 2.5	188 / 8.06	--	0 / 0	315 / 5.2	116 / 2.4	204 / 5.8	0	--	0.2	953[c]	---	56
2D1	3- 1-49[fg]	---	8.1	86	26	208	--	--	188	275	200	--	--	--	927[c]	---	58
	11-29-51[g]	---	7.6	278	192	--	--	--	--	217	232	--	--	--	800	---	--
	1-11-52[g]	1,670	7.4	113 / 5.6	43 / 3.6	196 / 8.5	--	0 / 0	346 / 5.7	210 / 4.4	240 / 6.8	0 / 0	0.5	0.2	1,172[c]	---	48
2E1	3- 1-49[fg]	---	7.9	88	23	--	--	0	298	162	216	--	--	--	1,034	---	--
	11-29-51[g]	---	8.2	58	100	--	--	--	--	55	184	--	--	--	550	---	--
	11-18-52[g]	1,940	7.7	191 / 9.53	50 / 4.11	163 / 7.09	4 / 0.09	--	424 / 6.95	510 / 10.62	168 / 4.74	1 / 0.02	--	0.2	1,299[c]	682	--

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10⁶ at 25°C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													
				HYDROGRAPHIC UNIT NO. 6 (continued)													
				Santa Margarita Coastal Basin (continued)													
				Ysidora Sub-basin (continued)													
11S/5W- 2E3	12-18-26[do]	---	--	56	22	142	--	--	275	104	145	--	--	--	770	---	--
2F1	8-10-48[fg]	---	8.1	156	55	--	--	--	--	98	180	--	--	--	---	---	--
	3- 1-49[fg]	---	7.9	56	24	186	--	0	310	107	176	--	--	--	884	---	--
	11-29-51[g]	---	7.7	164	114	--	--	--	--	13	304	--	--	--	630	---	--
	1- 8-52[g]	1,270	7.9	70 3.50	22 1.80	182 7.93	--	0 0	303 4.96	95 1.97	196 5.50	0	0.4	0.3	892	---	59
2K1	8-10-48[fg]	---	8.0	150	76	--	--	--	--	120	314	--	--	--	---	---	--
	9- 3-48[fg]	---	7.4	216	94	--	--	--	--	116	192	--	--	--	---	---	--
	3- 2-49[fg]	---	7.8	56	26	--	--	0	308	184	428	--	--	--	1,411	---	--
	11-29-51[g]	---	9.1	54	64	--	--	--	304	13	--	--	--	--	650	---	--
	1-10-52[gp]	3,340	7.6	109 5.45	62 5.11	532 23.1	7 0.18	--	303 5.0	203 4.2	875 24.7	1 0.01	0.3	0.4	1,970	527	68
	11-18-52[g]	2,400	8.0	91 4.54	29 2.38	355 15.44	5 0.13	--	204 4.98	160 3.33	532 15.00	1 0.02	--	0.2	1,327[c]	346	69
2N2	9-19-25[dq]	---	--	64	23	140	--	--	281	112	152	--	--	--	802	---	54
	12-18-26[dr]	---	--	30	9	54	--	--	143	27	60	--	--	--	337	---	51
2N3	12-18-26[dr]	---	--	34	25	192	--	--	244	85	224	--	--	--	818	---	69
2N4	6- 4-51[gs]	---	8.0	268	204	--	--	--	--	225	460	--	--	--	1,460	---	--
	1- 4-52[t]	14,100	7.4	480 24.0	289 23.8	2500 108.8	42 1.07	--	362 5.9	602 12.5	4910 138.5	--	0.3	1.0	9,030[c]	2,390	69

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25°C	pH	Mineral constituents in parts per million / equivalents per million: Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
HYDROGRAPHIC UNIT NO. 6 (continued)																	
Santa Margarita Coastal Basin (continued)																	
Ysidora Sub-basin (continued)																	
11S/5W- 2N4	11-18-52[g]	1,990	8.3	77/3.84	37/3.04	261/11.35	6/0.15	--	292/4.79	130/2.71	422/11.90	1/0.02	--	0.3	1,080[c]	346	62
Remainder of Unit																	
9S/3W-18K1	9-15-54	752	7.4	53/2.65	18/1.50	82/3.56	3/0.08	0/0	165/2.7	133/2.78	62/1.75	16/0.26	0.7	0.2	477	208	46
18P1	4- 2-54	900	8.3	84/4.2	28/2.3	81/3.54	4/0.11	--	159/2.6	262/5.45	71/2.0	6/0.09	0.4	0.1	650	325	35
19D1	8-25-54	865	7.3	57/2.85	36/2.96	65/2.83	2/0.06	--	174/2.84	89/1.86	119/3.35	53/0.86	0.2	0.1	592	290	32
19M1	8-25-54	947	7.2	60/3.0	47/3.90	67/2.90	3/0.08	0/0	168/2.75	107/2.22	170/4.8	3/0.05	0.2	0.1	665	345	29
9S/4W-24R1	8-25-54	645	7.6	39/1.95	28/2.35	57/2.46	2/0.06	0/0	186/3.05	63/1.32	74/2.1	44/0.71	0.2	0.1	443	215	36
25E3	8-24-54	615	8.0	45/2.25	12/1.0	66/2.87	4/0.09	0/0	180/2.95	7/0.15	87/2.45	64/1.02	0.8	--	395	162	46
10S/5W-13G1	8-24-51[g,u]	---	7.5	120	46	--	--	--	--	37	120	--	--	--	351	---	--
11S/5W- 2K2	8-23-51[g]	---	--	5	9	--	--	--	--	31	160	--	--	--	650	---	--
	1-11-52[g,v]	1,310	8.9	3/0.15	2/0.21	282/12.70	3/0.08	31/1.06	458/7.00	30/0.62	155/4.37	1/0.01	1.1	0.8	723[c]	18	96
2P1	8-23-51[g,j]	---	8.0	190	230	--	--	--	--	70	392	--	--	--	860	---	--
9J1	7-10-51[g,h]	---	7.6	300	670	--	--	--	--	250	1900	--	--	--	4,370	---	--
	1- 3-52[g,w]	48,300	6.9	577/28.8	1420/117	11000/478	274/7.0	--	182/3.0	2380/49.6	20300/572.5	--	0.7	3.3	36,100[c]	7,280	76

MINERAL ANALYSES OF GROUND WATERS IN AND ADJACENT TO SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date sampled	ECx10^6 at 25 C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
				Mineral constituents in parts per million / equivalents per million													

HYDROGRAPHIC UNIT NO. 6 (continued)

Remainder of Unit (continued)

Well number	Date sampled	ECx10^6 at 25 C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F ppm	B ppm	Total dissolved solids, ppm	Total hardness as $CaCO_3$, ppm	Per cent Na
11S/5W- 9J1	11-18-52[g]	22,300	7.5	255 / 12.72	393 / 32.32	4330 / 188.29	139 / 3.56	--	210 / 3.44	784 / 16.32	7810 / 220.27	6 / 0.10	--	0.6	13,684[c]	2,250	79
10B1	5-31-51[gx]	---	7.4	188	103	--	--	--	--	235	390	--	--	--	1,200	---	--
	1- 3-52[gy]	4,170	7.2	201 / 10.00	100 / 8.23	550 / 23.90	14 / 0.35	--	236 / 3.9	231 / 4.8	1210 / 34.1	2 / 0.02	0.1	0.6	2,440[c]	912	56
	11-18-52[gz]	2,640	8.2	142	53	313	7	--	262	163	642	1	--	0.1	1,674[c]	---	--

a. All analyses by Division of Water Resources unless otherwise noted.
b. United States Geological Survey Water Supply Paper 429.
c. Total dissolved solids determined by summation.
d. Analysis obtained from Vail Company.
e. Analyzed by Pacific Chemical Consultants.
f. Date analyzed.
g. Analysis obtained from United States Navy.
h. Sampled after 2 hours pumping with Homolite.
i. Sampled from pump discharge.
j. Sampled after 1 hour pumping with Homolite.
k. Sampled at 280 feet with mechanical thief, while pumping, after conductivity stabilized.
m. Sampled at 6 feet.
n. Sampled at 1½ hours pumping with Homolite.
o. Sampled at 90 feet.
p. Sampled at 185 feet with mechanical thief, while pumping, after conductivity stabilized.
q. Sampled at 100 feet.
r. Sampled at 90 feet.
s. Sampled after 3 hours pumping with Homolite.
t. Sampled at 195 feet with mechanical thief, while pumping, after conductivity stabilized. Partial analysis shows Cl 650 ppm and EC 2,700 for pumped sample after 4 3/4 hours.
u. Sampled after 1 hour discharge.
v. Sampled at 248 feet with mechanical thief, while pumping, after conductivity stabilized.
w. Sampled at 289 feet with mechanical thief, while pumping, after conductivity stabilized.
x. Sampled after 5½ hours with Homolite.
y. Sampled at 194 feet with mechanical thief, while pumping, after conductivity stabilized.
z. Homolite pumped.

TABLE H-4

PARTIAL MINERAL ANALYSES OF GROUND WATERS IN SANTA MARGARITA RIVER WATERSHED[a]

Well number	Date	Chloride, ppm	Total dissolved solids, ppm
10S/4W- 7H1	7-21-50	460	1,350
	6-11-51	132	646[b]
	6-12-51	126	630[b]
7J1	10-24-50	163	666[b]
7J2	10-24-50	122	701[b]
7R1	10-24-50	124	699[b]
	10-25-51	132	707[b]
18E1	10-24-50	123	701[b]
18M2	7-21-50	124	554
10S/5W-13G1	6-22-51	122	749[b]
	8-24-51	108	491[b]
	9-24-52	120	351
13J1	6-20-51	245	721[b]
	7- 6-51	116	658[b]
13R1	10-24-50	116	649[b]
14P1	10-25-51	232	875[b]
23J1	10-23-51	128	692[b]
23J3	6-20-51	112	646[b]
23L1	6-20-51	130	749[b]
	6-22-51	129	728[b]
23Q1	7-12-51	216	1,435[b]
	1-11-52[c]	525	1,420[b]
24N1	10-24-50	180	542[b]
26L1	6-18-51	168	854[b]
35K1	7-29-49	180	646
	8-11-49	204	595
	8-12-49	176	595
	8-19-49	176	629
	8-26-49	176	544
	9- 2-49	184	595
	9-12-49	176	510
	9-16-49	172	656
	9-26-49	176	476
	10- 3-49	176	510
	10- 7-49	172	595
	10-14-49	184	595
	10-21-49	176	544
	10-31-49	172	646
	11- 4-49	172	510
	11-14-49	212	590
	11-18-49	168	513
	11-28-49	172	610
	12- 2-49	182	561
	12- 9-49	178	513
	12-19-49	176	544
	12-23-49	180	544
	12-30-49	180	595
	1- 6-50	184	595
	1-20-50	188	576
	1-27-50	192	576
	2- 3-50	188	576
	5- 5-50	310	810
	5-19-50	212	810
	5-26-50	208	810
	6- 2-50	208	720
	6- 9-50	216	774
	9-15-50	180	714
	9-22-50	180	714
	9-29-50	200	731
	10- 6-50	190	731
	10-13-50	180	697
	10-20-50	176	540
10S/5W-35K1	10-24-50	165	843[b]
	10-27-50	180	544
	11- 3-50	180	544
	11-10-50	188	527
	11-17-50	184	544
	12- 1-50	170	539
	9-28-51	188	644
	10- 9-51	177	875[b]
	10-19-51	188	644
	10-24-51	179	854[b]
	10-25-51	180	600
	11- 1-51	188	600
	11-15-51	212	600
	11-22-51	184	590
	11-29-51	168	590
	12- 6-51	176	620
	3- 6-52	172	700
35K5	6-12-51	158	764[b]
	6-13-51	157	750[b]
	6-11-52	148	777[b]
11S/5W- 2A1	11-12-47	145	---
	11-20-47	149	---
	12- 4-47	146	---
	7- -48	190	---
	12- 8-48	200	595
	1- 5-49	126	---
	1-10-49	192	595
	1-24-49	208	590
	1-28-49	184	595
	2- 4-49	196	595
	2-11-49	192	595
	2-21-49	190	600
	2-24-49	192	595
	3- 4-49	192	595
	3-14-49	208	600
	3-18-49	192	595
	4- 4-49	200	595
	4- 8-49	212	595
	4-15-49	208	650
	5- 7-49	212	595
	5-13-49	208	595
	5-24-49	220	510
	5-31-49	208	600
	6- 3-49	212	595
	6-10-49	192	595
	6-17-49	200	595
	6-24-49	200	595
	7- 1-49	204	800
	7- 8-49	204	680
	7-18-49	200	647
	7-22-49	184	629
	7-29-49	200	646
	8-11-49	220	680
	8-12-49	204	561
	8-19-49	204	595
	8-26-49	208	595
	9- 2-49	200	680
	9-12-49	192	544
	9-16-49	204	680
	9-26-49	204	595
	10- 3-49	204	544
	10- 7-49	204	595

PARTIAL MINERAL ANALYSES OF GROUND WATERS IN SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date	Chloride, ppm	Total dissolved solids, ppm
11S/5W- 2A1	10-14-49	192	595
	10-21-49	204	595
	10-31-49	200	646
	11- 4-49	200	595
	11-14-49	208	---
	11-18-49	190	595
	11-28-49	190	513
	12- 2-49	197	610
	12- 9-49	194	595
	12-19-49	184	513
	12-23-49	208	595
	12-30-49	200	578
	1- 6-50	200	630
	1-13-50	216	630
	1-20-50	204	630
	1-27-50	212	630
	2- 3-50	212	630
	2-10-50	216	630
	2-17-50	192	630
	2-24-50	196	630
	3- 3-50	184	576
	3-10-50	192	630
	3-17-50	196	630
	3-27-50	184	630
	3-31-50	188	630
	4- 7-50	176	594
	4-14-50	196	630
	4-21-50	192	630
	4-28-50	184	630
	5- 5-50	204	630
	5-15-50	208	630
	5-19-50	192	594
	5-26-50	212	684
	6- 2-50	192	576
	6- 9-50	212	620
	6-16-50	208	576
	6-23-50	180	550
	6-29-50	212	630
	7- 6-50	208	630
	7-14-50	212	576
	7-21-50	192	576
	7-31-50	220	765
	8-18-50	212	782
	8-25-50	208	782
	9- 1-50	200	752
	9- 8-50	208	765
	9-15-50	204	731
	9-22-50	212	765
	9-29-50	212	918
	10- 6-50	212	646
	10-13-50	210	748
	10-20-50	212	594
	10-27-50	216	578
	11- 3-50	208	578
	11-10-50	212	561
	11-17-50	204	527
	11-30-50	200	561
	12- 1-50	202	583
	12- 8-50	196	565
	12-15-50	200	616
	1- 5-51	180	582
	1-12-51	246	727
	1-19-51	236	702
	1-26-51	248	684
11S/5W- 2A1	2- 3-51	228	680
	3-27-51	188	599
	3-30-51	184	599
	4- 6-51	192	616
	4-13-51	192	599
	5- 4-51	204	632
	5-12-51	204	616
	5-18-51	204	599
	6- 1-51	208	615
	6- 8-51	204	615
	6-15-51	200	599
	6-22-51	184	581
	7- 6-51	212	670
	7-24-51	214	685
	7-27-51	200	685
	8- 8-51	196	685
	8-13-51	208	670
	8-24-51	208	640
	9- 4-51	208	599
	9-10-51	204	616
	9-14-51	202	633
	9-24-51	220	684
	9-28-51	200	633
	10-19-51	192	600
	10-25-51	196	600
	11- 1-51	208	618
	11- 8-51	184	610
	11-15-51	200	600
	11-22-51	204	633
	11-29-51	184	600
	12- 6-51	188	610
	12-13-51	180	650
	12-21-51	192	650
	12-27-51	184	650
	1- 3-52	192	565
	1-10-52	180	580
	1-25-52	180	600
	1-31-52	212	840
	2- 7-52	174	670
	2-14-52	196	790
	3- 6-51	204	740
	3-14-52	212	750
	3-21-52	208	730
	3-28-52	208	750
2D1	11-12-47	156	---
	11-20-47	174	---
	12- 4-47	177	---
	2- 6-48	183	---
	12- 8-48	210	---
	12-16-48	210	765
	1- 5-49	206	---
	1-10-49	208	765
	1-24-49	192	700
	1-28-49	204	700
	2- 4-49	216	765
	2-11-49	216	765
	2-21-49	210	765
	2-24-49	204	700
	3- 4-49	160	700
	3-14-49	136	700
	3-18-49	208	700
	4- 4-49	204	765
	4- 8-49	204	720

PARTIAL MINERAL ANALYSES OF GROUND WATERS IN
SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date	Chloride, ppm	Total dissolved solids, ppm
11S/5W- 2D1	4-15-49	212	765
	4-29-49	212	720
	5- 7-49	204	765
	5-13-49	212	765
	5-24-49	212	725
	5-31-49	224	680
	6- 3-49	216	765
	6-10-49	192	700
	6-17-49	192	700
	6-24-49	198	700
	7- 1-49	220	840
	7- 8-49	204	765
	7-18-49	212	714
	7-22-49	228	850
	7-29-49	204	765
	8-11-49	224	765
	8-12-49	210	765
	8-19-49	188	799
	8-26-49	200	714
	9- 2-49	204	850
	9-12-49	204	765
	9-16-49	208	850
	9-26-49	204	714
	10- 3-49	208	680
	10- 7-49	208	765
	10-14-49	212	850
	10-21-49	204	680
	10-31-49	208	765
	11- 4-49	204	686
	11-14-49	216	---
	11-18-49	204	765
	11-28-49	193	769
	12- 2-49	209	765
	12- 9-49	209	765
	12-19-49	212	685
	12-23-49	224	714
	12-30-49	212	714
	1- 6-50	208	774
	1-13-50	208	810
	1-20-50	204	774
	1-27-50	212	810
	2- 3-50	216	684
	2-10-50	212	810
	2-17-50	---	810
	3-10-50	208	810
	3-17-50	196	810
	3-27-50	200	810
	3-31-50	200	810
	4- 7-50	204	774
	4-14-50	200	720
	4-21-50	208	810
	4-28-50	204	810
	5- 5-50	208	810
	5-15-50	204	810
	5-19-50	212	810
	5-26-50	208	810
	6- 2-50	212	720
	6- 9-50	216	774
	6-16-50	216	756
	6-23-50	212	730
	6-29-50	224	756
	7- 6-50	220	810
	7-14-50	224	774
	7-21-50	224	774
	7-31-50	228	1,020
	8-18-50	228	1,054
11S/5W- 2D1	8-25-50	224	1,054
	9- 1-50	232	1,020
	9- 8-50	228	1,071
	9-15-50	228	786
	9-22-50	[illegible]	1,105
	9-29-50	232	1,020
	10- 6-50	232	1,020
	10-13-50	224	986
	10-20-50	232	720
	10-24-50	217	843[b]
	10-27-50	228	714
	11- 3-50	236	714
	11-10-50	240	714
	11-17-50	236	714
	11-30-50	228	680
	12- 1-50	224	726
	12-15-50	176	676
	12-29-50	194	684
	2- 9-51	228	820
	2-17-51	228	826
	2-23-51	224	787
	3- 3-51	248	735
	3- 9-51	220	770
	3-16-51	228	812
	3-27-51	192	760
	3-30-51	188	735
	4- 6-51	184	770
	4-13-51	184	752
	4-20-51	184	752
	4-27-51	208	752
	5- 4-51	200	750
	5-12-51	212	770
	5-18-51	220	786
	6- 1-51	224	770
	6- 8-51	224	770
	6-15-51	216	727
	6-22-51	224	770
	7- 6-51	228	770
	7-24-51	204	770
	7-27-51	224	800
	8- 8-51	216	790
	8-13-51	220	820
	8-24-51	220	685
	9- 4-51	224	684
	9-10-51	228	684
	9-14-51	220	684
	9-24-51	228	820
	9-28-51	236	821
	10- 5-51	226	1,127[b]
	10-19-51	240	810
	10-25-51	236	810
	11- 1-51	232	812
	11- 8-51	244	840
	11-29-51	232	815
	12- 6-51	228	800
	12-13-51	220	840
	12-21-51	228	850
	12-27-51	232	860
	1- 3-52	236	840
2E1	11-11-47	168	---
	11-20-47	160	---
	12- 4-47	169	---
	7- 6-48	165	---
	12- 8-48	228	---
	12-16-48	240	700
	1- 5-49	240	---

PARTIAL MINERAL ANALYSES OF GROUND WATERS IN
SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date	Chloride, ppm	Total dissolved solids, ppm
11S/5W- 2E1	1-10-49	212	685
	1-24-49	196	680
	1-28-49	208	600
	2- 4-49	214	700
	2-11-49	212	680
	2-21-49	210	680
	2-24-49	206	595
	3- 4-49	212	680
	3-14-49	214	680
	3-18-49	212	600
	4- 4-49	204	595
	4- 8-49	212	595
	4-15-49	220	680
	4-29-49	212	600
	5- 7-49	208	680
	5-13-49	212	680
	5-24-49	240	680
	5-31-49	224	595
	6- 3-49	228	700
	6-10-49	216	600
	6-17-49	212	690
	6-24-49	234	720
	7- 1-49	244	600
	7- 8-49	238	765
	7-18-49	244	680
	11-10-50	170	626
	12- 8-50	152	598
	12-21-50	184	667
	12-29-50	196	684
	1- 5-51	212	701
	1-12-51	196	718
	1-19-51	224	718
	1-26-51	246	796
	2- 3-51	244	714
	2- 9-51	248	769
	2-17-51	252	765
	2-23-51	252	769
	3- 3-51	224	769
	3- 9-51	252	777
	3-16-51	248	770
	3-27-51	276	770
	3-30-51	276	804
	4- 6-51	300	840
	4-13-51	300	839
	4-20-51	308	838
	4-27-51	192	684
	11-29-51	184	512
	6-12-52	148	1,030[b]
2F1	11-12-47	149	---
	11-20-47	142	---
	12- 4-47	147	---
	7- -48	180	---
	12- 8-48	190	---
	12-16-48	200	595
	1- 5-49	126	---
	1-10-49	164	595
	1-24-49	192	550
	1-28-49	180	550
	2- 4-49	190	595
	2-11-49	190	550
	2-21-49	192	595
	2-24-49	194	595
	3- 4-49	180	550
	3-14-49	192	595
	3-18-49	192	550
11S/5W- 2F1	4- 4-49	184	550
	4- 8-49	192	550
	4-15-49	200	595
	4-29-49	200	550
	5- 7-49	184	595
	5-13-49	192	595
	5-24-49	192	476
	5-31-49	200	580
	6- 3-49	200	595
	6-10-49	200	550
	6-17-49	200	580
	6-24-49	200	580
	7- 1-49	184	520
	7- 8-49	194	595
	7-18-49	188	544
	7-22-49	196	629
	7-29-49	192	561
	8-11-49	212	595
	8-12-49	184	561
	8-19-49	188	595
	8-26-49	192	595
	9- 2-49	204	595
	9-12-49	192	595
	9-16-49	188	595
	9-26-49	192	510
	10- 3-49	196	544
	10- 7-49	192	510
	10-14-49	208	595
	10-21-49	192	510
	10-31-49	192	595
	11- 4-49	192	510
	11-14-49	200	595
	11-18-49	190	476
	11-28-49	186	595
	12- 2-49	197	595
	12- 9-49	198	547
	12-19-49	204	561
	12-23-49	212	510
	12-30-49	192	594
	1- 6-50	200	576
	1-13-50	192	540
	1-20-50	180	630
	1-27-50	196	594
	2- 3-50	204	576
	2-10-50	192	630
	2-17-50	196	576
	2-24-50	196	630
	3- 3-50	200	576
	3-10-50	192	576
	3-17-50	192	576
	3-27-50	184	576
	3-31-50	172	576
	4- 7-50	176	576
	4-14-50	188	594
	4-21-50	192	594
	4-28-50	176	594
	5- 5-50	180	476
	5-15-50	200	594
	5-19-50	204	630
	5-26-50	204	630
	6- 2-50	204	576
	6- 9-50	184	540
	6-16-50	208	576
	6-23-50	204	550
	6-29-50	204	594

PARTIAL MINERAL ANALYSES OF GROUND WATERS IN
SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date	Chloride, ppm	Total dissolved solids, ppm
11S/5W- 2F1	7- 6-50	196	594
	7-14-50	204	540
	7-21-50	200	576
	7-31-50	208	731
	8-18-50	204	748
	8-25-50	200	714
	9- 1-50	196	731
	9- 8-50	212	765
	9-15-50	212	714
	9-22-50	204	765
	9-29-50	212	765
	10- 6-50	212	714
	10-13-50	204	697
	10-20-50	212	576
	10-24-50	195	859[b]
	10-27-50	212	561
	11- 3-50	220	544
	11-10-50	212	544
	11-17-50	200	544
	11-30-50	192	510
	12- 1-50	200	548
	12- 8-50	200	565
	12-15-50	200	598
	12-21-50	201	599
	12-29-50	198	607
	1- 5-51	200	599
	1-12-51	190	633
	1-19-51	196	598
	1-26-51	208	633
	2- 3-51	212	595
	2- 9-51	204	649
	2-17-51	212	612
	2-23-51	204	615
	3- 3-51	212	615
	3- 9-51	208	599
	3-16-51	198	615
	3-27-51	190	590
	3-30-51	200	599
	4- 6-51	208	616
	4-13-51	200	599
	4-20-51	204	599
	4-27-51	204	617
	5-18-51	204	599
	6- 1-51	204	599
	6- 8-51	200	599
	6-15-51	192	556
	6-22-51	200	581
	7- 6-51	208	616
	7-24-51	200	632
	7-27-51	224	650
	8- 8-51	204	620
	8-13-51	208	650
	8-24-51	228	820
	9- 4-51	232	820
	9-10-51	232	820
	9-14-51	230	804
	9-24-51	206	633
	9-28-51	204	633
	10-19-51	216	618
	10-25-51	212	618
	11- 1-51	212	618
	11- 8-51	204	650
	11-15-51	216	632
11S/5W- 2F1	11-22-51	216	600
	11-29-51	186	590
	12- 6-51	200	650
	12-13-51	184	640
	12-21-51	208	700
	12-27-51	196	680
	1- 2-52	184	842[b]
	1- 3-52	184	580
	1-10-52	180	580
	1-25-52	208	670
	1-31-52	192	790
	2- 7-52	172	660
	2-14-52	208	750
	3- 6-52	212	750
	3-14-52	188	700
	3-21-52	180	660
	3-28-52	180	660
2K1	11-12-47	243	---
	11-20-47	260	---
	12- 4-47	297	---
	2- 6-48	167	---
	7- 48	314	---
	12- 8-48	450	1,100
	12-16-48	450	---
	1- 5-49	480	---
	1-10-49	---	680
	1-24-49	480	1,020
	1-28-49	480	1,020
	2- 4-49	468	1,190
	2-11-49	480	1,020
	2-21-49	465	1,100
	2-24-49	480	1,020
	3- 4-49	480	1,100
	3-14-49	480	1,100
	3-18-49	480	1,020
	4- 4-49	440	1,020
	4- 8-49	484	1,100
	4-15-49	488	1,020
	4-29-49	500	910
	5- 7-49	488	1,100
	5-13-49	356	800
	5-24-49	376	850
	5-31-49	384	900
	6- 3-49	428	900
	6-10-49	408	950
	6-17-49	448	1,020
	6-24-49	388	920
	7- 1-49	492	1,040
	7- 8-49	496	1,105
	7-18-49	488	1,020
	7-22-49	468	1,105
	7-29-49	420	1,020
	8-11-49	538	1,190
	8-12-49	492	1,020
	8-19-40	412	1,020
	8-26-49	432	935
	9- 2-49	528	1,190
	9-12-49	512	1,020
	9-16-49	496	1,139
	9-26-49	480	1,105
	10- 3-49	440	935
	10- 7-49	464	1,120
	10-14-49	476	1,215

PARTIAL MINERAL ANALYSES OF GROUND WATERS IN
SANTA MARGARITA RIVER WATERSHED[a]
(continued)

Well number	Date	Chloride, ppm	Total dissolved solids, ppm
11S/5W-2K1	10-21-49	428	1,020
	11- 4-49	484	1,360
	11-14-49	200	1,020
	11-18-49	418	1,096
	11-28-49	483	1,180
	12- 2-49	512	1,190
	12- 9-49	512	735
	12-19-49	312	765
	12-23-49	340	935
	12-30-49	430	1,116
	1- 6-50	520	1,126
	1-13-50	540	1,090
	1-20-50	540	1,120
	1-27-50	530	1,116
	2- 3-50	560	1,224
	2-10-50	340	810
	2-17-50	330	720
	2-24-50	480	1,080
	3- 3-50	536	1,116
	3-10-50	520	1,170
	3-17-50	560	1,170
	3-27-50	530	1,170
	3-31-50	510	1,170
	4- 7-50	310	810
	4-14-50	460	1,116
	4-21-50	420	1,100
	4-28-50	480	1,134
	5-15-50	200	630
	5-19-50	430	990
	5-26-50	470	1,080
	6- 9-50	500	1,080
	6-16-50	409	1,080
	6-23-50	512	1,240
	6-29-50	500	1,080
	7- 6-50	520	1,060
	7-14-50	520	1,080
	7-21-50	530	1,116
	7-31-50	540	1,495
	8-18-50	550	1,462
11S/5W-2K1	8-25-50	550	1,445
	9- 1-50	570	1,442
	9- 8-50	520	1,360
	9-15-50	570	1,394
	9-22-50	590	1,440
	10-20-50	580	1,116
	11- 3-50	610	1,037
	11-10-50	590	1,037
	11-17-50	450	850
	11-30-50	550	1,020
	12- 1-50	570	1,110
	12- 8-50	460	890
	12-15-50	420	958
	12-21-50	451	1,026
	12-29-50	475	1,060
	1- 5-51	410	975
	1-12-51	338	804
	1-19-51	380	873
	1-26-51	380	889
	2- 3-51	452	884
	2- 9-51	570	1,197
	2-17-51	450	935
	2-23-51	370	872
	3- 3-51	440	975
	3- 9-51	450	1,009
	3-27-51	530	960
	3-30-51	400	898
	4- 6-51	420	941
	4-13-51	430	906
	4-20-51	508	1,368
	11-29-51	304	590
	1-10-52[d]	520	1,582[b]
2K2	8-23-51	143	833[b]
	1-11-52[e]	157	812[b]
	9- 9-52	160	650
10B1	5-29-51	267	994[b]
	1- 2-52	650	1,852[b]

a. All analyses obtained from United States Navy.
b. Calculated as electrical conductance times 0.7.
c. Bailed at 250 feet.
d. Sampled after two hours pumping.
e. Bailed at 292 feet.

APPENDIX I

RESERVOIR YIELD STUDIES

TABLE OF CONTENTS

RESERVOIR YIELD STUDIES

TABLE I-1

YIELD STUDY
VAIL RESERVOIR ON TEMECULA CREEK

In Acre-Feet

Season	October-March				April-September			
	Inflow	Demand	Net evaporation	Storage, end of March	Inflow	Demand	Net evaporation	Storage, end of September
	Gross Storage Capacity: 49,520 acre-feet							
1894-95								49,520
95-96	1,610	2,200	620	48,310	790	4,900	2,020	42,180
96-97	4,230	2,200	20	44,190	2,070	4,900	2,020	39,340
97-98	1,340	2,200	520	37,960	660	4,900	1,640	32,080
98-99	1,140	2,200	430	30,590	560	4,900	1,410	24,840
1899-1900	1,140	2,200	370	23,410	560	4,900	1,020	18,050
1900-01	2,760	2,200	40	18,570	1,340	4,900	910	14,100
01-02	1,950	2,200	140	13,710	950	4,900	790	8,970
02-03	2,620	2,200	60	9,330	1,280	4,900	510	5,200
03-04	1,480	2,200	120	4,360	720	4,900	180	0
	Net Storage Capacity: 44,880 acre-feet (Silt: 4,640 acre-feet)							
1894-95								44,880
95-96	1,610	2,020	620	43,850	790	4,480	2,040	38,120
96-97	4,230	2,020	30	40,300	2,070	4,480	2,100	35,790
97-98	1,340	2,020	550	34,560	660	4,480	1,680	29,060
98-99	1,140	2,020	450	27,730	560	4,480	1,480	22,330
1899-1900	1,140	2,020	400	21,050	560	4,480	1,130	16,000
1900-01	2,760	2,020	50	16,690	1,340	4,480	1,040	12,510
01-02	1,950	2,020	150	12,290	950	4,480	880	7,880
02-03	2,620	2,020	60	8,420	1,280	4,480	710	4,510
03-04	1,480	2,020	210	3,760	720	4,480	0	0

Average Seasonal Yield: 6,800 acre-feet

YIELD STUDY
FALLBROOK (LIPPINCOTT) RESERVOIR ON SANTA MARGARITA RIVER

In Acre-Feet

Season	October-March				April-September			
	Inflow	Demand	Net evaporation	Storage, end of March	Inflow	Demand	Net evaporation	Storage, end of September
	Gross Storage Capacity: 65,000 acre-feet							
1894-95				65,000	5,000	8,170	2,490	59,340
95-96	4,400	4,030	370	59,340	1,800	8,170	2,100	50,870
96-97	7,600	4,030	-300	54,740	3,100	8,170	2,160	47,510
97-98	3,900	4,030	410	46,970	1,600	8,170	1,760	38,640
98-99	3,690	4,030	270	38,030	1,510	8,170	1,520	29,850
1899-1900	3,690	4,030	310	29,200	1,510	8,170	1,140	21,400
1900-01	6,320	4,030	-70	23,760	2,580	8,170	1,040	17,130
01-02	4,900	4,030	50	17,950	2,000	8,170	810	10,970
02-03	6,110	4,030	-20	13,070	2,490	8,170	500	6,890
03-04	4,120	4,030	100	6,880	1,680	8,170	390	0
	Net Storage Capacity: 56,300 acre-feet (Silt: 8,700 acre-feet)							
1894-95				56,300	5,000	7,440	2,530	51,330
95-96	4,400	3,660	370	51,700	1,800	7,440	2,160	43,900
96-97	7,600	3,660	-320	48,160	3,100	7,440	2,220	41,600
97-98	3,900	3,660	440	41,400	1,600	7,440	1,890	33,670
98-99	3,690	3,660	290	33,410	1,510	7,440	1,680	25,800
1899-1900	3,690	3,660	350	25,480	1,510	7,440	1,300	18,250
1900-01	6,320	3,660	-90	21,000	2,580	7,440	1,280	14,860
01-02	4,900	3,660	70	16,030	2,000	7,440	1,110	9,480
02-03	6,110	3,660	-30	11,960	2,490	7,440	890	6,120
03-04	4,120	3,660	160	6,420	1,680	7,440	660	0

Average Seasonal Yield: 11,650 acre-feet

YIELD STUDY
DE LUZ RESERVOIR ON SANTA MARGARITA RIVER

In Acre-Feet

Season	October-March				April-September			
	Inflow	Demand	Net evapo-ration	Storage, end of March	Inflow	Demand	Net evapo-ration	Storage, end of September
Gross Storage Capacity: 188,000 acre-feet								
1894-95				188,000	9,780	13,320	6,440	178,020
95-96	6,310	8,880	1,100	174,350	2,090	13,320	5,620	157,500
96-97	11,430	8,880	-440	160,490	3,670	13,320	5,670	145,270
97-98	5,550	8,880	1,030	140,810	1,850	13,320	4,880	124,460
98-99	5,260	8,880	870	119,970	1,740	13,320	4,450	103,940
1899-1900	5,260	8,880	840	99,480	1,740	13,320	3,620	84,280
1900-01	9,020	8,880	-30	84,450	2,980	13,320	3,380	70,730
01-02	6,990	8,880	290	68,550	2,310	13,320	2,990	54,550
02-03	8,720	8,880	60	54,330	2,880	13,320	2,280	41,610
03-04	5,860	8,880	460	38,130	1,940	13,320	1,870	24,880
1904-05	14,750	8,880	-390	31,140	4,550	13,320	1,600	20,770
05-06	38,140	8,880	-540	50,570	11,160	13,320	2,480	45,930
06-07	27,020	8,880	-480	64,550	7,980	13,320	3,060	56,150
07-08	10,960	8,880	200	58,030	3,540	13,320	2,560	45,690
08-09	16,620	8,880	-250	53,680	5,080	13,320	2,570	42,870
1909-10	15,920	8,880	-100	50,010	4,880	13,320	2,490	39,080
10-11	12,770	8,880	20	42,950	4,030	13,320	2,150	31,510
11-12	9,470	8,880	270	31,830	3,130	13,320	1,560	20,080
12-13	6,620	8,880	190	17,630	2,180	13,320	800	5,690
13-14	12,540	8,880	-40	9,390	3,960	13,320	30	0
Net Storage Capacity: 174,000 acre-feet (Silt: 14,000 acre-feet)								
1894-95				174,000	9,780	12,780	6,470	164,530
95-96	6,310	8,520	1,110	161,210	2,090	12,780	5,630	144,890
96-97	11,430	8,520	-440	148,240	3,670	12,780	5,680	133,450
97-98	5,550	8,520	1,040	129,440	1,850	12,780	4,950	113,560
98-99	5,260	8,520	880	109,420	1,740	12,780	4,520	93,860
1899-1900	5,260	8,520	850	89,750	1,740	12,780	3,660	75,050
1900-01	9,020	8,520	-30	75,580	2,980	12,780	3,490	62,290
01-02	6,990	8,520	290	60,470	2,310	12,780	3,050	46,950
02-03	8,720	8,520	60	47,090	2,880	12,780	2,350	34,840
03-04	5,860	8,520	470	31,710	1,940	12,780	1,960	18,910
1904-05	14,750	8,520	-410	25,550	4,550	12,780	1,720	15,600
05-06	38,140	8,520	-570	45,790	11,160	12,780	2,660	41,510
06-07	27,020	8,520	-510	60,520	7,980	12,780	3,280	52,440
07-08	10,960	8,520	220	54,660	3,540	12,780	2,800	42,620
08-09	16,620	8,520	-280	51,000	5,080	12,780	2,820	40,480
1909-10	15,920	8,520	-110	47,990	4,880	12,780	2,750	37,340
10-11	12,770	8,520	20	41,570	4,030	12,780	2,430	30,390
11-12	9,470	8,520	300	31,040	3,130	12,780	1,820	19,570
12-13	6,620	8,520	240	17,430	2,180	12,780	1,330	5,500
13-14	12,540	8,520	-60	9,580	3,960	12,780	760	0

Average Seasonal Yield: 21,750 acre-feet

YIELD STUDY
DE LUZ RESERVOIR ON SANTA MARGARITA RIVER IN COMBINATION WITH RESERVOIR AT FALLBROOK WITH 65,000 ACRE-FEET CAPACITY

In Acre-Feet

Season	October-March				April-September			
	Inflow	Demand	Net evaporation	Storage, end of March	Inflow	Demand	Net evaporation	Storage, end of September
Gross Storage Capacity: 75,000 acre-feet								
1894-95				75,000	4,780	3,930	3,560	72,290
95-96	1,910	3,220	600	70,380	290	3,930	3,160	63,580
96-97	3,830	3,220	-240	64,430	570	3,930	3,130	57,940
97-98	1,650	3,220	560	55,810	250	3,930	2,720	49,410
98-99	1,570	3,220	480	47,280	230	3,930	2,520	41,060
1899-1900	1,570	3,220	470	38,940	230	3,930	2,070	33,170
1900-01	2,700	3,220	-20	32,670	400	3,930	1,950	27,190
01-02	2,090	3,220	160	25,900	310	3,930	1,730	20,550
02-03	2,610	3,220	30	19,910	390	3,930	1,370	15,000
03-04	1,740	3,220	250	13,270	260	3,930	1,100	8,500
1904-05	5,660	3,220	-220	11,160	840	3,930	950	7,120
05-06	17,050	3,220	-330	21,280	2,550	3,930	1,540	18,360
06-07	11,830	3,220	-290	27,260	1,770	3,930	1,880	23,220
07-08	3,650	3,220	120	23,530	550	3,930	1,640	18,510
08-09	6,610	3,220	-150	22,050	990	3,930	1,670	17,440
1909-10	6,260	3,220	-60	20,540	940	3,930	1,590	15,960
10-11	4,610	3,220	10	17,340	690	3,930	1,380	12,720
11-12	2,870	3,220	160	12,210	430	3,930	970	7,740
12-13	2,000	3,220	110	6,410	300	3,930	630	2,150
13-14	4,520	3,220	-30	3,480	680	3,930	230	0
Net Storage Capacity: 71,100 acre-feet (Silt: 3,900 acre-feet)								
1894-95				71,100	4,780	3,770	3,480	68,630
95-96	1,910	3,080	600	66,860	290	3,770	3,130	60,250
96-97	3,830	3,080	-240	61,240	570	3,770	3,140	54,900
97-98	1,650	3,080	560	52,910	250	3,770	2,740	46,650
98-99	1,570	3,080	480	44,660	230	3,770	2,530	38,590
1899-1900	1,570	3,080	480	36,600	230	3,770	2,100	30,960
1900-01	2,700	3,080	-20	30,600	400	3,770	2,020	25,210
01-02	2,090	3,080	1,660	22,560	310	3,770	1,740	17,360
02-03	2,610	3,080	40	16,850	390	3,770	1,340	12,130
03-04	1,740	3,080	260	10,530	260	3,770	1,130	5,890
1904-05	5,660	3,080	-230	8,700	840	3,770	1,030	4,740
05-06	17,050	3,080	-340	19,050	2,550	3,770	1,590	16,240
06-07	11,830	3,080	-300	25,290	1,770	3,770	1,930	21,360
07-08	3,650	3,080	130	21,800	550	3,770	1,650	16,930
08-09	6,610	3,080	-160	20,620	990	3,770	1,720	16,120
1909-10	6,260	3,080	-60	19,360	940	3,770	1,640	14,890
10-11	4,610	3,080	10	16,410	690	3,770	1,460	11,870
11-12	2,870	3,080	180	11,480	430	3,770	1,100	7,040
12-13	2,000	3,080	140	5,820	300	3,770	740	1,610
13-14	4,520	3,080	-40	3,090	680	3,770	0	0

Average Seasonal Yield: 7,000 acre-feet

TABLE I-2

SEASONAL RUNOFF FROM STREAMS WITHIN THE SANTA MARGARITA RIVER WATERSHED, AND SEMISEASONAL INFLOW TO EXISTING AND PROPOSED RESERVOIRS*

NATURAL RUNOFF

In Acre-Feet

Water year	Temecula Creek at Nigger Canyon	Murrieta Creek at Temecula	Santa Margarita River: Near Temecula	Santa Margarita River: Near Fallbrook	Santa Margarita River: At De Luz dam site	Santa Margarita River: At Ysidora
1894-95	44,400	28,700	82,700	105,000	142,000	143,000
96	2,400	3,200	6,600	6,200	8,400	8,400
97	6,300	4,100	11,700	12,700	17,100	17,000
98	2,000	3,000	6,000	5,500	7,400	7,100
99	1,700	3,200	6,000	5,200	7,000	6,700
1899-1900	1,700	3,200	6,000	5,200	7,000	6,700
01	4,100	3,500	8,800	8,900	12,000	11,800
02	2,900	3,300	7,300	6,900	9,300	9,000
03	3,900	3,500	8,500	8,600	11,600	11,400
04	2,200	3,100	6,300	5,800	7,800	7,500
1904-05	9,900	4,700	16,100	18,600	25,100	25,100
06	27,600	13,100	45,100	56,100	75,700	76,400
07	20,200	8,800	31,900	38,900	52,500	52,900
08	6,100	3,700	11,000	12,000	16,200	16,100
09	11,600	4,800	18,000	21,700	29,300	29,400
1909-10	10,900	5,100	17,700	20,600	27,800	27,800
11	7,700	4,400	13,600	15,100	20,400	20,300
12	4,300	3,900	9,500	9,300	12,600	12,300
13	1,900	3,800	6,900	6,500	8,800	8,400
14	7,700	4,200	13,300	14,800	20,000	19,900
1914-15	24,200	24,500	56,800	71,200	96,100	96,900
16	80,600	60,300	161,000	206,000	278,000	282,000
17	10,400	5,500	17,700	20,300	27,400	27,400
18	8,500	4,100	13,900	15,500	20,900	20,800
19	2,900	3,800	7,900	7,900	10,700	10,500
1919-20	8,200	4,300	13,900	15,500	20,900	20,800
21	2,400	2,900	6,300	5,800	7,800	7,600
22	43,200	20,600	70,700	89,100	120,000	121,400
23	5,100	4,400	11,000	12,000	16,200	16,000
24	5,310	3,200	9,500	9,300	12,600	7,190
1924-25	3,520	3,800	8,580	8,370	11,300	6,320
26	8,930	2,800	12,600	15,600	21,400	20,300
27	40,500	26,400	75,800	87,500	111,000	95,100
28	3,350	3,400	7,930	8,460	9,960	8,570
29	4,660	2,000	7,390	7,290	7,790	5,430
1929-30	6,020	2,200	8,370	9,940	12,500	12,300
31	2,130	2,700	5,770	5,720	7,320	6,160
32	17,300	15,700	33,000	37,600	49,700	43,300
33	4,160	990	7,430	7,830	9,730	8,940
34	1,810	430	5,520	5,800	8,100	7,650
1934-35	4,270	2,020	7,220	8,280	14,000	14,400
36	3,930	2,390	7,520	7,810	12,000	13,500
37	36,700	22,400	61,300	78,800	116,000	119,000
38	31,900	31,500	72,800	91,900	125,000	125,000
39	8,400	4,990	16,500	20,200	28,200	25,700
1939-40	6,470	6,420	15,100	18,100	26,300	24,600
41	25,000	31,000	60,500	84,300	120,000	120,000
42	10,300	1,520	15,000	17,700	22,800	20,100
43	13,600	31,300	49,500	59,900	78,000	82,100
44	7,820	7,480	19,800	23,600	32,900	34,800

SEASONAL RUNOFF FROM STREAMS WITHIN THE SANTA MARGARITA RIVER WATERSHED, AND SEMISEASONAL INFLOW TO EXISTING AND PROPOSED RESERVOIRS*

NATURAL RUNOFF

In Acre-Feet
(continued)

Water year	Temecula Creek at Nigger Canyon	Murrieta Creek at Temecula	Santa Margarita River Near Temecula	Santa Margarita River Near Fallbrook	Santa Margarita River At De Luz dam site	Santa Margarita River At Ysidora
1944-45	7,230	4,700	14,600	17,300	24,900	27,500
46	4,890	2,830	12,500	13,300	16,900	19,700
47	3,070	1,300	9,640	10,700	13,300	14,200
48	2,370	690	7,550	8,300	10,100	8,660
49	3,140	700	6,740	7,400	9,000	8,270
1949-50	1,900	560	6,060	6,200	7,000	8,100
51	1,470	440	5,780	5,800	6,100	7,350
52	12,600	24,600	40,000	54,400	69,000	56,100
53	2,290	1,230	8,190	8,960	10,700	11,000
48-year Mean 1895-96 through 1942-43	11,600	8,630	22,900	27,300	37,000	36,300

GAGED RUNOFF

Water year	Temecula Creek at Nigger Canyon	Murrieta Creek at Temecula	De Luz Creek near Fallbrook	Santa Margarita River Near Temecula	Santa Margarita River Near Fallbrook	Santa Margarita River At Ysidora
1923-24	5,310			6,180		2,360
1924-25	3,520			4,510		790
26	8,930			9,580	12,500	15,700
27	40,500			73,400	85,100	91,200
28	3,350			4,950	5,480	4,000
29	4,660			4,930	4,830	1,360
1929-30	6,020			7,710	8,680	--
31	2,130	950		4,970	4,920	3,660
32	17,300	15,700		32,300	36,900	40,600
33	4,160	990		6,540	6,940	6,520
34	1,810	430		4,590	4,870	5,010
1934-35	4,270	2,020		6,720	7,780	13,000
36	3,930	2,390		6,780	7,070	11,100
37	36,700	22,400		60,900	78,300	117,000
38	31,900	31,500		71,900	91,100	122,000
39	8,400	4,990		15,100	18,800	22,900
1939-40	6,470	6,420		13,800	16,700	22,300
41	25,000	31,300		59,300	83,100	118,000
42	10,300	1,520		13,100	15,800	16,900
43	13,600	31,300		47,600	57,900	74,300
44	7,820	7,480		18,200	21,800	27,800
1944-45	7,230	4,700		13,000	15,600	20,300
46	4,890	2,830		10,500	11,200	11,700
47	3,070	1,300		7,780	8,700	6,930
48	2,370	690		5,920	6,640	560
49	3,140	700		5,310	5,880	480
1949-50	1,900	560		4,160	3,910	0
51	1,470	440		3,340	2,750	0
52	12,600	24,600	11,700	33,700	47,000	47,600
53	2,290	1,230	1,500	4,850	3,970	1,040

SEASONAL RUNOFF FROM STREAMS WITHIN THE SANTA MARGARITA RIVER WATERSHED, AND SEMISEASONAL INFLOW TO EXISTING AND PROPOSED RESERVOIRS*
(continued)

SEMISEASONAL INFLOW TO RESERVOIRS
UNDER PRESENT CONDITIONS*

In acre-feet

Water year	Vail		Fallbrook		De Luz	
	Oct.-Mar.	Apr.-Sept.	Oct.-Mar.	Apr.-Sept.	Oct.-Mar.	Apr.-Sept.
1894-95	29,800	14,600	78,100	5,000	110,000	9,900
96	1,610	790	4,400	1,800	6,310	2,090
97	4,230	2,070	7,600	3,100	11,400	3,700
98	1,340	660	3,900	1,600	5,530	1,850
99	1,140	560	3,690	1,510	5,260	1,740
1899-1900	1,140	560	3,690	1,510	5,260	1,740
01	2,760	1,340	6,320	2,580	9,020	2,980
02	1,950	950	4,900	2,000	6,990	2,310
03	2,620	1,280	6,110	2,490	8,720	2,880
04	1,480	720	4,120	1,680	5,860	1,940
1904-05	6,650	3,250	9,090	3,710	14,800	4,500
06	18,500	9,100	21,100	8,600	38,100	11,200
07	13,600	6,600	15,200	6,200	27,000	8,000
08	4,100	2,000	7,310	2,990	11,000	3,500
09	7,800	3,800	10,000	4,100	16,600	5,100
1909-10	7,320	3,580	9,660	3,940	15,900	4,900
11	5,170	2,530	8,160	3,340	12,800	4,000
12	2,890	1,410	6,600	2,700	9,470	3,130
13	1,280	620	4,620	1,880	6,620	2,180
14	5,170	2,530	8,020	3,280	12,500	4,000
1914-15	16,300	7,900	38,500	8,500	60,200	11,700
16	75,800	4,800	184,000	7,400	247,000	16,500
17	6,990	3,410	12,100	4,000	18,300	4,900
18	5,710	2,790	8,020	3,280	12,700	4,000
19	1,950	950	5 610	2,290	8,050	2,650
1919-20	5,500	2,700	8,160	3,340	13,900	4,000
21	1.610	790	4,120	1,680	5,860	1,940
22	35,400	7,800	53,800	9,100	81,000	10,100
23	3,180	1,920	7,420	2,780	11,100	3,300
24	3,380	1,930	4,270	1,730	7,140	2,160
1924-25	1,820	1,700	3,170	1,130	5,700	1,500
26	2,430	6,500	3,400	8,100	3,800	13,500
27	38,400	2,100	68,500	3,000	90,200	4,600
28	2,450	900	4,570	990	5,950	1,050
29	2,440	2,220	3,770	1,030	4,130	1,170
1929-30	2,650	3,370	5,000	2,900	6,480	4,020
31	1,240	890	3,500	1,200	5,000	1,300
32	15,300	2,000	25,300	2,500	36,900	3,000
33	2,890	1,270	4,690	1,910	6,550	1,950
34	1,230	580	3,660	1,240	5,880	1,220
1934-35	2,800	1,470	5,800	1,800	10,900	2,400
36	2,710	1,220	5,280	1,320	9,050	1,750
37	30,600	6,100	43,600	6,600	77,000	10,600
38	27,400	4,500	78,300	6,500	107,000	10,700
39	5,780	2,620	11,700	4,600	18,500	5,800

SEASONAL RUNOFF FROM STREAMS WITHIN THE SANTA MARGARITA RIVER WATERSHED, AND SEMISEASONAL INFLOW TO EXISTING AND PROPOSED RESERVOIRS*

SEMISEASONAL INFLOW TO RESERVOIRS UNDER PRESENT CONDITIONS*

In Acre-Feet
(continued)

Water year	Vail		Fallbrook		De Luz	
	Oct.-Mar.	Apr.-Sept.	Oct.-Mar.	Apr.-Sept.	Oct.-Mar.	Apr.-Sept.
1939-40	4,290	2,180	12,300	3,400	19,500	4,400
41	14,000	11,000	49,700	23,600	74,200	35,300
42	7,360	2,940	11,400	3,900	15,500	4,900
43	21,200	2,400	48,000	5,200	64,300	7,000
44	5,870	1,950	14,100	4,000	22,500	4,900
1944-45	5,020	2,210	10,400	3,600	17,100	4,500
46	3,070	1,820	6,600	3,100	8,930	4,370
47	2,230	840	5,750	2,570	8,270	2,630
48	1,490	880	4,360	2,240	5,850	2,550
49	2,180	960	3,940	2,060	5,300	2,300
1949-50	1,150	750	2,880	1,420	3,500	1,600
51	900	570	2,170	1,130	2,490	1,110
52	9,990	2,610	44,300	3,900	56,800	6,000
53	1,500	790	3,650	1,550	5,400	1,600
43-year Mean 1895-96 through 1942-43	11,500		21,800		31,500	

* See following page for description of derivation of data in this table.

EXPLANATION OF DERIVATION OF DATA APPEARING IN TABLE I-2

1. Values of natural runoff in Temecula Creek at Nigger Canyon and in Murrieta Creek at Temecula for the period 1894-95 through 1946-47 are from State Water Resources Board Bulletin No. 1, and are the measured values of runoff for the periods of record and quantities based on correlations of these values with longer records of flow in streams outside the watershed for the years prior to the period of record. For the period from 1947-48 through 1952-53, the values presented for Murrieta Creek are the measured quantities of runoff. For the year 1947-48, the runoff presented for Temecula Creek at Nigger Canyon is the measured discharge at the gaging station. From October, 1948, when Vail Dam gates were closed, the runoff presented equals measured inflow to the reservoir.

2. Values of natural runoff in Santa Margarita River near Temecula and Santa Margarita River near Fallbrook for the period 1894-95 through 1946-47 are from State Water Resources Board Bulletin No. 1. Values for both stations are the measured runoff quantities plus 60 per cent of Vail Company combined surface and ground water diversions for the period of record, and quantities based on correlations of these values with longer records of flow in streams outside the watershed for the years prior to the period of record. Also added to the Fallbrook values are the actual diversions by Fallbrook Public Utility District. From 1947-48 through 1952-53, the values are similarly determined, except that corrections are made for regulation by Vail Reservoir after its construction.

3. Natural runoff in Santa Margarita River at De Luz dam site is the sum of natural runoff at Fallbrook plus the estimated runoff from the drainage area between Fallbrook and De Luz dam site. Runoff from the latter area, on a monthly basis, is calculated to be 88 per cent of the difference between measured runoff at Fallbrook and Ysidora during wet periods, when there is little, if any, percolation into Santa Margarita Coastal Basin. For dry periods when there is little or no flow at Ysidora because of percolation, ground water pumpage, and phreatophyte use, the estimated values of runoff are assumed to be 194 per cent of the runoff between Fallbrook and Temecula gages. The values 88 and 194 per cent result from considerations of rainfall-runoff relationships of the respective areas concerned.

Annual estimates of runoff from the area between the Fallbrook gage and De Luz dam site for the period prior to establishment of stream gaging stations are made by comparing annual summations of monthly estimates for the period of record with the estimated seasonal natural runoff at Fallbrook. This correlation is used to extend annual estimates of runoff from the area to the water year 1894-95. The assumptions used in these calculations are believed to result in conservative values of runoff in that they are probably less than the actual values.

4. Values of natural runoff in Santa Margarita River at Ysidora for the period of record at Ysidora are the measured values of runoff at the station plus (a) the corrections due to diversions by the Vail Company, diversion from Santa Margarita River by Fallbrook Public Utility District, and operation of Vail Reservoir, all as used in determination of natural flow at Fallbrook in paragraph (2) above; (b) O'Neill Lake evaporation for the period

1923-24 through 1952-53; (c) 60 per cent of the difference between O'Neill ditch diversions and evaporation from O'Neill Lake for the period 1923-24 through 1941-42; (d) diversions from Santa Margarita River by Fallbrook Naval Ammunition Depot; (e) gross pumping from Santa Margarita Coastal Basin less sewage returned to the basin.

5. Under gaged runoff are listed the values of runoff measured at the gaging stations.

6. Inflows to Vail Reservoir under present conditions are assumed equal to the natural flow at Nigger Canyon. Semi-seasonal distribution of the flow prior to the period of record was, except as noted, 67 and 33 per cent for the October-March and April-September periods, respectively, based on the distribution as gaged during the period of record. During the period of record, since April, 1923, semiseasonal inflows are from U.S.G.S. records of gaged runoff. During the two water years 1915-16 and 1921-22, records at nearby stations indicated a greater percentage of runoff than normal occurred during the period October-March. These percentages were 94 and 6 per cent for the October-March and April-September periods, respectively, for 1915-16, and 82 and 18 per cent for 1921-22.

7. Inflows to Fallbrook and De Luz Reservoirs under present conditions are calculated on the assumption that all present diversions and development in the Santa Margarita River system upstream from Fallbrook Public Utility District Diversion 9S/3W-7D1, including the Vail Reservoir development, had been in operation throughout the entire period of study 1894-95 through 1952-53. Diversions by Fallbrook Public Utility District, and others downstream therefrom, are not deducted from reservoir

inflow, but the effect of such water development is accounted for in calculating the net safe seasonal yield or new water.

8. Inflows to Fallbrook Lippincott and Fallbrook Border Reservoirs are assumed equal and are determined by adjusting the measured runoff at the U.S.G.S. gaging station near Fallbrook for the period of record. Prior to the period of record, correlated values of runoff were adjusted. Most of the diversions in the watershed upstream from diversion 9S/3W-7D1 were in operation throughout the period of record and are automatically reflected in the historic record. The measured runoff at the gaging station is therefore adjusted by adding actual quantities of water diverted at diversion 9S/3W-7D1, and by deducting for the calculated effects of operation of Vail Reservoir.

Adjustments to measured flow at Fallbrook gaging station, to account for Vail Reservoir, were made on the assumption that the operation of Pauba Basin, with regard to regimen of ground water levels and consequent rising water, will continue in the future as in the past. That is, with Vail Reservoir yield applied on lands overlying the Basin, in accordance with terms of the permit for storage at Vail Dam, the return from such irrigation application would supply the Basin in lieu of the former supply by natural percolation, and it is assumed that pumping of ground water would be practiced to the extent that the water table and consequent rising water would fluctuate in the future in the same manner and to the same extent as in the past. With knowledge of the past occurrence and magnitude of rising water and utilizing daily runoff records, the runoff at the Fallbrook gage is estimated under the assumed conditions. Under such conditions, during periods of low flow when the entire flow at Fallbrook consists of rising water from Pauba and Murrieta Valleys, the measured Fallbroo flows are unadjusted, but during wet periods when Pauba Basin is essentially full and it is assumed that no percolation of Temecula Creek discharge occurs in the Basin, the entire flow at Vail Dam (Nigger Canyon) is deducted from the measured flow at Fallbrook.

Detailed analyses were developed on a mean daily basis, and it was found from further study that the adopted methods for adjusting the daily runoff could be applied on the monthly basis during the period of measured flow in the Santa Margarita River system with practically the same degree of reliability. The methods also gave reasonably good results on a seasonal basis, and prior to the period of measured runoff, adjusted runoff was determined by applying the methods on a seasonal basis. To seasonal values are added the calculated spills from Vail Reservoir, which were routed unimpaired to the Fallbrook reservoirs, and the total values, on a semiseasonal basis, appear in the table.

Semiseasonal distribution of the flow prior to the period of record was, except as noted, 71 and 29 per cent for the October-March and April-September periods, respectively, based on the distribution of adjusted runoff during the period of record. During the period of record, semiseasonal inflows were determined by summation of monthly adjusted values. During the water years 1914-15, 1915-16, and 1921-22, records at nearby stations indicated a greater percentage of runoff than normal occurred during the period October-March. These percentages were, for 1914-15 and 1921-22, 82 and 18 per cent for October-March and April-September, respectively, and 94 and 6 per cent for 1915-16. The above percentages were applied to "adjusted Fallbrook" flows. Vail Reservoir spills were added after the annual adjusted Fallbrook flows were distributed semiseasonally.

9. Inflows to De Luz Reservoir represent summation of the inflows to the Fallbrook reservoirs and the estimated natural runoff from the area between Fallbrook and De Luz dam site, as discussed in paragraph (3). Semiseasonal distribution of the additional runoff between Fallbrook and De Luz dam site was 87 and 13 per cent for October-March and April-September, respectively, and was applied to annual correlated values of runoff, prior to 1925-26. For the period beginning in 1925-26, semiseasonal values of inflow from this drainage area were determined by summation of monthly correlated values determined in detailed studies.

APPENDIX J

ESTIMATES OF COST

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ESTIMATES OF COST

APPENDIX J

ESTIMATED COST OF DE LUZ DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 50,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 270 feet, U.S.G.S. datum
Elevation of crest of spillway: 242 feet
Height of dam to spillway crest, above stream bed: 117 feet

Capacity of reservoir to crest of spillway: 50,000 acre-feet
Capacity of spillway with 5-foot freeboard: 151,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 15,000	
Diversion of stream and dewatering of foundation		lump sum	20,000	
Stripping topsoil	36,000 cu.yd.	$ 0.35	12,600	
Excavation for embankment				
Foundation	187,000 cu.yd.	0.90	168,300	
From borrow pits	749,800 cu.yd.	0.45	337,400	
From stream bed	657,500 cu.yd.	0.45	295,900	
Embankment				
Impervious	652,000 cu.yd.	0.16	104,300	
Pervious	756,000 cu.yd.	0.12	90,700	
Pervious, salvage	349,400 cu.yd.	0.20	69,900	
Rock riprap	39,000 cu.yd.	3.00	117,000	
Drilling grout holes	22,500 lin.ft.	3.00	67,500	
Pressure grouting	15,000 cu.ft.	4.00	60,000	$1,358,600
Spillway				
Excavation, unclassified	251,000 cu.yd.	1.80	451,800	
Concrete				
Weir and cutoff	2,790 cu.yd.	35.00	97,600	
Floor	3,900 cu.yd.	30.00	117,000	
Walls	580 cu.yd.	40.00	23,200	
Reinforcing steel	570,500 lbs.	0.13	74,200	763,800
Outlet Works				
Excavation				
Inlet and outlet structures	3,000 cu.yd.	1.50	4,500	
Conduit	5,200 cu.yd.	1.20	6,200	
Backfill	1,600 cu.yd.	0.80	1,300	
Concrete				
Conduit	1,340 cu.yd.	50.00	67,000	
Intake structure	150 cu.yd.	60.00	9,000	
Gate chamber and valve house	280 cu.yd.	50.00	14,000	
Reinforcing steel	176,700 lbs.	0.13	23,000	

ESTIMATED COST OF DE LUZ DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 50,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Miscellaneous metalwork	19,000 lbs.	$ 0.40	$ 7,600	
Steel pipe, 42-inch dia.	83,000 lbs.	0.25	20,800	
High pressure slide gate		lump sum	12,500	
Howell-Bunger valve, 30-inch dia.		lump sum	9,200	
Needle valve, 30-inch dia.		lump sum	9,600	$ 184,700
Reservoir				
Land and improvements		lump sum	9,000	
Clearing reservoir lands	980 ac.	100.00	98,000	
Relocation of utilities		lump sum	10,000	
Road relocation		lump sum	1,000	118,000
Subtotal				$2,425,100
Administration and engineering, 10%				$ 242,500
Contingencies, 15%				363,800
Interest during construction				121,300
TOTAL				$3,152,700
ANNUAL COSTS				
Interest, 3.5%				$ 110,300
Amortization, 40-year sinking fund at 3.5%				37,300
Operation and maintenance				7,500
TOTAL				$ 155,100

ESTIMATED COST OF DE LUZ DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 75,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 293 feet, U.S.G.S. datum
Elevation of crest of spillway: 265 feet
Height of dam to spillway crest, above stream bed: 140 feet

Capacity of reservoir to crest of spillway: 75,000 acre-feet
Capacity of spillway with 5-foot freeboard: 151,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 16,000	
Diversion of stream and dewatering of foundation		lump sum	25,000	
Stripping topsoil	55,000 cu.yd.	$ 0.35	19,200	
Excavation for embankment				
Foundation	262,000 cu.yd.	0.80	209,600	
From borrow pits	1,155,000 cu.yd.	0.50	577,500	
From stream bed	1,017,000 cu.yd.	0.45	457,600	
Embankment				
Impervious	1,004,000 cu.yd.	0.16	160,600	
Pervious	884,000 cu.yd.	0.12	106,100	
Pervious, salvage	765,000 cu.yd.	0.20	153,000	
Rock riprap	62,100 cu.yd.	3.00	186,300	
Drilling grout holes	2,600 lin.ft.	3.00	7,800	
Pressure grouting	1,740 cu.ft.	4.00	7,000	$1,925,700
Spillway				
Excavation, unclassified	694,000 cu.yd.	1.20	832,800	
Concrete				
Weir and cutoff	2,880 cu.yd.	35.00	100,800	
Floor	3,200 cu.yd.	30.00	96,000	
Walls	530 cu.yd.	40.00	21,200	
Reinforcing steel	513,000 lbs.	0.13	66,700	1,117,500
Outlet Works				
Excavation				
Inlet and outlet structures	3,000 cu.yd.	1.50	4,500	
Conduit	6,500 cu.yd.	1.20	7,800	
Backfill	2,500 cu.yd.	0.80	2,000	
Concrete				
Conduit	1,580 cu.yd.	50.00	79,000	
Intake structure	200 cu.yd.	60.00	12,000	
Gate chamber and valve house	330 cu.yd.	50.00	16,500	
Reinforcing steel	211,000 lbs.	0.13	27,400	

ESTIMATED COST OF DE LUZ DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 75,000 ACRE-FEET
(continued)

Item	Quantity	Unit price		Cost
CAPITAL COSTS				
Outlet Works (continued)				
Miscellaneous metalwork	24,600 lbs.	$ 0.40	$ 9,800	
Steel pipe, 48-inch dia.	103,000 lbs.	0.25	25,800	
High pressure slide gate		lump sum	18,000	
Howell-Bunger valve, 36-inch dia.		lump sum	10,300	
Needle valve, 36-inch dia.		lump sum	14,000	$ 227,100
Reservoir				
Land and improvements		lump sum	20,000	
Clearing reservoir lands	1,260 ac.	100.00	126,000	
Relocation of utilities		lump sum	15,000	
Road relocation		lump sum	1,000	162,000
Subtotal				$3,432,300
Administration and engineering, 10%				$ 343,200
Contingencies, 15%				514,800
Interest during construction				171,600
TOTAL				$4,461,900
ANNUAL COSTS				
Interest, 3.5%				$ 156,200
Amortization, 40-year sinking fund at 3.5%				52,800
Operation and maintenance				11,000
TOTAL				$ 220,000

ESTIMATED COST OF DE LUZ DAM AND RESERVOIR WITH STORAGE CAPACITY OF 143,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 334 feet, U.S.G.S. datum
Elevation of crest of spillway: 307 feet
Height of dam to spillway crest, above stream bed: 182 feet

Capacity of reservoir to crest of spillway: 143,000 acre-feet
Capacity of spillway with 5-foot freeboard: 141,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 18,000	
Diversion of stream and dewatering of foundation		lump sum	25,000	
Stripping topsoil	116,000 cu.yd.	$ 0.35	40,600	
Excavation for embankment				
Foundation	394,000 cu.yd.	0.80	315,200	
From borrow pits	2,161,000 cu.yd.	0.50	1,080,500	
From stream bed	3,719,000 cu.yd.	0.45	1,673,600	
Embankment				
Impervious	1,879,000 cu.yd.	0.16	300,600	
Pervious	3,234,000 cu.yd.	0.12	388,100	
Pervious, salvage	868,000 cu.yd.	0.20	173,600	
Rock riprap	121,000 cu.yd.	3.00	363,000	
Drilling grout holes	38,400 lin.ft.	3.00	115,200	
Pressure grouting	25,600 cu.ft.	4.00	102,400	$4,595,800
Auxiliary Dam				
Stripping topsoil	2,000 cu.yd.	0.35	700	
Excavation for embankment				
Foundation	3,000 cu.yd.	0.80	2,400	
From borrow pits	41,000 cu.yd.	0.50	20,500	
Embankment				
Impervious	12,000 cu.yd.	0.16	1,900	
Pervious	24,000 cu.yd.	0.12	2,900	
Rock riprap	5,900 cu.yd.	3.00	17,700	46,100
Spillway				
Excavation, unclassified	627,000 cu.yd.	1.60	1,003,200	
Backfill	15,000 cu.yd.	0.80	12,000	
Concrete				
Weir and cutoff	3,200 cu.yd.	35.00	112,000	
Floor	14,200 cu.yd.	30.00	426,000	
Walls	2,460 cu.yd.	40.00	98,400	
Reinforcing steel	1,642,000 lbs.	0.13	213,500	1,865,100
Outlet Works				
Excavation				
Inlet and outlet structures	4,000 cu.yd.	1.50	6,000	
Conduit	14,300 cu.yd.	1.20	17,200	

ESTIMATED COST OF DE LUZ DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 143,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Backfill	8,000 cu.yd.	$ 0.80	$ 6,400	
Concrete				
Conduit	3,100 cu.yd.	50.00	155,000	
Intake structure	390 cu.yd.	60.00	23,400	
Gate chamber and valve house	450 cu.yd.	50.00	22,500	
Reinforcing steel	390,000 lbs.	0.13	50,700	
Miscellaneous metalwork	14,000 lbs.	0.40	5,600	
Steel pipe, 66-inch dia.	212,000 lbs.	0.25	53,000	
High pressure slide gate		lump sum	37,000	
Howell-Bunger valve, 48-inch dia.		lump sum	13,500	
Needle valve, 36-inch dia.		lump sum	14,000	$ 404,300
Reservoir				
Land and improvements		lump sum	66,000	
Clearing reservoir lands	1,940 ac.	100.00	194,000	
Relocation of utilities		lump sum	30,000	
Road relocation		lump sum	21,000	
Access road		lump sum	30,000	341,000
Subtotal				$7,252,300
Administration and engineering, 10%				$ 725,200
Contingencies, 15%				1,087,800
Interest during construction				543,900
TOTAL				$9,609,200
ANNUAL COSTS				
Interest, 3.5%				$ 336,300
Amortization, 40-year sinking fund at 3.5%				113,700
Operation and maintenance				15,000
TOTAL				$ 465,000

ESTIMATED COST OF DE LUZ DAM AND RESERVOIR WITH STORAGE CAPACITY OF 188,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 355 feet, U.S.G.S. datum
Elevation of crest of spillway: 328 feet
Height of dam to spillway crest, above stream bed: 203 feet

Capacity of reservoir to crest of spillway: 188,000 acre-feet
Capacity of spillway with 5-foot freeboard: 137,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 20,000	
Diversion of stream and dewatering of foundation		lump sum	35,000	
Stripping topsoil	137,400 cu.yd.	$ 0.35	48,100	
Excavation for embankment				
Foundation	476,000 cu.yd.	0.80	380,800	
From borrow pits	2,929,000 cu.yd.	0.55	1,611,000	
From stream bed	5,101,000 cu.yd.	0.52	2,652,500	
Embankment				
Impervious	2,547,000 cu.yd.	0.16	407,500	
Pervious	4,435,000 cu.yd.	0.12	532,200	
Pervious, salvage	1,105,000 cu.yd.	0.20	221,000	
Rock riprap	164,600 cu.yd.	3.00	493,800	
Drilling grout holes	40,800 lin.ft.	3.00	122,400	
Pressure grouting	27,200 cu.ft.	4.00	108,800	$ 6,633,100
Auxiliary Dam				
Stripping topsoil	8,200 cu.yd.	0.35	2,900	
Excavation for embankment				
Foundation	23,000 cu.yd.	0.80	18,400	
From borrow pits	176,400 cu.yd.	0.50	88,200	
Embankment				
Impervious	69,000 cu.yd.	0.16	11,000	
Pervious	104,000 cu.yd.	0.12	12,500	
Rock riprap	12,200 cu.yd.	3.00	36,600	169,600
Spillway				
Excavation, unclassified	825,000 cu.yd.	1.60	1,320,000	
Backfill	15,000 cu.yd.	0.80	12,000	
Concrete				
Weir and cutoff	3,210 cu.yd.	35.00	112,400	
Floor	13,750 cu.yd.	30.00	412,500	
Walls	2,370 cu.yd.	40.00	94,800	
Reinforcing steel	1,604,000 lbs.	0.13	208,500	2,160,200
Outlet Works				
Excavation				
Inlet and outlet structures	4,500 cu.yd.	1.50	6,800	
Conduit	15,900 cu.yd.	1.20	19,100	

ESTIMATED COST OF DE LUZ DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 188,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Backfill	9,400 cu.yd.	$ 0.80	$ 7,500	
Concrete				
Conduit	3,850 cu.yd.	50.00	192,500	
Intake structure	490 cu.yd.	60.00	29,400	
Gate chamber and valve house	480 cu.yd.	50.00	24,000	
Reinforcing steel	482,000 lbs.	0.13	62,700	
Miscellaneous metalwork	48,000 lbs.	0.40	19,200	
Steel pipe, 72-inch dia.	241,700 lbs.	0.25	60,400	
High pressure slide gate		lump sum	46,000	
Howell-Bunger valve, 48-inch dia.		lump sum	13,500	
Needle valve, 42-inch dia.		lump sum	21,000	$ 502,100
Reservoir				
Land and improvements		lump sum	74,000	
Clearing reservoir lands	2,340 ac.	100.00	234,000	
Relocation of utilities		lump sum	30,000	
Road relocation		lump sum	40,000	
Access road		lump sum	30,000	408,000
Subtotal				$ 9,873,000
Administration and engineering, 10%				$ 987,300
Contingencies, 15%				1,481,000
Interest during construction				863,900
TOTAL				$13,205,200
ANNUAL COSTS				
Interest, 3.5%				$ 462,200
Amortization, 40-year sinking fund at 3.5%				156,200
Operation and maintenance				17,800
TOTAL				$ 636,200

ESTIMATED COST OF UPPER DE LUZ DAM AND RESERVOIR WITH STORAGE CAPACITY OF 50,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 392 feet, U.S.G.S. datum
Elevation of crest of spillway: 372 feet
Height of dam to spillway crest, above stream bed: 187 feet

Capacity of reservoir to crest of spillway: 50,000 acre-feet
Capacity of spillway with 5-foot freeboard: 41,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 15,000	
Diversion of stream and dewatering of foundation		lump sum	25,000	
Stripping topsoil	77,200 cu.yd.	$ 0.35	27,000	
Excavation for embankment				
Foundation	196,000 cu.yd.	0.80	156,800	
From borrow pits	1,217,000 cu.yd.	0.72	876,200	
From stream bed	2,632,000 cu.yd.	0.48	1,263,400	
Embankment				
Impervious	1,058,000 cu.yd.	0.16	169,300	
Pervious	2,289,000 cu.yd.	0.12	274,700	
Pervious, salvage	289,000 cu.yd.	0.20	57,800	
Rock riprap	49,700 cu.yd.	3.00	149,100	
Drilling grout holes	13,440 lin.ft.	3.00	40,300	
Pressure grouting	8,960 cu.ft.	4.00	35,800	$3,090,400
Spillway				
Excavation, unclassified	164,500 cu.yd.	1.20	197,400	
Concrete				
Weir and cutoff	1,100 cu.yd.	35.00	38,500	
Floor	1,360 cu.yd.	30.00	40,800	
Walls	350 cu.yd.	40.00	14,000	
Reinforcing steel	217,000 lbs.	0.13	28,200	318,900
Outlet Works				
Excavation				
Inlet and outlet structures	1,000 cu.yd.	1.50	1,500	
Conduit	8,100 cu.yd.	1.20	9,700	
Backfill	2,500 cu.yd.	0.80	2,000	
Concrete				
Conduit	2,100 cu.yd.	50.00	105,000	
Intake structure	150 cu.yd.	60.00	9,000	
Gate chamber and valve house	280 cu.yd.	50.00	14,000	
Reinforcing steel	253,000 lbs.	0.13	32,900	
Miscellaneous metalwork	23,800 lbs.	0.40	9,500	
Steel pipe, 42-inch dia.	126,000 lbs.	0.25	31,500	
High pressure slide gate		lump sum	15,000	

ESTIMATED COST OF UPPER DE LUZ DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 50,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Howell-Bunger valve, 30-inch dia.		lump sum	$ 9,200	
Needle valve, 30-inch dia.		lump sum	9,600	$ 248,900
Reservoir				
Land and improvements		lump sum	43,000	
Clearing reservoir lands	675 ac.	$100.00	67,500	
Relocation of utilities		lump sum	15,000	
Road relocation		lump sum	15,000	140,500
Subtotal				$3,798,700
Administration and engineering, 10%				$ 379,900
Contingencies, 15%				569,800
Interest during construction				189,900
TOTAL				$4,938,300
ANNUAL COSTS				
Interest, 3.5%				$ 172,800
Amortization, 40-year sinking fund at 3.5%				58,400
Operation and maintenance				7,500
TOTAL				$ 238,700

ESTIMATED COST OF FALLBROOK LIPPINCOTT DAM AND RESERVOIR WITH STORAGE CAPACITY OF 35,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 482 feet, U.S.G.S. datum
Elevation of crest of spillway: 457 feet
Height of dam to spillway crest, above stream bed: 143 feet

Capacity of reservoir to crest of spillway: 35,000 acre-feet
Capacity of spillway with 5-foot freeboard: 136,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 10,000	
Diversion of stream and dewatering of foundation		lump sum	5,000	
Stripping topsoil	37,300 cu.yd.	$ 0.35	13,100	
Excavation for embankment				
Foundation	32,600 cu.yd.	0.80	26,100	
From borrow pits	373,800 cu.yd.	0.60	224,300	
From stream bed	349,800 cu.yd.	0.45	157,400	
Embankment				
Impervious	325,000 cu.yd.	0.16	52,000	
Pervious	304,000 cu.yd.	0.12	36,500	
Pervious, salvage	521,000 cu.yd.	0.20	104,200	
Rock riprap	24,400 cu.yd.	3.00	73,200	
Drilling grout holes	8,300 lin.ft.	3.00	24,900	
Pressure grouting	5,500 cu.ft.	4.00	22,000	$ 748,700
Spillway				
Excavation, unclassified	683,700 cu.yd.	0.80	547,000	
Backfill	8,100 cu.yd.	0.80	6,500	
Concrete				
Weir and cutoff	2,895 cu.yd.	35.00	101,300	
Floor	6,670 cu.yd.	30.00	200,100	
Walls	2,660 cu.yd.	40.00	106,400	
Reinforcing steel	981,000 lbs.	0.13	127,500	1,088,800
Outlet Works				
Excavation				
Inlet and outlet structures	500 cu.yd.	1.50	800	
Conduit	6,400 cu.yd.	1.20	7,700	
Backfill	1,900 cu.yd.	0.80	1,500	
Concrete				
Conduit	1,640 cu.yd.	50.00	82,000	
Intake structure	150 cu.yd.	60.00	9,000	
Gate chamber and valve house	280 cu.yd.	50.00	14,000	
Reinforcing steel	207,600 lbs.	0.13	27,000	
Miscellaneous metalwork	21,800 lbs.	0.40	8,700	
Steel pipe, 42-inch dia.	100,000 lbs.	0.25	25,000	
High pressure slide gate		lump sum	14,500	

ESTIMATED COST OF FALLBROOK LIPPINCOTT DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 35,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Howell-Bunger valve, 30-inch dia.		lump sum	$ 9,200	
Needle valve, 30-inch dia.		lump sum	9,600	$ 209,000
Reservoir				
Land and improvements		lump sum	237,000	
Clearing reservoir lands	580 ac.	$60.00	34,800	
Relocation of utilities		lump sum	7,500	
Road relocation		lump sum	15,000	294,300
Subtotal				$2,340,800
Administration and engineering, 10%				$ 234,100
Contingencies, 15%				351,100
Interest during construction				117,000
TOTAL				$3,043,000
ANNUAL COSTS				
Interest, 3.5%				$ 106,500
Amortization, 40-year sinking fund at 3.5%				36,000
Operation and maintenance				6,000
TOTAL				$ 148,500

ESTIMATED COST OF FALLBROOK LIPPINCOTT DAM AND RESERVOIR WITH STORAGE CAPACITY OF 65,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 525 feet U.S.G.S. datum
Elevation of crest of spillway: 497 feet
Height of dam to spillway crest, above stream bed: 183 feet

Capacity of reservoir to crest of spillway: 65,000 acre-feet
Capacity of spillway with 5-foot freeboard: 130,400 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 12,000	
Diversion of stream and dewatering of foundation		lump sum	10,000	
Stripping topsoil	72,000 cu.yd.	$ 0.35	25,200	
Excavation for embankment				
Foundation	46,000 cu.yd.	0.80	36,800	
From borrow pits	625,000 cu.yd.	0.65	406,200	
From stream bed	1,799,000 cu.yd.	0.50	899,500	
Embankment				
Impervious	543,000 cu.yd.	0.16	86,900	
Pervious	1,564,000 cu.yd.	0.12	187,700	
Pervious, salvage	358,000 cu.yd.	0.20	71,600	
Rock riprap	49,200 cu.yd.	3.00	147,600	
Drilling grout holes	10,400 lin.ft.	3.00	31,200	
Pressure grouting	6,900 cu.ft.	4.00	27,600	$1,942,300
Auxiliary Dam				
Stripping topsoil	7,000 cu.yd.	0.35	2,400	
Excavation for embankment				
Foundation	9,000 cu.yd.	0.80	7,200	
From borrow pits	32,000 cu.yd.	0.50	16,000	
Embankment				
Impervious	10,000 cu.yd.	0.60	6,000	
Pervious	22,000 cu.yd.	0.50	11,000	
Rock riprap	4,500 cu.yd.	3.00	13,500	56,100
Spillway				
Excavation, unclassified	472,000 cu.yd.	0.80	377,600	
Backfill	6,000 cu.yd.	0.80	4,800	
Concrete				
Weir and cutoff	2,080 cu.yd.	35.00	72,800	
Floor	5,960 cu.yd.	30.00	178,800	
Walls	2,310 cu.yd.	40.00	92,400	
Reinforcing steel	843,400 lbs.	0.13	109,600	836,000
Outlet Works				
Excavation				
Inlet and outlet structures	500 cu.yd.	1.50	800	
Conduit	11,500 cu.yd.	1.20	13,800	

ESTIMATED COST OF FALLBROOK LIPPINCOTT DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 65,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Backfill	5,100 cu.yd.	$ 0.80	$ 4,100	
Concrete				
Conduit	2,760 cu.yd.	50.00	138,000	
Intake structure	250 cu.yd.	60.00	15,000	
Gate chamber and valve house	375 cu.yd	50.00	18,800	
Reinforcing steel	338,000 lbs.	0.13	43,900	
Miscellaneous metalwork	37,800 lbs.	0.40	15,100	
Steel pipe, 54-inch dia.	182,000 lbs.	0.25	45,500	
High pressure slide gate		lump sum	25,000	
Howell-Bunger valve, 42-inch dia.		lump sum	11,800	
Needle valve, 36-inch dia		lump sum	14,000	$ 345,800
Reservoir				
Land and improvements		lump sum	375,000	
Clearing reservoir lands	960 ac.	60.00	57,600	
Relocation of utilities		lump sum	7,500	
Road relocation		lump sum	20,000	460,100
Subtotal				$3,640,300
Administration and engineering, 10%				$ 364,000
Contingencies, 15%				546,000
Interest during construction				273,000
TOTAL				$4,823,300
ANNUAL COSTS				
Interest, 3.5%				$ 168,800
Amortization, 40-year sinking fund at 3.5%				57,100
Operation and maintenance				9,500
TOTAL				$ 235,400

ESTIMATED COST OF FALLBROOK BORDER DAM AND RESERVOIR WITH STORAGE CAPACITY OF 65,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 500 feet, U.S.G.S. datum
Elevation of crest of spillway: 472 feet
Height of dam to spillway crest, above stream bed: 195 feet

Capacity of reservoir to crest of spillway: 65,000 acre-feet
Capacity of spillway with 6-foot freeboard: 129,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 12,000	
Diversion of stream and dewatering of foundation		lump sum	15,000	
Stripping topsoil	32,800 cu.yd.	$ 0.35	11,500	
Excavation for embankment				
Foundation	90,500 cu.yd.	0.80	72,400	
From borrow pits	726,600 cu.yd.	0.65	472,300	
From stream bed	676,000 cu.yd.	0.50	338,000	
Embankment				
Impervious	631,800 cu.yd.	0.16	101,100	
Pervious	587,800 cu.yd.	0.12	70,500	
Pervious, salvage	848,700 cu.yd.	0.20	169,700	
Rock riprap	31,400 cu.yd.	1.50	47,100	
Drilling grout holes	4,200 lin.ft.	3.00	12,600	
Pressure grouting	2,800 cu.ft.	4.00	11,200	$1,333,400
Spillway				
Excavation, unclassified	897,400 cu.yd.	2.30	2,064,000	
Concrete				
Weir and cutoff	1,920 cu.yd.	35.00	67,200	
Floor	4,580 cu.yd.	30.00	137,400	
Walls	4,000 cu.yd.	40.00	160,000	
Reinforcing steel	855,000 lbs.	0.13	111,200	2,539,800
Outlet Works				
Excavation				
Inlet and outlet structures	500 cu.yd.	1.50	800	
Conduit	11,500 cu.yd.	1.20	13,800	
Backfill	5,200 cu.yd.	0.80	4,200	
Concrete				
Conduit	2,720 cu.yd.	50.00	136,000	
Intake structure	250 cu.yd.	60.00	15,000	
Gate chamber and valve house	375 cu.yd.	50.00	18,800	
Reinforcing steel	335,000 lbs.	0.13	43,600	
Miscellaneous metalwork	35,700 lbs.	0.40	14,300	
Steel pipe, 54-inch dia.	165,000 lbs.	0.25	41,300	
High pressure slide gate		lump sum	25,000	

ESTIMATED COST OF FALLBROOK BORDER DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 65,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Howell-Bunger valve, 42-inch dia.		lump sum	$ 11,800	
Needle valve, 36-inch dia.		lump sum	14,000	$ 338,600
Reservoir				
Land and improvements		lump sum	171,000	
Clearing reservoir lands	900 ac.	$60.00	54,000	
Relocation of utilities		lump sum	7,500	
Road relocation		lump sum	56,700	289,200
Subtotal				$4,501,000
Administration and engineering, 10%				$ 450,100
Contingencies, 15%				675,200
Interest during construction				337,600
TOTAL				$5,963,900
ANNUAL COSTS				
Interest, 3.5%				$ 208,700
Amortization, 40-year sinking fund at 3.5%				70,600
Operation and maintenance				9,000
TOTAL				$ 288,300

ESTIMATED COST OF FALLBROOK BORDER DAM AND RESERVOIR WITH STORAGE CAPACITY OF 125,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 550 feet, U.S.G.S. datum
Elevation of crest of spillway: 523 feet
Height of dam to spillway crest, above stream bed: 246 feet

Capacity of reservoir to crest of spillway: 125,000 acre-feet
Capacity of spillway with 6-foot freeboard: 128,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 15,000	
Diversion of stream and dewatering of foundation		lump sum	20,000	
Stripping topsoil	59,900 cu.yd.	$ 0.35	21,000	
Excavation for embankment				
Foundation	120,400 cu.yd.	0.80	96,300	
From borrow pits	1,058,000 cu.yd.	0.75	793,500	
From stream bed	2,632,000 cu.yd.	0.55	1,447,600	
Embankment				
Impervious	920,000 cu.yd.	0.16	147,200	
Pervious	2,289,000 cu.yd.	0.12	274,700	
Pervious, salvage	874,000 cu.yd.	0.20	174,800	
Rock riprap	62,500 cu.yd.	1.50	93,800	
Drilling grout holes	5,200 lin.ft.	3.00	15,600	
Pressure grouting	3,500 cu.ft.	4.00	14,000	$3,113,500
Spillway				
Excavation, unclassified	934,000 cu.yd.	2.30	2,148,200	
Concrete				
Weir and cutoff	2,100 cu.yd.	35.00	73,500	
Floor	5,830 cu.yd.	30.00	174,900	
Walls	4,710 cu.yd.	40.00	188,400	
Reinforcing steel	1,032,000 lbs.	0.13	134,200	2,719,200
Outlet Works				
Excavation				
Inlet and outlet structures	1,000 cu.yd.	1.50	1,500	
Conduit	20,200 cu.yd.	1.20	24,200	
Backfill	11,900 cu.yd.	0.80	9,500	
Concrete				
Conduit	4,120 cu.yd.	50.00	206,000	
Intake structure	480 cu.yd.	60.00	28,800	
Gate chamber and valve house	470 cu.yd.	50.00	23,500	
Reinforcing steel	507,000 lbs.	0.13	65,900	
Miscellaneous metalwork	55,000 lbs.	0.40	22,000	
Steel pipe, 72-inch dia.	303,000 lbs.	0.25	75,800	
High pressure slide gate		lump sum	52,000	

ESTIMATED COST OF FALLBROOK BORDER DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 125,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Howell-Bunger valve, 48-inch dia		lump sum	$ 13,500	
Needle valve, 42-inch dia.		lump sum	21,000	$ 543,700
Reservoir				
Land and improvements		lump sum	232,700	
Clearing reservoir lands	1,250 ac.	$60.00	75,000	
Relocation of utilities		lump sum	7,500	
Road relocation		lump sum	64,900	380,100
Subtotal				$6,756,500
Administration and engineering, 10%				$ 675,700
Contingencies, 15%				1,013,500
Interest during construction				675,700
TOTAL				$9,121,400
ANNUAL COSTS				
Interest, 3.5%				$ 319,200
Amortization, 40-year sinking fund at 3.5%				107,900
Operation and maintenance				14,000
TOTAL				$ 441,100

ESTIMATED COST OF FALLBROOK BORDER DAM AND RESERVOIR WITH STORAGE CAPACITY OF 150,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 565 feet, U.S.G.S. datum
Elevation of crest of spillway: 538 feet
Height of dam to spillway crest, above stream bed: 261 feet

Capacity of reservoir to crest of spillway: 150,000 acre-feet
Capacity of spillway with 6-foot freeboard: 128,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 18,000	
Diversion of stream and dewatering of foundation		lump sum	22,000	
Stripping topsoil	75,700 cu.yd.	$ 0.35	26,500	
Excavation for embankment				
Foundation	200,300 cu.yd.	0.80	160,200	
From borrow pits	1,284,000 cu.yd.	0.80	1,027,200	
From stream bed	3,734,000 cu.yd.	0.60	2,240,400	
Embankment				
Impervious	1,117,000 cu.yd.	0.16	178,700	
Pervious	3,247,000 cu.yd.	0.12	389,600	
Pervious, salvage	856,000 cu.yd.	0.20	171,200	
Rock riprap	79,600 cu.yd.	1.50	119,400	
Drilling grout holes	5,500 lin.ft.	3.00	16,500	
Pressure grouting	3,680 cu.ft.	4.00	14,700	$ 4,384,400
Spillway				
Excavation, unclassified	973,000 cu.yd.	2.30	2,237,900	
Concrete				
Weir and cutoff	2,100 cu.yd.	35.00	73,500	
Floor	6,300 cu.yd	30.00	189,000	
Walls	4,750 cu.yd.	40.00	190,000	
Reinforcing steel	1,315,000 lbs	0.13	171,000	2,861,400
Outlet Works				
Excavation				
Inlet and outlet structures	1,000 cu.yd.	1.50	1,500	
Conduit	23,600 cu.yd.	1.20	28,300	
Backfill	13,900 cu.yd.	0.80	11,100	
Concrete				
Conduit	4,760 cu.yd.	50.00	238,000	
Intake structure	480 cu.yd.	60.00	28,800	
Gate chamber and valve house	470 cu.yd.	50.00	23,500	
Reinforcing steel	571,000 lbs.	0.13	74,200	
Miscellaneous metalwork	58,700 lbs.	0.40	23,500	
Steel pipe, 72-inch dia.	337,000 lbs.	0.25	84,300	
High pressure slide gate		lump sum	52,000	

ESTIMATED COST OF FALLBROOK BORDER DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 150,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Howell-Bunger valve, 48-inch dia.		lump sum	$ 13,500	
Needle valve, 42-inch dia.		lump sum	21,000	$ 599,700
Reservoir				
Land and improvements		lump sum	239,400	
Clearing reservoir lands	1,660 ac.	$60.00	99,600	
Relocation of utilities		lump sum	7,500	
Road relocation		lump sum	67,200	413,700
Subtotal				$ 8,259,200
Administration and engineering, 10%				$ 825,900
Contingencies, 15%				1,238,900
Interest during construction				825,900
TOTAL				$11,149,900
ANNUAL COSTS				
Interest, 3.5%				$ 390,200
Amortization, 40-year sinking fund at 3.5%				131,900
Operation and maintenance				15,500
TOTAL				$ 537,600

ESTIMATED COST OF VALLECITOS DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 3,000 ACRE-FEET

(Based on prices prevailing in spring of 1955)

Elevation of crest of dam: 890 feet, U.S.G.S. datum
Elevation of crest of spillway: 880 feet
Height of dam to spillway crest, above stream bed: 115 feet

Capacity of reservoir to crest of spillway: 3,000 acre-feet
Capacity of spillway with 4-foot freeboard: 2,000 second-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Dam				
Exploration		lump sum	$ 2,000	
Diversion of stream and dewatering of foundation		lump sum	1,000	
Stripping topsoil	10,000 cu.yd.	$ 0.35	3,500	
Excavation for embankment				
Foundation	28,000 cu.yd.	0.60	16,800	
From borrow pits	168,000 cu.yd.	0.60	100,800	
From stream bed	229,000 cu.yd.	0.45	103,100	
Embankment				
Impervious	146,000 cu.yd.	0.16	23,400	
Pervious	199,000 cu.yd.	0.12	23,900	
Pervious, salvage	22,000 cu.yd.	0.20	4,400	
Rock riprap	9,400 cu.yd.	3.00	28,200	
Drilling grout holes	3,100 lin.ft.	3.00	9,300	
Pressure grouting	2,000 cu.ft.	4.00	8,000	$324,400
Spillway				
Excavation, unclassified	6,000 cu.yd.	0.80	4,800	
Backfill	500 cu.yd.	0.80	400	
Concrete				
Weir and cutoff	45 cu.yd.	35.00	1,600	
Floor	270 cu.yd.	30.00	8,100	
Walls	310 cu.yd.	40.00	12,400	
Reinforcing steel	52,000 lbs.	0.13	6,800	34,100
Outlet Works				
Excavation				
Inlet and outlet structures	130 cu.yd.	1.50	200	
Conduit	500 cu.yd.	1.20	600	
Backfill	200 cu.yd.	0.80	200	
Concrete				
Pipe encasement and control works	780 cu.yd.	40.00	31,200	
Reinforcing steel	78,000 lbs.	0.13	10,100	

ESTIMATED COST OF VALLECITOS DAM AND RESERVOIR
WITH STORAGE CAPACITY OF 3,000 ACRE-FEET
(continued)

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Outlet Works (continued)				
Miscellaneous metal work	4,000 lbs.	$ 0.40	$ 1,600	
Reinforced concrete pipe, 18-inch dia.	965 ft.	7.10	6,900	
High pressure slide gates	3 each	2,000.00	6,000	
Needle valve, 12-inch dia.		lump sum	600	$ 57,400
Reservoir				
Land and improvements		lump sum	40,000	
Clearing reservoir lands	90 ac.	60.00	5,400	
Relocation of utilities		lump sum	5,000	50,400
Subtotal				$466,300
Administration and engineering, 10%				$ 46,600
Contingencies, 15%				70,000
Interest during construction				11,700
TOTAL				$594,600
ANNUAL COSTS				
Interest, 3.5%				$ 20,800
Amortization, 40-year sinking fund at 3.5%				7,000
Operation and maintenance				3,000
TOTAL				$ 30,800

ESTIMATED COST OF FACILITIES TO DELIVER 6,200 ACRE-FEET OF WATER PER SEASON FROM DE LUZ RESERVOIR TO FALLBROOK

(Based on prices prevailing in spring of 1955)

Capacity of conduit: 16.6 cfs Length of conduit: 23,000 feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Pipe line				
Excavation	28,800 cu.yd.	$ 0.90	$ 25,900	
Backfill	24,200 cu.yd.	0.40	9,700	
Pipe, reinforced concrete, furnish and install 30-inch dia.	23,000 lin.ft.	9.70	223,100	
Fittings		lump sum	11,500	
Valves				
Air release, 3-inch dia.	7 each	370.00	2,600	
Blowoff, 6-inch dia.	8 each	1,450.00	11,600	
Gate, 30-inch dia.	2 each	2,200.00	4,400	
Meter	1 each	1,200.00	1,200	
Chlorinator and equipment		lump sum	8,800	$298,800
Regulatory reservoir		lump sum	14,000	14,000
Pumping plant and equipment	3 each	30,700.00	92,100	92,100
Subtotal				$404,900
Administration and engineering, 10%				$ 40,500
Contingencies, 15%				60,700
Interest during construction				5,100
TOTAL				$511,200
ANNUAL COSTS				
Interest, 3.5%				$ 17,900
Amortization, 40-year sinking fund at 3.5%				6,000
Replacement				2,000
Electrical energy				53,300
Operation and maintenance				4,000
TOTAL				$ 83,200

ESTIMATED COST OF FACILITIES TO DELIVER 4,900 ACRE-FEET OF WATER PER SEASON FROM DE LUZ RESERVOIR TO FALLBROOK

(Based on prices prevailing in spring of 1955)

Capacity of conduit: 13.1 cfs   Length of conduit: 23,000 feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Pipe line				
Excavation	25,900 cu.yd.	$ 0.90	$ 23,300	
Backfill	22,300 cu.yd.	0.40	8,900	
Pipe, reinforced concrete, furnish and install 27-inch dia.	23,000 lin.ft.	9.00	207,000	
Fittings		lump sum	10,500	
Valves				
Air release, 3-inch dia.	7 each	370.00	2,600	
Blowoff, 6-inch dia.	8 each	1,450.00	11,600	
Gate, 30-inch dia.	2 each	2,200.00	4,400	
Meter	1 each	1,200.00	1,200	
Chlorinator and equipment		lump sum	8,800	$278,300
Regulatory reservoir		lump sum	14,000	14,000
Pumping plant and equipment	3 each	26,300.00	78,900	78,900
Subtotal				$371,200
Administration and engineering, 10%				$ 37,100
Contingencies, 15%				55,700
Interest during construction				4,600
TOTAL				$468,600
ANNUAL COSTS				
Interest, 3.5%				$ 16,400
Amortization, 40-year sinking fund at 3.5%				5,500
Replacement				1,700
Electrical energy				42,600
Operation and maintenance				3,800
TOTAL				$ 70,000

ESTIMATED COST OF FACILITIES TO DELIVER 7,600 ACRE-FEET OF WATER PER SEASON FROM FALLBROOK, LIPPINCOTT RESERVOIR TO FALLBROOK

(Based on prices prevailing in spring of 1955)

Capacity of conduit: 30.5 cfs   Length of conduit: 7,200 feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Pipe line				
Excavation	10,800 cu.yd.	$ 0.90	$ 9,700	
Backfill	8,800 cu.yd.	0.40	3,500	
Pipe, reinforced concrete, furnish and install 36-inch dia.	7,200 lin.ft.	12.70	91,400	
Fittings		lump sum	4,600	
Valves				
Air release, 4-inch dia.	2 each	370.00	700	
Blowoff, 6-inch dia.	2 each	1,430.00	2,900	
Gate, 30-inch dia.	2 each	2,400.00	4,800	
Meter	1 each	1,200.00	1,200	
Right of way		lump sum	1,000	$119,800
Regulatory reservoir		lump sum	42,000	42,000
Pumping plant and equipment		lump sum	110,000	110,000
Subtotal				$271,800
Administration and engineering, 10%				$ 27,200
Contingencies, 15%				40,800
Interest during construction				3,400
TOTAL				$343,200
ANNUAL COSTS				
Interest, 3.5%				$ 12,000
Amortization, 40-year sinking fund at 3.5%				4,100
Replacement				2,200
Electrical energy				46,300
Operation and maintenance				3,600
TOTAL				$ 68,200

ESTIMATED COST OF FACILITIES TO DELIVER 5,800 ACRE-FEET OF WATER PER SEASON FROM FALLBROOK, LIPPINCOTT RESERVOIR TO FALLBROOK

(Based on prices prevailing in spring of 1955)

Capacity of conduit: 23.3 cfs   Length of conduit: 7,200 feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Pipe line				
Excavation	9,900 cu.yd.	$ 0.90	$ 8,900	
Backfill	8,100 cu.yd.	0.40	3,200	
Pipe, reinforced concrete, furnish and install 33-inch dia.	7,200 lin.ft.	11.50	82,800	
Fittings		lump sum	4,500	
Valves				
Air release, 4-inch dia.	2 each	370.00	700	
Blowoff, 6-inch dia.	2 each	1,430.00	2,900	
Gate, 24-inch dia.	2 each	2,400.00	4,800	
Meter	1 each	1,200.00	1,200	
Right of way		lump sum	1,000	$110,000
Regulatory reservoir		lump sum	42,000	42,000
Pumping plant and equipment		lump sum	68,000	68,000
Subtotal				$220,000
Administration and engineering, 10%				$ 22,000
Contingencies, 15%				33,000
Interest during construction				2,800
TOTAL				$277,800
ANNUAL COSTS				
Interest, 3.5%				$ 9,700
Amortization, 40-year sinking fund at 3.5%				3,300
Replacement				1,400
Electrical energy				35,300
Operation and maintenance				3,600
TOTAL				$ 53,300

ESTIMATED COST OF FACILITIES TO DELIVER 9,000
ACRE-FEET PER SEASON OF COLORADO RIVER WATER FROM
SAN DIEGO AQUEDUCT TO CAMP PENDLETON

(Based on prices prevailing in spring of 1955)

Capacity of conduit: 36.0 cfs | Length of conduit: 70,400 feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Pipe line				
Excavation	96,100 cu.yd.	$ 1.10	$105,700	
Backfill	80,600 cu.yd.	0.50	40,300	
Pipe, reinforced concrete, furnish and install				
36-inch dia.	48,400 lin.ft.	14.30	692,100	
27-inch dia.	12,000 lin.ft.	8.70	104,400	
24-inch dia.	10,000 lin.ft.	8.10	81,000	
Fittings		lump sum	44,000	
Outlet structure		lump sum	5,000	
Valves				
Air release, 3-inch dia.	11 each	370.00	4,100	
Blowoff, 6-inch dia.	12 each	1,450.00	17,400	
Gate, 30-inch dia.	1 each	2,200.00	2,200	
24-inch dia.	3 each	2,000.00	6,000	
Venturi meter	2 each	1,200.00	2,400	
Right of way		lump sum	15,900	$1,120,500
Regulatory reservoir		lump sum	42,000	42,000
Subtotal				$1,162,500
Administration and engineering, 10%				$ 116,300
Contingencies, 15%				174,400
Interest during construction				29,100
TOTAL				$1,482,300
ANNUAL COSTS				
Interest, 3.5%				$ 51,900
Amortization, 40-year sinking fund at 3.5%				17,500
Operation and maintenance				3,700
TOTAL				$ 73,100

ESTIMATED COST OF FACILITIES TO DELIVER 6,000
ACRE-FEET PER SEASON OF COLORADO RIVER WATER
FROM SAN DIEGO AQUEDUCT TO FALLBROOK

(Based on prices prevailing in spring of 1955)

Capacity of conduit: 24.0 cfs | Length of conduit: 37,600 feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Pipe line				
Excavation	55,900 cu.yd.	$ 1.10	$ 61,500	
Backfill	45,600 cu.yd.	0.50	22,800	
Pipe, reinforced concrete, furnish and install				
24-inch dia.	1,000 lin.ft.	8.50	8,500	
36-inch dia.	36,600 lin.ft.	14.60	534,400	
Fittings		lump sum	27,200	
Outlet structure		lump sum	5,000	
Valves				
Air release, 3-inch dia.	6 each	370.00	2,200	
Blowoff, 6-inch dia.	6 each	1,450.00	8,700	
Gate, 24-inch dia.	2 each	2,000.00	4,000	
30-inch dia.	2 each	2,200.00	4,400	
Venturi meter	2 each	1,200.00	2,400	
Right of way		lump sum	8,400	$689,500
Regulatory reservoir		lump sum	42,000	42,000
Subtotal				$731,500
Administration and engineering, 10%				$ 73,200
Contingencies, 15%				109,700
Interest during construction				18,300
TOTAL				$932,700
ANNUAL COSTS				
Interest, 3.5%				$ 32,600
Amortization, 40-year sinking fund at 3.5%				11,000
Operation and maintenance				2,400
TOTAL				$ 46,000

ESTIMATED COST OF SANTA MARGARITA BASIN WELL FIELD, PUMPING PLANT, PIPE LINE, AND REGULATORY RESERVOIR

(Based on prices prevailing in spring of 1955)

Capacity of pumps: 18 cfs Seasonal extractions: 5,700 acre-feet

Item	Quantity	Unit price	Cost	
CAPITAL COSTS				
Well, gravel packed, drilled and cased, 18-inch dia.	8 each	$2,900.00	$ 23,200	
Pump, motor, and equipment installed	8 each	3,200.00	25,600	
Pipe, reinforced concrete in place				
12-inch dia.	1,200 lin.ft.	4.40	5,300	
18-inch dia.	5,600 lin.ft.	6.20	34,700	
24-inch dia.	8,500 lin.ft.	7.20	61,200	
30-inch dia.	4,200 lin.ft.	10.60	44,500	
Fittings		lump sum	7,300	
Valves		lump sum	5,200	
Meter	1 each	1,200.00	1,200	$208,200
Regulatory reservoir		lump sum	42,000	42,000
Pumping plant		lump sum	52,600	52,600
Subtotal				$302,800
Administration and engineering, 10%				$ 30,300
Contingencies, 15%				45,400
Interest during construction				3,800
TOTAL				$382,300
ANNUAL COSTS				
Interest, 3.5%				$ 13,400
Amortization, 40-year sinking fund at 3.5%				4,500
Replacement				2,200
Electrical energy				35,200
Operation and maintenance				5,700
TOTAL				$ 61,000

APPENDIX K

APPLICATIONS TO APPROPRIATE WATER

APPENDIX K

APPLICATIONS TO APPROPRIATE WATER

Application number	Date filed	Applicant	Diversion number	Source	Location of point of diversion: 1/4	1/4	Section	Township	Range	Meridian	Amount applied for, or licensed	Purpose	Status
1922	7-19-20	R. R. and Georgia Kerr	7S/1E-35E	Wilson Creek	S W	N W	35	7S	1E	S B	0.19 cfs	Irrigation	License
6893	3-13-31	Milton M. and Evelyn M. Lloyd	9S/2E-20C	Unnamed Spring	N E	N W	20	9S	2E	S B	820 gpd	Irrigation and domestic	License
7035	8-10-31	Gustav and Eugene Lawler, Jr.	9S/1E-29C	Cutca Creek	N E	N W	29	9S	1E	S B	5,725 gpd	Irrigation and domestic	License
7731	11- 2-33	Milton M. and Evelyn M. Lloyd	9S/2E-20E	Unnamed Spring	S W	N W	20	9S	2E	S B	7,200 gpd	Irrigation and domestic	License
8007	7- 3-34	Estate of Alexander F. Hansen	8S/4W-36D	Sandia Creek	N W S E	N W N W	36 36	8S 8S	4W 4W	S B) S B)	2.5 cfs	Irrigation and domestic	Permit
8484	11- 4-35	B. M. Jurkovich	8S/1W-25B	Unnamed Spring	N W	N E	25	8S	1W	S B	640 gpd	Domestic	License
9137	10- 7-37	Elmer B. Denio	9S/1E-12L	Unnamed Spring	N E	S W	12	9S	1E	S B	400 gpd	Domestic	License
9242	2-19-38	Cyril Meade Ewing	8S/5W-23Q	Unnamed Spring	S W	S E	23	8S	5W	S B	0.025 cfs	Irrigation and domestic	License
9259	3-22-38	Sydney Grossman	8½S/3E-31R	Cooper Canyon Creek	S E	S E	31	8½S	3E	S B	0.10 cfs and 9.0 af	Mining and domestic	Permit
9291	5-13-38	Adelbert S. Nelson	8S/5W-23J	Nelson Creek and Colman Creek	N E S E N E N W N W N W	S E N E S E S W S W S W	23 23 23 24 24 24	8S 8S 8S 8S 8S 8S	5W 5W 5W 5W 5W 5W	S B) S B) S B) S B) S B) S B)	0.025 cfs and 4.0 af	Irrigation and domestic	Permit
9783	12- 6-39	Felix R. Garnsey and Theodora L. Garnsey	8S/4W-30B	Cottonwood Creek	N W	N E	30	8S	4W	S B	1.0 cfs	Irrigation	Permit
10269	8-21-41	Edgar S. Lohman	8S/1W-29R	Hillside Cienega	S E	S E	29	8S	1W	S B	3,500 gpd	Irrigation and domestic	License
10806	4-22-44	Martin Grammer	9S/2E-34L	Unnamed Spring	N E	S W	34	9S	2E	S B	16,000 gpd	Domestic	Permit
11158	9-21-45	Georgia E. Kerr	7S/1E-35E	Wilson Creek	S W	N W	35	7S	1E	S B	0.25 cfs	Irrigation	Permit
11163	9-26-45	Estate of Adelbert V. Studer	9S/2E-28C	Rattlesnake Canyon	N E	N W	28	9S	2E	S B	16,000 gpd	Irrigation and domestic	Permit

APPLICATIONS TO APPROPRIATE WATER
(continued)

Application number	Date filed	Applicant	Diversion number	Source	Location of point of diversion: 1/4	1/4	Section	Township	Range	Meridian	Amount applied for, or licensed	Purpose	Status
11518	8-16-46	Vail Company	8S/1W-10D	Temecula Creek	N W	N W	10	8S	1W	S B	40,000 af	Irrigation and domestic	Permit
11578	10- 4-46	Santa Margarita Mutual Water Co.	None*	(1) Santa Margarita River	N W	N E	24	8S	3W	S B	60.0 cfs)	Irrigation and domestic	Pending
				(2) Temecula Creek	S E	N W	10	8S	1W	S B	5,000 af)		
11586	10-11-46	Fallbrook Public Utility District	9S/3W- 7D1	Santa Margarita River	N W	N W	7	9S	3W	S B	2.5 cfs	Irrigation domestic, and municipal	Permit
11587	10-11-46	Fallbrook Public Utility District	None*	Santa Margarita River	S E	N E	12	9S	4W	S B	10,000 af	Irrigation, domestic, and municipal	Permit
12152	11-12-47	Santa Margarita Mutual Water Co.	None*	Santa Margarita River	N E	N E	12	9S	4W	S B	60.0 cfs and 60,000 af	Irrigation and domestic	Pending
12178	11-28-47	Fallbrook Public Utility District	None*	Rainbow Creek	S W	N E	8	9S	3W	S B	500 af	Irrigation, domestic, and municipal	Pending
				Santa Margarita River	S E	N E	12	9S	4W	S B	9,500 af		
12179	11-28-47	Fallbrook Public Utility District	None*	Sandia Creek	N E	N E	12	9S	4W	S B	1,500 af	Irrigation, domestic, and municipal	Pending
				Santa Margarita River	S E	N E	12	9S	4W	S B	8,500 af		
12576	6-30-48	United States Navy Department	None*	Santa Margarita River	N W	N W	32	9S	4W	S B	165,000 af	Municipal	Pending
13505	12-12-49	Felix R. Garnsey and Theodora L. Garnsey	8S/4W-30H	Cottonwood Creek	N W	N E	30	8S	4W	S B)	0.75 cfs and	Irrigation	Permit
					S E	N E	30	8S	4W	S B)	42 af		
13577	2-10-50	A. F. Borel	None*	East Fork Warm Springs Creek	N W	S W	6	7S	2W	S B	100 af	Irrigation and stock	Pending
14561	11- 2-51	Paul D. Bradshaw, et al.	8S/3W-31L	Brians Creek	N E	S W	31	8S	3W	S B	35 af	Irrigation	Pending
14707	3-10-52	Doris I. Worcester	7S/2E-12N	Unnamed Spring Tributary to Coahuila Creek	S W	S W	12	7S	2E	S B	25 gpm	Domestic and stock	Permit
15031	9-26-52	Mike A. Seery	8S/5W-13Q	Three Unnamed Springs Tributary to Cottonwood Creek	S W	S E	13	8S	5W	S B)	2,000 gpd	Domestic	Pending
					S E	S W	13	8S	5W	S B)			

* Diversion works not constructed.

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