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THE RESOURCES AGENCY OF CALIFORNIA

Department of Water Resources

BULLETIN No. 65-59

# QUALITY OF SURFACE WATERS IN CALIFORNIA

1959

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## PART II SOUTHERN CALIFORNIA

NOVEMBER 1962

EDMUND G. BROWN  
Governor  
State of California

WILLIAM E. WARNE  
Administrator  
The Resources Agency of California  
and Director  
Department of Water Resources

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3 - WATER POLLUTION CONTROL BOARD REGION

State of California  
THE RESOURCES AGENCY OF CALIFORNIA  
Department of Water Resources

BULLETIN No. 65-59

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Department of Water Resources



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THE RESOURCES AGENCY OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES

1120 N STREET, SACRAMENTO

October 26, 1962

Honorable Edmund G. Brown, Governor,  
and Members of the Legislature of  
the State of California

State and Regional Water Pollution Control Boards

Gentlemen:

I have the honor to transmit Bulletin No. 65-59 entitled "Quality of Surface Waters in California, 1959, Part II, Southern California." The period January through December 1959 is covered in this fifth volume of a continuing chronological series on quality of surface waters in California. The quality of surface waters in Northern and Central California is discussed in Part I, published in July 1961, and Southern California surface water quality is discussed in this report, Part II.

At the request of the State Water Pollution Control Board a statewide surface water monitoring program was initiated in April 1951. As authorized by Section 229 of the Water Code, the Department of Water Resources has administered this program in cooperation with the State Department of Public Health, Bureau of Sanitary Engineering; the State Department of Fish and Game; the United States Geological Survey; and various other agencies and individuals. Under the statewide program, samples from 210 stations, located on 143 different water sources, are collected and analyzed periodically to maintain surveillance on the quality of surface waters in California. This volume reports the results of monitoring at 54 of these stations, located on 34 streams, lakes, and artificial channels in Southern California.

During 1959, surface water quality data, for Southern California, showed varying degrees of increases in concentration of mineral constituents, primarily due to the lower than normal precipitation in the 1958-59 rainfall season, resulting in low runoff and decreased streamflows. A few of the streams that normally flow

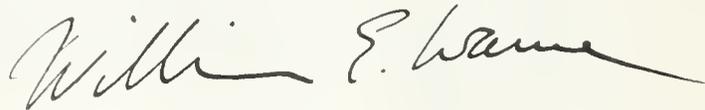
Honorable Edmund G. Brown, Governor,  
and Members of the Legislature of  
the State of California

State and Regional Water Pollution  
Control Boards

continuously were dry for several successive months in the latter part of the year. The flow in a few other streams consisted almost entirely of waste water discharges. At several stations new maxima for the period covered by this continuing series of annual reports were recorded for mineral constituents of concern in water quality.

These conditions emphasize the need for continued surveillance of the quality of the surface waters of the State in order to determine first, the natural variation in water quality that may be expected and second, the average quality against which changes caused by the activities of man can be evaluated. This report indicates that the existing network of monitoring stations is adequate for general comparisons in Southern California; special problem areas are treated separately under authorization of other sections of the California Water Code.

Sincerely yours,

A handwritten signature in black ink, reading "William E. Warne". The signature is fluid and cursive, with a long, sweeping underline that extends to the right.

William E. Warne  
Director

STATE OF CALIFORNIA  
THE RESOURCES AGENCY OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES

EDMUND G. BROWN, Governor  
WILLIAM E. WARNE, Administrator, The Resources Agency of California  
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CALIFORNIA WATER COMMISSION

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MARION R. WALKER, Ventura

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WILLIAM M. CARAH  
Executive Secretary

GEORGE B. GLEASON  
Principal Engineer

## ACKNOWLEDGMENTS

The extensive coverage of the statewide surface water quality monitoring program is made possible through the cooperation of federal, state, and local agencies. The valuable assistance of the following agencies in the Southern California portion of the program is gratefully acknowledged.

United States Geological Survey

United States Public Health Service

California Department of Public Health, Division of  
Laboratories

California Disaster Office, Radiological Services

City of Long Beach, Department of Public Health

City of Los Angeles

Department of Public Health

Department of Water and Power

City of San Bernardino

Los Angeles County Flood Control District

Imperial Irrigation District

The Metropolitan Water District of Southern California

Ventura County Water Resources Division

Bacteriological determinations were made by the California State Department of Public Health, Division of Laboratories, Los Angeles, and radiological counts were made by the California Disaster Office, Sacramento, under provisions of a continuing agreement with the State Water Pollution Control Board.



## INTRODUCTION

An abundant and usable source of water is an essential commodity in man's environment. To insure that California's rapidly expanding economy and increasing population are provided with a usable supply of water, an effective surveillance program must be maintained. The early detection and control of quality impairment is necessary in order to insure the fullest beneficial use of the State's water resources. Realizing the need for a detection system, the State of California initiated a statewide surface water monitoring program in April 1951. Since that time the monitoring program has been conducted by the Department of Water Resources in cooperation with numerous agencies and individuals. The department's monitoring program is integrated with monitoring stations maintained by other agencies at various places throughout the State.

Bulletin No. 65-59 is the fifth volume in a series on surface water quality conditions in California. Data presented were collected by the Department of Water Resources under its surface water quality monitoring program and by other public agencies in California. In addition to basic data, this bulletin contains evaluations and interpretations of significant quality variations detected during 1959 and, where possible, an explanation of the causes of these variations.

Part I of this bulletin, published July 1961, presented surface water quality data and an evaluation of surface water quality conditions in Water Pollution Control Regions 1 and 2, the portion of Region 3 north of the San Antonio-Salinas River drainage boundary, Region 5, and the portion of Region 6 north of the Mono Lake drainage divide. Part II of

this bulletin, the present volume, presents surface water quality data and an evaluation of surface water quality conditions in the southern portion of Region 3 (Santa Ynez, Santa Maria, Nacimiento, and San Antonio Rivers and the portion of Salinas River upstream from the confluence of San Antonio River), all of Region 4, Region 6 south of the northern Mono Lake drainage boundary, and all of Regions 7, 8 and 9. The regions and the areas reported on in this volume are shown on the frontispiece map.

The 1959 stream sampling program reported herein comprised the collection of water samples and analyses from 54 stations on 34 streams, lakes, and artificial channels throughout Southern California. Previous quality monitoring data are included in the following report and bulletins:

California Department of Public Works, Division of  
Water Resources, Water Quality Investigations,  
Report No. 15, "Quality of Surface Waters in  
California, 1951-1954"

California Department of Water Resources, Division  
of Resources Planning, Bulletin No. 65, "Quality of  
Surface Waters in California, 1955-1956"

----. Bulletin No. 65-57, "Quality of Surface Waters  
in California, 1957"

----. Bulletin No. 65-58, "Quality of Surface Waters  
in California, 1958"

In addition to the Bulletin 65 series, the department publishes and distributes a monthly report containing water quality data and preliminary evaluations of detected quality variations. These reports are distributed to pollution control, public health, and other agencies and interested individuals to provide them with data on water quality as soon as practicable after collection and analysis of water samples.

The activities of the department's surface water monitoring program are authorized by Section 229 of the Water Code, which directs that:

"The department, . . . , shall investigate conditions of the quality of all waters within the State, including saline waters, coastal and inland, as related to all sources of pollution of whatever nature and shall report thereon to the Legislature and to the appropriate regional water pollution control board annually, and may recommend any steps which might be taken to improve or protect the quality of such waters."

The basic objectives of the department's surface water quality monitoring program are:

- (a) to secure continuous and reliable water quality data, on a periodic basis, from a network of stations which will provide representative data pertaining to the quality of water in the major surface streams and lakes of the State;
- (b) to evaluate and interpret chemical, physical, biological and radiological information collected during the course of the program to develop a comprehensive understanding of the factors which make up and alter the water quality at any station; and
- (c) to detect changes in water quality and to notify the appropriate control agency (regional water pollution control boards, state and local health departments, State Department of Fish and Game) when warranted.

The discussion of water quality data presented in this bulletin is by water pollution control regions, which are numbered and named substantially in accordance with the major surface drainage basins with which they are coterminous (see Frontispiece). Within each region, the

discussion is presented by basins or stream groups. In each basin or stream group, the main stream is discussed first, followed by a discussion and summary of data, in downstream order, of all monitoring stations. The discussion for each monitoring station includes a description of the sampling point, period of quality record, a discussion of water quality characteristics, and an analysis of significant water quality changes in 1959. For each station the maximum and minimum concentrations of the mineral constituents in the water for the period of record and for 1959 are given, and also for each station, curves depicting variations in stream flow, specific conductance, and, where applicable, pertinent problem mineral constituent concentrations are presented.

Results of bacteriological and radiological determinations presented in this bulletin should be considered as only qualitative indicators; undue weight should not be given to quantitative values. The indicators contribute to long-term environmental studies.

Results of bacteriological examinations are expressed as the most probable number (MPN) of coliform bacteria per milliliter (ml) of sample. In view of the rapidity and frequency of change in the density of coliform organisms, frequent and lengthy sampling is necessary before a truly reliable evaluation can be made.

Results of radiological determinations are expressed in terms of activity, measured in micro-micro curies per liter (uuc/l). No well defined limits have been established for maximum safe concentrations of unknown alpha and beta emitters in domestic water supplies. The International Commission on Radiological Protection has recommended provisional criteria for permissible concentrations of radioactivity in

water. Even though evaluation criteria have been recommended by this commission, this bulletin does not attempt to evaluate the specific safety conditions. Pertinent features of these criteria are given in Appendix A, "Procedures and Criteria."

Appendix A contains a discussion of field and laboratory procedures and methods, and the criteria utilized by the Department of Water Resources in evaluating the quality of water. Appendix B contains the physical, mineral, bacteriological and radiological data for samples collected during 1959.



## SURFACE WATER QUALITY IN SOUTHERN CALIFORNIA

### SUMMARY

During 1959, the quality of surface water in Southern California was extremely variable, as it has been in prior years of record and reported in previous bulletins of this series. Deficiency of precipitation in the 1958-59 rainfall season resulted in reduced runoff and abnormally low natural flows in most of the river basins, and at many stations the stream channels were dry during the later months of the year. Reservoir storage for regulation of stream flows showed a general decline, as did the storage in those reservoirs impounding natural flows for other uses. Many stream flows in Southern California consist wholly of waste waters in the absence of natural runoff, and, as a consequence, the average quality for the year at many stations was not as good as normal, showing the lack of dilution with the better quality natural stream flows.

A few new maximum values were established for concentrations of constituents of significance in evaluation of water quality; these maximums were, for the most part, for minor constituents such as fluoride and boron, usually present in only small amounts.

### Central Coastal Region (No. 3)

The Central Coastal Region (No. 3) comprises approximately 11,000 square miles of coastal valleys and mountain ranges. The region extends about 275 miles along the coast, from the southern boundary of Pescadero Creek Basin (about 35 miles south of the City of San Francisco) to the southeasterly boundary of Rincon Creek Basin (approximately 70 miles north of Los Angeles), and averages about 50 miles in width.

Valley and mesa lands occupy about 2,000 square miles in the region. The coast line is rocky and rugged except for a few river deltas. Mountain peaks exceed 5,000 feet in elevation in most of the ranges. Sawmill Mountain at the head of Sisquoc River, tributary to Santa Maria River, reaches an altitude of 8,750 feet.

Mean seasonal runoff in the region is 2,447,600 acre-feet. The region is semiarid, and most of the streams flow intermittently. Winter and spring flows are often large and constitute a flood hazard.

The principal hydrographic units in Central Coastal Region include San Lorenzo, Pajaro, Salinas, Carmel, Santa Maria, and Santa Ynez. In this region 14 sampling stations are monitored to maintain surveillance of surface water quality. The monitored streams and the number of stations on each (in parentheses) are presented in the following tabulation:

|                       |                      |                       |
|-----------------------|----------------------|-----------------------|
| San Lorenzo River (1) | San Benito River (1) | San Antonio River (1) |
| Soquel River (1)      | Carmel River (1)     | Cuyama River (1)      |
| Pajaro River (1)      | Salinas River (3)    | Santa Ynez River (2)  |
| Uvas Creek (1)        | Nacimiento River (1) |                       |

The upper reaches of the Salinas River, and the Nacimiento, Cuyama, and Santa Ynez Rivers are in the area monitored by the Southern District of the Department of Water Resources. The stations on these streams are shown on Plate 1 and are discussed in this report (Part II of Bulletin No. 65-59). The remaining stations in this region are discussed in Part I, published separately.

## Salinas River Basin

The Salinas River Basin is located in the central portion of the Central Coastal Region. The watershed has an area of 4,400 square miles, of which mountains and foothills cover approximately 3,480 square miles, and valley and mesa lands occupy the remaining 920 square miles. The basin extends inland from the coast about 150 miles in a southeasterly direction, bounded on the west by the Coast Range and on the east by the Temblor Range. The Salinas River traverses the rich lands of Salinas Valley for nearly 100 miles, and discharges to Monterey Bay near Castroville.

Mean annual runoff from the watershed is approximately 713,800 acre-feet, while the average annual flow at Station 43c, near Bradley, is about 340,000 acre-feet.

Nacimiento River and San Antonio River are tributaries of Salinas River. During the summer season all three of these rivers are usually dry.

The principal reservoirs on the Salinas River system are Nacimiento Reservoir and Salinas Reservoir. Several smaller reservoirs in the headwater area store surface water supplies for local needs. Since 1956, flood waters stored by Nacimiento Reservoir have been released during the summer months for artificial replenishment of ground water storage. Recreational facilities are provided at Nacimiento Reservoir and Salinas Reservoir.

The economy of the basin depends primarily on agriculture, which is extensively developed on the highly productive valley lands. Food processing and sugar refining are the dominant industries. Water

requirements for agriculture, industry, municipalities, and domestic use are met by utilization of ground water supplies.

The five stations maintained to monitor surface water quality in this basin are:

| <u>Monitoring Station</u>        | <u>Page Number of<br/>Station Discussion</u> |
|----------------------------------|--|
| Salinas River at Paso Robles     | 12   |
| Salinas River near Bradley       | 14   |
| Salinas River near Spreckels     | Part I of this bulletin                      |
| Nacimiento River near San Miguel | 16   |
| San Antonio River at Pleyto      | 18   |

SALINAS RIVER AT PASO ROBLES (STA. 43a)

Sampling Point. Station 43a is located in Section 33 of Township 26 South, Range 12 East, Mount Diablo Base and Meridian. Water samples were collected from the left bank just upstream from the United States Geological Survey gage on 13th Street Bridge in Paso Robles, 3.5 miles upstream from Huerhuero Creek.

Period of Record. April 1951 through December 1959.

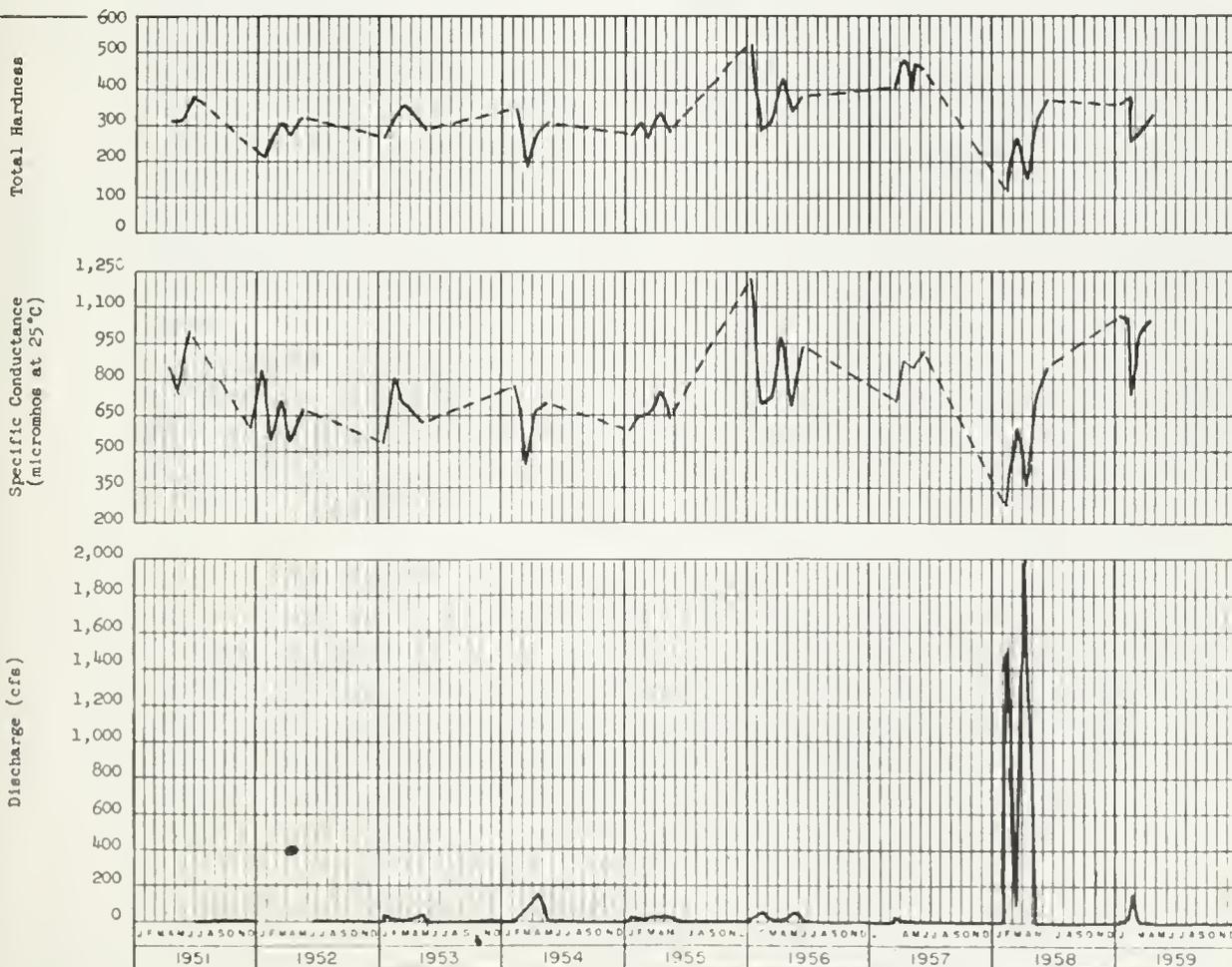
Water Quality Characteristics. Throughout the period of record the water has generally been calcium-sodium bicarbonate in character, usually class 1 for irrigation, moderately to very hard, and has met drinking water standards for mineral constituents. Boron occasionally exceeds the limit of 0.5 ppm for class 1 irrigation water.

Significant Water Quality Changes. The nine year record indicates seasonal changes in mineral concentrations, varying with volume of flow, and a slight increase in mineral content during the period of record. Surface flow occurred from January to April 1959.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959                          | Minimum - 1959 |
|--|-------------------|-------------------|---|----------------|
| Specific conductance (micromhos at 25°C)                 | 1,213             | 277               | 1,079                                   | 585            |
| Temperature in °F  | 79                | 46                | 76                                      | 52             |
| Dissolved oxygen in parts per million                    | 14.0              | 6.8               | 14.0                                    | 7.0            |
| Percent saturation                                       | 136               | 70                | 136                                     | 79             |
| pH   | 9.8               | 6.8               | 8.2                                     | 7.5            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |   |                |
| Calcium (Ca)   | 95                | 45                | 95                                      | 65             |
| Magnesium (Mg)   | 37                | 17                | 37                                      | 26             |
| Sodium (Na)  | 114               | 20                | 114                                     | 29             |
| Potassium (K)  | 7.2               | 0.4               | 2.8                                     | 1.8            |
| Carbonate (CO <sub>3</sub> )                             | 19                | 0.0               | 0.00                                    | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                          | 373               | 115               | 373                                     | 226            |
| Sulfate (SO <sub>4</sub> )                               | 161               | 40                | 161                                     | 91             |
| Chloride (Cl)  | 96                | 11.5              | 96                                      | 35             |
| Nitrate (NO <sub>3</sub> )                               | 5.6               | 0.5               | 4.2                                     | 2.0            |
| Fluoride (F)   | 0.7               | 0.14              | 0.7                                     | 0.2            |
| Boron (B)  | 0.80              | 0.04              | 0.55                                    | 0.15           |
| Silica (SiO <sub>2</sub> )                               | 40                | 15                | 40                                      | 20             |
| Total dissolved solids in parts per million              | 1,283             | 178               | 655                                     | 403            |
| Percent sodium   | 47                | 16                | 47                                      | 19             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |   |                |
| Total  | 527               | 120               | 389                                     | 269            |
| Noncarbonate   | 128               | 0                 | 89                                      | 0              |
| Turbidity in parts per million                           | >1,200            | <5                | <5                                      | <5             |
| Coliform in most probable number per milliliter          | 7,000             | <0.45             | 700                                     | 23             |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |   |                |
| Dissolved alpha  | 0.00              | 0.00              | Station dry during<br>May and September |                |
| Solid alpha  | 3.37              | 0.00              |   |                |
| Dissolved beta   | 18.02             | 0.00              |   |                |
| Solid beta   | 29.18             | 0.00              |   |                |

## WATER QUALITY VARIATIONS



SALINAS RIVER AT PASO ROBLES (STA. 430)

SALINAS RIVER NEAR BRADLEY (STA. 43c)

Sampling Point. Station 43c is located in Section 15 of Township 23 South, Range 10 East, Mount Diablo Base and Meridian. Samples were collected from the left bank at the United States Geological Survey gaging station, six miles northwest of Bradley and seven miles downstream from San Antonio River's confluence with the Salinas River.

Period of Record. October 1958 through December 1959.

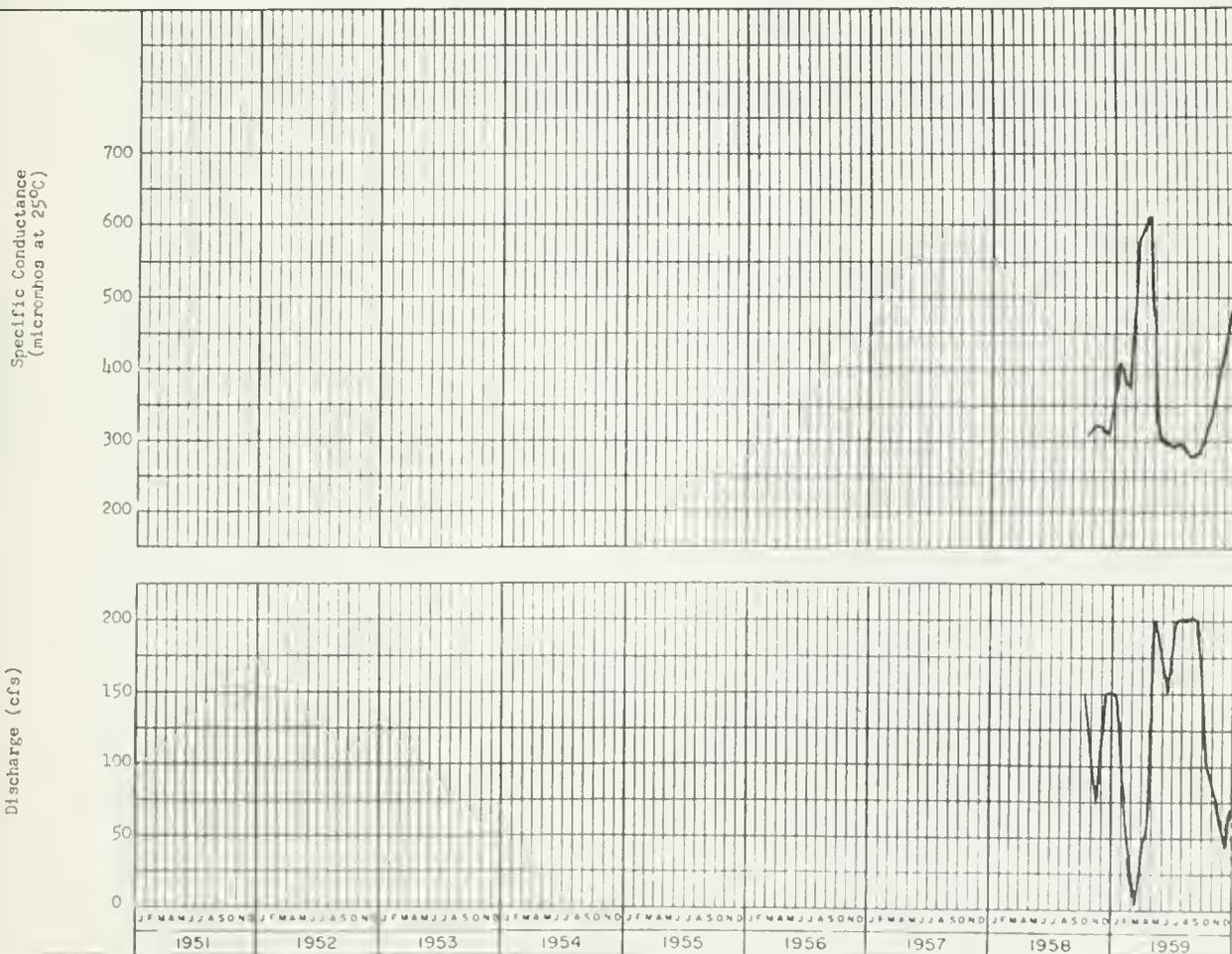
Water Quality Characteristics. The surface water at this station is calcium-magnesium bicarbonate in character, class 1 for irrigation, moderately hard, and meets drinking water standards for mineral constituents.

Significant Water Quality Changes. The data for the 15 month period of record indicate a very slight increase in mineral content. Surface flow at this station occurred throughout the year, regulated by Nacimiento reservoir releases.

### WATER QUALITY RANGES

| Item   | Maximum of Record                   | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 612                                 | 278               | 612            | 278            |
| Temperature in °F  | 73                                  | 55                | 73             | 58             |
| Dissolved oxygen in parts per million                    | 12.0                                | 7.5               | 12.0           | 7.5            |
| Percent saturation                                       | 124                                 | 74                | 124            | 82             |
| pH   | 8.4                                 | 7.7               | 8.4            | 7.7            |
| <b>Mineral constituents in parts per million</b>         |                                     |                   |                |                |
| Calcium (Ca)   | 29                                  | 26                | 29             | 26             |
| Magnesium (Mg)   | 16                                  | 11                | 16             | 13             |
| Sodium (Na)  | 46                                  | 11                | 46             | 11             |
| Potassium (K)  | 2.0                                 | 1.2               | 2.0            | 1.7            |
| Carbonate (CO <sub>3</sub> )                             | 12                                  | 0.00              | 12             | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                          | 224                                 | 105               | 224            | 105            |
| Sulfate (SO <sub>4</sub> )                               | 35                                  | 24                | 34             | 24             |
| Chloride (Cl)  | 33                                  | 8                 | 33             | 8              |
| Nitrate (NO <sub>3</sub> )                               | 0.6                                 | 0.25              | 0.6            | 0.5            |
| Fluoride (F)   | 0.2                                 | 0.1               | 0.2            | 0.1            |
| Boron (B)  | 0.14                                | 0.05              | 0.12           | 0.05           |
| Silica (SiO <sub>2</sub> )                               | 20                                  | 10                | 15             | 10             |
| Total dissolved solids in parts per million              | 210                                 | 164               | 210            | 175            |
| Percent sodium   | 31                                  | 16                | 31             | 16             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                                     |                   |                |                |
| Total  | 226                                 | 116               | 226            | 119            |
| Noncarbonate   | 51                                  | 0                 | 51             | 0              |
| Turbidity in parts per million                           | <25                                 | <5                | <25            | <5             |
| Coliform in most probable number per milliliter          | No coliforms in 1958                |                   | 62             | 0.45           |
| <b>Radioactivity in micro-micro curies per liter</b>     |                                     |                   |                |                |
| Dissolved alpha  | Station established<br>October 1958 |                   | 0.09           | 0.00           |
| Solid alpha  |                                     |                   | 0.41           | 0.18           |
| Dissolved beta   |                                     |                   | 2.50           | 0.00           |
| Solid beta   |                                     |                   | 6.56           | 3.71           |

### WATER QUALITY VARIATIONS



SALINAS RIVER NEAR BRADLEY (STA. 43c)

NACIMIENTO RIVER NEAR SAN MIGUEL (STA. 43b)

Sampling Point. Station 43b is located in Section 4 of Township 25 South, Range 11 East, Mount Diablo Base and Meridian. Samples were collected from the right bank at the United States Geological Survey gaging station at Bee Rock Road bridge in Camp Roberts, four miles upstream from the Nacimiento River's confluence with Salinas River.

Period of Record. October 1958 through December 1959.

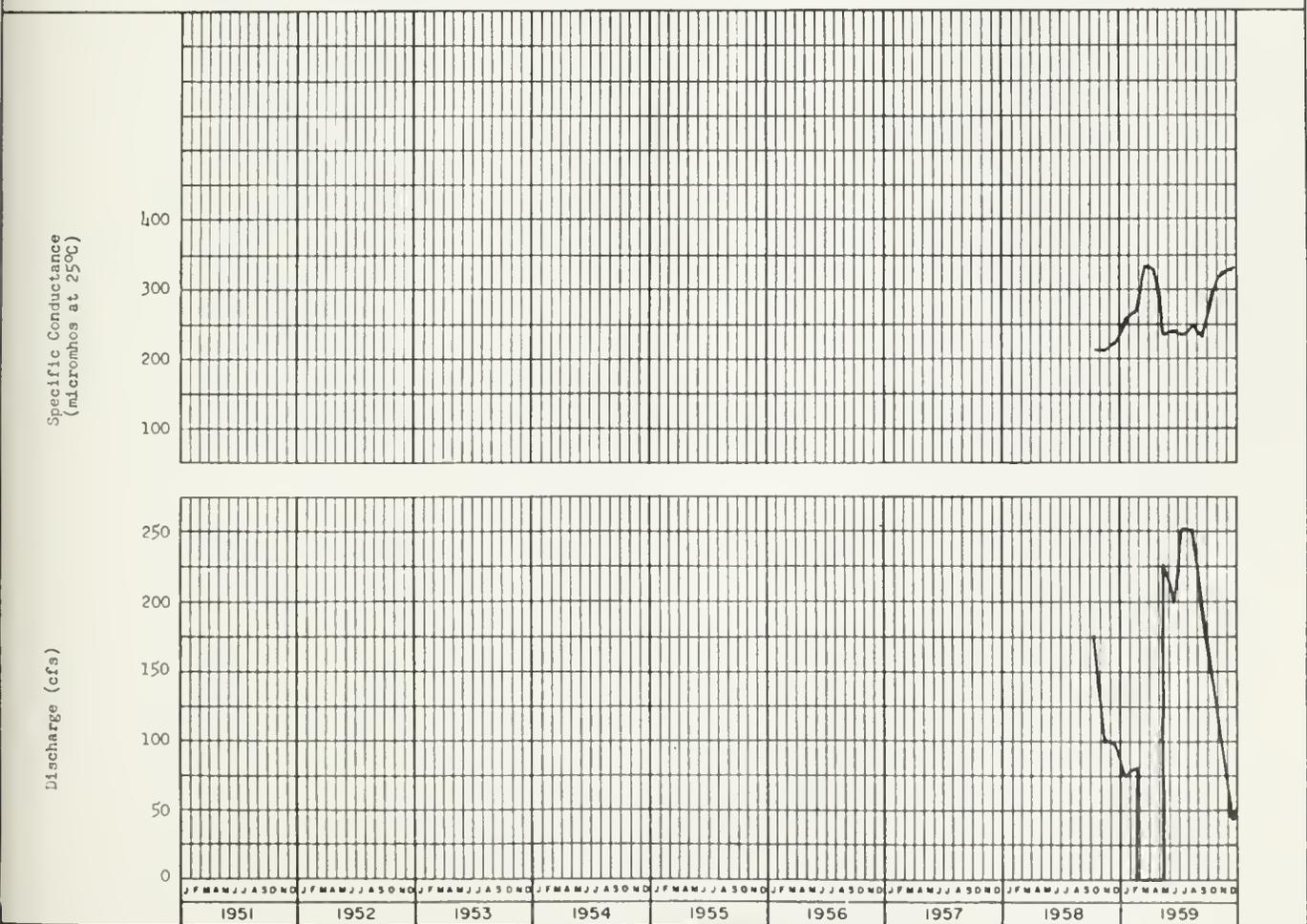
Water Quality Characteristics. The quality of the surface water at this station is excellent. The water is calcium bicarbonate in character, class 1 for irrigation, meets drinking water standards for mineral content, and is moderately hard.

Significant Water Quality Changes. The data show that there has been a very slight increase in mineral content during the 15 month period of record. Surface flow was available for sampling each month.

### WATER QUALITY RANGES

| Item   | Maximum of Record                   | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 338                                 | 218               | 338            | 238            |
| Temperature in °F                                  | 76                                  | 56                | 76             | 56             |
| Dissolved oxygen in parts per million              | 13.0                                | 7.0               | 10.6           | 7.0            |
| Percent saturation                                 | 125                                 | 71                | 102            | 74             |
| pH   | 8.4                                 | 7.4               | 8.4            | 7.4            |
| Mineral constituents in parts per million          |                                     |                   |                |                |
| Calcium (Ca)                                       | 33                                  | 22                | 33             | 22             |
| Magnesium (Mg)                                     | 18                                  | 9.6               | 18             | 13             |
| Sodium (Na)  | 11                                  | 6.4               | 11             | 7              |
| Potassium (K)                                      | 2.0                                 | 0.7               | 2.0            | 1.1            |
| Carbonate (CO <sub>3</sub> )                       | 7.2                                 | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 166                                 | 90                | 166            | 112            |
| Sulfate (SO <sub>4</sub> )                         | 29                                  | 20                | 29             | 20             |
| Chloride (Cl)                                      | 12                                  | 5                 | 12             | 7              |
| Nitrate (NO <sub>3</sub> )                         | 1.0                                 | 0.3               | 1.0            | 0.5            |
| Fluoride (F)                                       | 0.1                                 | 0.00              | 0.1            | 0.00           |
| Boron (B)  | 0.18                                | 0.00              | 0.18           | 0.00           |
| Silica (SiO <sub>2</sub> )                         | 20                                  | 10                | 20             | 10             |
| Total dissolved solids in parts per million        | 220                                 | 117               | 220            | 155            |
| Percent sodium                                     | 16                                  | 10                | 16             | 10             |
| Hardness as CaCO <sub>3</sub> in parts per million |                                     |                   |                |                |
| Total  | 156                                 | 97                | 156            | 110            |
| Noncarbonate                                       | 30                                  | 13                | 30             | 13             |
| Turbidity in parts per million                     | <25                                 | <5                | <25            | <5             |
| Coliform in most probable number per milliliter    | 23                                  | 0.45              | 23             | 0.45           |
| Radioactivity in micro-micro curies per liter      |                                     |                   |                |                |
| Dissolved alpha                                    | Station Established<br>October 1958 |                   | 0.52           | 0.00           |
| Solid alpha  |                                     |                   | 0.27           | 0.20           |
| Dissolved beta                                     |                                     |                   | 11.14          | 3.19           |
| Solid beta   |                                     |                   | 2.59           | 2.51           |

### WATER QUALITY VARIATIONS



NACIMIENTO RIVER NEAR SAN MIGUEL (STA.43b)

SAN ANTONIO RIVER AT PLEYTO (STA. 43d)

Sampling Point. Station 43d is located in Section 3 of Township 24 South, Range 9 East, Mount Diablo Base and Meridian. Samples were collected from the left bank, at the United States Geological Survey gage at Pleyto bridge, 15 miles west of Bradley.

Period of Record. February 1954 through December 1959.

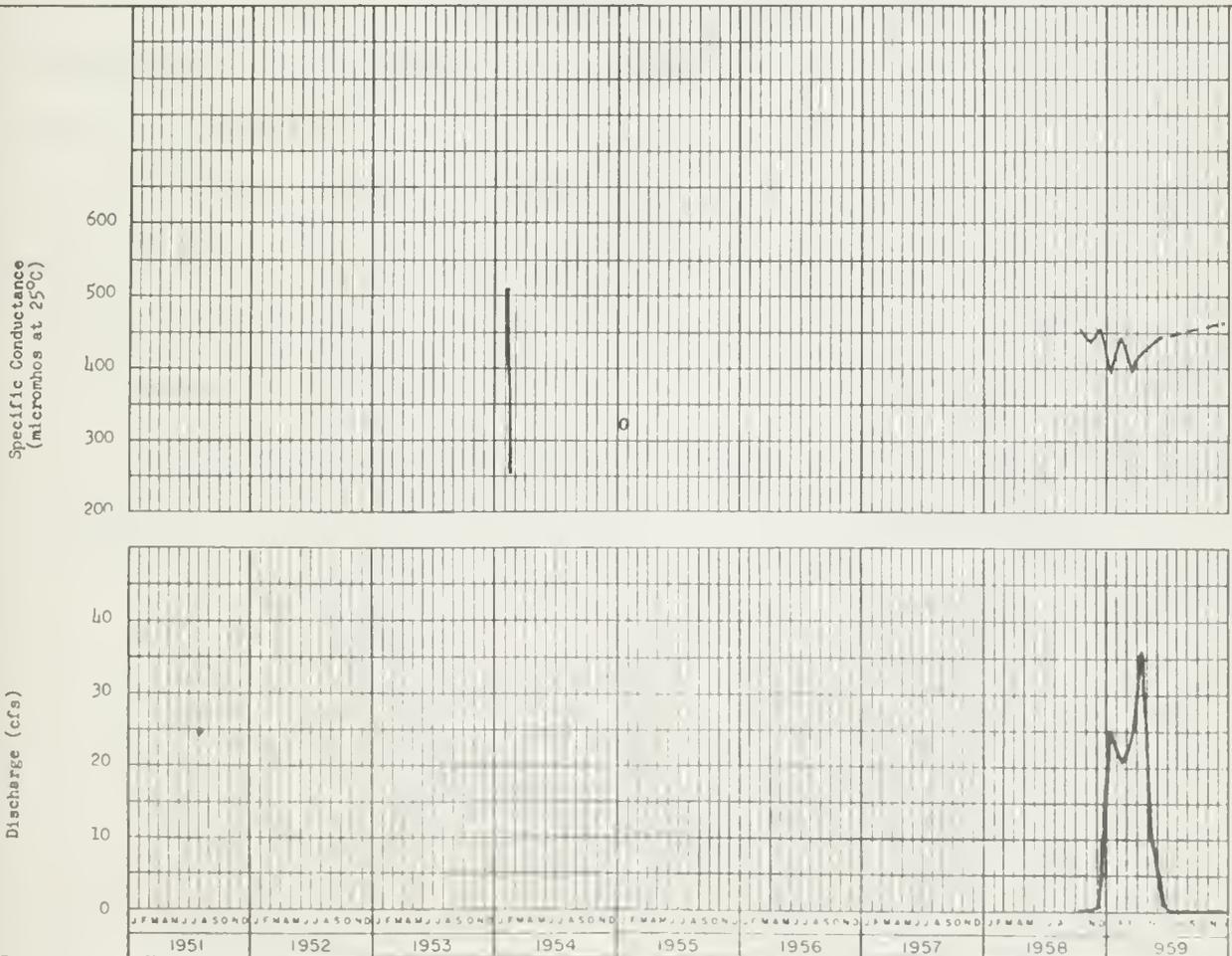
Water Quality Characteristics. The surface water at this station is calcium-magnesium bicarbonate in character, moderately hard, class 1 for irrigation, and meets drinking water standards for mineral constituents.

Significant Water Quality Changes. None.

## WATER QUALITY RANGES

| Item   | Maximum of Record                    | Minimum of Record | Maximum - 1959 | Minimum - 1959                 |
|--|--------------------------------------|-------------------|----------------|--------------------------------|
| Specific conductance (micromhos at 25°C)                 | 12                                   | 257               | 44             | 297                            |
| Temperature in °F  | 82                                   | 54                | 82             | 54                             |
| Dissolved oxygen in parts per million                    | 13.2                                 | 4.0               | 12.5           | 11.0                           |
| Percent saturation                                       | 138                                  | 70                | 125            | 70                             |
| pH   | 8.4                                  | 7.1               | 8.4            | 7.2                            |
| <b>Mineral constituents in parts per million</b>         |                                      |                   |                |                                |
| Calcium (Ca)   | 59                                   | 30                | 55             | 41                             |
| Magnesium (Mg)   | 19                                   | 9                 | 19             | 15                             |
| Sodium (Na)  | 25                                   | 8                 | 23             | 15                             |
| Potassium (K)  | 2.0                                  | 1.3               | 2.0            | 1.7                            |
| Carbonate (CO <sub>3</sub> )                             | 0.0                                  | 0.0               | 0.0            | 0.0                            |
| Bicarbonate (HCO <sub>3</sub> )                          | 198                                  | 104               | 180            | 156                            |
| Sulfate (SO <sub>4</sub> )                               | 66                                   | 39                | 66             | 58                             |
| Chloride (Cl)  | 26                                   | 6                 | 19             | 12                             |
| Nitrate (NO <sub>3</sub> )                               | 3.1                                  | 0.0               | 3.1            | 0.0                            |
| Fluoride (F)   | 0.6                                  | 0.0               | 0.6            | 0.0                            |
| Boron (B)  | 0.07                                 | 0.00              | 0.04           | 0.00                           |
| Silica (SiO <sub>2</sub> )                               | 30                                   | 24                | 30             | 25                             |
| Total dissolved solids in parts per million              | 315                                  | 161               | 315            | 264                            |
| Percent sodium   | 23                                   | 13                | 21             | 14                             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                                      |                   |                |                                |
| Total  | 208                                  | 112               | 197            | 172                            |
| Noncarbonate   | 47                                   | 0                 | 47             | 0                              |
| Turbidity in parts per million                           | <25                                  | <5                | <25            | <5                             |
| Coliform in most probable number per milliliter          | 62                                   | 0.45              | 62             | 0.45                           |
| <b>Radioactivity in micro-micro curies per liter</b>     |                                      |                   |                |                                |
| Dissolved alpha  | Station Established<br>October, 1958 |                   | 0.20           | Station Dry<br>September, 1959 |
| Solid alpha  |                                      |                   | 0.62           |                                |
| Dissolved beta   |                                      |                   | 0.94           |                                |
| Solid beta   |                                      |                   | 3.86           |                                |

## WATER QUALITY VARIATIONS



SAN ANTONIO RIVER NEAR PLEYTO (STA. 43d)



## Cuyama River Basin

Cuyama River Basin is a part of the Santa Maria River drainage area and is in the southeastern portion of the Central Coastal Region. The upper reach of the river flows northwesterly through narrow canyons and small valleys, and then westward across the northern part of Cuyama Valley to Twitchell Dam. The river flows southerly from the dam to join the Sisquoc River, forming Santa Maria River at their confluence. The Cuyama Valley Basin is bounded on the north by the Santa Lucia Mountains and Caliente Mountains, and on the south by the San Rafael Mountains and Sierra Madre Mountains.

The Cuyama River drains about 1,200 square miles. The mean annual discharge measured at a point about 10 miles upstream from Santa Maria is estimated at 15,200 acre-feet. The river is usually dry during the summer months. Twitchell Dam, completed late in 1959, stored no water during the year.

There are no known direct uses of the surface waters. Normal flows percolate into the streambed to recharge ground water basins in Cuyama and Santa Maria Valleys. Local water needs are met by pumping from wells.

The one station maintained to monitor surface water quality in this basin is Cuyama River near Garey. It is discussed on page 22.

CUYAMA RIVER NEAR GAREY (STA. 44a)

Sampling Point. This station is located in Section 25 of Township 10 North, Range 33 West, San Bernardino Base and Meridian. Samples were collected from the left bank at mid depth of the flow, 0.5 mile north of Santa Maria Mesa Road and 6 miles downstream from Twitchell Dam.

Period of Record. October 1958 through December 1959.

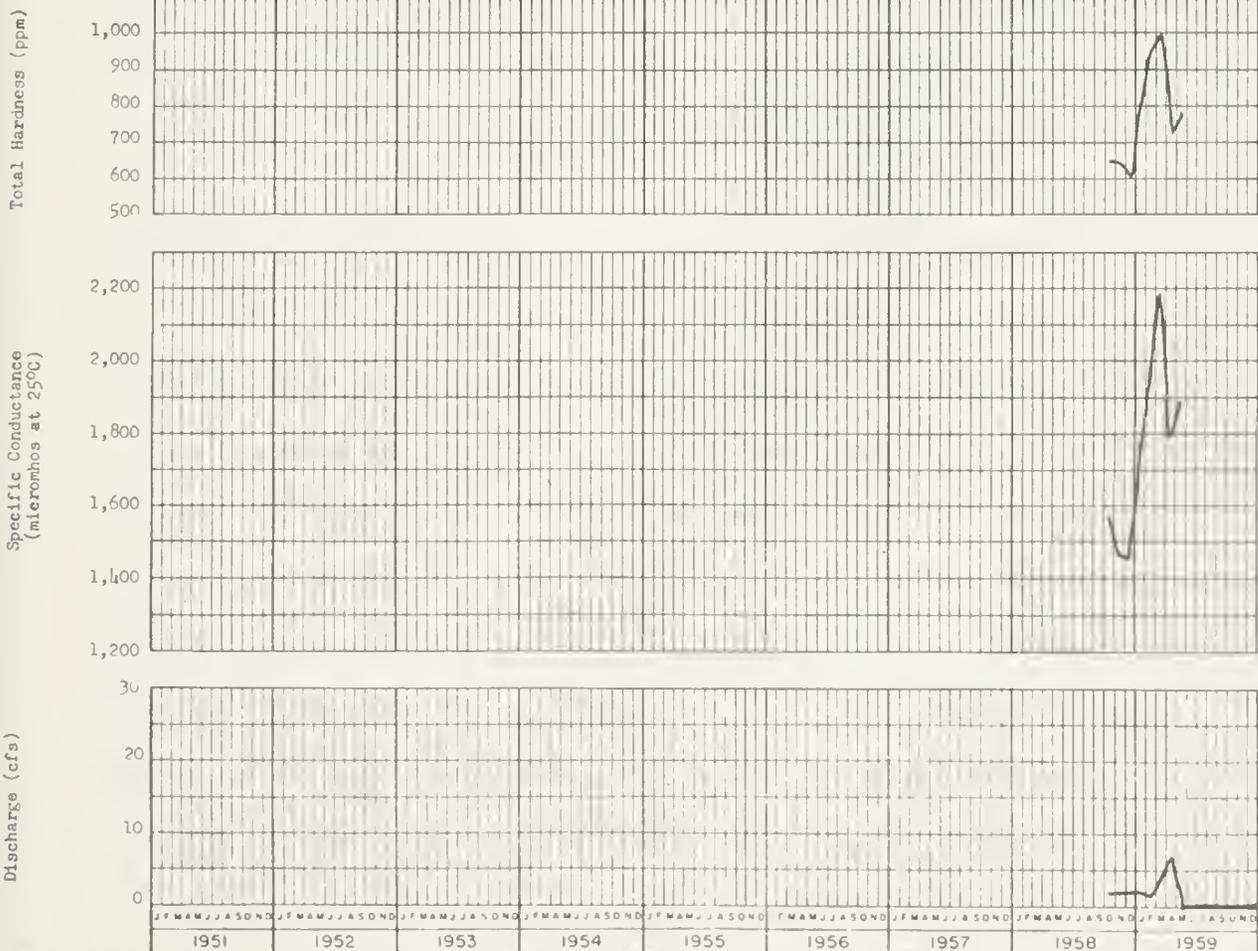
Water Quality Characteristics. The surface flow has generally been calcium-sodium-magnesium sulfate in character, very hard, and has not met drinking water standards for mineral content. A high sulfate content is a characteristic of this water. It is Class 2 for irrigation.

Significant Water Quality Changes. Water samples were collected during the first 5 months of 1959. During the remaining months of the year the station was dry. The data for the 15 months of record for this station indicate a gradual increase in mineral content of the surface water.

### WATER QUALITY RANGES

| Item   | Maximum of Record                   | Minimum of Record | Maximum - 1959 | Minimum - 1959                  |
|--|-------------------------------------|-------------------|----------------|---------------------------------|
| Specific conductance (micromhos at 25°C)           | 2,189                               | 1,464             | 2,189          | 1,761                           |
| Temperature in °F                                  | 74                                  | 54                | 74             | 54                              |
| Dissolved oxygen in parts per million              | 14.2                                | 7.0               | 13.0           | 9.5                             |
| Percent saturation                                 | 100                                 | 74                | 125            | 100                             |
| pH   | 8.4                                 | 8.0               | 8.4            | 8.0                             |
| Mineral constituents in parts per million          |                                     |                   |                |                                 |
| Calcium (Ca)                                       | 227                                 | 126               | 227            | 157                             |
| Magnesium (Mg)                                     | 103                                 | 83                | 103            | 96                              |
| Sodium (Na)  | 165                                 | 120               | 165            | 136                             |
| Potassium (K)                                      | 6.6                                 | 3.7               | 6.6            | 5.1                             |
| Carbonate (CO <sub>3</sub> )                       | 0.00                                | 0.00              | 0.00           | 0.00                            |
| Bicarbonate (HCO <sub>3</sub> )                    | 327                                 | 209               | 327            | 209                             |
| Sulfate (SO <sub>4</sub> )                         | 947                                 | 604               | 947            | 739                             |
| Chloride (Cl)                                      | 99                                  | 77                | 99             | 90                              |
| Nitrate (NO <sub>3</sub> )                         | 0.00                                | 0.00              | 0.00           | 0.00                            |
| Fluoride (F)                                       | 0.7                                 | 0.6               | 0.7            | 0.6                             |
| Boron (B)  | 0.43                                | 0.26              | 0.42           | 0.26                            |
| Silica (SiO <sub>2</sub> )                         | 20                                  | 15                | 20             | 20                              |
| Total dissolved solids in parts per million        | 1,760                               | 1,167             | 1,760          | 1,523                           |
| Percent sodium                                     | 30                                  | 23                | 29             | 23                              |
| Hardness as CaCO <sub>3</sub> in parts per million |                                     |                   |                |                                 |
| Total  | 990                                 | 614               | 990            | 729                             |
| Noncarbonate                                       | 800                                 | 435               | 800            | 520                             |
| Turbidity in parts per million                     | <25                                 | <5                | <25            | <5                              |
| Coliform in most probable number per milliliter    | No Coliforms in 1958                |                   | 13             | 0.6                             |
| Radioactivity in micro-micro curies per liter      | Station Established<br>October 1958 |                   |                |                                 |
| Dissolved alpha                                    |                                     |                   | 0.20           | Dry during<br>September<br>1959 |
| Solid alpha  |                                     |                   | 0.31           |                                 |
| Dissolved beta                                     |                                     |                   | 4.70           |                                 |
| Solid beta   |                                     |                   | 0.28           |                                 |

### WATER QUALITY VARIATIONS



CUYAMA RIVER NEAR GAREY (STA 440)

## Santa Ynez River Basin

The Santa Ynez River Basin drains an area of about 900 square miles in the southern part of the Central Coastal Region. The basin lies between the San Rafael Mountains on the north and the Santa Ynez Mountains on the south. Three-fourths or 769 square miles of the drainage basin is mountainous, and the remaining 132 square miles is classed as valley and mesa lands.

The Santa Ynez River flows westward across the southern portion of Santa Barbara County, and discharges to the Pacific Ocean near Surf, California, 10 miles downstream from Lompoc. The mean annual runoff to the ocean is approximately 40,000 acre-feet.

The three reservoirs on the main Santa Ynez River channel controlling the flow are: Jamison Lake, Santa Barbara Reservoir, and Lake Cachuma. Of these, only Lake Cachuma offers recreational facilities. Recreational opportunities are also available at several locations along the river.

The principal use of the Santa Ynez River water is municipal supply for the City of Santa Barbara. The water is exported from Santa Barbara Reservoir and from Cachuma Reservoir to the city by means of tunnels. Water is also diverted and exported through a tunnel at a point downstream from Jamison Lake to Montecito County Water District. Water requirements of the coastal portion of the Santa Ynez River Basin are met by ground water supplies.

The headwaters area of the river contains a number of resorts and campsites. Agricultural land in the middle reach east of the Lompoc Plain is fully developed, but the land area involved is small. Agriculture

in the Lompoc Plain is extensive. The Vandenberg Air Force Base in and adjacent to the basin near the coast is the scene of the chief industrial activity in the basin. The rapid expansion of the City of Lompoc is associated with activities at the base. Processing of agricultural products is the major civilian industry.

The two stations established to monitor surface water quality in this basin are:

| <u>Monitoring Station</u>                | <u>Page Number of<br/>Station Discussion</u> |
|--|--|
| Santa Ynez River at Cachuma<br>Reservoir | 26   |
| Santa Ynez River near Solvang            | 28   |

SANTA YNEZ RIVER AT CACHUMA RESERVOIR (STA. 44b)

Sampling Point. Station 44b is located in Section 19, Township 6 North, Range 30 West, San Bernardino Base and Meridian. Samples were collected from Cachuma Reservoir at the left abutment of the dam, one-half foot below the water surface.

Period of Record. April 1958 through December 1959.

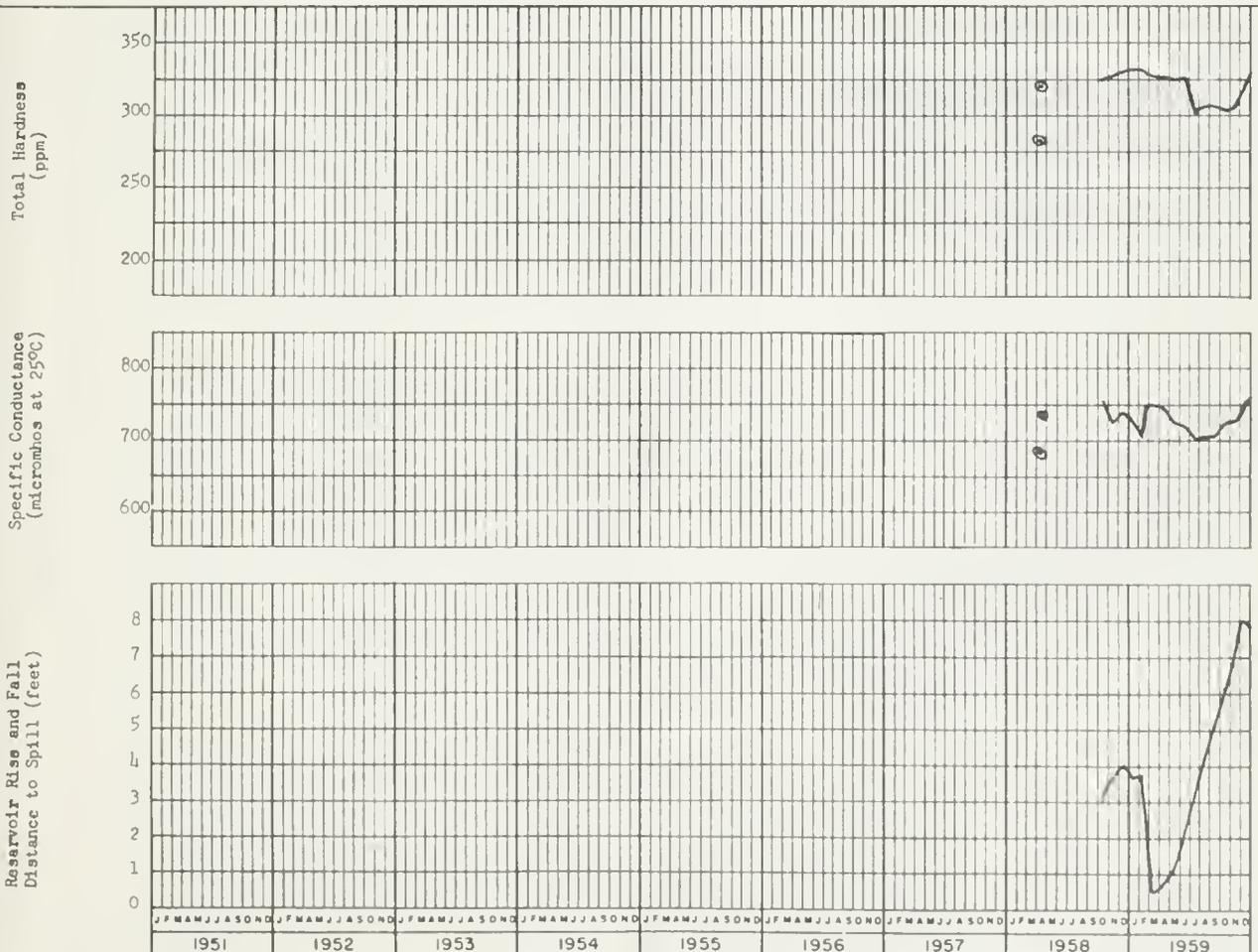
Water Quality Characteristics. The reservoir water is calcium-magnesium sulfate-bicarbonate in character and very hard; however, it meets drinking water standards for mineral constituents. It is class 1 irrigation water, except that boron content occasionally exceeds the limit of 0.5 ppm for class 1 water.

Significant Water Quality Changes. None. Cachuma Reservoir filled to near capacity in February and March of 1959. Improved water quality was evident from analyses of water samples collected in the summer months.

## WATER QUALITY RANGES

| Item   | Maximum of Record                   | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 757                                 | 685               | 752            | 703            |
| Temperature in °F                                  | 72                                  | 54                | 72             | 54             |
| Dissolved oxygen in parts per million              | 11.4                                | 4.0               | 11.0           | 5.8            |
| Percent saturation                                 | 129                                 | 41                | 126            | 60             |
| pH   | 8.4                                 | 7.1               | 8.4            | 7.1            |
| Mineral constituents in parts per million          |                                     |                   |                |                |
| Calcium (Ca)                                       | 78                                  | 60                | 74             | 61             |
| Magnesium (Mg)                                     | 38                                  | 30                | 38             | 35             |
| Sodium (Na)  | 38                                  | 33                | 38             | 33             |
| Potassium (K)                                      | 3.5                                 | 2.6               | 3.4            | 2.6            |
| Carbonate (CO <sub>3</sub> )                       | 0.0                                 | 0.0               | 0.0            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                    | 215                                 | 168               | 215            | 168            |
| Sulfate (SO <sub>4</sub> )                         | 235                                 | 182               | 222            | 208            |
| Chloride (Cl)                                      | 23                                  | 12                | 17             | 12             |
| Nitrate (NO <sub>3</sub> )                         | 1.7                                 | 0.0               | 1.7            | 0.0            |
| Fluoride (F)                                       | 0.5                                 | 0.2               | 0.5            | 0.2            |
| Boron (B)  | 0.82                                | 0.18              | 0.58           | 0.21           |
| Silica (SiO <sub>2</sub> )                         | 14                                  | 2                 | 5              | 2              |
| Total dissolved solids in parts per million        | 530                                 | 464               | 530            | 507            |
| Percent sodium                                     | 22                                  | 17                | 21             | 17             |
| Hardness as CaCO <sub>3</sub> in parts per million |                                     |                   |                |                |
| Total  | 330                                 | 283               | 330            | 307            |
| Noncarbonate                                       | 174                                 | 136               | 172            | 151            |
| Turbidity in parts per million                     | <25                                 | <5                | <25            | <5             |
| Coliform in most probable number per milliliter    | 2.3                                 | 0.45              | 2.3            | 0.45           |
| Radioactivity in micro-micro curies per liter      |                                     |                   |                |                |
| Dissolved alpha                                    | Station established<br>October 1958 |                   | 0.44           | 0.20           |
| Solid alpha  |                                     |                   | 1.04           | 0.27           |
| Dissolved beta                                     |                                     |                   | 6.67           | 4.88           |
| Solid beta   |                                     |                   | 7.12           | 0.00           |

## WATER QUALITY VARIATIONS



SANTA YNEZ RIVER AT CACHUMA RESERVOIR  
(STA. 44b)

SANTA YNEZ RIVER NEAR SOLVANG (STA. 45a)

Sampling Point. Station 45a is located in Section 22 of Township 6 North, Range 31 West, San Bernardino Base and Meridian. Samples were collected from the right bank at mid-depth of the flow, at the United States Geological Survey gage at Mission Road bridge, 25 feet downstream from Alisal Creek and 0.9 mile south of Solvang.

Period of Record. April 1951 through December 1959.

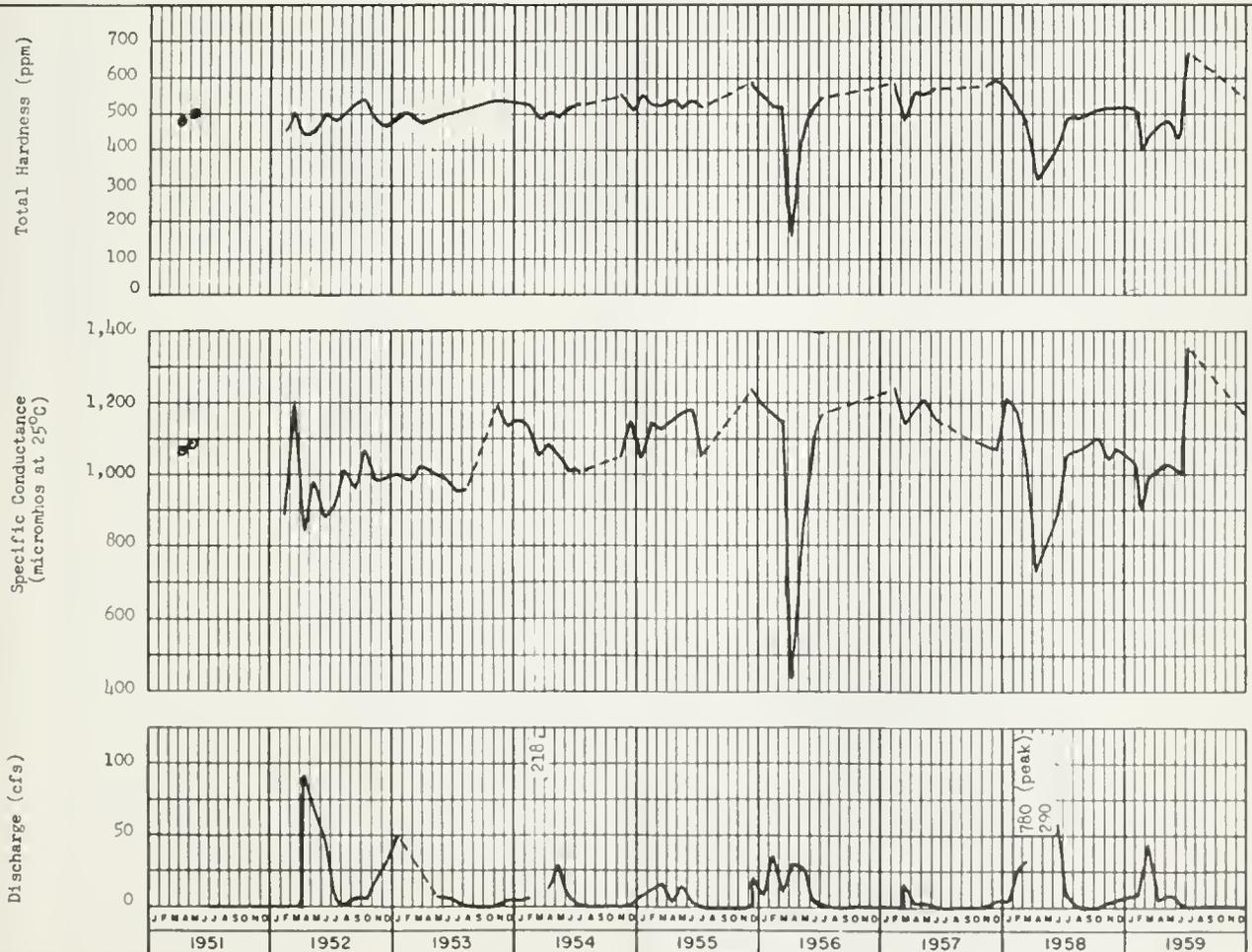
Water Quality Characteristics. The surface water at this station is generally calcium-magnesium sulfate-bicarbonate in character, occasionally changing to magnesium bicarbonate. The specific conductance normally exceeds 1,000 micromhos, placing the water in class 2 for irrigation. The water is extremely hard, but generally meets drinking water standards for mineral constituents. Boron has only rarely exceeded 0.5 ppm.

Significant Water Quality Changes. The data for the nine years of record for this station show a slight increase in mineral content. The river at this station was dry from August to December 1959.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959            |
|--|-------------------|-------------------|----------------|---------------------------|
| Specific conductance (micromhos at 25°C)                 | 1,361             | 441               | 1,361          | 900                       |
| Temperature in °F  | 80                | 48                | 80             | 54                        |
| Dissolved oxygen in parts per million                    | 16.0              | 4.2               | 12.5           | 6.6                       |
| Percent saturation                                       | 142               | 43                | 116            | 66                        |
| pH   | 9.4               | 6.8               | 8.6            | 7.8                       |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                           |
| Calcium (Ca)   | 113               | 76                | 91             | 90                        |
| Magnesium (Mg)   | 68                | 37                | 61             | 43                        |
| Sodium (Na)  | 76                | 36                | 76             | 45                        |
| Potassium (K)  | 7.0               | 1.8               | 2.2            | 1.8                       |
| Carbonate (CO <sub>3</sub> )                             | 24                | 0.00              | 0.00           | 0.00                      |
| Bicarbonate (HCO <sub>3</sub> )                          | 527               | 144               | 527            | 281                       |
| Sulfate (SO <sub>4</sub> )                               | 294               | 189               | 241            | 210                       |
| Chloride (Cl)  | 84                | 17                | 56             | 34                        |
| Nitrate (NO <sub>3</sub> )                               | 5.00              | 0.00              | 5.00           | 0.00                      |
| Fluoride (F)   | 0.60              | 0.20              | 0.60           | 0.20                      |
| Boron (B)  | 0.72              | 0.00              | 0.40           | 0.17                      |
| Silica (SiO <sub>2</sub> )                               | 40                | 10                | 25             | 22                        |
| Total dissolved solids in parts per million              | 874               | 565               | 724            | 629                       |
| Percent sodium   | 25                | 16                | 22             | 18                        |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                           |
| Total  | 667               | 162               | 667            | 400                       |
| Noncarbonate   | 272               | 146               | 235            | 166                       |
| Turbidity in parts per million                           | 450               | <5                | 150            | <5                        |
| Coliform in most probable number per milliliter          | 7,000             | <0.45             | 7,000          | 0.45                      |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                           |
| Dissolved alpha  | 0.55              | 0.00              | 0.00           | Station Dry<br>Sept. 1959 |
| Solid alpha  | 0.31              | 0.00              | 0.31           |                           |
| Dissolved beta   | 2.01              | 0.00              | 0.71           |                           |
| Solid beta   | 7.55              | 0.00              | 0.81           |                           |

## WATER QUALITY VARIATIONS



SANTA YNEZ RIVER NEAR SOLVANG (STA. 45a)





STREAM  
CENTRAL CO

KEY MAP

Station  
Number

|     |         |
|-----|---------|
| 43a | Salinas |
| 43b | Nacimie |
| 43c | Salinas |
| 43d | Santa A |
| 44a | Cuyama  |
| 44b | Santa Y |
| 45a | Santa Y |

LEGEND

- 43a SURFACE WATER SAMPLING STATION
- SEWAGE WASTE DISCHARGE

35° 30'

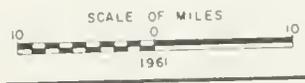
STATE OF CALIFORNIA  
THE RESOURCES AGENCY OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES  
SOUTHERN DISTRICT

34° 30'

RFACE WATER QUALITY MONITORING  
PROGRAM

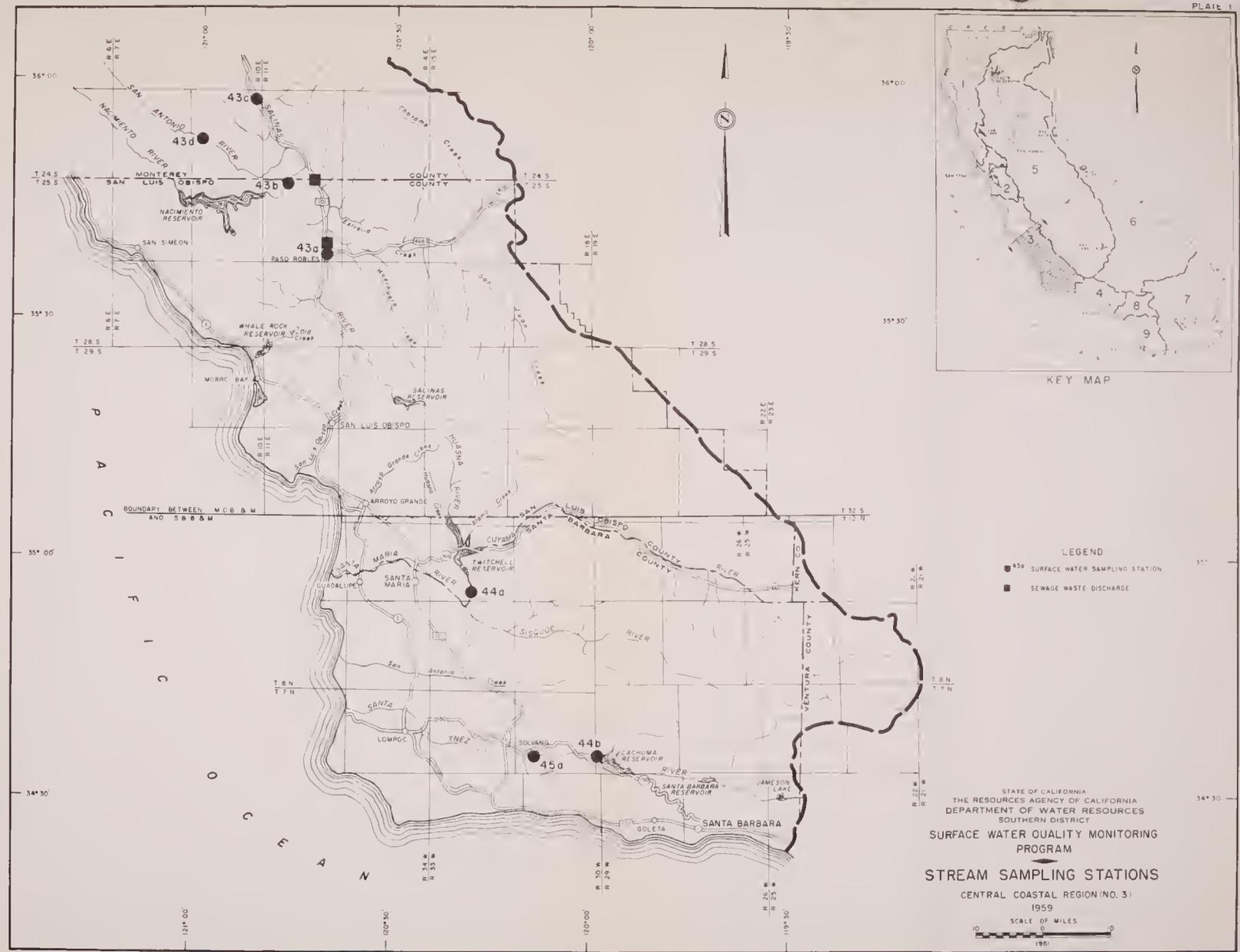
REAM SAMPLING STATIONS

CENTRAL COASTAL REGION (NO. 3)  
1959



STREAM SAMPLING STATIONS  
CENTRAL COASTAL REGION (NO. 3)

| Station Number | Station Name                          |
|----------------|---------------------------------------|
| 43a            | Salinas River at Paso Robles          |
| 43b            | Nacimiento River near San Miguel      |
| 43c            | Salinas River near Bradley            |
| 43d            | Santa Antonio River near Pleyto       |
| 44a            | Cuyama River near Garey               |
| 44b            | Santa Ynez River at Cachuma Reservoir |
| 45a            | Santa Ynez River near Solvang         |



STATE OF CALIFORNIA  
 THE RESOURCES AGENCY OF CALIFORNIA  
 DEPARTMENT OF WATER RESOURCES  
 SOUTHERN DISTRICT

**SURFACE WATER QUALITY MONITORING PROGRAM**

**STREAM SAMPLING STATIONS**  
 CENTRAL COASTAL REGION (NO. 3)  
 1959

SCALE OF MILES  
 0 10  
 1961

## Los Angeles Region (No. 4)

The Los Angeles Region (No. 4) comprises all areas draining into the Pacific Ocean between the southeastern boundary of the watershed of Rincon Creek in Ventura County and the Los Angeles-Orange County line. The region extends approximately 130 miles along the coast and averages 40 miles in width, occupying an area of about 4,260 square miles.

The region contains broad coastal and inland valleys hemmed in by rugged mountainous terrain. The Santa Monica Mountains, Simi Hills, and San Gabriel Mountains form a drainage divide between the group of streams flowing over the Ventura County Coastal Plain and the group that flows across the Los Angeles County Coastal Plain.

Four stream systems on which surveillance is maintained for surface water quality monitoring are shown on Plate 2, and are listed in the following tabulation together with the number of sampling stations (in parentheses) monitored on each.

|                       |                       |
|-----------------------|-----------------------|
| Ventura River (2)     | Los Angeles River (3) |
| Santa Clara River (5) | San Gabriel River (3) |

Surface water imported to the region is monitored at the termini of the conveyance systems. The sources of these waters are the Mono Basin-Owens River, and the Colorado River.

Los Angeles Region is semiarid, and its streams flow intermittently. Occasionally, winter storms of flood magnitude occur, but flood control works in both Ventura County and Los Angeles County minimize the hazards in the populated areas on the flood plains. A number of off-stream percolation basins are used to recharge ground water basins artificially with storm water stored in flood control basins, making up,



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in part, the natural percolation in river channels lost through channel improvement. Precipitation throughout the 1958-1959 rainfall season was below normal, resulting in substantially reduced runoff and stream flows. During the summer months, most of the natural watercourses were dry, and reservoir storage was very low. The drought conditions resulted in increased mineral content of the surface waters in 1959.

## Ventura River Basin

The Ventura River Basin watershed lies in the northwest portion of the Los Angeles Region. It comprises an area of approximately 225 square miles, 195 square miles of which are mountains and foothills and only 32 square miles are valley land. It is bounded on the west by the Santa Ynez Mountains and on the east by the Sulphur and Topatopa Mountains. The Ventura River flows southward to the ocean near Ventura. The mean annual runoff of the Ventura River is estimated to be 67,800 acre-feet.

There are two reservoirs in the Ventura River watershed. Casitas Reservoir on Coyote Creek was completed in 1959 and did not store water during the year. Matilija Reservoir on the Ventura River stored water for irrigation use. Limited recreational use is made of Matilija Reservoir.

The arable portion of the basin is fully developed for agriculture. Petroleum is produced from several oil fields along the Ventura River system. The oil waste waters are discharged to evaporation ponds or sumps, or are discharged to the ocean by pipeline.

The City of Ojai discharges sewage effluent from a secondary treatment plant (0.2 mgd) to San Antonio Creek, a tributary to Ventura River.

The two monitoring stations maintained for surveillance of surface water quality in the Ventura River watershed are:

| <u>Monitoring Station</u>            | <u>Page Number of<br/>Station Discussion</u> |
|--------------------------------------|--|
| Matilija Creek above Matilija<br>Dam | 34   |
| Ventura River near Ventura           | 36   |

MATILIJA CREEK ABOVE MATILIJA DAM (STA. 45b)

Sampling Point. Station 45b is located in Section 19 of Township 5 North, Range 23 West, San Bernardino Base and Meridian. Matilija Creek was sampled from the left bank during high flows and at the center of the stream during low flows, at the United States Geological Survey gaging station two miles upstream from Matilija Dam.

Period of Record. May 1953 through December 1959.

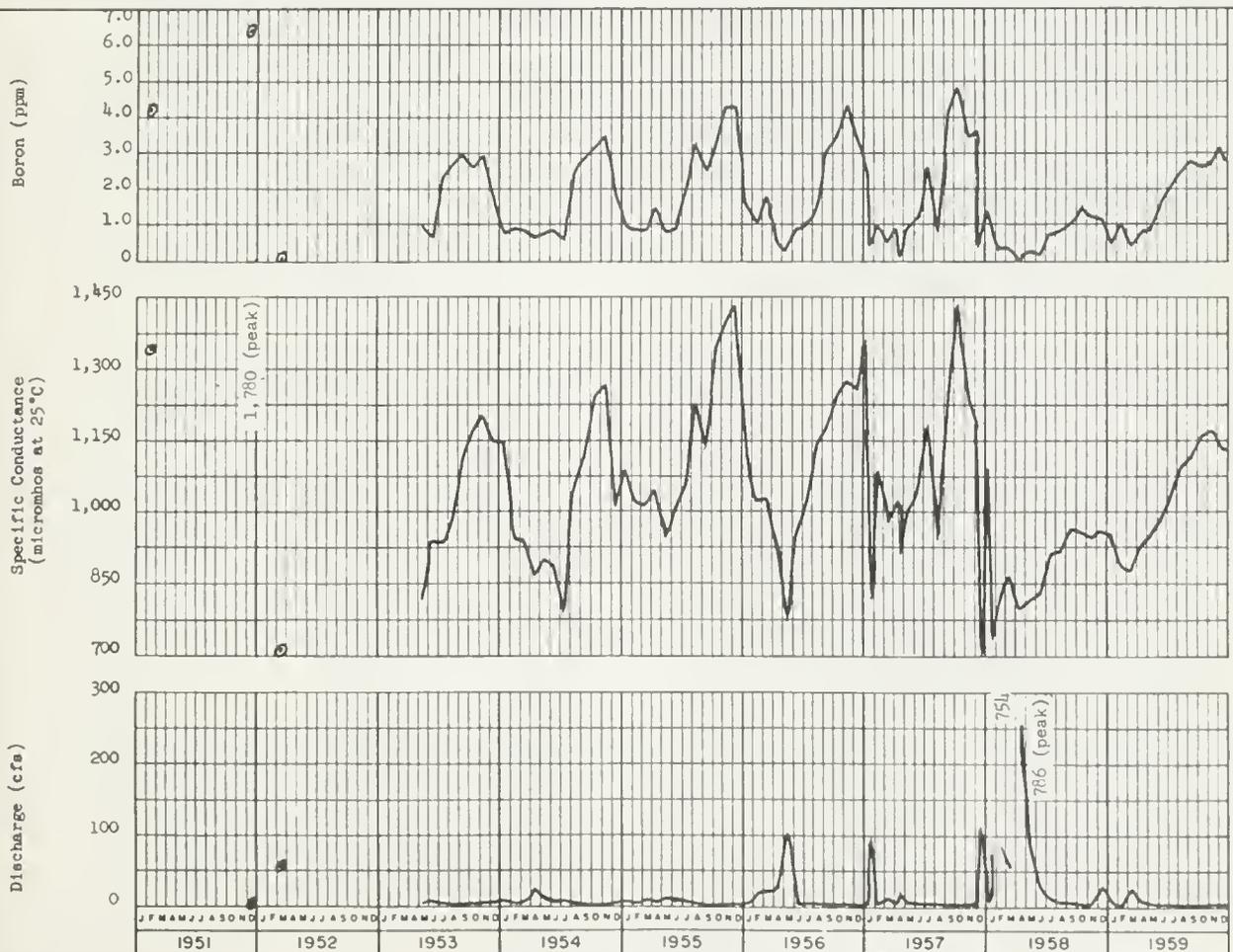
Water Quality Characteristics. The water at this station is usually calcium sulfate-bicarbonate in character and extremely hard. Sulfate concentrations generally exceed the maximum value recommended for drinking water, and boron concentrations often place the water in class 2 or class 3 for irrigation use.

Significant Water Quality Changes. Boron concentrations in 1959 exceeded the limit of 0.5 ppm for class 1 irrigation water. Low flows during the latter part of the year did not provide enough dilution to prevent boron concentrations from exceeding limiting concentrations for class 2 irrigation water. Hydrogen sulfide odor was noted in all samples collected in 1959.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,780             | 463               | 1,174          | 887            |
| Temperature in °F                                  | 86                | 49                | 80             | 56             |
| Dissolved oxygen in parts per million              | 14.5              | 4.0               | 9.0            | 7.0            |
| Percent saturation                                 | 153               | 40                | 108            | 71             |
| pH   | 8.4               | 6.8               | 8.3            | 7.8            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 166               | 69.5              | 120            | 111            |
| Magnesium (Mg)                                     | 44                | 18                | 31             | 30             |
| Sodium (Na)  | 154               | 17                | 91             | 40             |
| Potassium (K)                                      | 9.1               | 0.0               | 3.8            | 1.9            |
| Carbonate (CO <sub>3</sub> )                       | 75                | 0.0               | 0.0            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                    | 453               | 144               | 266            | 190            |
| Sulfate (SO <sub>4</sub> )                         | 411               | 224               | 279            | 276            |
| Chloride (Cl)                                      | 276               | 7                 | 100            | 19             |
| Nitrate (NO <sub>3</sub> )                         | 5.5               | 0.0               | 0.00           | 0.00           |
| Fluoride (F)                                       | 2.5               | 0.4               | 1.4            | 0.7            |
| Boron (B)  | 6.4               | 0.0               | 3.15           | 0.56           |
| Silica (SiO <sub>2</sub> )                         | 45                | 10                | 20             | 10             |
| Total dissolved solids in parts per million        | 1,240             | 424               | 795            | 672            |
| Percent sodium                                     | 38                | 12                | 33             | 18             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 925               | 204               | 484            | 387            |
| Noncarbonate                                       | 811               | 88                | 264            | 203            |
| Turbidity in parts per million                     | 5,000             | 1                 | < 25           | < 5            |
| Coliform in most probable number per milliliter    | > 7,000           | < 0.45            | 240            | < 0.45         |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 1.68              | 0.00              | .46            | No Sample      |
| Solid alpha  | 1.02              | 0.00              | .70            | in Sept. 1959  |
| Dissolved beta                                     | 9.71              | 0.00              | 1.59           |                |
| Solid beta   | 8.79              | 0.00              | 2.25           |                |

## WATER QUALITY VARIATIONS



MATILIJA CREEK ABOVE MATILIJA DAM (STA. 45b)

VENTURA RIVER NEAR VENTURA (STA. 61)

Sampling Point. Station 61 is located in Section 8 of Township 3 North, Range 23 West, San Bernardino Base and Meridian. Samples were collected from the right bank five miles north of Ventura, 300 feet downstream from Highway 150 bridge at the United States Geological Survey gage in Foster Memorial Park.

Period of Record. May 1951 through December 1959.

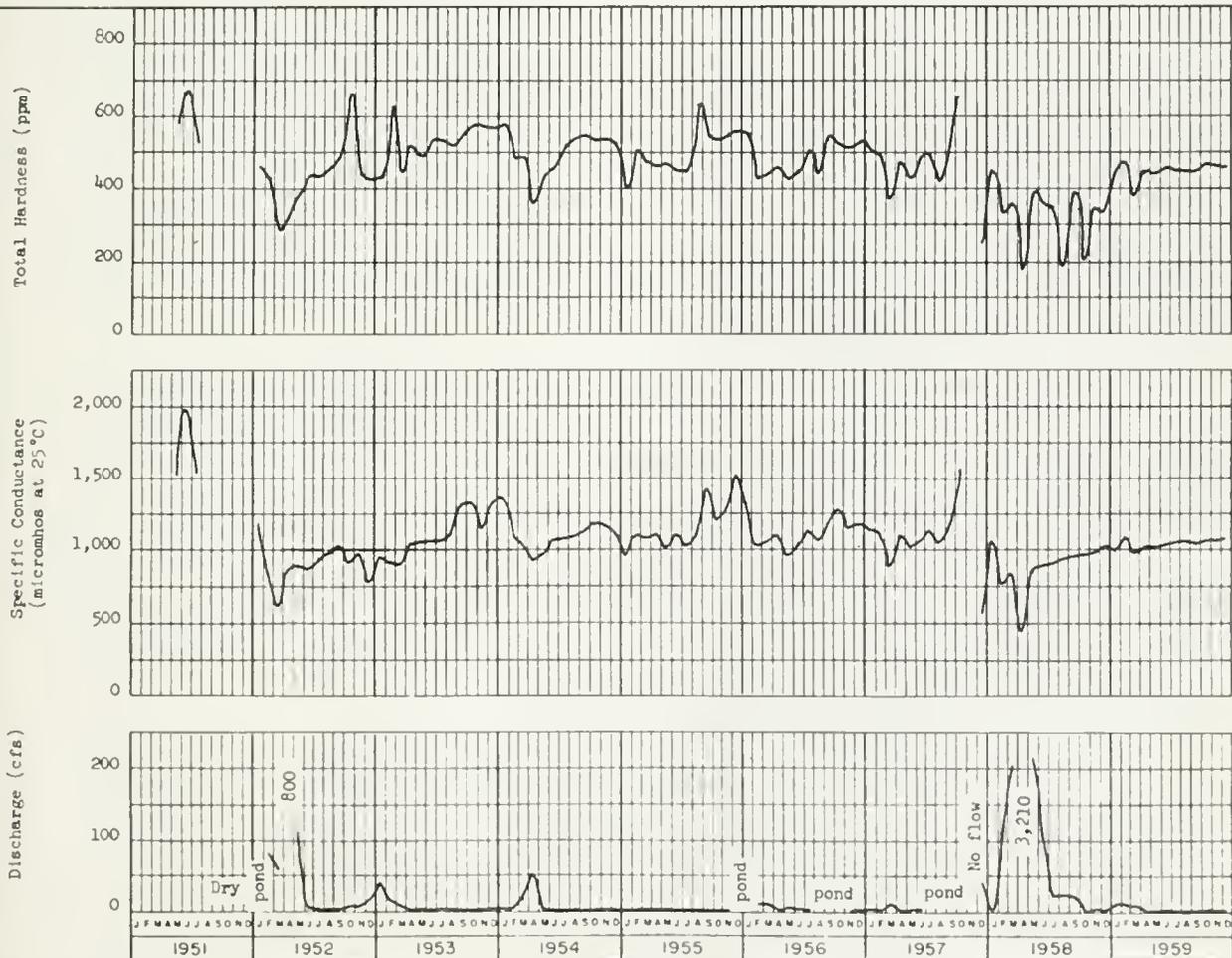
Water Quality Characteristics. Ventura River water at this station is calcium sulfate-bicarbonate in character, and very hard. Boron occasionally exceeds the limit of 0.5 ppm for class 1 irrigation water. This water meets drinking water standards for mineral content, except in some instances when sulfates exceed the recommended limits.

Significant Water Quality Changes. The quality of the water in 1959, depreciated to near the average for the period of record, after showing improvement in 1958 as the result of higher than average runoff from the above normal rainfall in the 1957-1958 precipitation season.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,980             | 282               | 1,114          | 433            |
| Temperature in °F                                  | 82                | 43                | 79             | 55             |
| Dissolved oxygen in parts per million              | 16.8              | 2.0               | 12.0           | 6.0            |
| Percent saturation                                 | 211               | 24                | 147            | 64             |
| pH   | 8.5               | 7.2               | 8.3            | 7.4            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 166               | 37                | 121            | 118            |
| Magnesium (Mg)                                     | 45                | 6                 | 37             | 36             |
| Sodium (Na)  | 119               | 10                | 86             | 53             |
| Potassium (K)                                      | 6.0               | 1.4               | 2.6            | 2.4            |
| Carbonate (CO <sub>3</sub> )                       | 19.0              | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 364               | 115               | 315            | 200            |
| Sulfate (SO <sub>4</sub> )                         | 324               | 33                | 272            | 261            |
| Chloride (Cl)                                      | 260               | 8                 | 73             | 44             |
| Nitrate (NO <sub>3</sub> )                         | 10.9              | 0.00              | 2.0            | 0.00           |
| Fluoride (F)                                       | 0.8               | 0.1               | 0.6            | 0.5            |
| Boron (B)  | 1.32              | 0.00              | 0.66           | 0.30           |
| Silica (SiO <sub>2</sub> )                         | 25                | 10                | 25             | 15             |
| Total dissolved solids in parts per million        | 1,037             | 205               | 725            | 695            |
| Percent sodium                                     | 37                | 12                | 28             | 20             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 674               | 122               | 450            | 189            |
| Noncarbonate                                       | 438               | 1                 | 241            | 206            |
| Turbidity in parts per million                     | 1,600             | 2                 | < 25           | < 5            |
| Coliform in most probable number per milliliter    | > 700             | < 0.45            | > 700          | < 0.45         |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.58              | 0.00              | 0.58           | 0.09           |
| Solid alpha  | 0.60              | 0.00              | 0.50           | 0.36           |
| Dissolved beta                                     | 21.96             | 0.00              | 4.61           | 3.30           |
| Solid beta   | 7.11              | 0.00              | 3.66           | 0.00           |

### WATER QUALITY VARIATIONS



VENTURA RIVER NEAR VENTURA (STA. 61)

## Santa Clara River Basin

The Santa Clara River Basin lies in the north central portion of the Los Angeles Region. The watershed area is about 1,690 square miles. About fifteen percent of the area is usable for agriculture, the remainder being mountainous or arid rolling hills. The upper reach of the Santa Clara River drains the western slopes of the San Gabriel Mountains. It flows westward between the Santa Susana Mountains and the Topatopa Mountains to the Pacific Ocean just south of Ventura. The mean annual runoff of Santa Clara River Basin is estimated at 216,400 acre-feet.

Santa Felicia Reservoir (Lake Piru) on Piru Creek is the only large reservoir on the Santa Clara River system. Fishing and boating offered by the reservoir are heavily patronized recreational activities.

Surface flow in the Santa Clara River system is generally intermittent, except in areas of rising water. Some surface water is diverted for irrigation, and to spreading operations for recharge of ground water basins. Surface waters in the main tributaries are used for municipal purposes or for spreading, but most of the water supply used in the Santa Clara River Basin is pumped from wells.

Most of the land in the Santa Clara River Basin suitable for agriculture has been developed, with the exception of a portion of the flood plain of the river. Food processing and sugar refining are the major industries in the basin. The United States Navy's Air Missile Test Center at Port Hueneme and Construction Battalion Center at Point Mugu are the major military activities in the basin.

Few waste discharges reach the Santa Clara River or its tributaries because they are retained in percolation ponds and only rarely overflow to the river channels.

The five stations established to monitor the quality of surface waters in the Santa Clara River Basin are:

| <u>Monitoring Station</u>                            | <u>Page Number of<br/>Station Discussion</u> |
|--|--|
| Santa Clara River at Los Angeles-Ventura County Line | 40   |
| Santa Clara River near Santa Paula                   | 42   |
| Piru Creek near Piru                                 | 44   |
| Sespe Creek near Fillmore                            | 46   |
| Santa Paula Creek near Santa Paula                   | 48   |

SANTA CLARA RIVER AT LOS ANGELES-VENTURA COUNTY LINE (STA. 46)

Sampling Point. Station 46 is situated in Section 30 of Township 4 North, Range 17 West, San Bernardino Base and Meridian. The river was sampled from the right bank at Newhall Ranch Road crossing, one-half mile downstream from Los Angeles-Ventura County line and one-half mile upstream from Ventura County gage.

Period of Record. April 1951 through December 1959.

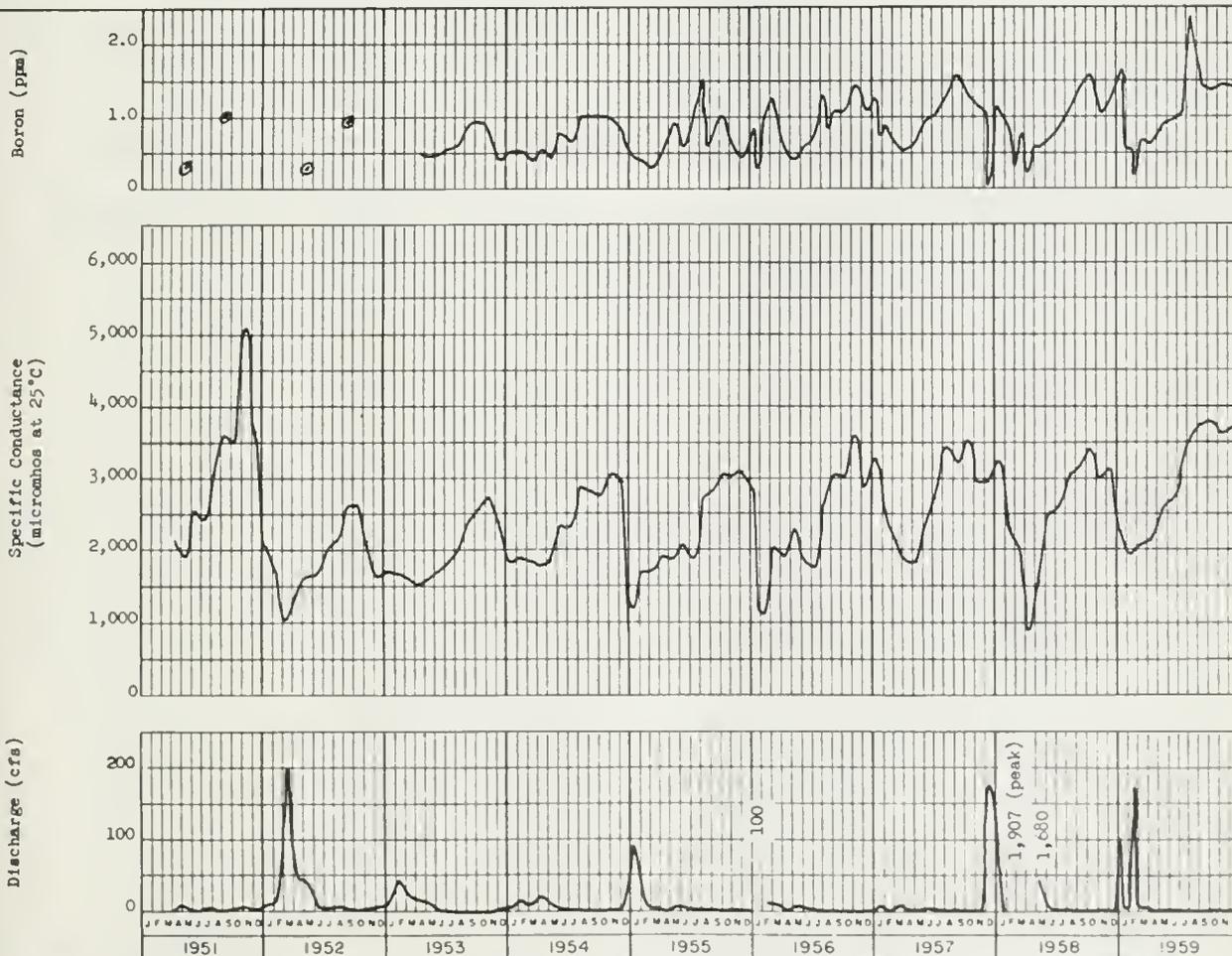
Water Quality Characteristics. The surface water at Station 46 is usually calcium-sodium sulfate in character, poor in quality, high in sulfates, and extremely hard. This water is often class 2 or class 3 for irrigation use due to high total dissolved solids, and boron concentrations which often exceed 0.5 ppm.

Significant Water Quality Changes. Data reveal a significant increase in dissolved solids in 1959, reaching a new maximum of 3,245 ppm for the nine-year period of record. The concentration of boron also reached a new record of 2.31 ppm during the year, while the concentration of sulfate reached a maximum of 1,645 ppm in September 1959.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 5,155             | 668               | 3,774          | 780            |
| Temperature in °F                                  | 88                | 42.8              | 80             | 48             |
| Dissolved oxygen in parts per million              | 15.0              | 6.0               | 10.6           | 7.2            |
| Percent saturation                                 | 149               | 67                | 111            | 82             |
| pH   | 8.4               | 7.0               | 8.4            | 7.0            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 302               | 85                | 302            | 94             |
| Magnesium (Mg)                                     | 159               | 32                | 148            | 32             |
| Sodium (Na)  | 575               | 47                | 575            | 72             |
| Potassium (K)                                      | 9.6               | 3.4               | 8.0            | 5.6            |
| Carbonate (CO <sub>3</sub> )                       | 14                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 403               | 167               | 389            | 216            |
| Sulfate (SO <sub>4</sub> )                         | 1,645             | 256               | 1,645          | 256            |
| Chloride (Cl)                                      | 267               | 20                | 267            | 40             |
| Nitrate (NO <sub>3</sub> )                         | 7.9               | 0.00              | 2.0            | 0.00           |
| Fluoride (F)                                       | 1.2               | 0.4               | 1.02           | 0.60           |
| Boron (B)  | 2.31              | 0.00              | 2.31           | 0.26           |
| Silica (SiO <sub>2</sub> )                         | 30                | 10                | 23             | 15             |
| Total dissolved solids in parts per million        | 3,245             | 634               | 3,245          | 649            |
| Percent sodium                                     | 69                | 23                | 55             | 27             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 1,450             | 273               | 1,353          | 366            |
| Noncarbonate                                       | 1,128             | 120               | 1,057          | 136            |
| Turbidity in parts per million                     | > 10,000          | < 5               | > 10,000       | < 5            |
| Coliform in most probable number per milliliter    | > 70,000          | 0.45              | 700            | 1.3            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.56              | 0.00              | 0.46           | 0.09           |
| Solid alpha  | 1.02              | 0.00              | 0.59           | 0.00           |
| Dissolved beta                                     | 16.95             | 0.00              | 0.68           | 0.00           |
| Solid beta   | 20.77             | 0.00              | 0.00           | 0.00           |

### WATER QUALITY VARIATIONS



SANTA CLARA RIVER NEAR LOS ANGELES -  
VENTURA COUNTY LINE (STA. 46)

SANTA CLARA RIVER NEAR SANTA PAULA (STA. 46a)

Sampling Point. Station 46a is located in Section 12 of Township 3 North, Range 21 West, San Bernardino Base and Meridian. Samples were collected from the left bank 1.5 miles upstream from Santa Paula bridge (Willard Bridge) and 100 feet north of South Mountain Road.

Period of Record. April 1951 through December 1959.

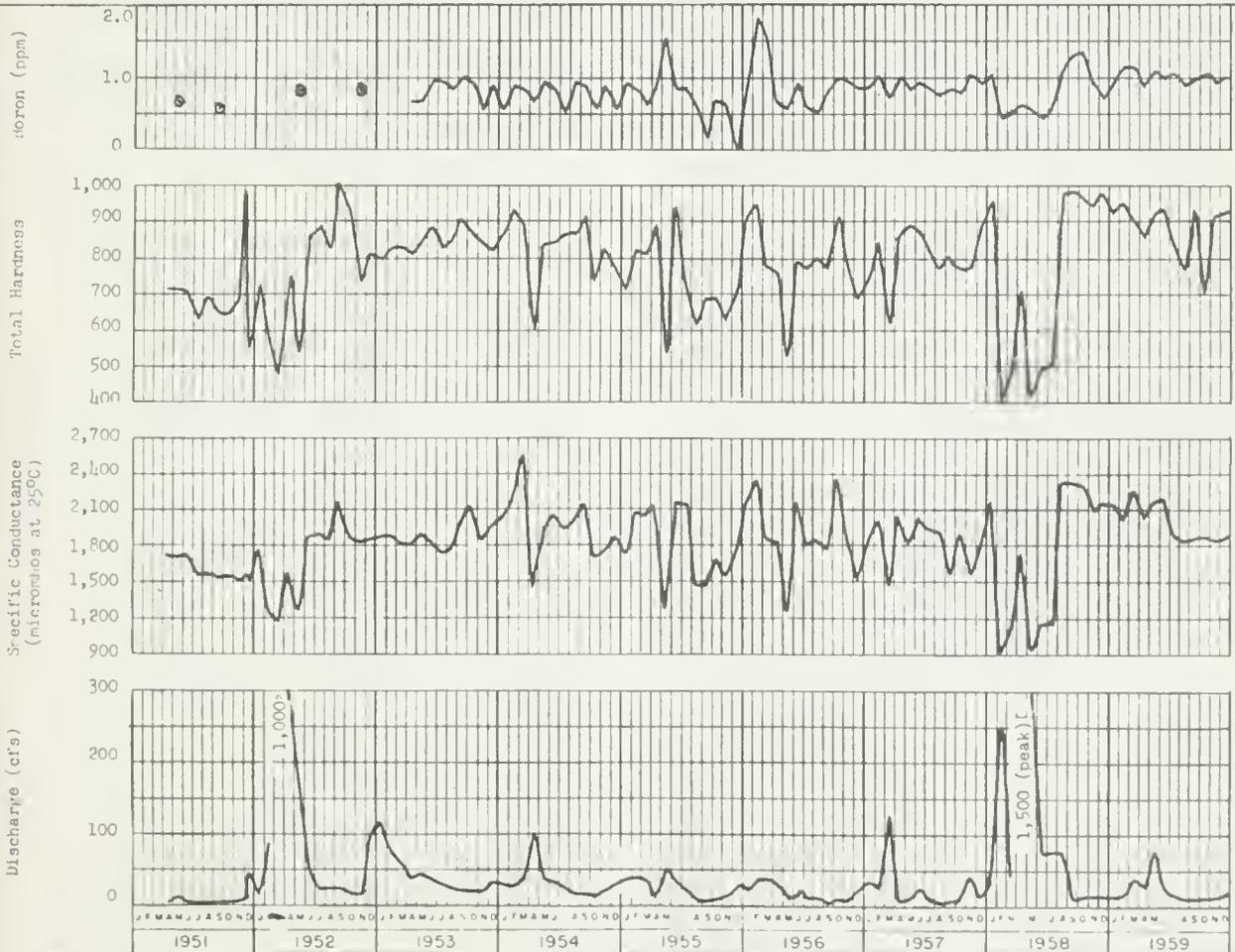
Water Quality Characteristics. Santa Clara River water at Station 46a is usually slightly better in quality than that upstream at Station 46, due to better quality tributary inflow from Piru and Sespe Creeks between these stations. The water is usually calcium-sodium sulfate in character, poor in mineral quality, and extremely hard. Moderately high boron concentrations and specific conductance values often place the water in class 2 for irrigation use. Sulfates generally greatly exceed the limit of 250 ppm recommended for drinking water.

Significant Water Quality Changes. Analyses data for 1959 indicate that concentrations of dissolved minerals were slightly higher than the average for the prior years of record.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 2,557             | 933               | 2,257          | 1,846          |
| Temperature in °F                                  | 86                | 50                | 77             | 58             |
| Dissolved oxygen in parts per million              | 16.2              | 7.6               | 11.2           | 7.0            |
| Percent saturation                                 | 170               | 69                | 112            | 72             |
| pH   | 8.4               | 7.4               | 8.2            | 7.7            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 232               | 108               | 230            | 219            |
| Magnesium (Mg)                                     | 98                | 33                | 91             | 88             |
| Sodium (Na)  | 210               | 51                | 210            | 143            |
| Potassium (K)                                      | 9.3               | 2.9               | 7.2            | 6.5            |
| Carbonate (CO <sub>3</sub> )                       | 16.5              | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 399               | 203               | 399            | 290            |
| Sulfate (SO <sub>4</sub> )                         | 957               | 281               | 905            | 883            |
| Chloride (Cl)                                      | 110               | 27                | 101            | 72             |
| Nitrate (NO <sub>3</sub> )                         | 12                | 0.00              | 12             | 8.5            |
| Fluoride (F)                                       | 1.2               | 0.04              | 0.9            | 0.8            |
| Boron (B)  | 1.78              | 0.00              | 1.16           | 0.87           |
| Silica (SiO <sub>2</sub> )                         | 40                | 10                | 30             | 20             |
| Total dissolved solids in parts per million        | 1,946             | 655               | 1,890          | 1,840          |
| Percent sodium                                     | 44                | 22                | 36             | 29             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 1,007             | 402               | 957            | 700            |
| Noncarbonate                                       | 729               | 219               | 729            | 450            |
| Turbidity in parts per million                     | 4,800             | < 5               | < 25           | < 5            |
| Coliform in most probable number per milliliter    | 7,000             | 0.45              | 2,300          | 4.5            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 18.4              | 0.00              | 0.58           | 0.18           |
| Solid alpha  | 1.9               | 0.00              | 0.70           | 0.18           |
| Dissolved beta                                     | 20.1              | 0.00              | 5.20           | 0.80           |
| Solid beta   | 8.50              | 0.00              | 0.00           | 0.00           |

## WATER QUALITY VARIATIONS



SANTA CLARA RIVER NEAR SANTA PAULA  
(STA. 46a)

PIRU CREEK NEAR PIRU (STA. 46c)

Sampling Point. Station 46c is located in Section 20 of Township 4 North, Range 18 West, San Bernardino Base and Meridian. Samples were taken from the left bank, six inches below the water surface, directly downstream from the railroad bridge at Piru.

Period of Record. June 1957 through December 1959.

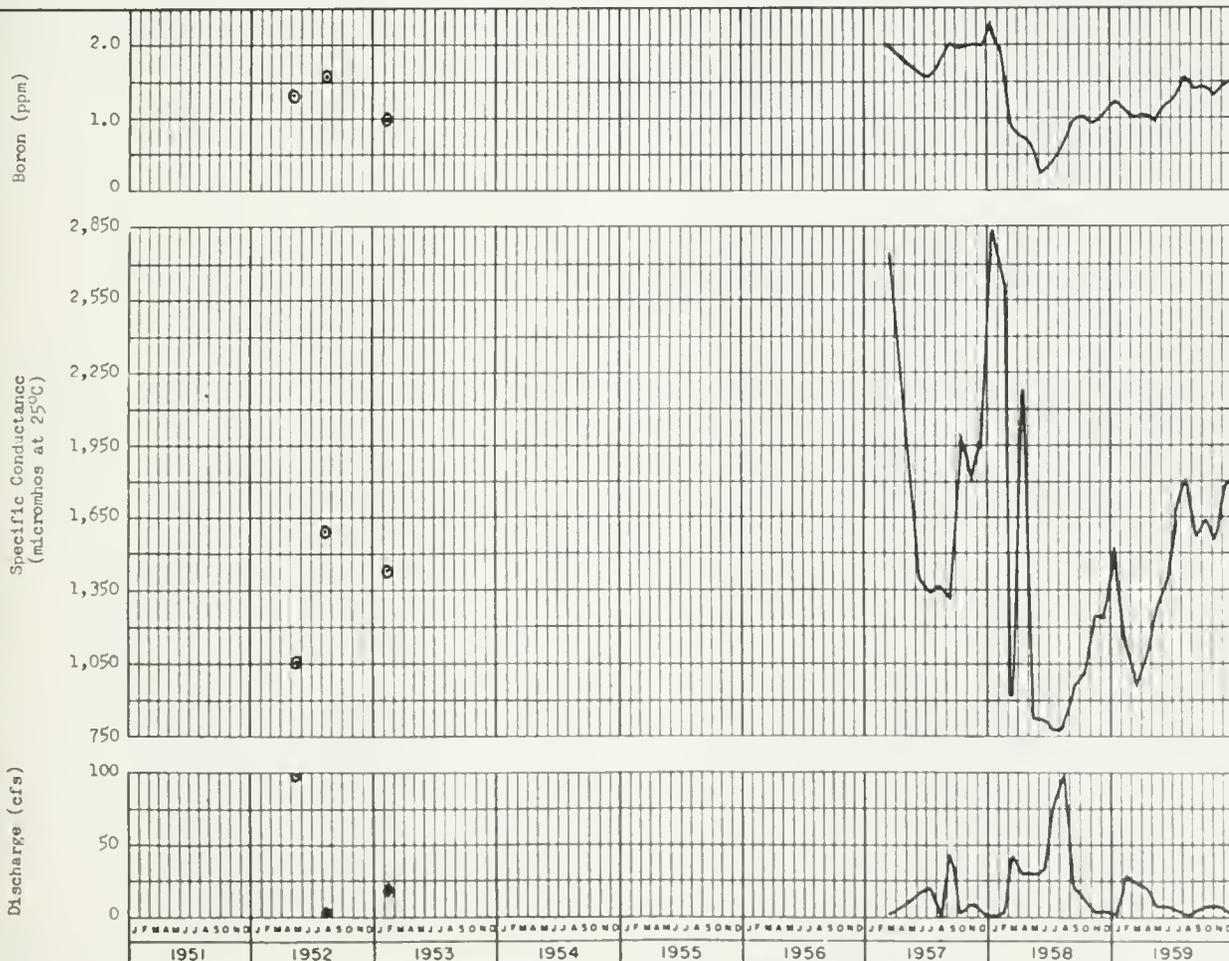
Water Quality Characteristics. Piru Creek water is calcium-magnesium sulfate in character, and varies in mineral quality with releases from Lake Piru. Sulfate concentrations normally exceed the limit recommended for drinking water. Boron is usually present in sufficiently high concentrations to place the water in class 2 or class 3 for irrigation use.

Significant Water Quality Changes. Mineral analyses for 1959 indicate that fluoride concentrations averaged about 1.0 ppm and boron averaged more than 1.0 ppm. The maximum fluoride concentration was 1.2 ppm, equivalent to the previous maximum over the three years of record.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhoe at 25°C)           | 2,824             | 784               | 1,792          | 974            |
| Temperature in °F                                  | 84                | 44                | 74             | 44             |
| Dissolved oxygen in parts per million              | 12.8              | 7.6               | 12.0           | 7.6            |
| Percent saturation                                 | 125               | 77                | 118            | 94             |
| pH   | 8.4               | 7.7               | 8.4            | 8.0            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 267               | 99                | 137            | 132            |
| Magnesium (Mg)                                     | 135               | 39                | 71             | 50             |
| Sodium (Na)  | 327               | 54                | 139            | 58             |
| Potassium (K)                                      | 10.7              | 4.0               | 6.4            | 4.5            |
| Carbonate (CO <sub>3</sub> )                       | 14                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 503               | 163               | 496            | 198            |
| Sulfate (SO <sub>4</sub> )                         | 1,300             | 338               | 604            | 460            |
| Chloride (Cl)                                      | 99                | 13                | 43             | 23             |
| Nitrate (NO <sub>3</sub> )                         | 4.7               | 0.00              | 0.00           | 0.00           |
| Fluoride (F)                                       | 1.4               | 0.07              | 1.2            | 0.9            |
| Boron (B)  | 2.30              | 0.37              | 1.56           | 0.94           |
| Silica (SiO <sub>2</sub> )                         | 20                | 10                | 15             | 10             |
| Total dissolved solids in parts per million        | 2,485             | 725               | 1,270          | 1,006          |
| Percent sodium                                     | 38                | 19                | 31             | 24             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 1,071             | 340               | 748            | 404            |
| Noncarbonate                                       | 800               | 167               | 480            | 242            |
| Turbidity in parts per million                     | >10,000           | < 5               | < 25           | < 5            |
| Coliform in most probable number per milliliter    | 7,000             | 0.6               | 7,000          | 0.6            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.93              | 0.00              | .93            | 0.00           |
| Solid alpha  | 0.52              | 0.00              | 0.34           | 0.00           |
| Dissolved beta                                     | 14.58             | 2.51              | 9.47           | 4.75           |
| Solid beta   | 5.43              | 2.99              | 5.43           | 0.53           |

### WATER QUALITY VARIATIONS



PIRU CREEK NEAR PIRU (STA. 46c)

SESPE CREEK NEAR FILLMORE (STA. 46d)

Sampling Point. Station 46d is located in Section 12 of Township 4 North, Range 20 West, San Bernardino Base and Meridian. Sespe Creek was sampled from the left bank during low flows and from the right bank during high flows at the gage, six miles above its confluence with Santa Clara River.

Period of Record. June 1957 through December 1959.

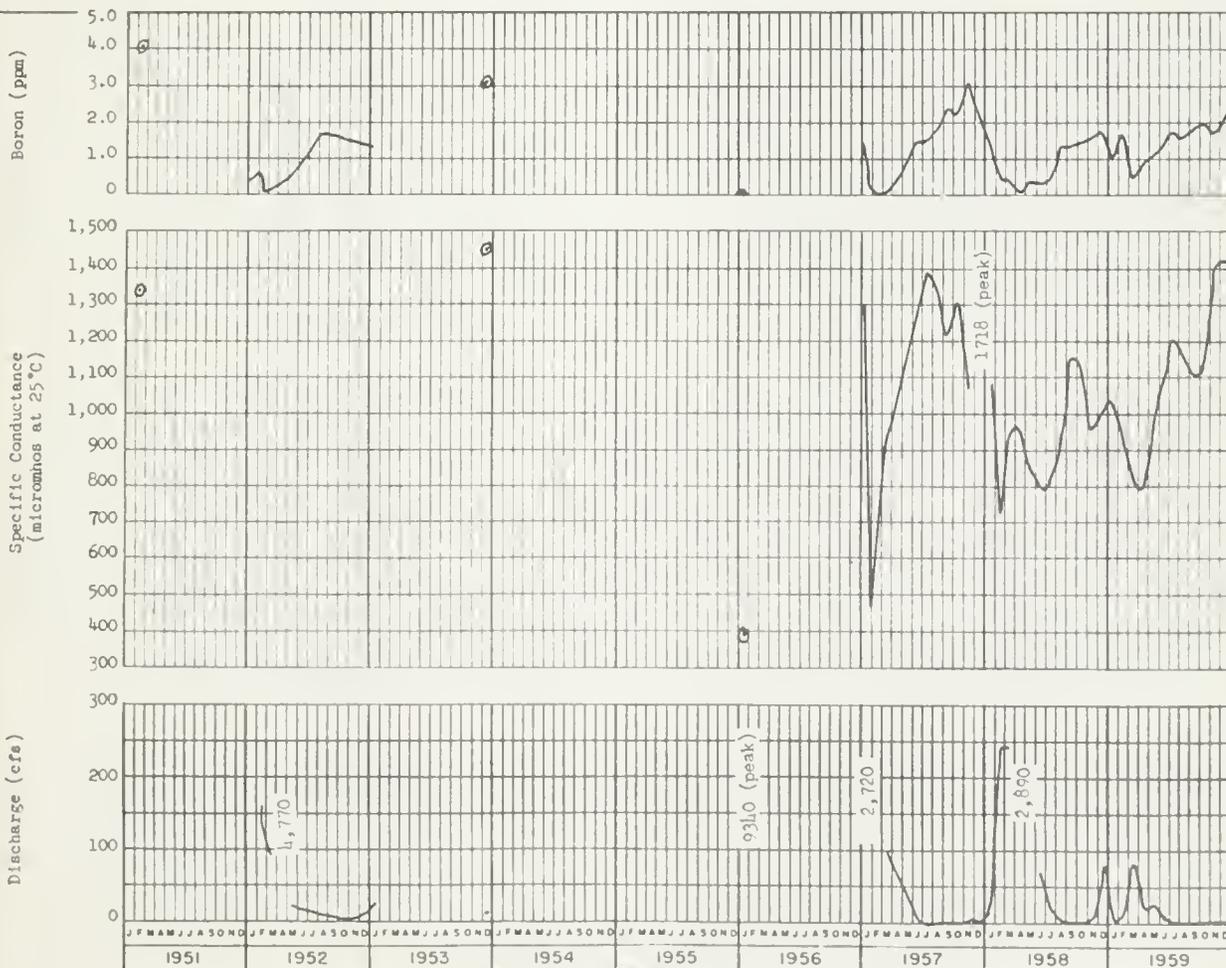
Water Quality Characteristics. The water at Station 46d is calcium-sodium sulfate in character, class 2 to class 3 for irrigation use, and extremely hard. Sulfates usually exceed the limiting concentration of 250 ppm recommended for drinking water. Boron exceeds 1.0 ppm and ranges to more than 4.0 ppm.

Significant Water Quality Changes. Data show that there has been a slight increase in mineral concentration in the two and one-half years of record. Fluoride content was 1.5 ppm in May 1959.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,718             | 344               | 1,425          | 788            |
| Temperature in °F                                  | 81                | 48                | 79             | 50             |
| Dissolved oxygen in parts per million              | 15.0              | 2.5               | 15.0           | 2.5            |
| Percent saturation                                 | 170               | 23                | 170            | 23             |
| pH   | 8.45              | 7.2               | 8.4            | 7.9            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 148               | 43.6              | 111            | 99             |
| Magnesium (Mg)                                     | 58                | 9.2               | 32             | 29             |
| Sodium (Na)  | 140               | 10.6              | 102            | 46             |
| Potassium (K)                                      | 5.0               | 1.9               | 3.8            | 2.4            |
| Carbonate (CO <sub>3</sub> )                       | 24                | 0.00              | 12             | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 265               | 89                | 234            | 133            |
| Sulfate (SO <sub>4</sub> )                         | 408               | 82                | 323            | 300            |
| Chloride (Cl)                                      | 160               | 5                 | 120            | 24             |
| Nitrate (NO <sub>3</sub> )                         | 3.4               | 0.00              | 0.00           | 0.00           |
| Fluoride (F)                                       | 1.5               | 0.2               | 1.5            | 1.0            |
| Boron (B)  | 4.06              | 0.04              | 2.20           | 0.52           |
| Silica (SiO <sub>2</sub> )                         | 16                | 10                | 10             | 10             |
| Total dissolved solids in parts per million        | 960               | 163               | 775            | 725            |
| Percent sodium                                     | 43                | 9                 | 38             | 23             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 622               | 147               | 536            | 295            |
| Noncarbonate                                       | 405               | 55                | 374            | 174            |
| Turbidity in parts per million                     | 4,000             | < 5               | < 25           | < 5            |
| Coliform in most probable number per milliliter    | 700               | < 0.45            | 62             | < 0.45         |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.23              | 0.00              | 0.23           | 0.09           |
| Solid alpha  | 0.94              | 0.00              | 0.94           | 0.17           |
| Dissolved beta                                     | 5.75              | 0.00              | 5.75           | 4.25           |
| Solid beta   | 7.75              | 0.00              | 5.21           | 1.28           |

## WATER QUALITY VARIATIONS



SESPE CREEK NEAR FILLMORE (STA. 46d)

SANTA PAULA CREEK NEAR SANTA PAULA (STA. 46e)

Sampling Point. Station 46e is located in Section 27 of Township 4 North, Range 21 West, San Bernardino Base and Meridian. The creek water was sampled from the right bank at the gage near Santa Paula.

Period of Record. June 1957 through December 1959.

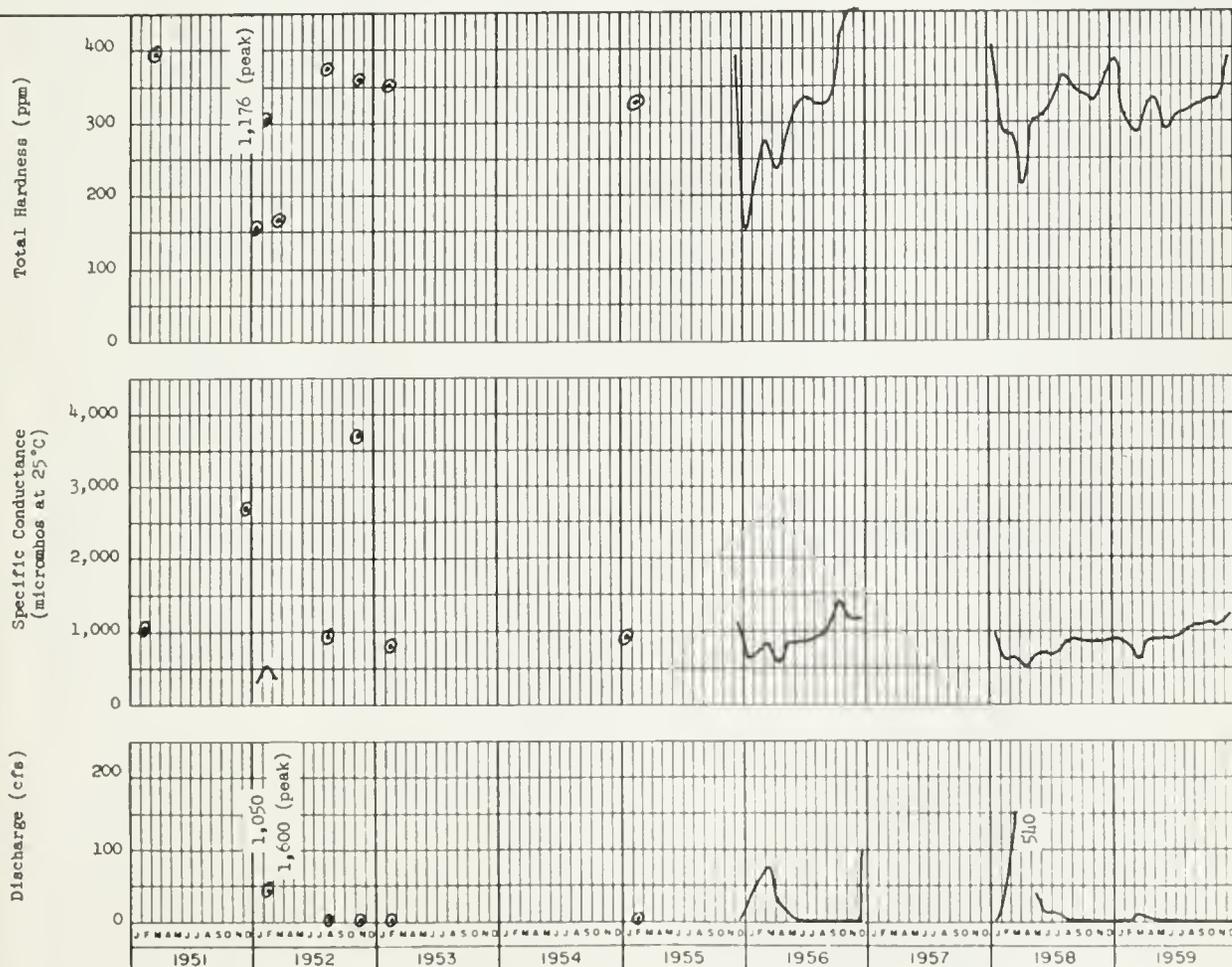
Water Quality Characteristics. The water at this station is calcium-sodium sulfate-bicarbonate in character, class 1 for irrigation use, and very hard. Although it usually meets drinking water standards for mineral content, sulfate concentrations occasionally exceed the recommended limit of 250 ppm.

Quality Changes. None.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 3,745             | 328               | 1,207          | 689            |
| Temperature in °F                                  | 81                | 41                | 81             | 55             |
| Dissolved oxygen in parts per million              | 14.2              | 6.0               | 14.2           | 7.0            |
| Percent saturation                                 | 137               | 69                | 137            | 69             |
| pH   | 8.4               | 7.3               | 8.4            | 7.9            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 309               | 27                | 92             | 67             |
| Magnesium (Mg)                                     | 98                | 9                 | 39             | 25             |
| Sodium (Na)  | 750               | 15.6              | 106            | 36             |
| Potassium (K)                                      | 12                | 0.8               | 2.6            | 1.8            |
| Carbonate (CO <sub>3</sub> )                       | 42                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 1,015             | 104               | 283            | 190            |
| Sulfate (SO <sub>4</sub> )                         | 1,288             | 74                | 255            | 228            |
| Chloride (Cl)                                      | 160               | 9                 | 80             | 23             |
| Nitrate (NO <sub>3</sub> )                         | 5.9               | 0.00              | 0.9            | 0.00           |
| Fluoride (F)                                       | 0.7               | 0.02              | 0.6            | 0.5            |
| Boron (B)  | 2.16              | 0.00              | 0.55           | 0.02           |
| Silica (SiO <sub>2</sub> )                         | 20                | 10                | 20             | 15             |
| Total dissolved solids in parts per million        | 2,663             | 266               | 713            | 590            |
| Percent sodium                                     | 42                | 16                | 42             | 22             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 1,176             | 154               | 389            | 282            |
| Noncarbonate                                       | 1,035             | 61                | 176            | 118            |
| Turbidity in parts per million                     | 1,300             | < 5               | 90             | < 5            |
| Coliform in most probable number per milliliter    | 240               | < 0.45            | 240            | < 0.45         |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.46              | 0.00              | 0.46           | 0.09           |
| Solid alpha  | 0.94              | 0.00              | 0.94           | 0.00           |
| Dissolved beta                                     | 5.63              | 0.00              | 5.63           | 3.53           |
| Solid beta   | 11.17             | 0.00              | 5.86           | 1.87           |

## WATER QUALITY VARIATIONS



SANTA PAULA CREEK NEAR SANTA PAULA  
(STA. 46e)



## Los Angeles River Basin

The Los Angeles River Basin lies in the central part of the Los Angeles Region. Its drainage area is about 820 square miles, one-half of which is valley and mesa lands and the remainder mountainous terrain. The San Gabriel Mountains bound the headwater area on the north and east and the Santa Monica Mountains bound it on the west. The Los Angeles River drains the San Fernando Valley and flows southward across the coastal plain to the Pacific Ocean at Long Beach. Mean annual runoff to the river is estimated at 91,700 acre-feet.

The Los Angeles River in its lower reach serves as a drainage channel for industrial waste water and storm water through the Los Angeles metropolitan area. Summer flows in this reach consist almost entirely of industrial waste water, which has a pronounced effect on the quality of the streamflow. As a result, the surface waters of this river vary widely in characteristics and quality depending on the point of sampling and ratio of industrial discharges to natural or storm flow. In 1959, low flows associated with the prevailing dry weather showed higher than usual concentrations of mineral constituents.

The two stations established to monitor the quality of surface water of Los Angeles River are:

| <u>Monitoring Station</u>        | <u>Page Number of<br/>Station Discussion</u> |
|----------------------------------|--|
| Los Angeles River at Los Angeles | 52   |
| Los Angeles River at Long Beach  | 54   |

LOS ANGELES RIVER AT LOS ANGELES (STA. 47)

Sampling Point. Station 47 is located in Section 15 of Township 1 South, Range 13 West, San Bernardino Base and Meridian. Samples were collected at the United States Geological Survey and Los Angeles County Flood Control District's gaging station at Figueroa Street bridge, 0.1 mile upstream from the confluence of the Arroyo Seco with the river.

Period of Record. April 1951 through December 1959.

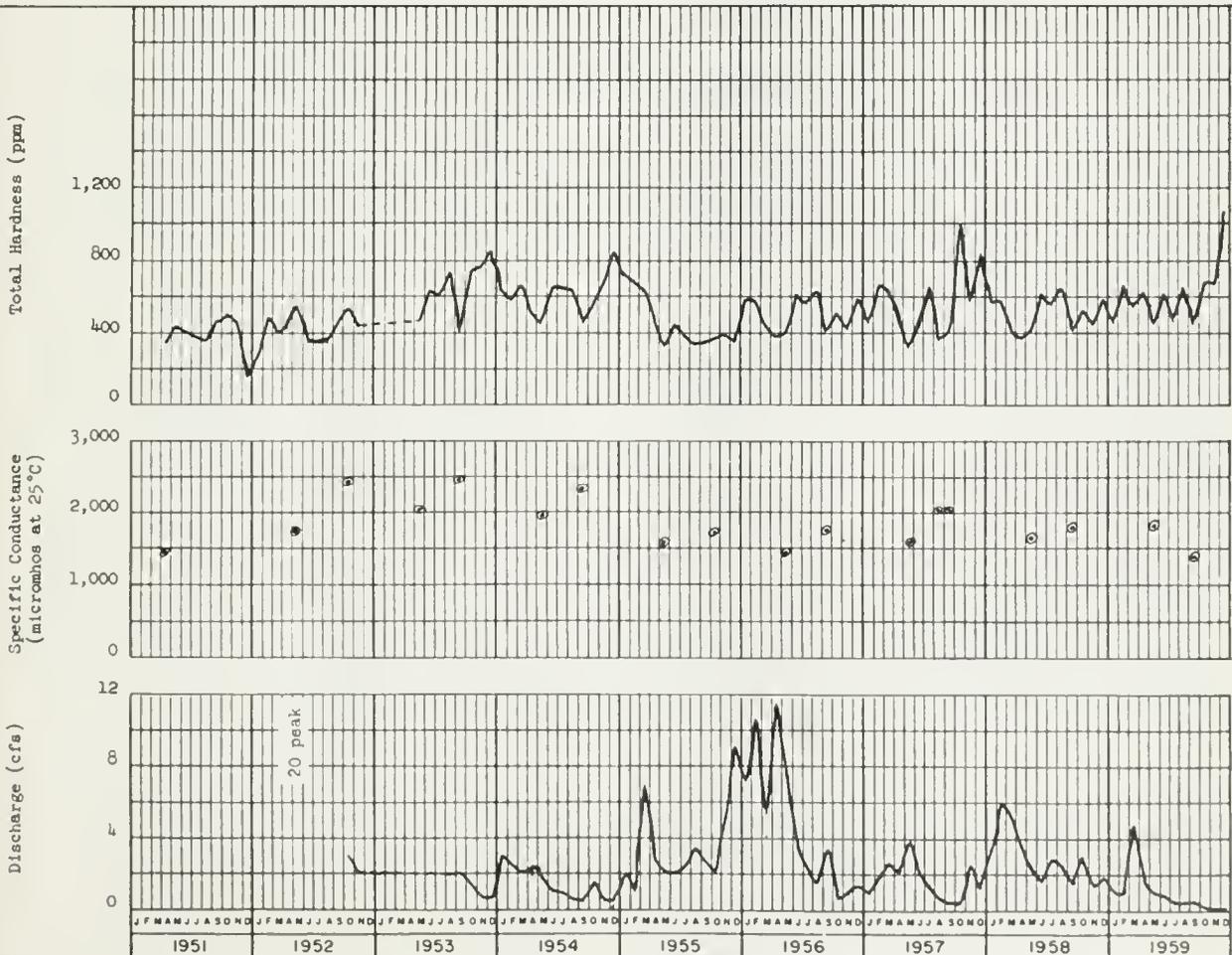
Water Quality Characteristics. The water at this station is usually sodium sulfate-chloride in character, and extremely hard. Total dissolved solids content and boron usually place the waters at this station in class 2 for irrigation or domestic uses.

Significant Water Quality Changes. In 1959 new maximums for the period of record were recorded for concentrations of calcium, magnesium, sulfate, and silica. Extremely low flows observed in the latter part of 1959 would account for the excessive mineral concentrations found in samples collected during this interval.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 2,500 Est.        | 206               | 2,500 Est.     | 1,300 Est.     |
| Temperature in °F                                  | 93                | 50                | 88             | 52             |
| Dissolved oxygen in parts per million              | 25.1              | 0.0               | 21.68          | 0.00           |
| Percent saturation                                 | 279               | 0                 | 256            | 0.00           |
| pH   | 9.3               | 5.6               | 9.3            | 7.7            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 178               | 17                | 178            | 18             |
| Magnesium (Mg)                                     | 145               | 4                 | 145            | 42             |
| Sodium (Na)  | 596               | 14                | 453            | 32             |
| Potassium (K)                                      | 12                | 3                 | 12             | 5.9            |
| Carbonate (CO <sub>3</sub> )                       | 120               | 0.0               | 100            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                    | 1,445             | 55                | 330            | 55             |
| Sulfate (SO <sub>4</sub> )                         | 745               | 25                | 745            | 290            |
| Chloride (Cl)                                      | 760               | 10                | 450            | 53             |
| Nitrate (NO <sub>3</sub> )                         | 19                | 0.0               | 9              | 0.0            |
| Fluoride (F)                                       | 0.8               | 0.2               | 0.5            | 0.5            |
| Boron (B)  | 4.0               | 0.00              | 1.4            | 0.00           |
| Silica (SiO <sub>2</sub> )                         | 35                | 10                | 35             | 20             |
| Total dissolved solids in parts per million        | 1,970             | 115               | 1,774          | 850            |
| Percent sodium                                     | 73                | 39                | 63             | 39             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 1,045             | 72                | 1,045          | 441            |
| Noncarbonate                                       | 708               | 13                | 708            | 202            |
| Turbidity in parts per million                     | 3,000             | <5                | <5             | <5             |
| Coliform in most probable number per milliliter    | 24,000            | <0.45             | 700            | <0.45          |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 1.24              | 0.00              | 0.11           | 0.09           |
| Solid alpha  | 0.9               | 0.00              | 0.59           | 0.00           |
| Dissolved beta                                     | 14.23             | 0.00              | 6.58           | 1.48           |
| Solid beta   | 11.27             | 0.00              | 8.54           | 0.00           |

### WATER QUALITY VARIATIONS



LOS ANGELES RIVER AT LOS ANGELES (STA. 47)

LOS ANGELES RIVER AT LONG BEACH (STA. 48)

Sampling Point. Station 48 is located in Section 26 of Township 4 South, Range 13 West, San Bernardino Base and Meridian. The surface water was sampled from the left bank immediately downstream from Highway 101 (State Street) bridge.

Period of Record. April 1951 through December 1959.

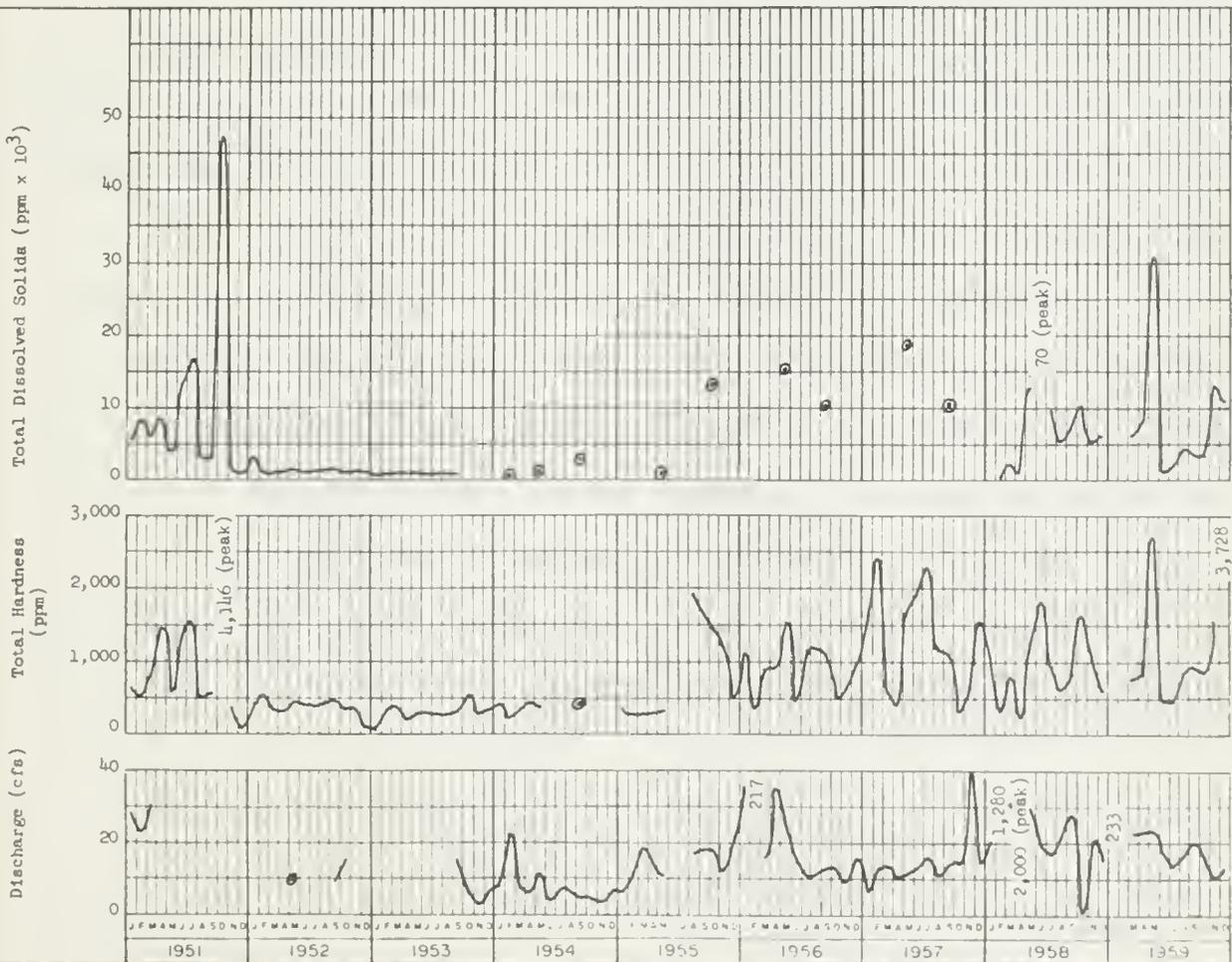
Water Quality Characteristics. Water at this station is usually unacceptable in quality for recognized beneficial uses. Toxic concentrations of various metallic constituents are generally present. The station is located in the tidal reach of the river, and analyses often show the presence of sea water in samples collected at this point.

Significant Water Quality Changes. During 1959, analyses of samples of water collected from this station revealed higher concentrations of arsenic, copper, and ammonia than in the previous years of record. In May of 1959 ammonia was present at a concentration of 79 ppm. In September, arsenic was found present at a concentration of 3.5 ppm and copper at 0.2 ppm.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 44,200            | 541               | 44,200         | 2,491 lrt.     |
| Temperature in °F  | 93                | 48                | 93             | 52             |
| Dissolved oxygen in parts per million                    | 16.4              | 0.0               | 6.7            | 0.0            |
| Percent saturation                                       | 161               | 0.                | 76             | 0.             |
| pH   | 9.2               | 7.0               | 8.0            | 7.2            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 589               | 22                | 589            | 106            |
| Magnesium (Mg)   | 870               | 4                 | 620            | 4              |
| Sodium (Na)  | 10,550            | 58                | 10,550         | 205            |
| Potassium (K)  | 86                | 3.5               | 86             | 38             |
| Carbonate (CO <sub>3</sub> )                             | 72                | 0.0               | 0.0            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                          | 276               | 61                | 976            | 240            |
| Sulfate (SO <sub>4</sub> )                               | 2,200             | 5                 | 1,466          | 5              |
| Chloride (Cl)  | 17,600            | 61                | 17,600         | 335            |
| Nitrate (NO <sub>3</sub> )                               | 140               | 0.00              | 140            | 0.06           |
| Fluoride (F)   | 3.2               | 0.1               | 2.0            | 0.6            |
| Boron (B)  | 40                | 0.19              | 40             | 9.3            |
| Silica (SiO <sub>2</sub> )                               | 55                | 10                | 40             | 30             |
| Total dissolved solids in parts per million              | 47,400            | 363               | 30,877         | 1,730          |
| Percent sodium   | 99                | 39                | 91             | 39             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 3,693             | 84                | 3,693          | 420            |
| Noncarbonate   | 3,646             | 56                | 3,546          | 187            |
| Turbidity in parts per million                           | 800               | < 5               | 78             | < 5            |
| Coliform in most probable number per milliliter          | >700,000          | 2.1               | >700,000       | 240            |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Dissolved alpha  | 0.58              | 0.00              | 0.58           | 0.00           |
| Solid alpha  | 3.47              | 0.00              | 0.46           | 0.34           |
| Dissolved beta   | 19.01             | 0.00              | 6.95           | 6.18           |
| Solid beta   | 8.4               | 0.00              | 5.97           | 1.34           |

## WATER QUALITY VARIATIONS



LOS ANGELES RIVER AT PACIFIC COAST HIGHWAY  
(STA. 48)

## Rio Hondo

Rio Hondo originates as a bifurcation of the San Gabriel River in the southern portion of the Los Angeles Region; it flows southwesterly from the San Gabriel Valley through the Whittier Narrows and across the coastal plain to join the Los Angeles River near Imperial Highway. It is therefore a tributary of the Los Angeles River even though its flow originates primarily from the San Gabriel River. The recent construction of the Santa Fe flood control dam by the U. S. Army Corps of Engineers conveys normal flows to the San Gabriel River channel and spillway flows to the Rio Hondo. The Rio Hondo collects runoff from the western portion of the San Gabriel Valley for conveyance to the downstream Whittier Narrows Flood Control Basin. Off-channel spreading basins along the lower reach from Whittier Narrows to the Los Angeles River are used for artificial recharge of ground water basins in the Los Angeles Coastal Plain. Water imported from the Colorado River is also released to the Rio Hondo about one and one-half miles above Whittier Narrows for replenishment of the downstream ground water basins.

The station Mission Creek at Whittier Narrows (Sta. 49a) monitors quality of native rising water (outflow from the upstream ground water basin) at the narrows. Mission Creek is passed through the Whittier Narrows Dam to downstream spreading basins along the Rio Hondo.

There are no known waste discharges to the river.

The two monitoring stations established for surveillance of surface water quality in the Rio Hondo are:

| <u>Monitoring Station</u>            | <u>Page Number of<br/>Station Discussion</u> |
|--------------------------------------|--|
| Rio Hondo at Whittier Narrows        | 58   |
| Mission Creek at Whittier<br>Narrows | 60   |

RIO HONDO AT WHITTIER NARROWS (STA. 49)

Sampling Point. Station 49 is located in Section 6 of Township 2 South, Range 11 West, San Bernardino Base and Meridian. Water samples were collected from the right bank at the Los Angeles County Flood Control District's gaging station, 125 yards upstream from the San Gabriel Boulevard bridge.

Period of Record. April 1951 through December 1959.

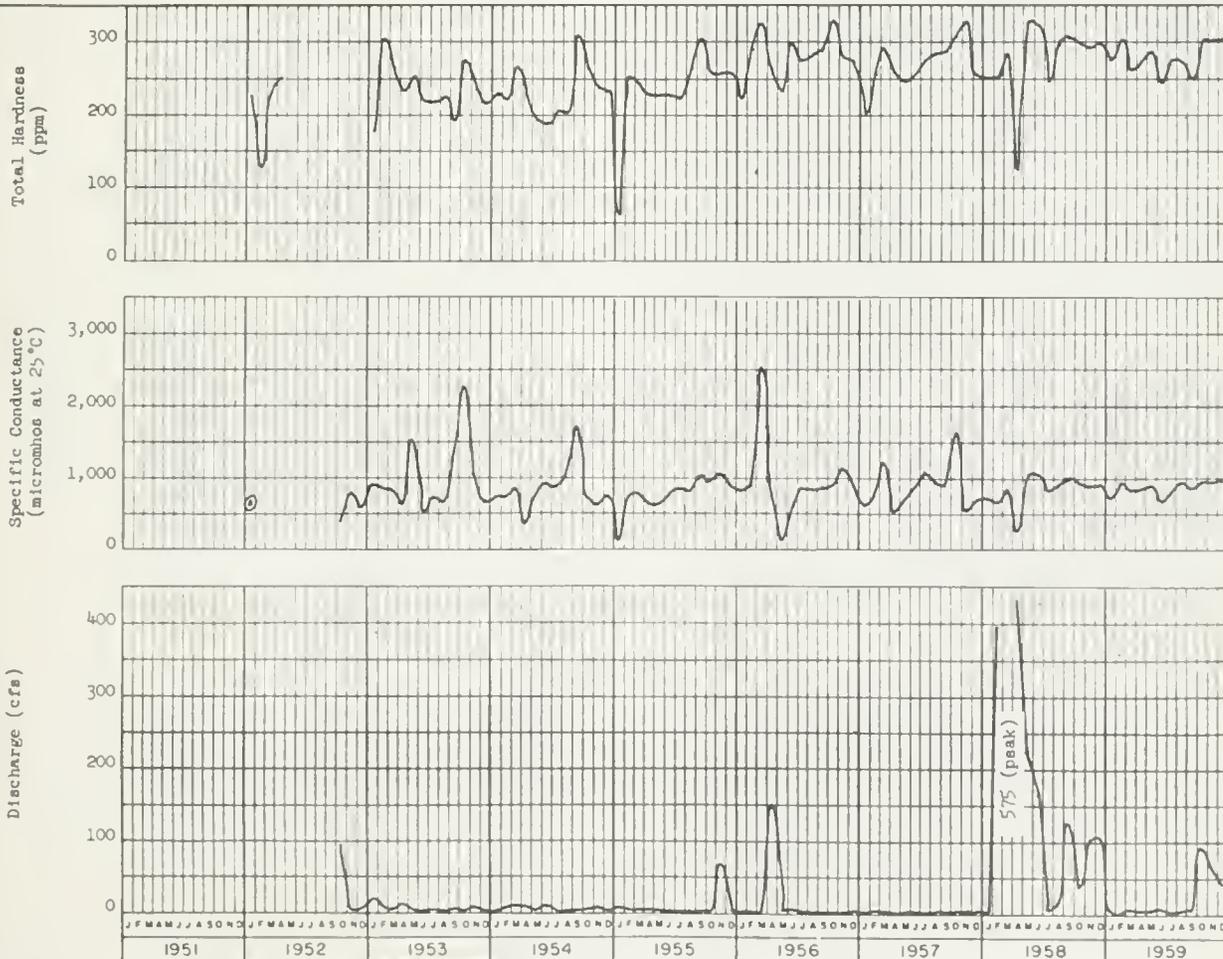
Water Quality Characteristics. Except for storm periods, the flow in the Rio Hondo usually consists of effluent ground water from the Main San Gabriel Basin supplemented by imported Colorado River water released from a main pipeline upstream from this station. Therefore, the character and mineral quality of the water varies. However, the native water is usually calcium-sodium bicarbonate in character and very hard. It is generally class 1 for irrigation use and usually meets drinking water standards for mineral content. The mingled waters are generally good in quality but sulfates exceed standards recommended for drinking water.

Significant Water Quality Changes. None.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 2,532             | 182               | 956            | 691            |
| Temperature in °F  | 90                | 43                | 79             | 56             |
| Dissolved oxygen in parts per million                    | 16.2              | 3.0               | 12.6           | 5.6            |
| Percent saturation                                       | 180               | 37                | 130            | 61             |
| pH   | 9.0               | 6.8               | 8.4            | 7.4            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 87                | 22                | 78             | 61             |
| Magnesium (Mg)   | 29                | 4                 | 26             | 24             |
| Sodium (Na)  | 280               | 5                 | 86             | 55             |
| Potassium (K)  | 10.7              | 2.9               | 6.3            | 4.6            |
| Carbonate (CO <sub>3</sub> )                             | 23                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                          | 378               | 64                | 259            | 150            |
| Sulfate (SO <sub>4</sub> )                               | 296               | 20                | 250            | 120            |
| Chloride (Cl)  | 385               | 6                 | 78             | 45             |
| Nitrate (NO <sub>3</sub> )                               | 17.9              | 0.00              | 2.5            | 0.00           |
| Fluoride (F)   | 1.2               | 0.3               | 0.8            | 0.3            |
| Boron (B)  | 0.48              | 0.00              | 0.43           | 0.07           |
| Silica (SiO <sub>2</sub> )                               | 45                | 8                 | 30             | 10             |
| Total dissolved solids in parts per million              | 1,097             | 126               | 636            | 493            |
| Percent sodium   | 74                | 12                | 40             | 30             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 337               | 63                | 308            | 249            |
| Noncarbonate   | 188               | 0                 | 184            | 47             |
| Turbidity in parts per million                           | 1,150             | < 5               | 35             | < 5            |
| Coliform in most probable number per milliliter          | 70,000            | < 4.5             | > 700          | < 4.5          |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Dissolved alpha  | 2.98              | 0.00              | 0.09           | 0.00           |
| Solid alpha  | 1.44              | 0.00              | 0.47           | 0.09           |
| Dissolved beta   | 16.66             | 0.00              | 16.66          | 6.09           |
| Solid beta   | 30.20             | 0.00              | 8.59           | 5.77           |

### WATER QUALITY VARIATIONS



RIO HONDO AT WHITTIER NARROWS (STA. 49)

MISSION CREEK AT WHITTIER NARROWS (STA. 49a)

Sampling Point. Station 49a is located in Section 6 of Township 2 South, Range 11 West, San Bernardino Base and Meridian. Samples were collected from the left bank opposite the Los Angeles County Flood Control District's gaging station located immediately upstream from the San Gabriel Boulevard bridge, about two miles northwest of Montebello.

Period of Record. April 1951 through December 1959.

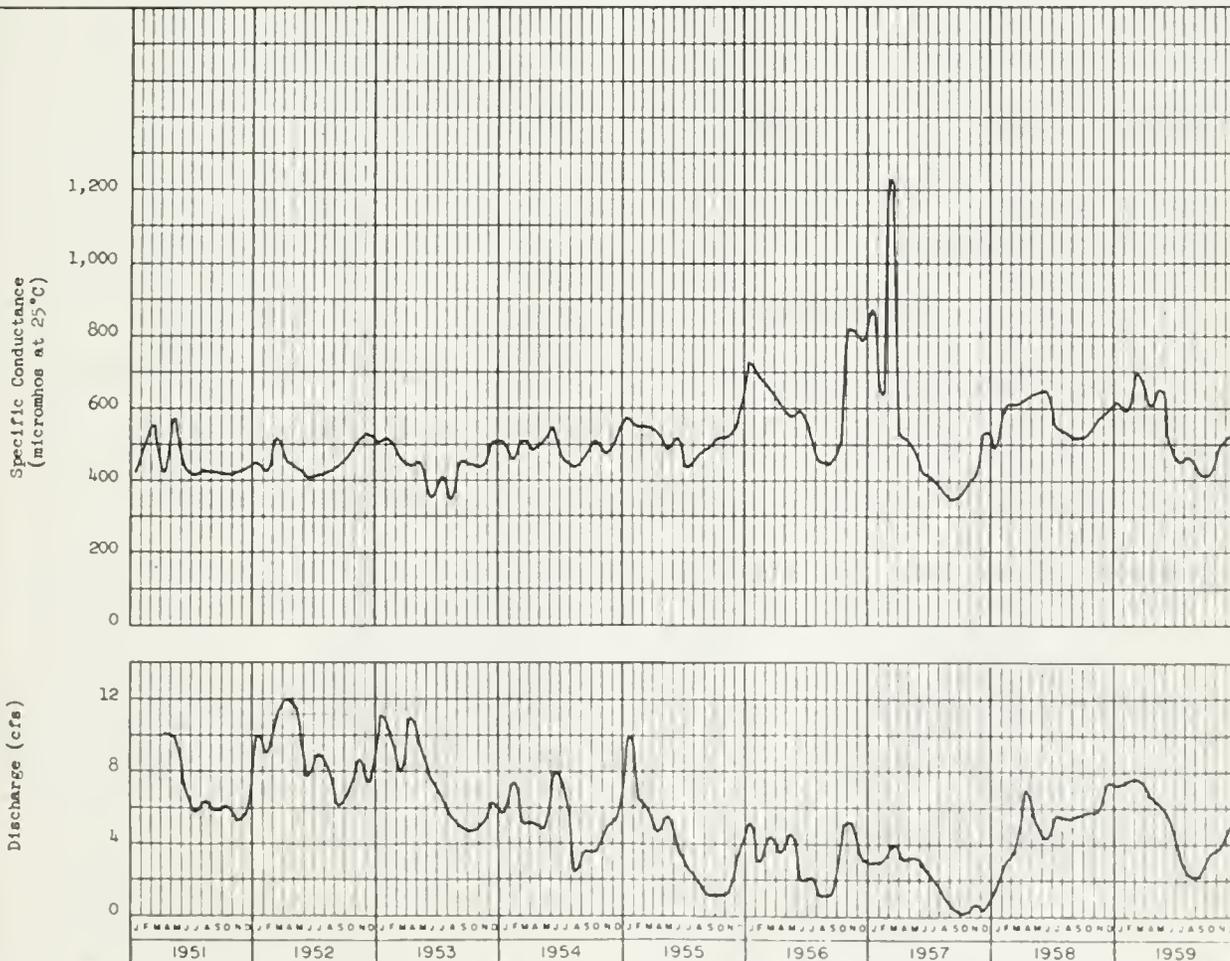
Water Quality Characteristics. Past analyses of this water reveal that bicarbonate is predominant among anions, and calcium and magnesium among cations. The water is usually excellent in mineral quality and meets drinking water standards for mineral constituents. The water is moderately to very hard, and class 1 for irrigation use.

Significant Water Quality Changes. None.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 1,224             | 354               | 695            | 417            |
| Temperature in °F  | 73                | 52                | 73             | 55             |
| Dissolved oxygen in parts per million                    | 11.8              | 5.8               | 8.5            | 6.8            |
| Percent saturation                                       | 114               | 60                | 94             | 72             |
| pH   | 8.5               | 7.3               | 7.9            | 7.4            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 92                | 29                | 84             | 48             |
| Magnesium (Mg)   | 39                | 9                 | 19             | 15             |
| Sodium (Na)  | 63                | 16                | 25             | 16             |
| Potassium (K)  | 9.2               | 1.6               | 3.0            | 2.4            |
| Carbonate (CO <sub>3</sub> )                             | 14                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                          | 327               | 174               | 268            | 176            |
| Sulfate (SO <sub>4</sub> )                               | 137               | 21                | 93             | 49             |
| Chloride (Cl)  | 218               | 9                 | 21             | 9              |
| Nitrate (NO <sub>3</sub> )                               | 10.8              | 2.9               | 6.5            | 2.9            |
| Fluoride (F)   | 0.8               | 0.16              | 0.6            | 0.5            |
| Boron (B)  | 0.31              | 0.00              | 0.28           | 0.00           |
| Silica (SiO <sub>2</sub> )                               | 30                | 20                | 20             | 20             |
| Total dissolved solids in parts per million              | 561               | 252               | 440            | 315            |
| Percent sodium   | 54                | 10                | 17             | 10             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 349               | 155               | 316            | 184            |
| Noncarbonate   | 122               | 0                 | 96             | 31             |
| Turbidity in parts per million                           | < 25              | 2.5               | < 25           | < 5            |
| Coliform in most probable number per milliliter          | 7,000             | 1.2               | 7,000          | 2              |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Dissolved alpha  | 0.58              | 0.00              | 0.58           | 0.00           |
| Solid alpha  | 0.76              | 0.00              | 0.47           | 0.09           |
| Dissolved beta   | 13.34             | 0.00              | 3.93           | 2.94           |
| Solid beta   | 8.65              | 0.00              | 8.65           | 2.28           |

### WATER QUALITY VARIATIONS



MISSION CREEK AT WHITTIER NARROWS (STA. 490)

## San Gabriel River Basin

The drainage area of the San Gabriel River system occupies the easterly portion of Los Angeles Region south of the San Gabriel Mountains. The watershed is comprised of about 375 square miles of mountains and foothills and approximately 210 square miles of valley and mesa lands, and has a total area of 585 square miles. The San Gabriel River system rises in the San Gabriel Mountains and drains San Gabriel Valley. The river flows across the most easterly portion of the Los Angeles Coastal Plain and discharges to San Pedro Bay at the Los Angeles County-Orange County line. The mean annual runoff of San Gabriel River Basin is about 35,080 acre-feet.

There are several storage and flood control reservoirs controlling flows of the San Gabriel River. Named in downstream order, they are Cogswell Reservoir on the West Fork of San Gabriel River; and San Gabriel Number One, Morris Reservoir, Santa Fe Flood Control Basin, and Whittier Narrows Flood Control Basin on the main channel. The Whittier Narrows Flood Control Basin also receives the flow of the upper reaches of Rio Hondo and its tributaries.

Off-channel spreading grounds along Rio Hondo and San Gabriel River from the mountains to below the Whittier Narrows Flood Control Basin supplement the natural percolation from the stream channels to recharge ground water basins of the stream system.

At various times during 1959, Colorado River water was discharged to the San Gabriel River from a pipeline located immediately downstream from San Bernardino Road for replenishment of the ground water basins in the coastal plain.

The two sampling stations maintained for monitoring surface water quality of the San Gabriel River are:

| <u>Monitoring Station</u>                | <u>Page Number of<br/>Station Discussion</u> |
|--|--|
| San Gabriel River at Azusa<br>Powerhouse | 64   |
| San Gabriel River at<br>Whittier Narrows | 66   |

SAN GABRIEL RIVER AT AZUSA POWERHOUSE (STA. 50d)

Sampling Point. Station 50d is located in Section 22 of Township 1 North, Range 10 West, San Bernardino Base and Meridian. The river water was sampled at the tailrace of the Azusa power plant.

Period of Record. March 1957 through December 1959.

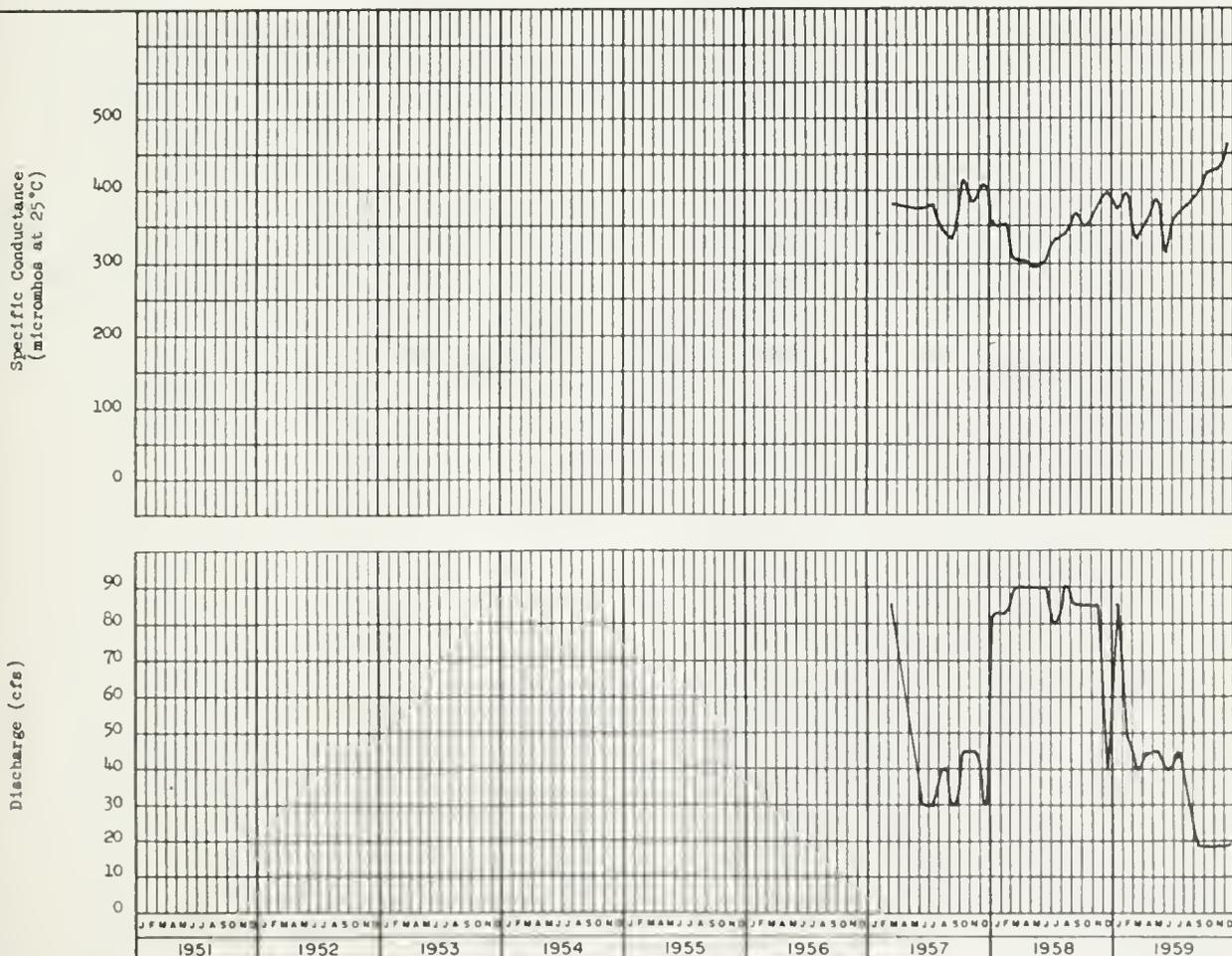
Water Quality Characteristics. The water at Station 50d is excellent in quality, calcium bicarbonate in character, class 1 for irrigation, moderately to very hard, and meets drinking water standards for mineral constituents.

Significant Water Quality Changes. Increases of mineral content in samples collected in the late months of 1959 are associated with lower than normal stream flows.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959    | Minimum - 1959 |
|--|-------------------|-------------------|-------------------|----------------|
| Specific conductance (micromhos at 25°C)           | 462               | 293               | 462               | 315            |
| Temperature in °F                                  | 74                | 47                | 74                | 49             |
| Dissolved oxygen in parts per million              | 14.4              | 7.2               | 11.0              | 7.2            |
| Percent saturation                                 | 121               | 81                | 101               | 81             |
| pH   | 8.4               | 7.3               | 8.0               | 7.4            |
| Mineral constituents in parts per million          |                   |                   |                   |                |
| Calcium (Ca)                                       | 63                | 34                | 53                | 45             |
| Magnesium (Mg)                                     | 16                | 10                | 13                | 13             |
| Sodium (Na)  | 17                | 7                 | 11                | 8.6            |
| Potassium (K)                                      | 4.5               | 2.9               | 4.5               | 4.2            |
| Carbonate (CO <sub>3</sub> )                       | 17                | 0.00              | 0.00              | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 266               | 148               | 264               | 171            |
| Sulfate (SO <sub>4</sub> )                         | 30                | 18                | 24                | 23             |
| Chloride (Cl)                                      | 10                | 3                 | 7                 | 4              |
| Nitrate (NO <sub>3</sub> )                         | 3.2               | 0.2               | 0.5               | 0.00           |
| Fluoride (F)                                       | 0.6               | 0.3               | 0.4               | 0.3            |
| Boron (B)  | 0.23              | 0.00              | 0.08              | 0.00           |
| Silica (SiO <sub>2</sub> )                         | 20                | 10                | 20                | 10             |
| Total dissolved solids in parts per million        | 243               | 190               | 243               | 230            |
| Percent sodium                                     | 14                | 6                 | 13                | 8              |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                   |                |
| Total  | 238               | 148               | 238               | 190            |
| Noncarbonate                                       | 106               | 0                 | 71                | 8              |
| Turbidity in parts per million                     | 30                | < 5               | < 25              | < 5            |
| Coliform in most probable number per milliliter    | 240               | < 0.45            | 240               | < 0.45         |
| Radioactivity in micro-micro curies per liter      |                   |                   |                   |                |
| Dissolved alpha                                    | 0.17              | 0.00              | No Report in 1959 |                |
| Solid alpha  | 0.59              | 0.00              |                   |                |
| Dissolved beta                                     | 9.88              | 6.88              |                   |                |
| Solid beta   | 3.81              | 0.00              |                   |                |

### WATER QUALITY VARIATIONS



SAN GABRIEL RIVER AT AZUSA POWER HOUSE  
(STA. 50d)

SAN GABRIEL RIVER AT WHITTIER NARROWS (STA. 50)

Sampling Point. Station 50 is located in Section 5 of Township 2 South, Range 11 West, San Bernardino Base and Meridian. Samples were collected from the right bank, 200 feet beyond the end of San Gabriel Boulevard (Syphon Road), upstream from Whittier Narrows Dam.

Period of Record. April 1951 through December 1959.

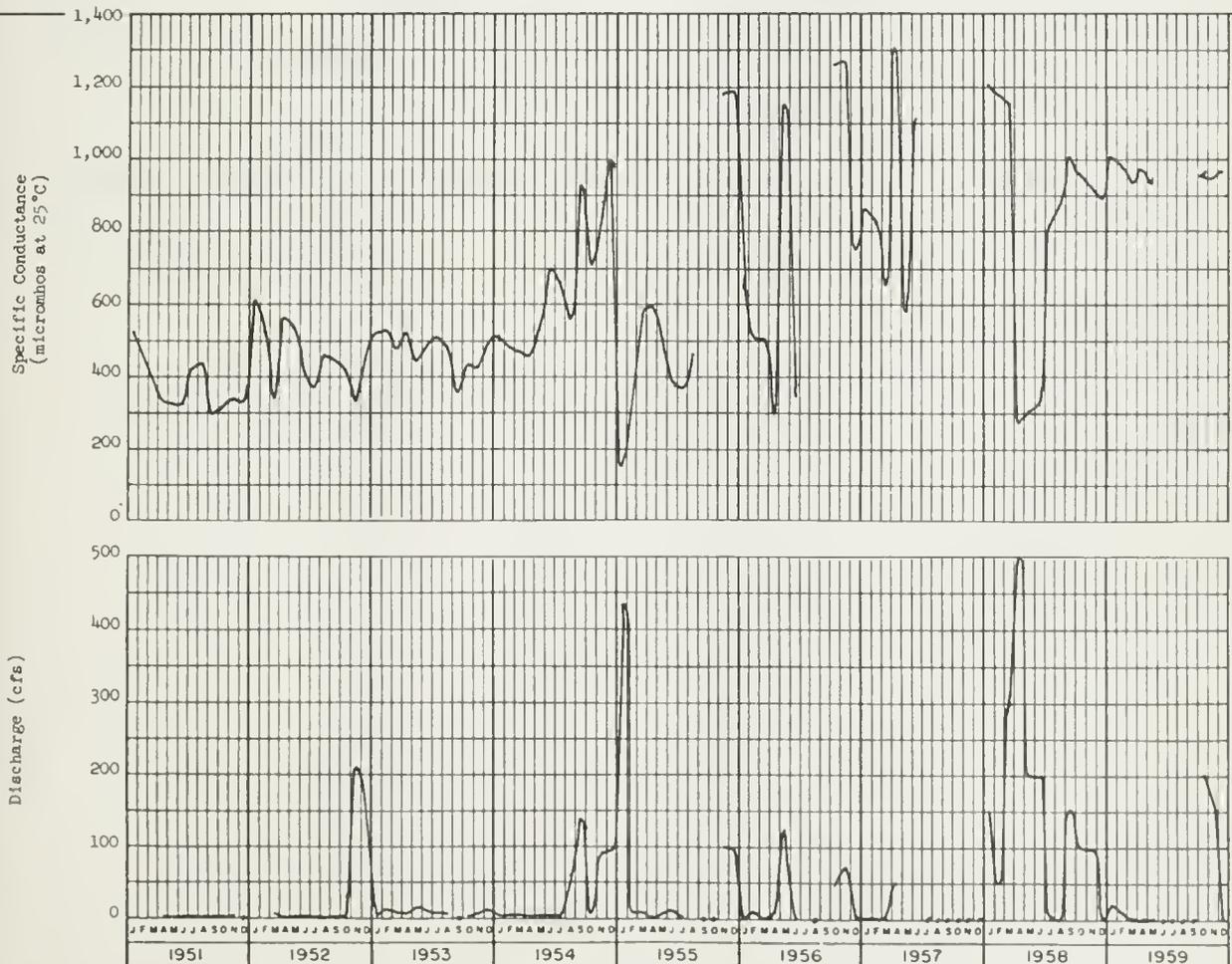
Water Quality Characteristics. The mineral content of San Gabriel River water at Station 50 is usually higher than that of the upper reaches of the river. The native water is calcium-sodium bicarbonate in character and very hard. It is generally class 1 for irrigation use and meets drinking water standards for mineral constituents. Occasionally, imported Colorado River water is released above this station to recharge the ground water basins. The sulfate concentration of Colorado River water at times causes the character of water at this station to shift to calcium-sodium sulfate.

Significant Water Quality Changes. Specific conductance shows a trend of increasing values over the last six years of record; this characteristic may in part reflect the increasing releases of Colorado River water.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,302             | 157               | 1,001          | 941            |
| Temperature in °F                                  | 86                | 43                | 75             | 49             |
| Dissolved oxygen in parts per million              | 21.0              | 3.0               | 15.5           | 6.6            |
| Percent saturation                                 | 216               | 30                | 166            | 68             |
| pH   | 8.7               | 7.2               | 8.4            | 7.7            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 92                | 23                | 89             | 75             |
| Magnesium (Mg)                                     | 44                | 5                 | 33             | 27             |
| Sodium (Na)  | 109               | 7                 | 86             | 65             |
| Potassium (K)                                      | 10.0              | 2.9               | 8.2            | 6.1            |
| Carbonate (CO <sub>3</sub> )                       | 19                | 0.00              | 19             | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 307               | 103               | 261            | 110            |
| Sulfate (SO <sub>4</sub> )                         | 333               | 2                 | 263            | 162            |
| Chloride (Cl)                                      | 112               | 3                 | 81             | 65             |
| Nitrate (NO <sub>3</sub> )                         | 23                | 0.00              | 23             | 0.00           |
| Fluoride (F)                                       | 0.6               | 0.00              | 0.5            | 0.3            |
| Boron (B)  | 0.45              | 0.00              | 0.45           | 0.06           |
| Silice (SiO <sub>2</sub> )                         | 30                | 5                 | 30             | 10             |
| Total dissolved solids in parts per million        | 835               | 187               | 648            | 602            |
| Percent sodium                                     | 58                | 10                | 36             | 30             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 390               | 70                | 345            | 300            |
| Noncarbonate                                       | 256               | 16                | 210            | 111            |
| Turbidity in parts per million                     | 3,200             | < 5               | < 25           | < 5            |
| Coliform in most probable number per milliliter    | 2,400             | 0.23              | 240            | < 4.5          |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 4.04              | 0.00              | 0.11           | 0.11           |
| Solid alpha  | 0.96              | 0.00              | 0.59           | 0.59           |
| Dissolved beta                                     | 12.89             | 0.00              | 9.69           | 9.69           |
| Solid beta   | 7.97              | 0.00              | 2.14           | 2.14           |

### WATER QUALITY VARIATIONS



SAN GABRIEL RIVER AT WHITTIER NARROWS (STA. 50)



## Los Angeles Aqueduct

The Los Angeles Aqueduct, owned and operated by the City of Los Angeles Department of Water and Power, obtains water from the Mono Basin and Owens River Valley. The aqueduct delivers Sierra Nevada runoff water from the Lahontan Region to the City of Los Angeles 300 miles to the south, where it is sampled in Los Angeles Region. The surface water supply is supplemented at times by pumping water from wells in Owens Valley.

During 1959, the aqueduct delivered about 322,000 acre-feet of water to Los Angeles.

The Los Angeles Department of Water and Power samples the water once a month at the terminus of the aqueduct at Upper Van Norman Reservoir near San Fernando and transmits the analyses to this department for use in the Quality of Surface Waters reports.

The monitoring station, Los Angeles Aqueduct near San Fernando, maintained for surveillance of quality of the imported water, is discussed on page 70.

LOS ANGELES AQUEDUCT NEAR SAN FERNANDO (STA. 70)

Sampling Point. Station 70 is located in Section 30 of Township 3 North, Range 15 West, San Bernardino Base and Meridian. Water samples from the aqueduct were collected at the inlet to Upper Van Norman Reservoir.

Period of Record. April 1951 through December 1959.

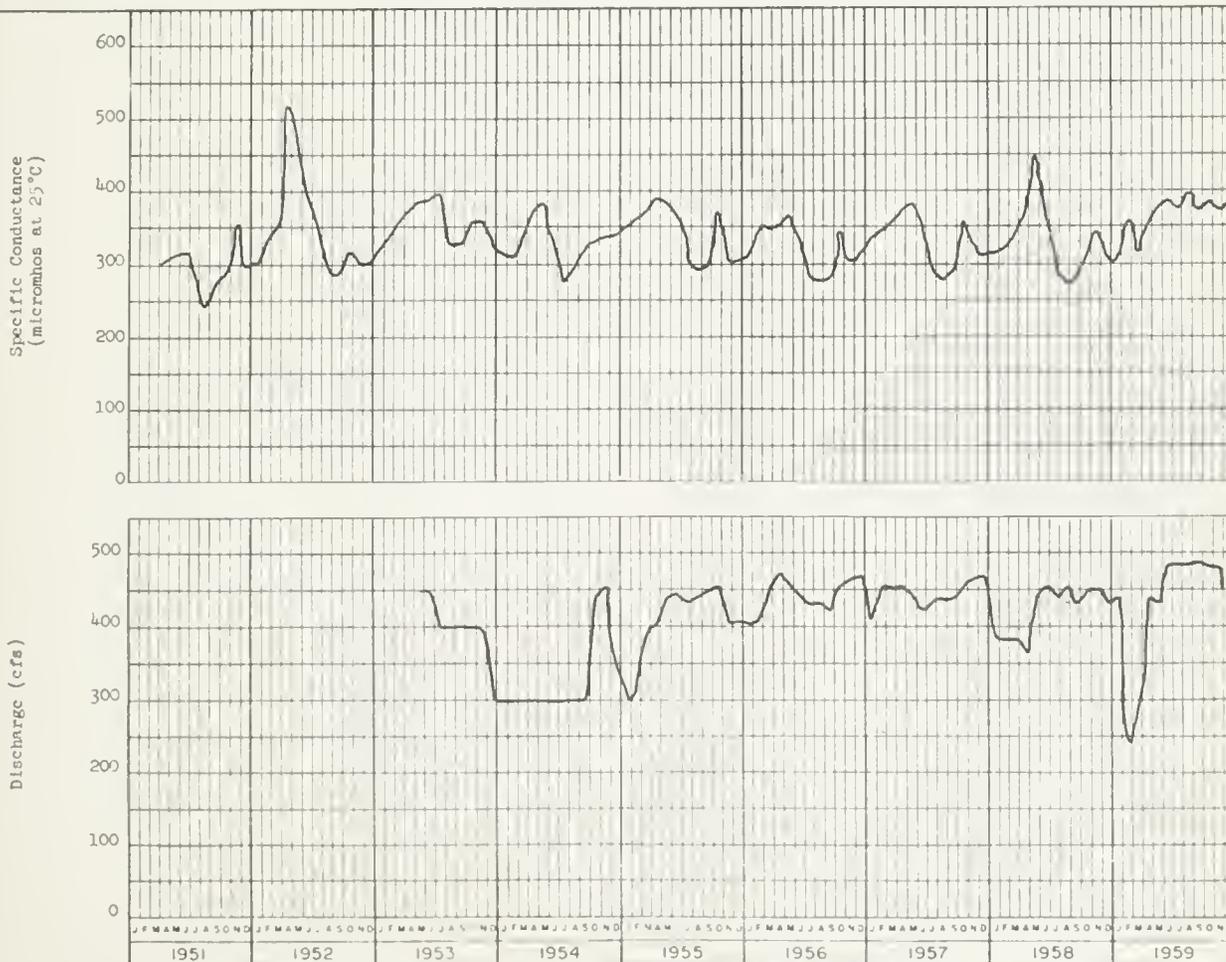
Water Quality Characteristics. This water is sodium-calcium bicarbonate in character, soft, and generally of excellent mineral quality for all uses; however, boron occasionally placed this water in class 2 for irrigation.

Significant Water Quality Changes. The analyses for 1959 indicate a slight increase in mineral content, above the average of the prior record. The utilization of water from wells in the Owens Valley to supplement the surface water supply is believed to be the probable cause.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 516               | 216               | 399            | 303            |
| Temperature in °F  | 79                | 42                | 75             | 47             |
| Disolved oxygen in parts per million                     | 13.1              | 6.8               | 12.0           | 7.3            |
| Percent saturation                                       | 121               | 70                | 91             | 73             |
| pH   | 9.2               | 7.5               | 8.4            | 7.9            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 29                | 19                | 29             | 24             |
| Magnesium (Mg)   | 7.5               | 4.1               | 7.5            | 5.8            |
| Sodium (Na)  | 58                | 25                | 44             | 32             |
| Potassium (K)  | 6.4               | 3.0               | 5.1            | 3.4            |
| Carbonate (CO <sub>3</sub> )                             | 8.0               | 0.00              | 4              | 1              |
| Bicarbonate (HCO <sub>3</sub> )                          | 143               | 80                | 135            | 109            |
| Sulfate (SO <sub>4</sub> )                               | 39                | 17                | 39             | 18             |
| Chloride (Cl)  | 28                | 11                | 24             | 18             |
| Nitrate (NO <sub>3</sub> )                               | 1.0               | 0.00              | 0.4            | 0.00           |
| Fluoride (F)   | 0.8               | 0.4               | 0.63           | 0.40           |
| Boron (B)  | 0.78              | 0.21              | 0.59           | 0.30           |
| Silica (SiO <sub>2</sub> )                               | 28                | 17                | 22             | 17             |
| Total dissolved solids in parts per million              | 259               | 159               | --             | --             |
| Percent sodium   | 84                | 41                | --             | --             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 102               | 68                | 102            | 84             |
| Noncarbonate   | 0                 | 0                 | --             | --             |
| Turbidity in parts per million                           | 16                | 0                 | 5              | < 1            |
| Coliform in most probable number per milliliter          | 0.092             | 0.00              | 0.092          | 0.00           |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Beta-Gamma   |                   |                   | 25.6           | 1.02           |

## WATER QUALITY VARIATIONS



LOS ANGELES AQUEDUCT NEAR SAN FERNANDO  
(STA. 70)



## Colorado River Aqueduct

The Colorado River Aqueduct is sampled at La Verne to monitor the quality of raw Colorado River water entering the F. E. Weymouth Softening and Filtration Plant at La Verne, California, in Los Angeles Region. A monthly composite sample of the raw water inflow is collected by The Metropolitan Water District of Southern California and analyzed in its laboratory.

The approximate average flow of raw water through the softening and filtration plant is about 400 cfs. Total flow through the plant was about 290,000 acre-feet in 1959.

The monitoring station, Colorado River Aqueduct at La Verne, maintained for surveillance of the quality of the imported Colorado River water is discussed on page 74.

COLORADO RIVER AQUEDUCT AT LA VERNE (STA. 69)

Sampling Point. This station is situated in Section 6 of Township 1 South, Range 9 West, San Bernardino Base and Meridian. Raw water monthly composite samples are taken by The Metropolitan Water District of Southern California of the inflow of Colorado River water to the F. E. Weymouth Softening and Filtration Plant at La Verne.

Period of Record. April 1951 through December 1959.

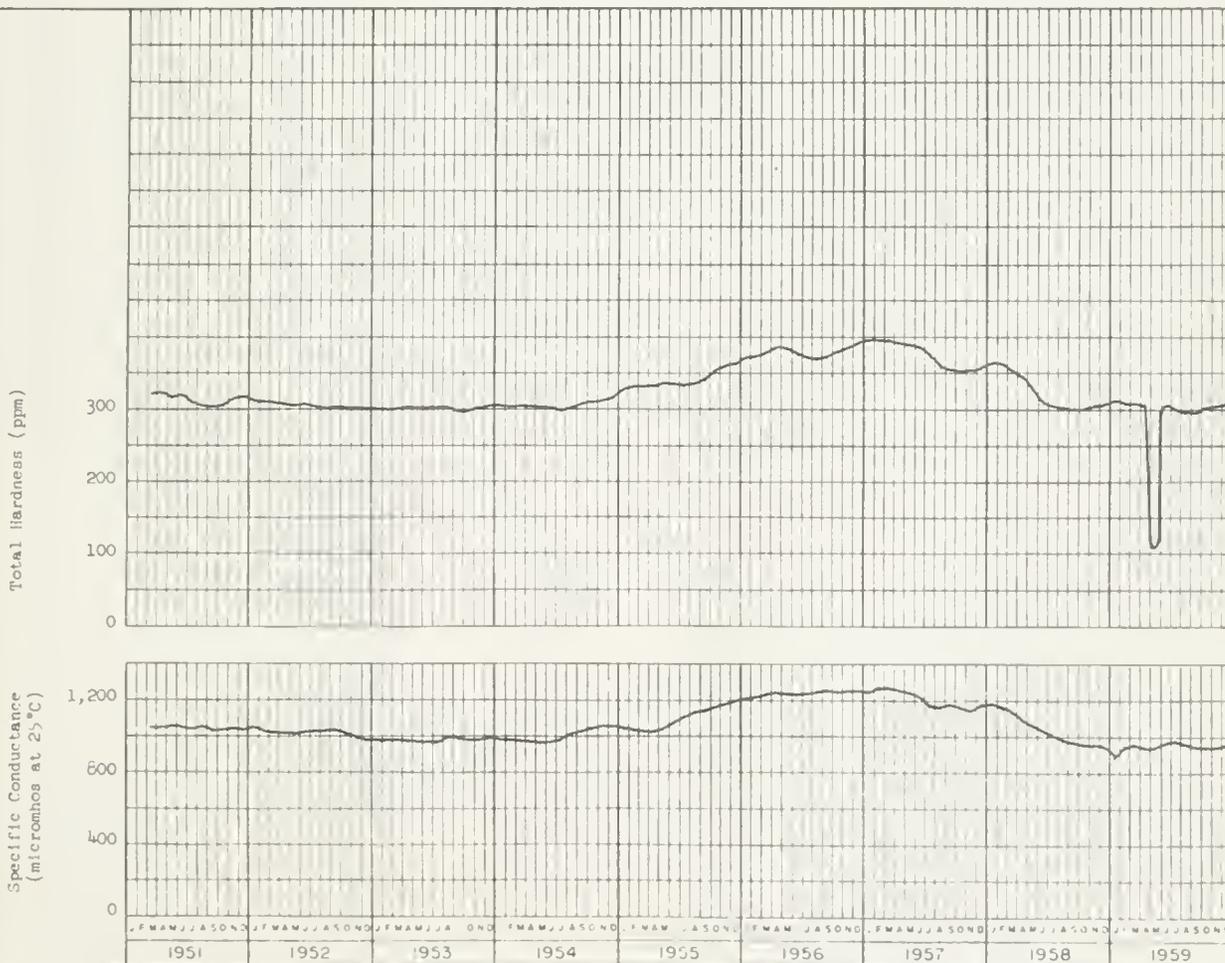
Water Quality Characteristics. The water is calcium-sodium sulfate in character, usually class 1 for irrigation, and very hard. The water meets drinking water standards for mineral constituents except that sulfate slightly exceeds the recommended limit of 250 ppm.

Significant Water Quality Changes. Analyses of water for 1959 show that the water has decreased in mineral content from the average for the years 1955 through 1958.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 1,285             | 324               | 990            | 884            |
| Temperature in °F  | 79                | 51                | 79             | 54             |
| Dissolved oxygen in parts per million                    | 11.3              | 6.8               | --             | --             |
| Percent saturation                                       | 130               | 82                | --             | --             |
| pH   | 8.5               | 8.1               | 8.5            | 8.3            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 126               | 72                | 85             | 76             |
| Magnesium (Mg)   | 35                | 25                | 27             | 25             |
| Sodium (Na)  | 123               | 31                | 90             | 80             |
| Potassium (K)  | 9.0               | 2.5               | 5              | 4              |
| Carbonate (CO <sub>3</sub> )                             | 14                | 0.0               | 4              | 1              |
| Bicarbonate (HCO <sub>3</sub> )                          | 156               | 109               | 144            | 124            |
| Sulfate (SO <sub>4</sub> )                               | 367               | 260               | 275            | 260            |
| Chloride (Cl)  | 111               | 64                | 78             | 64             |
| Nitrate (NO <sub>3</sub> )                               | 2.0               | 0.0               | 2.0            | 0.5            |
| Fluoride (F)   | 0.4               | 0.2               | 0.4            | 0.3            |
| Boron (B)  | 0.7               | 0.07              | 0.16           | 0.16           |
| Silica (SiO <sub>2</sub> )                               | 11.2              | 3.8               | 11             | 10             |
| Total dissolved solids in parts per million              | 830               | 603               | 630            | 603            |
| Percent sodium   | 42                | 36                | 39             | 36             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 397               | 297               | 313            | 297            |
| Noncarbonate   | 267               | 189               | 198            | 189            |
| Turbidity in parts per million                           | 4.6               | 1.1               | 4.6            | 1.1            |
| Coliform in most probable number per milliliter          | --                | --                | --             | --             |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Gross Alpha  | 0.9               | 2.9               | 4.6            | 2.9            |
| Gross Beta   | 33.0              | 4.8               | 20.4           | 7.7            |

### WATER QUALITY VARIATIONS



COLORADO RIVER AQUEDUCT AT LA VERNE (STA. 69)



Station  
Number

45b  
46

46a  
46c  
46d  
46e  
47  
48

49  
49a  
50  
50d  
61  
69  
70

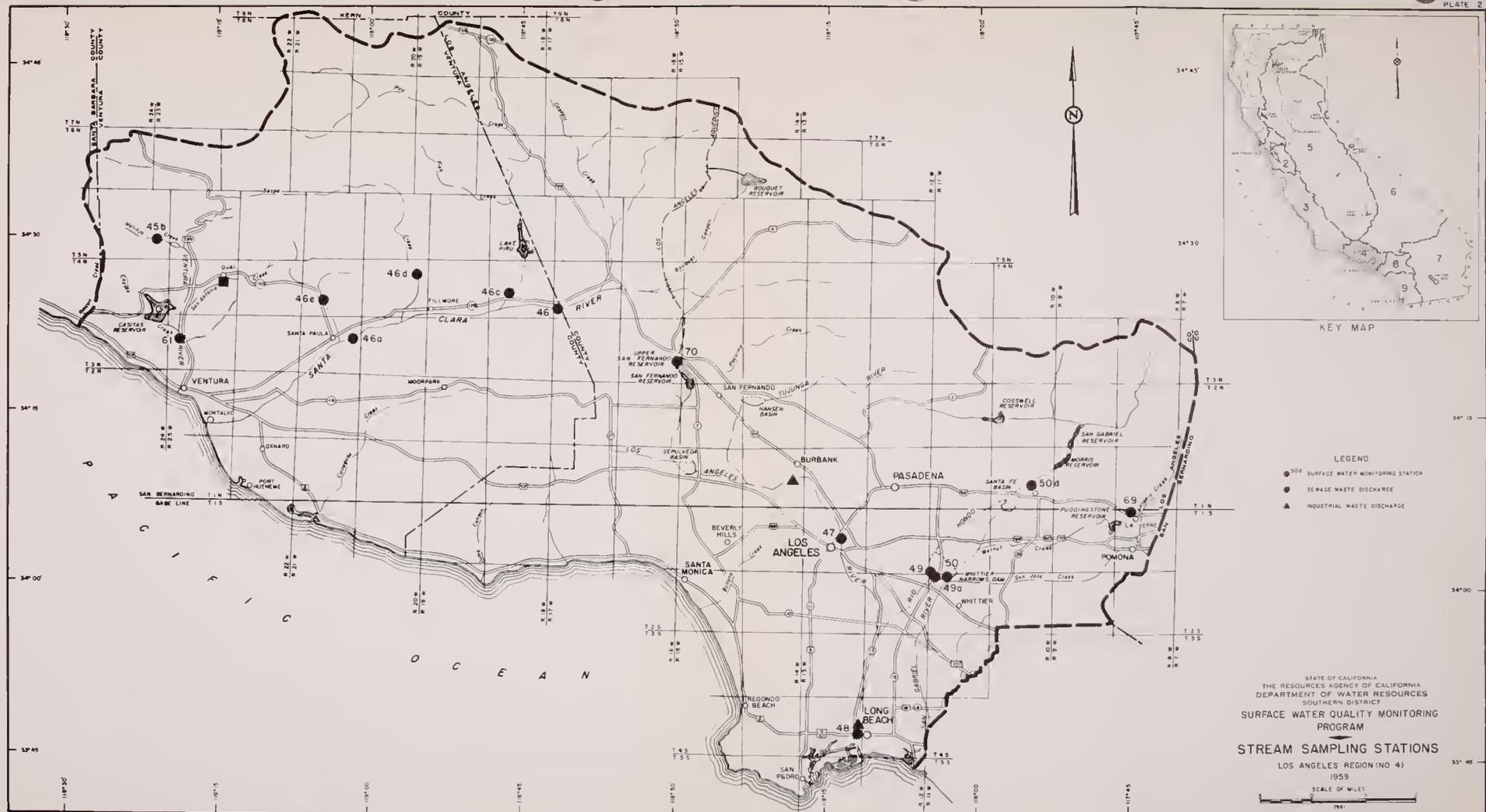


STREAM SAMPLING STATIONS  
LOS ANGELES REGION (NO. 4)

Station  
Number

Station Name

- 45b Matilija Creek above Dam
- 46 Santa Clara River at Loa Angeles-Ventura County Line
- 46a Santa Clara River near Santa Paula
- 46c Pisu Creek near Pisu
- 46d Sespe Creek near Fillmore
- 46e Santa Paula Creek near Santa Paula
- 47 Loa Angeles River at Figueroa Street
- 48 Loa Angeles River at Pacific Coast Highway
- 49 Rio Hondo at Whittier Narrows
- 49a Mission Creek at Whittier Narrows
- 50 San Gabriel River at Whittier Narrows
- 50d San Gabriel River at Azusa Power House
- 61 Ventura River near Ventura
- 69 Colorado River Aqueduct at La Verne
- 70 Los Angeles Aqueduct near San Fernando



LEGEND

- SURFACE WATER MONITORING STATION
- SEWAGE WASTE DISCHARGE
- ▲ INDUSTRIAL WASTE DISCHARGE

STATE OF CALIFORNIA  
THE RESOURCES AGENCY OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES  
SOUTHERN DISTRICT

**SURFACE WATER QUALITY MONITORING PROGRAM**

**STREAM SAMPLING STATIONS**  
LOS ANGELES REGION (NO. 4)  
1959

SCALE OF MILES

## Lahontan Region (No. 6)

The Lahontan Region (No. 6) extends from the Oregon-California border to the San Bernardino Mountains, between the Sierra Nevada on the west and the California-Nevada state boundary on the east. The region covers an area of about 33,000 square miles, 10,000 square miles of which are valley and mesa lands. The length, north to south, is about 500 miles, and the width varies from less than 20 miles in the north, to over 170 miles across the Mojave Desert and Antelope Valley in the south.

The terrain is characterized by basins of interior drainage, or sinks, surrounded by mountains. The eastern slopes of the Sierra Nevada Range and the White Mountains dominate the mountainous portions of the region. The southern part of the Lahontan Region is arid, and precipitation is generally light, but storms of severe intensities have caused locally damaging floods. The estimated mean seasonal runoff in the region is 3,177,000 acre-feet, most of which comes from the Sierra Nevada.

The principal streams in the region are the Susan, Truckee, Carson, Walker, Owens, and Mojave Rivers. To maintain surveillance of surface water quality in the region, 12 stations have been established. The names of the sources and the number of sampling stations on each (in parentheses) are shown in the following tabulation.

|                   |                  |
|-------------------|------------------|
| Susan River (1)   | Carson River (2) |
| Lake Tahoe (3)    | Walker River (2) |
| Truckee River (2) | Mojave River (2) |

The sources other than the Mojave River are in Northern California, and are discussed in Part I of this bulletin, published separately.



Lahontan Region (No. 6)

The Lahontan Region (No. 6) extends from the Oregon-California border to the San Bernardino Mountains, between the Sierra Nevada on the west and the California-Nevada state boundary on the east. The region covers an area of about 33,000 square miles, 10,000 square miles of which are valley and mesa lands. The length, north to south, is about 500 miles, and the width varies from less than 20 miles in the north, to over 170 miles across the Mojave Desert and Antelope Valley in the south.

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|                   |                  |
|-------------------|------------------|
| Susan River (1)   | Carson River (2) |
| Lake Tahoe (3)    | Walker River (2) |
| Truckee River (2) | Mojave River (2) |

The sources other than the Mojave River are in Northern California, and are discussed in Part I of this bulletin, published separately.

## Mojave River Basin

The Mojave River Basin lies in the southeastern portion of the Lahontan Region. It occupies about 4,900 square miles comprised of about 1,400 square miles of valley and mesa lands and about 3,500 square miles of mountainous terrain.

The source of the Mojave River is at Lake Arrowhead in the San Bernardino Mountains. The outflow from the lake travels down Deep Creek to the Mojave River at The Forks, which is at the northern base of the mountains. From The Forks, the river flows northerly through the desert, past Victorville, to Barstow. From Barstow the course is generally easterly to Soda Dry Lake, an interior sink. During years of normal precipitation, surface flow ceases below The Forks after the spring runoff and the only surface flow in the lower reaches of the Mojave River appears as rising water (outflow from the upstream ground water basin) near Victorville. The average annual runoff of the Mojave River at The Forks is estimated to be about 80,000 acre-feet.

Most of the water used in the Mojave River Basin comes from wells. However, some surface diversions of the rising water below Victorville is used for irrigation.

Irrigated agriculture is sparsely developed in the Mojave River Basin; it exists primarily along the river where depths to ground water are small. Railroad yards and shops in Barstow and cement mills in Victorville and Oro Grande represent the major industrial activities in the basin. There are military establishments in Nebo, Daggett, and Yermo.

The major waste discharges to the river channel are treated effluents from the sewage treatment plants of the Cities of Barstow (0.8 mgd) and Victorville (0.9 mgd). Industrial waste waters discharged to percolation ponds in the river channel from the railroad shop and yards in Barstow amount to about 0.2 mgd. Minor discharges of domestic wastes to the river from the recreational developments in the headwaters area have little influence on surface water quality.

The monitoring stations maintained for surveillance of surface water quality in the Mojave River are:

| <u>Monitoring Station</u>     | <u>Page Number of<br/>Station Discussion</u> |
|-------------------------------|--|
| Mojave River at The Forks     | 80   |
| Mojave River near Victorville | 82   |

MOJAVE RIVER AT THE FORKS (STA. 67a)

Sampling Point. Station 67a is located in Section 18 of Township 3 North, Range 3 West, San Bernardino Base and Meridian. Samples were collected from the right bank 100 feet downstream from the confluence of Deep Creek and the West Fork of the Mojave River.

Period of Record. July 1957 through December 1959.

Water Quality Characteristics. The surface water at this station is suitable for most beneficial uses, soft to moderately hard, and class 1 for irrigation. It is usually sodium-calcium bicarbonate in character.

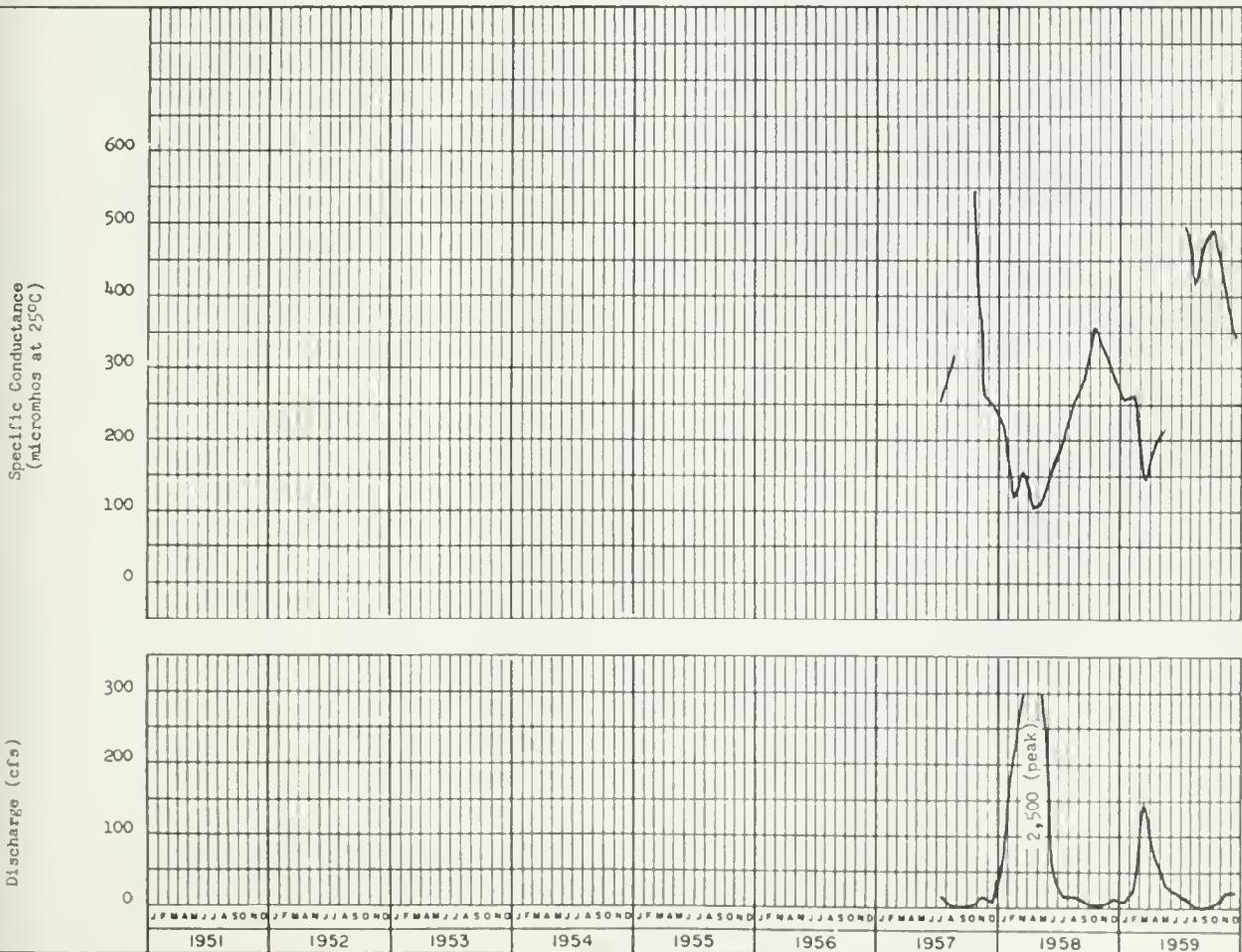
Mineral content varies greatly, and is dependent on quantity of flow.

Significant Water Quality Changes. The quality has changed very little in the past two and one-half years of record. In September 1959, fluorides reached a value of 2.7 ppm, exceeding the mandatory limit of 1.5 ppm in drinking water.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 548               | 104               | 493            | 144            |
| Temperature in °F                                  | 77                | 40                | 76             | 40             |
| Dissolved oxygen in parts per million              | 11.0              | 5.0               | 11.0           | 5.0            |
| Percent saturation                                 | 101               | 59                | 100            | 59             |
| pH   | 8.4               | 7.0               | 8.4            | 7.6            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 31                | 12                | 31             | 13             |
| Magnesium (Mg)                                     | 8                 | 2.1               | 8              | 4              |
| Sodium (Na)  | 56                | 6.6               | 56             | 11             |
| Potassium (K)                                      | 8.8               | 1.0               | 4.3            | 1.0            |
| Carbonate (CO <sub>3</sub> )                       | 0.00              | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 293               | 50                | 293            | 71             |
| Sulfate (SO <sub>4</sub> )                         | 98                | 5.7               | 98             | 5.7            |
| Chloride (Cl)                                      | 34                | 1                 | 34             | 6              |
| Nitrate (NO <sub>3</sub> )                         | 2.7               | 0.00              | 0.5            | 0.00           |
| Fluoride (F)                                       | 3.0               | 0.1               | 2.7            | 0.2            |
| Boron (B)  | 0.21              | 0.00              | 0.21           | 0.00           |
| Silica (SiO <sub>2</sub> )                         | 50                | 15                | 30             | 15             |
| Total dissolved solids in parts per million        | 309               | 90                | 309            | 102            |
| Percent sodium                                     | 58                | 22                | 52             | 33             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 147               | 39                | 147            | 49             |
| Noncarbonate                                       | 4                 | 0                 | 4              | 0.00           |
| Turbidity in parts per million                     | 60                | <5                | <25            | <5             |
| Coliform in most probable number per milliliter    | 62                | 0.45              | 62.0           | 0.45           |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.61              | 0.17              | 0.61           | 0.17           |
| Solid alpha  | 0.36              | 0.00              | 0.36           | 0.35           |
| Dissolved beta                                     | 8.98              | 0.00              | 4.60           | 0.00           |
| Solid beta   | 3.97              | 0.00              | 3.97           | 0.00           |

## WATER QUALITY VARIATIONS



MOJAVE RIVER AT THE FORKS (STA. 670)

MOJAVE RIVER NEAR VICTORVILLE (STA. 67)

Sampling Point. Station 67 is located in Section 29 of Township 6 North, Range 4 West, San Bernardino Base and Meridian. The surface water was sampled from the left bank at the United States Geological Survey gage, three miles northwest of Victorville and 500 feet upstream from the old U. S. Highway 66 bridge across the Lower Narrows.

Period of Record. March 1951 through December 1959.

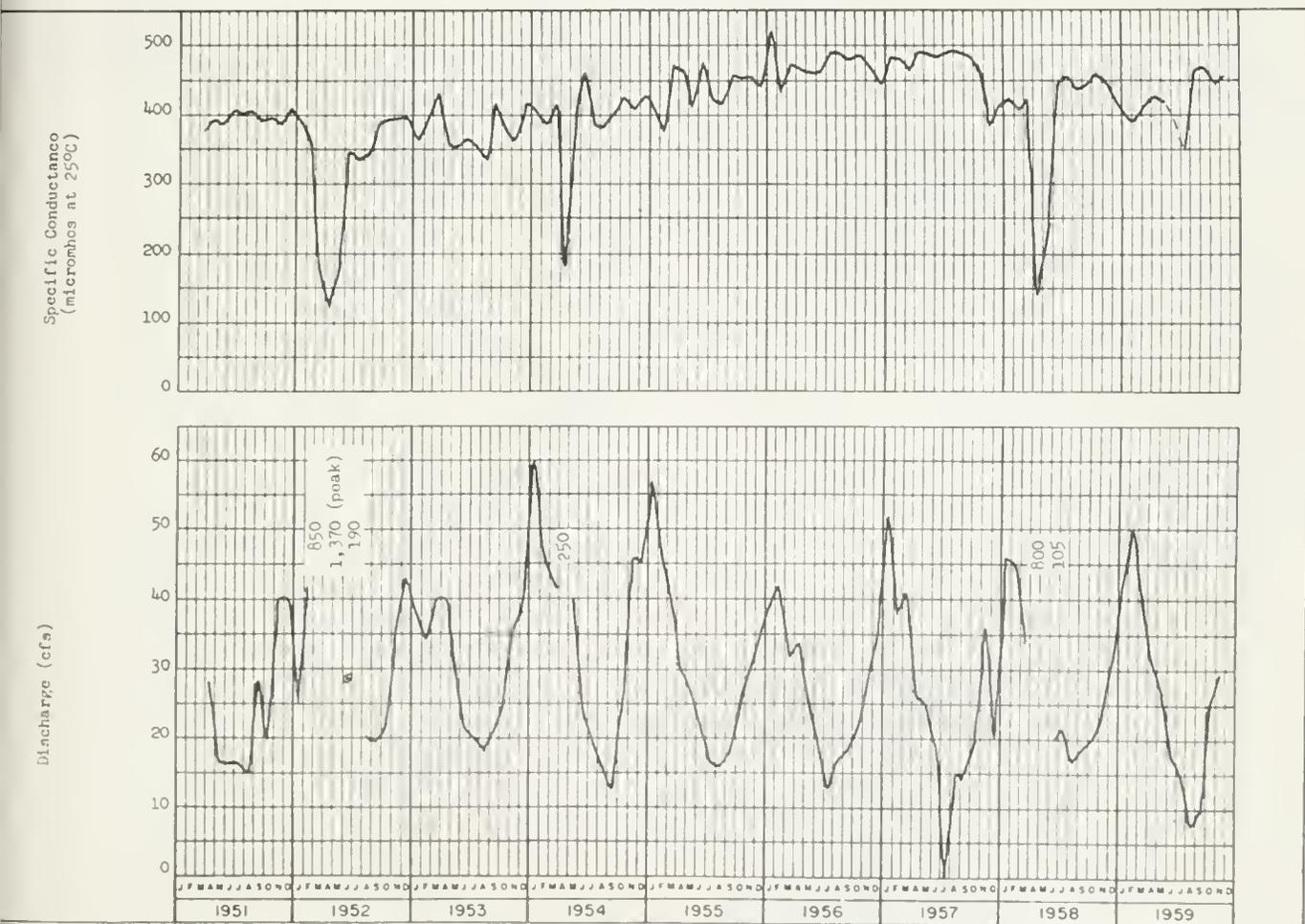
Water Quality Characteristics. The water at Station 67 is calcium-sodium bicarbonate in character, meets drinking water standards for mineral constituents, and is soft to moderately hard. It is class 1 water for irrigation use, and meets mineral quality standards for drinking water.

Significant Water Quality Changes. The uniform gradual increase in mineral content apparent in the first seven years of the period of record was reversed in 1958 as the result of higher than normal precipitation rates in the 1957-1958 rainfall season, and larger volumes of flow. Thunderstorms in the 1958-1959 rainfall season resulted in greater than normal rainfall in the middle and lower reaches of the river, and the improvement in mineral content was maintained through the year.

### WATER QUALITY RANGES

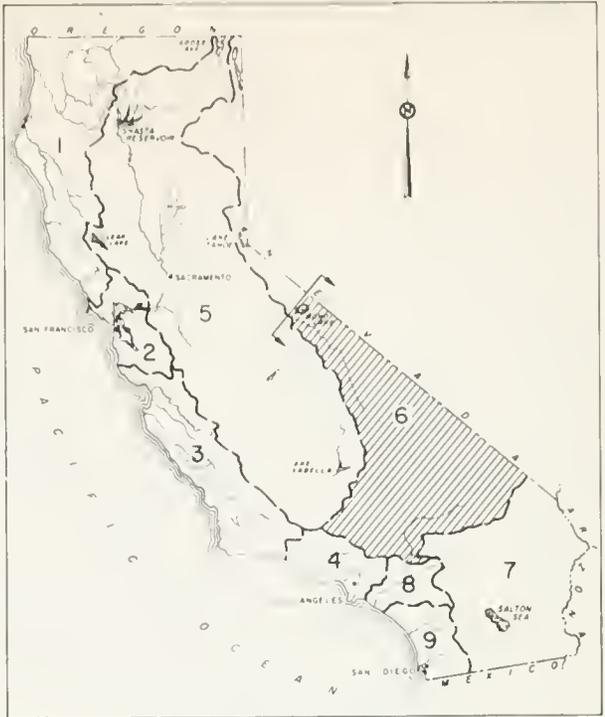
| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 520               | 122               | 468            | 350            |
| Temperature in °F                                  | 91                | 41                | 78             | 41             |
| Dissolved oxygen in parts per million              | 13.5              | 5.4               | 13.5           | 5.4            |
| Percent saturation                                 | 112               | 60                | 112            | 60             |
| pH   | 8.3               | 7.5               | 8.2            | 7.6            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 47                | 15                | 41             | 38             |
| Magnesium (Mg)                                     | 15                | 5                 | 10             | 9              |
| Sodium (Na)  | 45                | 9.1               | 45             | 36             |
| Potassium (K)                                      | 3.2               | 1.2               | 3.2            | 1.8            |
| Carbonate (CO <sub>3</sub> )                       | 12                | 0.00              | 12             | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 193               | 69                | 193            | 124            |
| Sulfate (SO <sub>4</sub> )                         | 52                | 11                | 38             | 33             |
| Chloride (Cl)                                      | 35                | 5                 | 32             | 11             |
| Nitrate (NO <sub>3</sub> )                         | 1.7               | 0.2               | 1.7            | 0.3            |
| Fluoride (F)                                       | 0.6               | 0.1               | 0.6            | 0.3            |
| Boron (B)  | 0.17              | 0.00              | 0.10           | 0.00           |
| Silica (SiO <sub>2</sub> )                         | 50                | 15                | 25             | 20             |
| Total dissolved solids in parts per million        | 311               | 127               | 288            | 261            |
| Percent sodium                                     | 49                | 26                | 49             | 36             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 168               | 43                | 142            | 87             |
| Noncarbonate                                       | 4                 | 0                 | 0              | 0              |
| Turbidity in parts per million                     | 550               | <5                | <25            | <5             |
| Coliform in most probable number per milliliter    | 2,400             | 0.18              | 62             | 0.45           |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 1.03              | 0.00              | 0.30           | 0.18           |
| Solid alpha  | 3.44              | 0.00              | 0.54           | 0.00           |
| Dissolved beta                                     | 12.85             | 0.00              | 12.85          | 6.21           |
| Solid beta   | 3.31              | 0.00              | 3.31           | 1.74           |

### WATER QUALITY VARIATIONS



MOJAVE RIVER NEAR VICTORVILLE (STA. 67)





KEY MAP

Sta  
Num

6  
6

BERNARDINO MERIDIAN

LEGEND

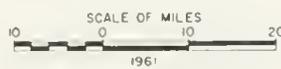
- 67a SURFACE WATER MONITORING STATION
- SEWAGE WASTE DISCHARGE
- ▲ INDUSTRIAL WASTE DISCHARGE

STATE OF CALIFORNIA  
 THE RESOURCES AGENCY OF CALIFORNIA  
 DEPARTMENT OF WATER RESOURCES  
 SOUTHERN DISTRICT  
 SURFACE WATER QUALITY MONITORING  
 PROGRAM

STREAM SAMPLING STATIONS

LAHONTAN REGION (NO 6)

1959



118° 00'

115° 30'

116° 00'

116° 30'

35° 00'

115° 00'



STREAM SAMPLING STATIONS  
LAHONTAN REGION (NO. 6)

| Station Number | Station Name                  |
|----------------|-------------------------------|
| 67             | Mojave River near Victorville |
| 67a            | Mojave River at the Forks     |

- LEGEND
- STS SURFACE WATER MONITORING STATION
  - SEWAGE WASTE DISCHARGE
  - ▲ INDUSTRIAL WASTE DISCHARGE

STATE OF CALIFORNIA  
THE RESOURCE AGENCY OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES  
SOUTHERN DISTRICT  
SURFACE WATER QUALITY MONITORING PROGRAM

STREAM SAMPLING STATIONS  
LAHONTAN REGION (NO. 6)  
1959

SCALE OF MILES  
0 10 20  
1961

## Colorado River Basin Region (No. 7)

The Colorado River Basin Region (No. 7) is located in the southeastern portion of California. It extends from a series of mountain ranges on the north which separate it from the Lahontan Region, approximately 150 miles to the United States-Mexico International Boundary; and from the San Bernardino, San Jacinto and Peninsular Mountain ranges on the west to the California-Arizona State Line on the east, an average distance of about 125 miles. The area of the region is about 19,370 square miles, half of which consists of isolated mountains and mountain ranges, and the remainder of valleys and mesas. The climate is arid and most of the area is desert.

The principal drainage in this region is to the Salton Sea, a saline interior drainage lake. Its principal tributary is the Whitewater River which rises in the San Bernardino Mountains and flows southeasterly through Coachella Valley to the Salton Sea. The New and Alamo Rivers are perennial streams composed primarily of irrigation drainage water and sewage that flow northerly from the Mexican Border to the Salton Sea. Other than these two rivers other drainage to the Salton Sea including the Whitewater River is intermittent.

Another major portion of this region drains to the Colorado River, the boundary between California and Arizona. The principal regulating reservoir on the Colorado River in this region is Lake Havasu, impounded by Parker Dam. Water is also exported from Lake Havasu through the Colorado River Aqueduct to the coastal portion of Southern California (Regions 4, 8, and 9). Colorado River water is also used extensively for irrigation along the river and in Imperial and Coachella Valleys.



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The remainder of the Colorado River Basin Region, about 34 percent of the area, drains to interior dry lakes or sinks and is typically desert, subject to torrential flash floods but without perennial streams.

The economy of the region is predominantly agricultural, and much of the urban development is an adjunct of the agricultural community. Agriculture in the Colorado River Basin Region is primarily dependent on the diversion and distribution of Colorado River water for irrigation. Limited local use of ground water for irrigation is practiced in Coachella, Lucerne, and Borrego Valleys, located in the northern and western parts of the region. A few large desert resort communities are situated in the northern portion of Coachella Valley.

Fourteen stations are employed in the Colorado River Basin Region to monitor surface water quality. The following tabulation shows the names of the sources monitored and, in parentheses, the number of stations maintained on each source:

|                        |                 |
|------------------------|-----------------|
| Colorado River (6)     | New River (2)   |
| All American Canal (1) | Alamo River (2) |
| Whitewater River (2)   | Salton Sea (1)  |

The Colorado River stations are monitored by the Department of Water Resources, Southern District, and sampled twice a year. The remaining surface sources are visited at two-month intervals. One station at Lake Havasu maintained by The Metropolitan Water District of Southern California monitors the quality of water diverted to the Colorado River Aqueduct. The analyses of monthly samples collected at this station are furnished the department for use in the surveillance

program. Additional samples are collected and analyzed by the United States Public Health Service for several other stations on the Colorado River. These analyses are included in this report.

## Colorado River Basin

The Colorado River Basin in California is located in the eastern part of the Colorado River Basin Region. The Colorado River drains portions of seven states, a total drainage area in the United States of about 258,000 square miles. The portion of the Colorado River Basin in California is about 4,300 square miles in extent of which 1,200 square miles are mountains and foothills and 3,100 square miles are valleys and mesas. The Colorado River is the eastern boundary of California for about 400 miles; it flows southerly between Arizona and California into Mexico and to the Gulf of California.

The natural unimpaired average annual runoff of the Colorado River above the Gila River is about 16,000,000 acre-feet. However, since 1935 when Hoover Dam was placed in operation, the river flows have been regulated to supply the needs of downstream water users. Other major reservoirs regulating the river flows are Lake Mojave and Lake Havasu. Water is diverted to the Colorado River Aqueduct at Lake Havasu for export to coastal Southern California, at Palo Verde for irrigation of the Palo Verde Valley, and at Imperial Dam for irrigation of the Imperial and Coachella Valleys.

The City of Needles sewage treatment plant discharge of about 2.5 mgd is the only major waste discharge to the river within California.

The names of the stations maintained for surveillance of the quality of Colorado River water are:

| <u>Monitoring Station</u>                           | <u>Page Number of<br/>Station Discussion</u> |
|---|--|
| Colorado River near Topock,<br>Arizona              | 90   |
| Colorado River at Colorado<br>River Aqueduct Intake | 92   |
| Colorado River below Parker<br>Dam                  | 94   |
| Colorado River near Blythe                          | 96   |
| All American Canal near<br>Pilot Knob               | 98   |
| Colorado River at Yuma,<br>Arizona                  | 100  |
| Colorado River below Morelos<br>Dam, Mexico         | 102  |

COLORADO RIVER NEAR TOPOCK, ARIZONA (STA. 54)

Sampling Point. Station 54 is located in Section 8 of Township 7 North, Range 24 East, San Bernardino Base and Meridian. Samples were collected from the right bank on the California side at the United States Geological Survey gage on the high pressure gas-line bridge farthest downstream from the Highway 66 bridge.

Period of Record. April 1951 through September 1959.

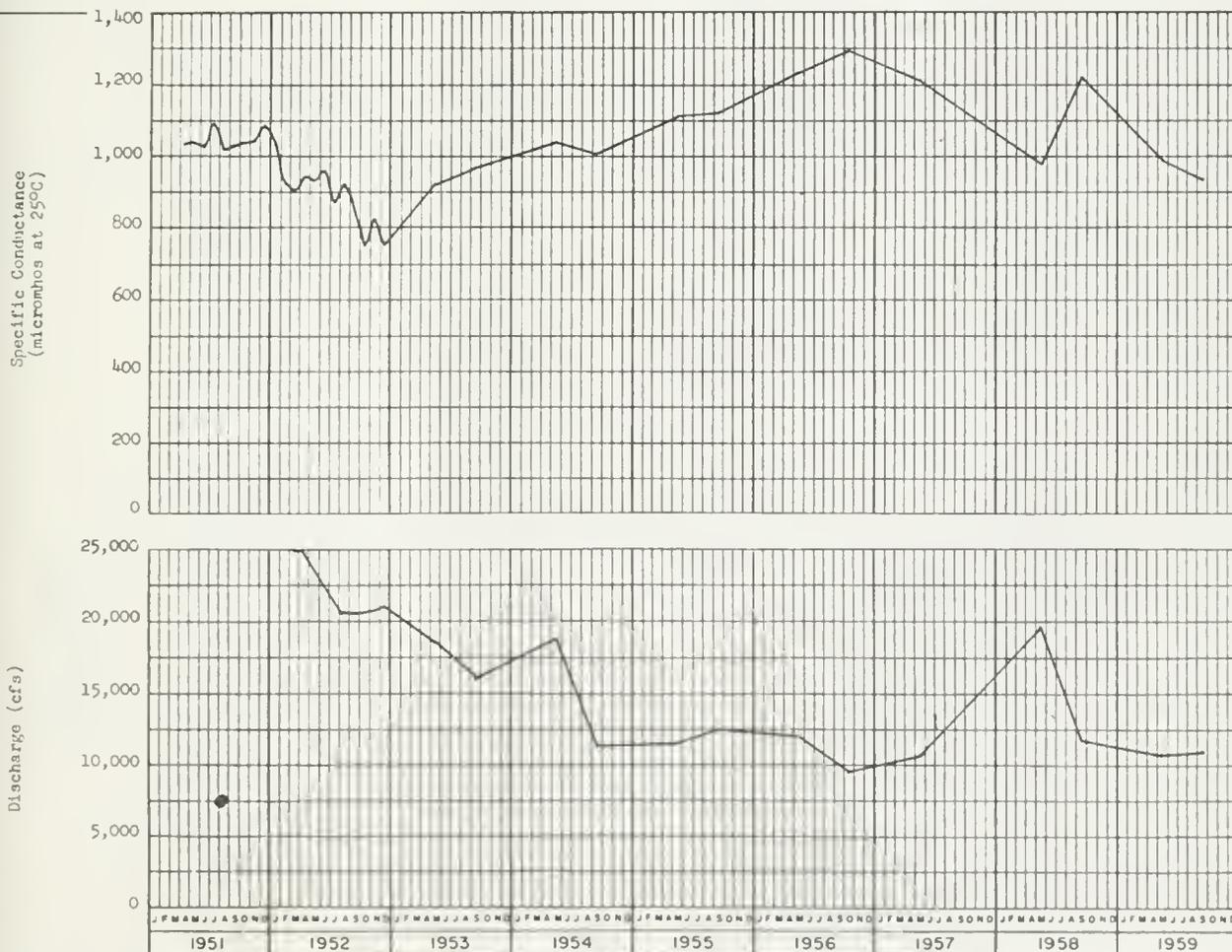
Water Quality Characteristics. The water at this station is sodium-calcium sulfate-bicarbonate in character, class 1 for irrigation, and very hard. The mineral content meets drinking water standards with the exception of sulfate, which slightly exceeds the recommended limit.

Significant Water Quality Changes. None.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,295             | 757               | 991            | 939            |
| Temperature in °F                                  | 76                | 48                | 76             | 70             |
| Dissolved oxygen in parts per million              | 15.5              | 6.8               | 8.0            | 7.8            |
| Percent saturation                                 | 145               | 78                | 95             | 87             |
| pH   | 8.5               | 7.5               | 7.9            | 7.8            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 116               | 71                | 83             | 82             |
| Magnesium (Mg)                                     | 36                | 26                | 29             | 26             |
| Sodium (Na)  | 116               | 68                | 87             | 74             |
| Potassium (K)                                      | 5.2               | 2.9               | 4              | 4.1            |
| Carbonate (CO <sub>3</sub> )                       | 10                | 0                 | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 181               | 145               | 161            | 145            |
| Sulfate (SO <sub>4</sub> )                         | 356               | 246               | 261            | 252            |
| Chloride (Cl)                                      | 107               | 50                | 77             | 75             |
| Nitrate (NO <sub>3</sub> )                         | 4.5               | 0.00              | 2.8            | 1.7            |
| Fluoride (F)                                       | 0.7               | 0.09              | 0.4            | 0.3            |
| Boron (B)  | 0.26              | 0.00              | 0.12           | 0.04           |
| Silica (SiO <sub>2</sub> )                         | 20                | 5                 | 10             | 8              |
| Total dissolved solids in parts per million        | 858               | 588               | 664            | 630            |
| Percent sodium                                     | 40                | 33                | 37             | 34             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 397               | 250               | 323            | 314            |
| Noncarbonate                                       | 258               | 124               | 195            | 191            |
| Turbidity in parts per million                     | 60                | < 5               | < 5            | < 5            |
| Coliform in most probable number per milliliter    | 700,000           | 0.45              | 6.2            | 0.6            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 2.48              | 0                 | 0.72           | 0.08           |
| Solid alpha  | 1.08              | 0                 | 0.18           | 0.00           |
| Dissolved beta                                     | 13.96             | 0                 | 13.96          | 4.75           |
| Solid beta   | 9.25              | 0                 | 1.41           | 1.37           |

## WATER QUALITY VARIATIONS



COLORADO RIVER NEAR TOPOCK (STA. 54)

COLORADO RIVER AT COLORADO RIVER AQUEDUCT INTAKE (STA. 56d)

Sampling Point. Station 56d is located in Section 28 of Township 3 North, Range 27 East, San Bernardino Base and Meridian. Samples were collected from the right bank of Lake Havasu at the intake to the Colorado River Aqueduct, 1.5 miles upstream from Parker Dam.

Period of Record. November 1953 through December 1959.

Water Quality Characteristics. Colorado River water at Station 56d is calcium-sodium sulfate in character and very hard, with moderate concentrations of dissolved solids. Sulfate, with a median of 273 ppm for the 6-year period of record, exceeds the recommended limit for drinking water. The water is class 1 for irrigation use.

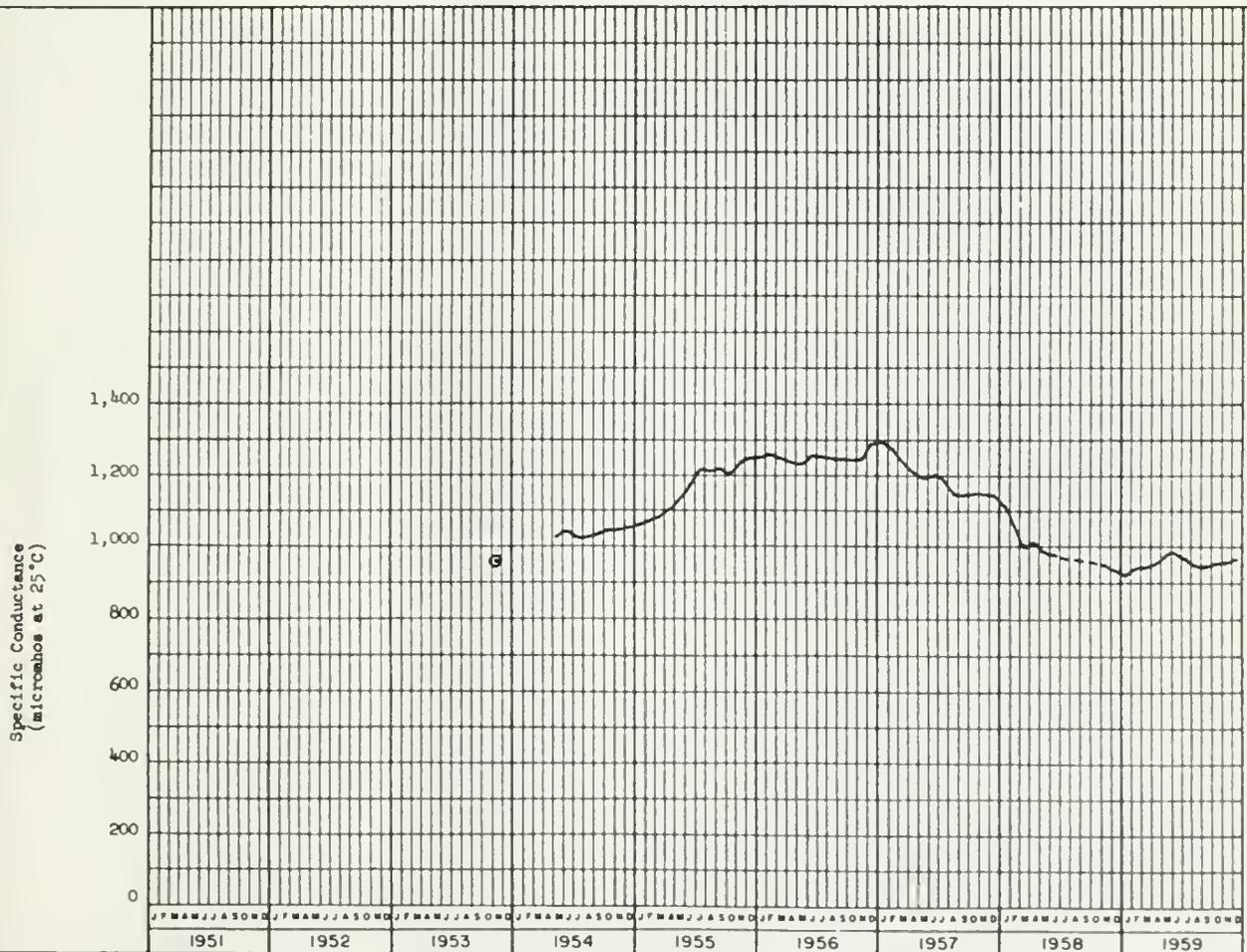
Significant Water Quality Changes. During 1959, the quality of the water was about the same as that in 1958, which showed improvement over that of the previous four years of record. Analysis of the radioactivity of the water indicated the solid beta activity was 472 uuc/l on January 14, 1959.

## WATER QUALITY RANGES

Limits from Metropolitan Water District  
Analyses Only

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,295             | 922               | 990            | 922            |
| Temperature in °F                                  | 87                | 50                | 85             | 52             |
| Dissolved oxygen in parts per million              | --                | --                | --             | --             |
| Percent saturation                                 | --                | --                | --             | --             |
| pH   | 8.5               | 7.2               | 8.5            | 7.4            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 104               | 75                | 85             | 75             |
| Magnesium (Mg)                                     | 36                | 24                | 27             | 24             |
| Sodium (Na)  | 122               | 73                | 90             | 73             |
| Potassium (K)                                      | 6                 | 4                 | 6              | 4              |
| Carbonate (CO <sub>3</sub> )                       | 6                 | 0                 | 5              | 0              |
| Bicarbonata (HCO <sub>3</sub> )                    | 168               | 111               | 148            | 111            |
| Sulfate (SO <sub>4</sub> )                         | 370               | 248               | 273            | 248            |
| Chloride (Cl)                                      | 112               | 64                | 78             | 64             |
| Nitrate (NO <sub>3</sub> )                         | 2.6               | 0.4               | 2.1            | 0.6            |
| Fluoride (F)                                       | 0.4               | 0.3               | 0.4            | 0.3            |
| Boron (B)  | --                | --                | --             | --             |
| Silice (SiO <sub>2</sub> )                         | 15.4              | 8.3               | 11             | 10             |
| Total dissolved solids in parts per million        | 842               | 376               | 639            | 580            |
| Percent sodium                                     | 41                | 34                | 39             | 34             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 402               | 277               | 340            | 268            |
| Noncarbonate                                       | 268               | 185               | 200            | 186            |
| Turbidity in parts per million                     | 25                | 0.2               | 25             | 0.4            |
| Coliforma in most probable number per milliliter   | --                | --                | --             | --             |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 5.9               | 1.9               | 5.4            | 3.0            |
| Solid alpha  | --                | --                | --             | --             |
| Dissolved beta                                     | 136.5             | 4.4               | 21.2           | 13.0           |
| Solid beta   | --                | --                | --             | --             |

## WATER QUALITY VARIATIONS



COLORADO RIVER AT COLORADO RIVER AQUEDUCT  
INTAKE (STA. 56d)

COLORADO RIVER BELOW PARKER DAM (STA. 55)

Sampling Point. Station 55 is located in Section 16 of Township 2 North, Range 27 East, San Bernardino Base and Meridian. Samples were collected from the right bank on the California side at the River Lodge boat dock, which is one mile upstream from the United States Geological Survey gage and three miles downstream from Parker Dam.

Period of Record. April 1951 through 1959.

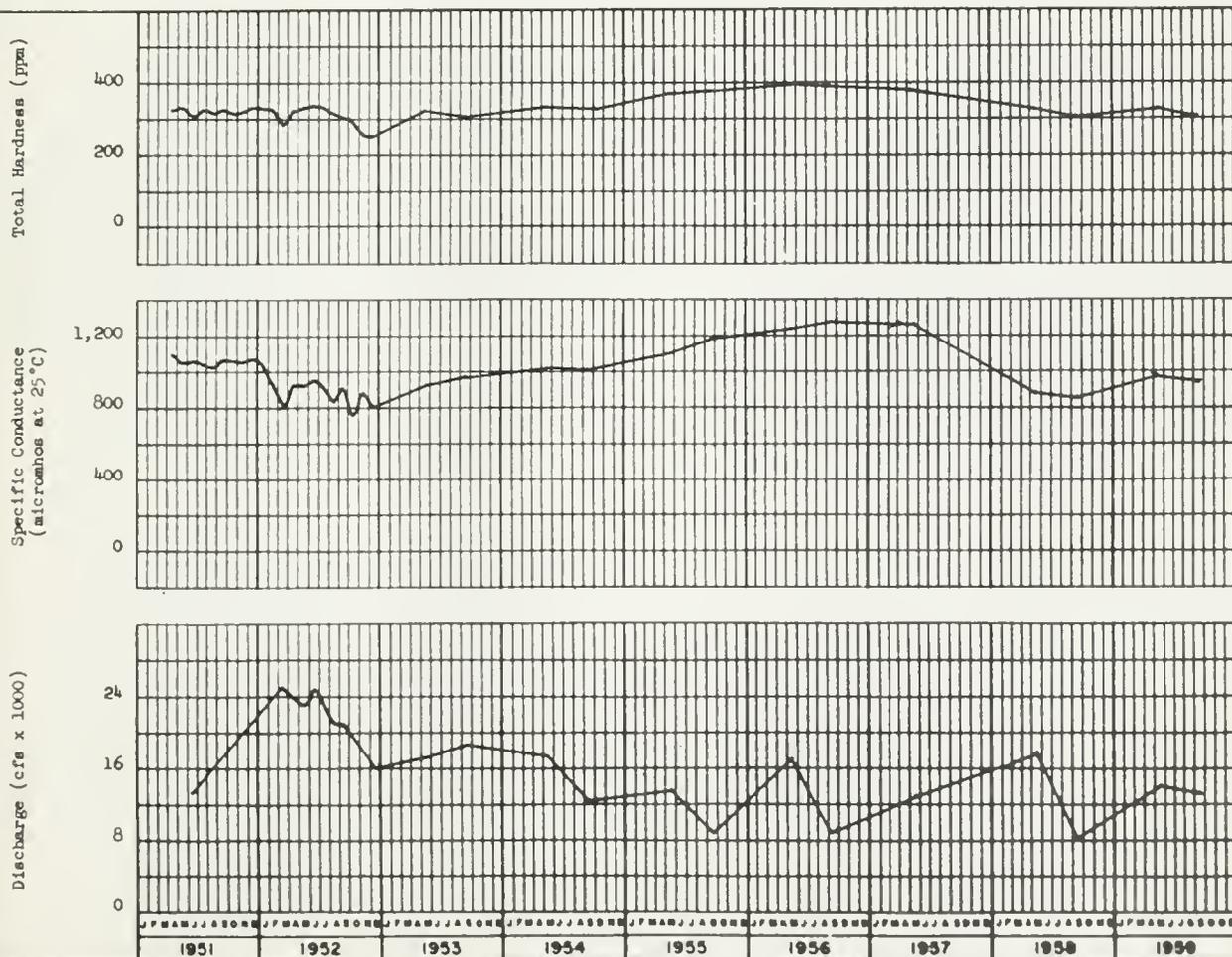
Water Quality Characteristics. Past analyses show this water to be sodium-calcium sulfate-bicarbonate in character and very hard. The water is class 1 for irrigation, and meets drinking water standards for mineral constituents, except that sulfate exceeds the recommended limit.

Significant Water Quality Changes. None.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1957 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,268             | 771               | 983            | 942            |
| Temperature in °F                                  | 81                | 66                | 76             | 69             |
| Dissolved oxygen in parts per million              | 9.7               | 6.0               | 7.2            | 6.2            |
| Percent saturation                                 | 105               | 73                | 77             | 73             |
| pH   | 8.4               | 7.2               | 8.0            | 8.0            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 110               | 75                | 81             | 77             |
| Magnesium (Mg)                                     | 36                | 25                | 30             | 28             |
| Sodium (Na)  | 120               | 72                | 88             | 75             |
| Potassium (K)                                      | 42                | 2.9               | 42             | 4.0            |
| Carbonate (CO <sub>3</sub> )                       | 10                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 183               | 140               | 154            | 140            |
| Sulfate (SO <sub>4</sub> )                         | 360               | 228               | 265            | 258            |
| Chloride (Cl)                                      | 109               | 52                | 76             | 75             |
| Nitrate (NO <sub>3</sub> )                         | 5.0               | 0.00              | 2.5            | 1.2            |
| Fluoride (F)                                       | 0.7               | 0.00              | 0.30           | 0.3            |
| Boron (B)  | 0.30              | 0.05              | 0.12           | 0.05           |
| Silica (SiO <sub>2</sub> )                         | 20                | 5                 | 10             | 9              |
| Total dissolved solids in parts per million        | 850               | 560               | 674            | 630            |
| Percent sodium                                     | 40                | 34                | 37             | 34             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 399               | 256               | 327            | 307            |
| Noncarbonate                                       | 265               | 186               | 201            | 197            |
| Turbidity in parts per million                     | 25                | < 5               | < 5            | < 5            |
| Coliform in most probable number per milliliter    | 77                | 0.045             | 2.3            | 0.2            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 1.29              | 0.00              | 0.72           | 0.36           |
| Solid alpha  | 0.82              | 0.00              | 0.62           | 0.54           |
| Dissolved beta                                     | 12.63             | 0.00              | 2.05           | 0.06           |
| Solid beta   | 7.24              | 0.00              | 7.24           | 0.00           |

### WATER QUALITY VARIATIONS



COLORADO RIVER BELOW PARKER DAM (STA. 55)

COLORADO RIVER NEAR BLYTHE (STA. 56c)

Sampling Point. Station 56c is located in Section 2 of Township 7 South, Range 23 East, San Bernardino Base and Meridian. Samples were collected 0.5 mile downstream from the U. S. 60-70 Highway bridge from the boat dock on the California side.

Period of Record. May 1953 through 1959.

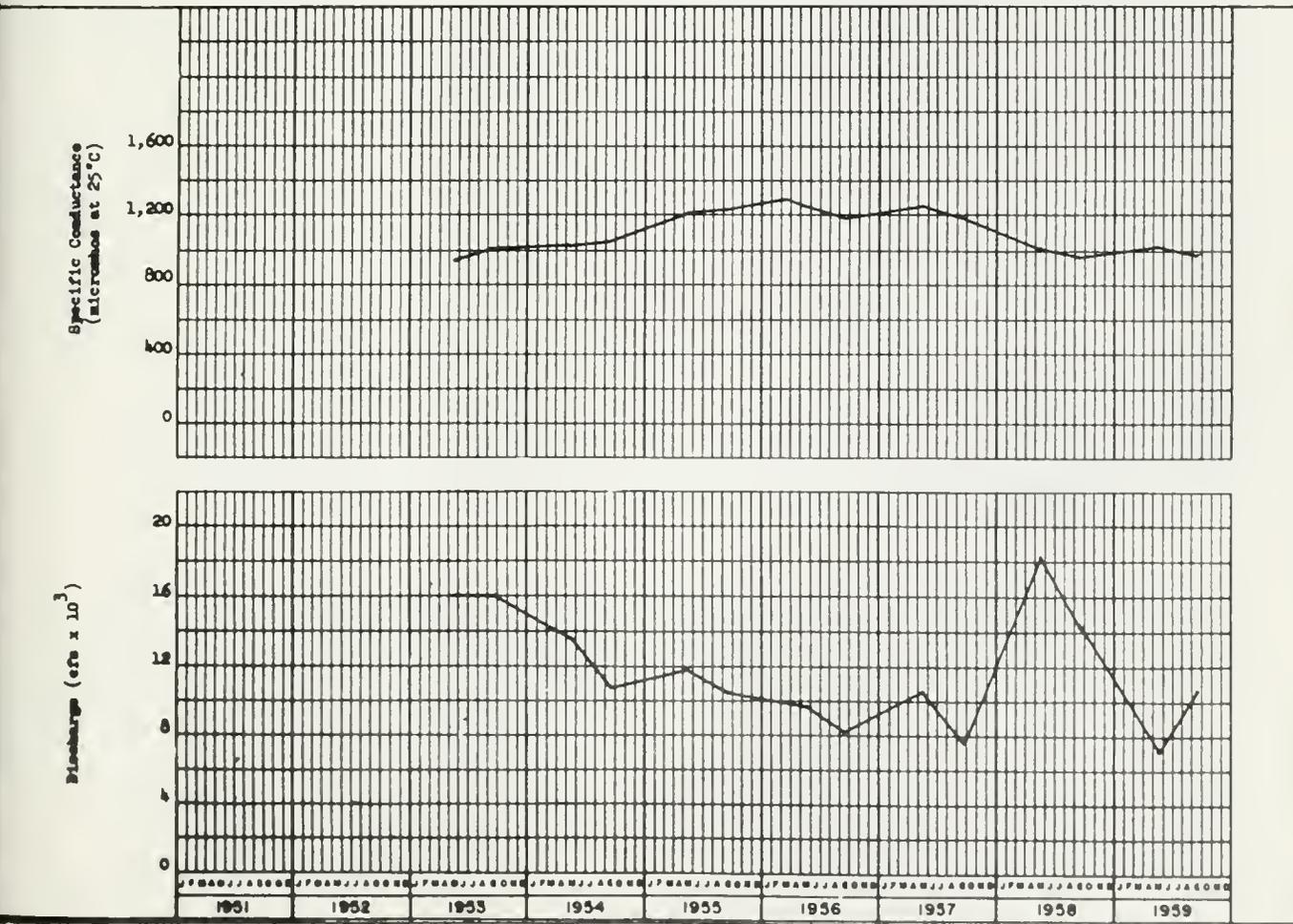
Water Quality Characteristics. The water at this station is sodium-calcium sulfate-bicarbonate in character, very hard, and class 1 for irrigation. The mineral constituents meet drinking water standards except for sulfate, which slightly exceeds the recommended limit of 250 ppm.

Significant Water Quality Changes. The slight improvement in mineral quality which occurred in 1958 was maintained in 1959.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,290             | 946               | 1,019          | 948            |
| Temperature in °F                                  | 82                | 70                | 76             | 73             |
| Dissolved oxygen in parts per million              | 8.6               | 7.0               | 7.6            | 7.2            |
| Percent saturation                                 | 105               | 87                | 87             | 87             |
| pH   | 8.3               | 7.7               | 7.9            | 7.8            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 104               | 78                | 85             | 83             |
| Magnesium (Mg)                                     | 36                | 26                | 29             | 26             |
| Sodium (Na)  | 121               | 81                | 90             | 88             |
| Potassium (K)                                      | 5.6               | 4.0               | 4.4            | 4.3            |
| Carbonate (CO <sub>3</sub> )                       | 14                | 0.0               | 0.0            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                    | 172               | 149               | 159            | 149            |
| Sulfate (SO <sub>4</sub> )                         | 364               | 263               | 273            | 266            |
| Chloride (Cl)                                      | 116               | 71                | 85             | 80             |
| Nitrate (NO <sub>3</sub> )                         | 4.5               | 0.7               | 2.1            | 1.5            |
| Fluoride (F)                                       | 0.8               | 0.3               | 0.5            | 0.3            |
| Boron (B)  | 0.22              | 0.06              | 0.13           | 0.10           |
| Silica (SiO <sub>2</sub> )                         | 20                | 5                 | 20             | 8              |
| Total dissolved solids in parts per million        | 910               | 625               | 690            | 657            |
| Percent sodium                                     | 40                | 34                | 38             | 37             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 398               | 310               | 327            | 319            |
| Noncarbonate                                       | 264               | 161               | 197            | 197            |
| Turbidity in parts per million                     | 25                | < 5               | < 25           | < 5            |
| Coliform in most probable number per milliliter    | 6.2               | 0.45              | 6.2            | 2.3            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.86              | 0.00              | 0.51           | 0.17           |
| Solid alpha  | 0.34              | 0.00              | 0.34           | 0.00           |
| Dissolved beta                                     | 11.08             | 0.00              | 10.71          | 5.26           |
| Solid beta   | 5.32              | 0.00              | 1.88           | 0.00           |

## WATER QUALITY VARIATIONS



COLORADO RIVER NEAR BLYTHE (STA. 56c )

ALL AMERICAN CANAL NEAR PILOT KNOB (STA. 56a)

Sampling Point. Station 56a is located in Section 24 of Township 16 South, Range 21 East, San Bernardino Base and Meridian. Samples were collected from the left bank just upstream from the Highway 80 bridge over the canal, 5 miles west of the Yuma bridge.

Period of Record. May 1953 through 1959.

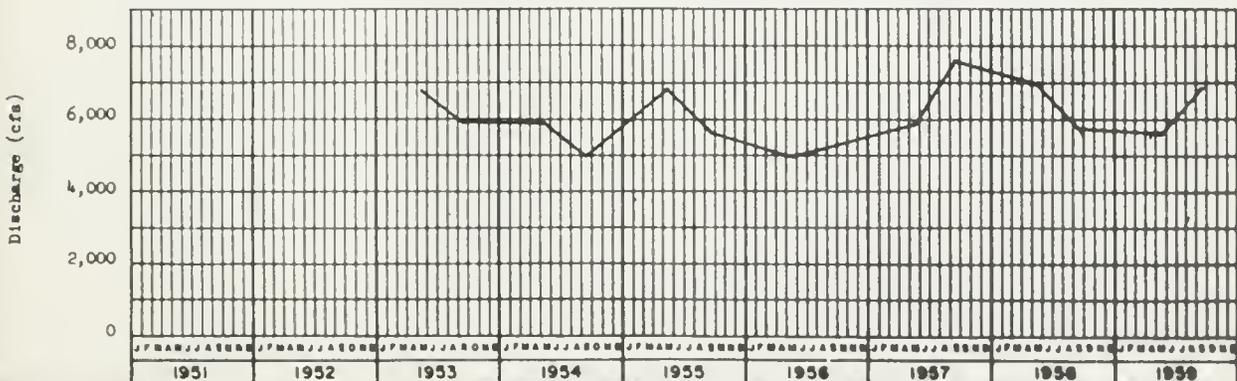
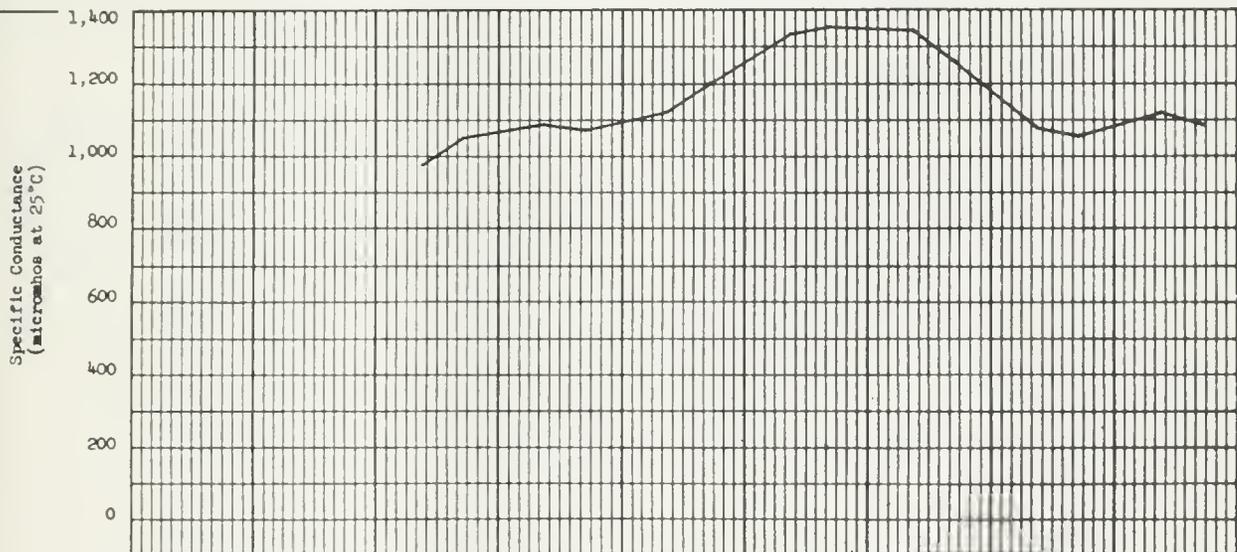
Water Quality Characteristics. The canal water at Station 56a is sodium-calcium sulfate-bicarbonate in character and very hard. Except for moderately high sulfate concentrations, the water meets drinking water standards for mineral constituents. Total dissolved solids and specific conductance values generally place this water in class 2 for irrigation use.

Significant Water Quality Changes. In 1958 the mineral quality of the water improved over that of the previous years of record and the improvement was maintained in 1959.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,353             | 981               | 1,116          | 1,095          |
| Temperature in °F                                  | 84                | 65                | 84             | 65             |
| Dissolved oxygen in parts per million              | 10.0              | 5.5               | 8.2            | 5.5            |
| Percent saturation                                 | 119               | 71                | 86             | 71             |
| pH   | 8.4               | 7.8               | 8.2            | 8.2            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 101               | 82                | 92             | 87             |
| Magnesium (Mg)                                     | 41                | 26                | 28             | 28             |
| Sodium (Na)  | 132               | 93                | 108            | 108            |
| Potassium (K)                                      | 6.2               | 4.0               | 4.6            | 4.3            |
| Carbonate (CO <sub>3</sub> )                       | 10                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 177               | 154               | 171            | 159            |
| Sulfate (SO <sub>4</sub> )                         | 365               | 280               | 292            | 280            |
| Chloride (Cl)                                      | 131               | 81                | 108            | 101            |
| Nitrate (NO <sub>3</sub> )                         | 4.5               | 0.70              | 1.5            | 1.0            |
| Fluoride (F)                                       | 0.7               | 0.4               | 0.5            | 0.5            |
| Boron (B)  | 0.9               | 0.10              | 0.12           | 0.12           |
| Silice (SiO <sub>2</sub> )                         | 20                | 5                 | 20             | 10             |
| Total dissolved solids in parts per million        | 934               | 683               | 785            | 726            |
| Percent sodium                                     | 42                | 36                | 41             | 40             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 405               | 311               | 345            | 332            |
| Noncarbonate                                       | 265               | 180               | 205            | 202            |
| Turbidity in parts per million                     | < 25              | < 5               | < 25           | < 25           |
| Coliform in most probable number per milliliter    | 240               | 0.45              | 23             | 2.3            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.83              | 0.00              | 0.83           | 0.25           |
| Solid alpha  | 1.55              | 0.00              | 0.51           | 0.36           |
| Dissolved beta                                     | 16.72             | 0.00              | 9.58           | 9.29           |
| Solid beta   | 18.36             | 0.00              | 3.66           | 2.02           |

### WATER QUALITY VARIATIONS



ALL AMERICAN CANAL NEAR PILOT KNOB (STA. 56a)

COLORADO RIVER AT YUMA, ARIZONA (STA. 56)

Sampling Point. Station 56 is located in Section 36 of Township 16 South, Range 22 East, San Bernardino Base and Meridian. Samples were collected from the left bank, Arizona side, at the old Highway 80 bridge, 0.4 mile north of the United States Geological Survey gage.

Period of Record. April 1951 through 1959.

Water Quality Characteristics. Water at this station is sodium-calcium sulfate-bicarbonate in character and very hard. Total dissolved solids usually place this water in class 2 for irrigation. Mineral constituents meet drinking water standards except for sulfate, which has exceeded the recommended limit of 250 ppm throughout the nine year period of record.

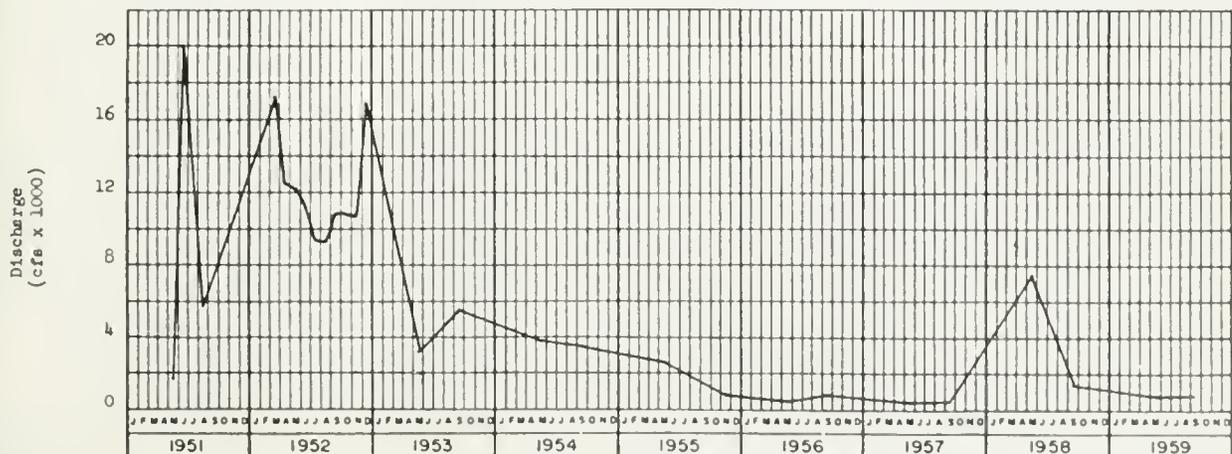
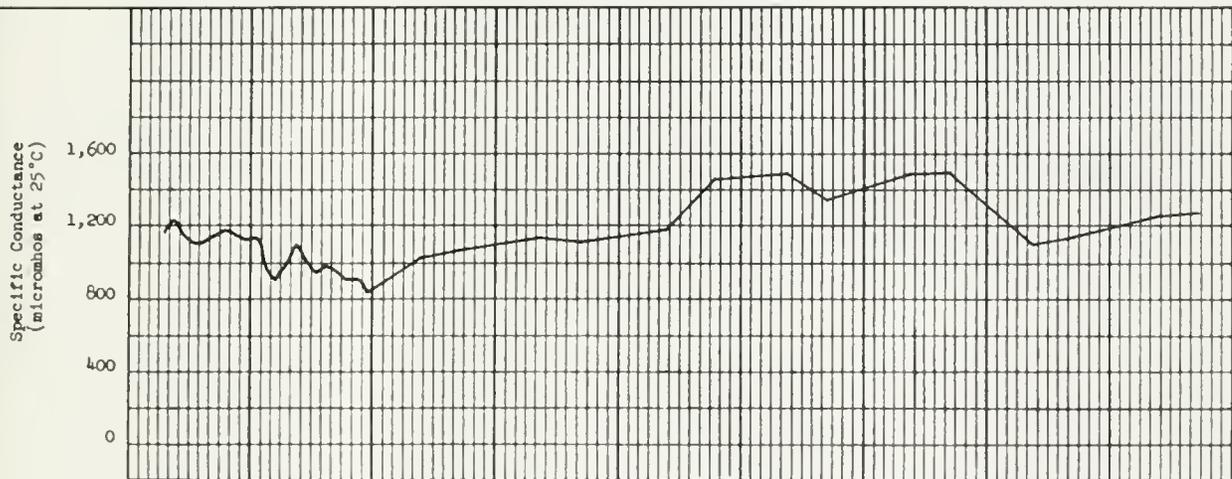
Significant Water Quality Changes. None.

## WATER QUALITY RANGES

Limits from DWR Analyses only

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,582             | 833               | 1,247          | 1,199          |
| Temperature in °F                                  | 91                | 52                | 86             | 52             |
| Dissolved oxygen in parts per million              | 8.8               | 6.0               | 8.0            | 6.0            |
| Percent saturation                                 | 106               | 71                | 89             | 79             |
| pH   | 9.2               | 7.0               | 9.2            | 7.0            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 111               | 76                | 97             | 90             |
| Magnesium (Mg)                                     | 45                | 28                | 32             | 31             |
| Sodium (Na)  | 168               | 92                | 127            | 120            |
| Potassium (K)                                      | 6.4               | 3.3               | 4.8            | 4.6            |
| Carbonate (CO <sub>3</sub> )                       | 10                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 220               | 137               | 190            | 171            |
| Sulfate (SO <sub>4</sub> )                         | 381               | 252               | 309            | 299            |
| Chloride (Cl)                                      | 176               | 58                | 160            | 92             |
| Nitrate (NO <sub>3</sub> )                         | 3.5               | 0.00              | 1.5            | 0.5            |
| Fluoride (F)                                       | 0.80              | 0.1               | 0.5            | 0.4            |
| Boron (B)  | 0.56              | 0.02              | 0.16           | 0.14           |
| Silica (SiO <sub>2</sub> )                         | 20                | 0.00              | 10             | 10             |
| Total dissolved solids in parts per million        | 1,050             | 642               | 870            | 802            |
| Percent sodium                                     | 47                | 39                | 42             | 42             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 462               | 264               | 394            | 284            |
| Noncarbonate                                       | 279               | 189               | 218            | 212            |
| Turbidity in parts per million                     | 45                | < 5               | 45             | 18             |
| Coliform in most probable number per milliliter    | 70,000            | 0.1               | 75             | 0.4            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.97              | 0.00              | 0.44           | 0.41           |
| Solid alpha  | 2.24              | 0.00              | 0.45           | 0.44           |
| Dissolved beta                                     | 10.80             | 0.00              | 7.63           | 2.67           |
| Solid beta   | 17.68             | 0.00              | 1.35           | 0.00           |

## WATER QUALITY VARIATIONS



COLORADO RIVER AT YUMA (STA. 56)

COLORADO RIVER BELOW MORELOS DAM (STA. 56b)

Sampling Point. Station 56b is located in Section 28 of Township 8 South, Range 24 West, Gila and Salt River Base and Meridian. Samples were taken from the left bank, Arizona side, 0.25 mile downstream from Morelos Dam. The dam is approximately 1 mile downstream from the California-Mexico-Arizona boundary junction.

Period of Record. May 1953 through 1959.

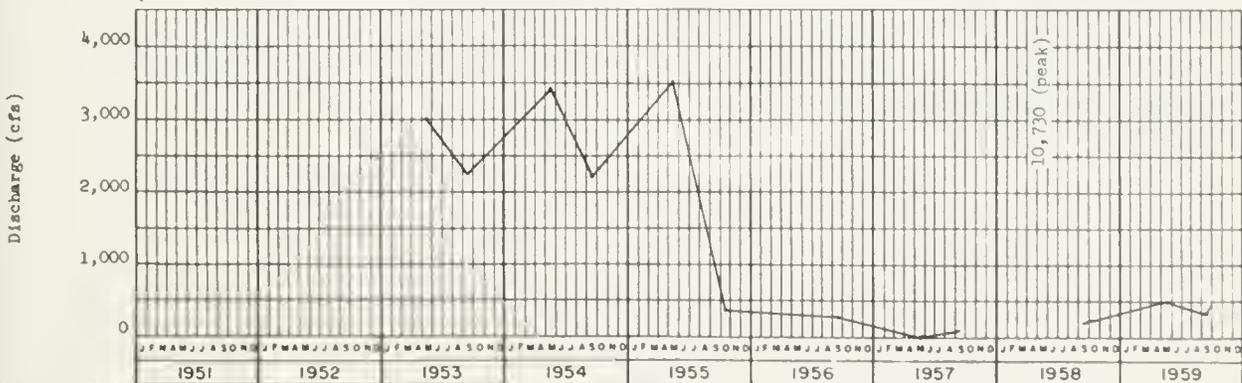
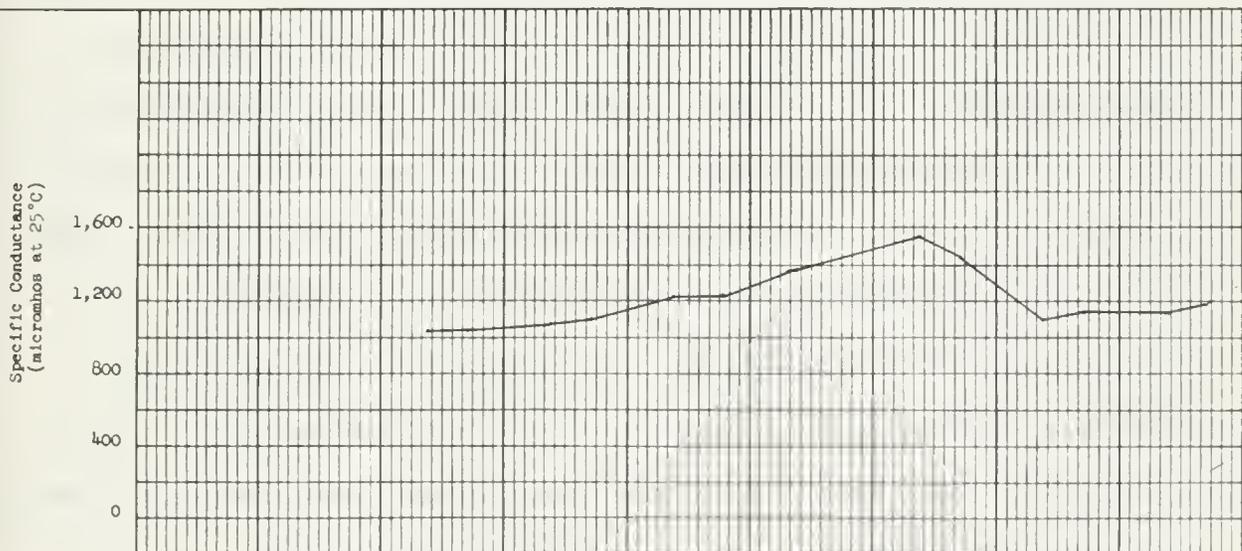
Water Quality Characteristics. The mineral content of the surface water at this station is significantly higher than in the upper reaches of the river. Specific conductance values have continually exceeded 1,000 micromhos in the six year period of record, placing this water in class 2 for irrigation use. Sulfate content exceeds the standard for drinking water. The water is usually sodium-calcium sulfate-bicarbonate in character and very hard.

Significant Water Quality Changes. Improvement in mineral quality exhibited in analysis data for 1958 was maintained in 1959.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,557             | 1,041             | 1,193          | 1,146          |
| Temperature in °F                                  | 86                | 58                | 86             | 72             |
| Dissolved oxygen in parts per million              | 8.8               | 4.0               | 5.2            | 4.0            |
| Percent saturation                                 | 104               | 52                | 59             | 52             |
| pH   | 8.4               | 7.6               | 8.3            | 8.1            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 124               | 79                | 97             | 90             |
| Magnesium (Mg)                                     | 43                | 28                | 33             | 31             |
| Sodium (Na)  | 150               | 94                | 117            | 106            |
| Potassium (K)                                      | 6.2               | 4.0               | 4.8            | 4.0            |
| Carbonate (CO <sub>3</sub> )                       | 12                | 0.0               | 0.0            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                    | 326               | 142               | 203            | 176            |
| Sulfate (SO <sub>4</sub> )                         | 404               | 286               | 300            | 286            |
| Chloride (Cl)                                      | 154               | 88                | 118            | 99             |
| Nitrate (NO <sub>3</sub> )                         | 4.0               | 0.25              | 1.0            | 0.5            |
| Fluoride (F)                                       | 0.7               | 0.4               | 0.5            | 0.5            |
| Boron (B)  | 0.26              | 0.10              | 0.14           | 0.12           |
| Silica (SiO <sub>2</sub> )                         | 20                | 10                | 10             | 10             |
| Total dissolved solids in parts per million        | 1,090             | 707               | 800            | 787            |
| Percent sodium                                     | 43                | 36                | 41             | 38             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 486               | 325               | 370            | 360            |
| Noncarbonate                                       | 300               | 188               | 216            | 204            |
| Turbidity in parts per million                     | 35                | < 5               | 35             | < 25           |
| Coliform in most probable number per milliliter    | 700               | 223               | 700            | 240            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.90              | 0.00              | 0.83           | 0.26           |
| Solid alpha  | 0.91              | 0.00              | 0.57           | 0.37           |
| Dissolved beta                                     | 26.22             | 0.00              | 12.91          | 7.75           |
| Solid beta   | 17.30             | 0.00              | 2.79           | 0.00           |

## WATER QUALITY VARIATIONS



COLORADO RIVER BELOW MORELOS DAM (STA. 56b)

## Alamo River Basin

The Alamo River, together with the New River, serve as drainage channels for the Imperial Valley in the southern portion of the Colorado River Basin Region. Their combined drainage area in California is about 1,695 square miles, of which only about 10 square miles are mountains or hills.

The Alamo River originates in Mexico and flows northward to the Salton Sea, draining the east side of the Imperial Valley. The valley's climate is arid, and the natural runoff to the Alamo River is virtually nonexistent. The surface flow in the Alamo River consists almost entirely of waste water, primarily irrigation return water. The average annual discharge of the Alamo River to Salton Sea is about 700,000 acre-feet.

The extensive agricultural economy of the Imperial Valley depends upon irrigation with Colorado River water conveyed to the valley by the All American Canal. The irrigation return water, and occasionally waste water from the All American Canal, as well as the waste waters of a number of communities in California constitute the flow of the Alamo River. Major domestic and food processing waste discharges to the Alamo River are treated sewage wastes from the City of El Centro (2.0 mgd) and the City of Holtville (0.9 mgd), raw sewage from the City of Calipatria (0.25 mgd), and industrial waste water from a beet sugar refinery near Brawley (2.0 mgd). Sewage and irrigation waste waters reach the stream in Mexico.

The two stations maintained for surveillance of surface water quality on the Alamo River are:

| <u>Monitoring Station</u>                | <u>Page Number of<br/>Station Discussion</u> |
|--|--|
| Alamo River<br>at International Boundary | 106  |
| Alamo River<br>near Calipatria           | 108  |

ALAMO RIVER AT INTERNATIONAL BOUNDARY (STA. 59)

Sampling Point. Station 59 is located in Section 18 of Township 17 South, Range 16 East, San Bernardino Base and Meridian. Samples were collected between the All American Canal and the International Boundary, upstream from canal seepage pipes (Imperial Irrigation District Station AR-1).

Period of Record. February 1951 through 1959.

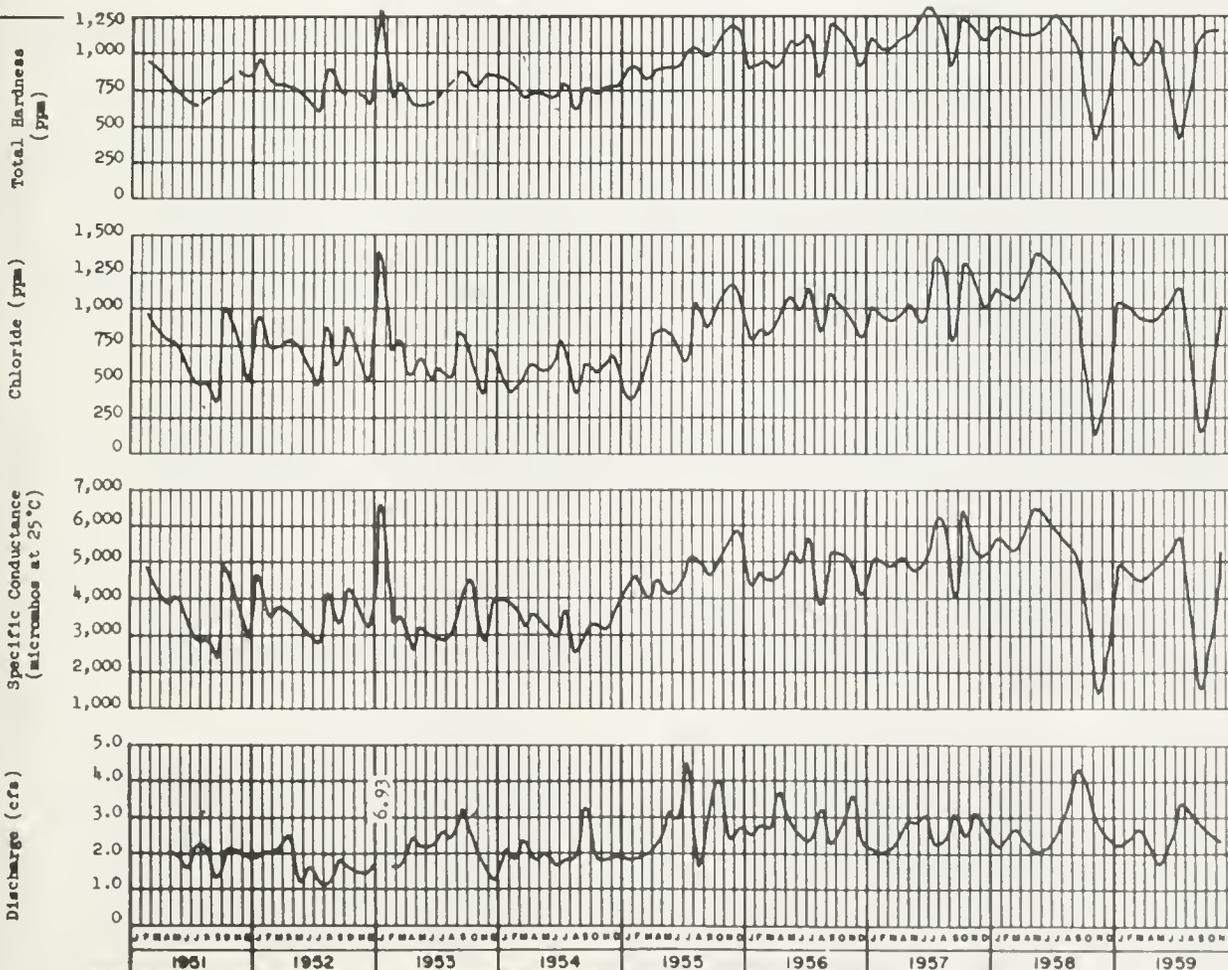
Water Quality Characteristics. The water at this station is sodium sulfate-chloride in character and extremely hard. It is unsuitable for domestic use and class 3 for irrigation.

Significant Water Quality Changes. None.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 6,666             | 1,314             | 5,700          | 1,314          |
| Temperature in °F  | 83                | 44                | 83             | 53             |
| Dissolved oxygen in parts per million                    | 16.0              | 0                 | 16.0           | 2.8            |
| Percent saturation                                       | 174               | 0                 | 174            | 36             |
| pH   | 8.4               | 7.3               | 8.0            | 7.7            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 307               | 94                | 266            | 95             |
| Magnesium (Mg)   | 168               | 35                | 129            | 35             |
| Sodium (Na)  | 960               | 140               | 836            | 140            |
| Potassium (K)  | 14                | 4.6               | 12             | 4.8            |
| Carbonate (CO <sub>3</sub> )                             | 24                | 0.0               | 0.0            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                          | 486               | 110               | 381            | 234            |
| Sulfate (SO <sub>4</sub> )                               | 1,288             | 340               | 1,073          | 340            |
| Chloride (Cl)  | 1,400             | 108               | 1,120          | 108            |
| Nitrate (NO <sub>3</sub> )                               | 18.6              | 0.0               | 8.5            | 0.0            |
| Fluoride (F)   | 1.2               | 0.6               | 0.8            | 0.8            |
| Boron (B)  | 2.32              | 0.20              | 2.06           | 0.20           |
| Silica (SiO <sub>2</sub> )                               | 25                | 10                | 15             | 10             |
| Total dissolved solids in parts per million              | 4,679             | 672               | 3,540          | 894            |
| Percent sodium   | 65                | 44                | 62             | 44             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 1,457             | 381               | 1,155          | 381            |
| Noncarbonate   | 1,137             | 63                | 923            | 189            |
| Turbidity in parts per million                           | 160               | < 5               | 30             | < 5            |
| Coliform in most probable number per milliliter          | 70,000            | 0.95              | 700            | 2.8            |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Dissolved alpha  | 0.83              | 0.00              | 0.83           | 0.00           |
| Solid alpha  | 1.57              | 0.00              | 0.36           | 0.16           |
| Dissolved beta   | 13.00             | 0.00              | 10.48          | 1.42           |
| Solid beta   | 11.15             | 0.00              | 6.23           | 0.17           |

### WATER QUALITY VARIATIONS



ALAMO RIVER AT INTERNATIONAL BOUNDARY  
(STA. 59)

ALAMO RIVER NEAR CALIPATRIA (STA. 60)

Sampling Point. Station 60 is located in Section 22 of Township 11 South, Range 13 East, San Bernardino Base and Meridian. Samples were collected from the left bank 6.2 miles north of the Westmorland-Calipatria Highway, 0.4 mile downstream from the lateral 3-road bridge (Imperial Irrigation District Gaging Station AR-17).

Period of Record. March 1951 through 1959.

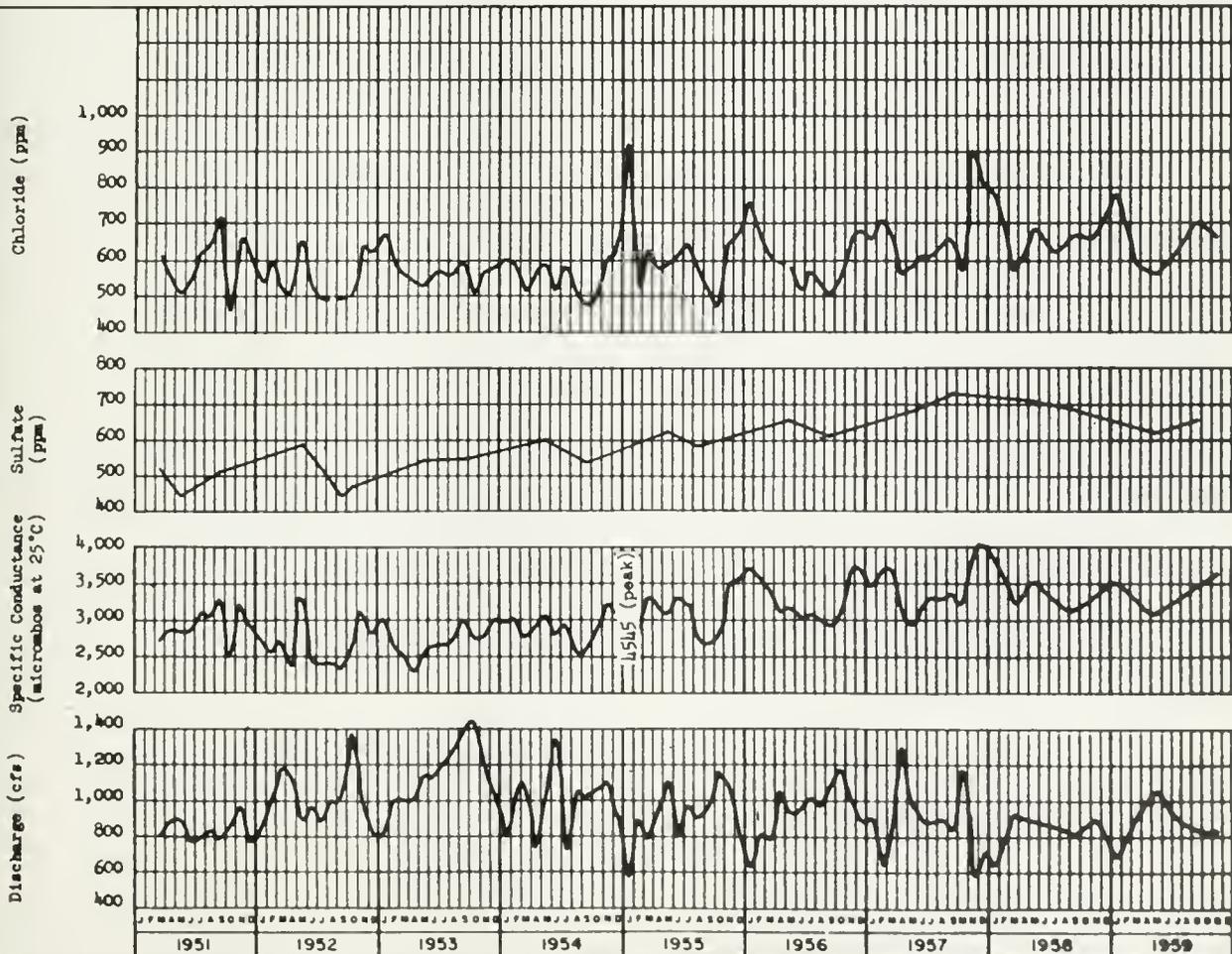
Water Quality Characteristics. The water at Station 60 is slightly better in mineral quality than that at Station 59 upstream. Dilution by irrigation return water from the surrounding area is apparently the cause. The water is sodium chloride-sulfate in character and unsuitable for domestic or agricultural use.

Significant Water Quality Changes. In 1959 the mineral content decreased slightly over that of the previous three years. The City of El Centro discharged raw sewage into the Alamo River until late 1958, and since that time has discharged treated effluent from its sewage treatment plant to the stream. The City of Holtville also discharged treated sewage effluent into the Alamo River in 1959.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 4,545             | 2,230             | 3,624          | 3,096          |
| Temperature in °F                                  | 87                | 48                | 85             | 57             |
| Dissolved oxygen in parts per million              | 14.2              | 5.0               | 10.5           | 5.0            |
| Percent saturation                                 | 131               | 59                | 95             | 65             |
| pH   | 8.4               | 7.1               | 8.2            | 7.7            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 207               | 127               | 179            | 172            |
| Magnesium (Mg)                                     | 99                | 55                | 89             | 81             |
| Sodium (Na)  | 475               | 296               | 475            | 380            |
| Potassium (K)                                      | 15.6              | 7.5               | 11             | 10             |
| Carbonate (CO <sub>3</sub> )                       | 18.0              | 0.0               | 0              | 0              |
| Bicarbonate (HCO <sub>3</sub> )                    | 366               | 118               | 366            | 195            |
| Sulfate (SO <sub>4</sub> )                         | 735               | 452               | 666            | 637            |
| Chloride (Cl)                                      | 935               | 1,165             | 790            | 565            |
| Nitrate (NO <sub>3</sub> )                         | 19.2              | 0.6               | 13             | 12             |
| Fluoride (F)                                       | 1.2               | 0.00              | 0.8            | 0.8            |
| Boron (B)  | 1.0               | 0.23              | 0.59           | 0.28           |
| Silica (SiO <sub>2</sub> )                         | 38                | 10                | 20             | 10             |
| Total dissolved solids in parts per million        | 2,707             | 1,460             | 2,303          | 2,135          |
| Percent sodium                                     | 59                | 15                | 56             | 52             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 1,042             | 548               | 900            | 757            |
| Noncarbonate                                       | 765               | 405               | 729            | 589            |
| Turbidity in parts per million                     | 600               | < 5               | 600            | 180            |
| Coliform in most probable number per milliliter    | 70,000            | 23                | 5,000          | 60             |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 1.92              | 0.00              | 0.20           | 0.00           |
| Solid alpha  | 1.92              | 0.00              | 0.27           | 0.00           |
| Dissolved beta                                     | 19.81             | 0.00              | 5.07           | 2.36           |
| Solid beta   | 14.75             | 0.00              | 1.97           | 0.81           |

## WATER QUALITY VARIATIONS



ALAMO RIVER NEAR CALIPATRIA (STA. 60)

## New River Basin

The New River, together with the Alamo River, serve as drainage channels for the Imperial Valley in the southern portion of the Colorado River Basin Region. Their combined drainage area in California is about 1,695 square miles, of which only about 10 square miles are mountains or hills.

The New River originates in Mexico and flows northward to the Salton Sea, draining the west side of the Imperial Valley. It was first eroded into a river channel in 1904 and 1905 when the Colorado River broke through the bank of an irrigation canal, flowing to the previously dry Salton Sink. The valley's climate is arid and the natural runoff to the New River is virtually nonexistent. The surface flow consists almost entirely of waste water, primarily irrigation return water. The average annual discharge of the New River to the Salton Sea is about 560,000 acre-feet.

The extensive agricultural economy of the Imperial Valley depends on irrigation with Colorado River water conveyed to the valley by the All American Canal. Irrigation return water, and occasionally waste waters from the All American Canal, as well as waste waters of a number of communities in California and Mexico constitute the flow of the New River. Major sewage discharges including food processing wastes are untreated wastes from the City of Brawley (1.0 mgd) and the City of Calexico (0.4 mgd) in California, and from the City of Mexicali in Mexico.

The two stations maintained for surveillance of surface water quality on the New River are:

| <u>Monitoring Station</u>              | <u>Page Number of<br/>Station Discussion</u> |
|--|--|
| New River at International<br>Boundary | 112  |
| New River near Westmorland             | 114  |

NEW RIVER AT INTERNATIONAL BOUNDARY (STA. 57)

Sampling Point. Station 57 is located in Section 14 of Township 17 South, Range 14 East, San Bernardino Base and Meridian. The water was sampled from the right bank, 150 yards north of the International Boundary (Imperial Irrigation District Station NR-1).

Period of Record. April 1951 through 1959.

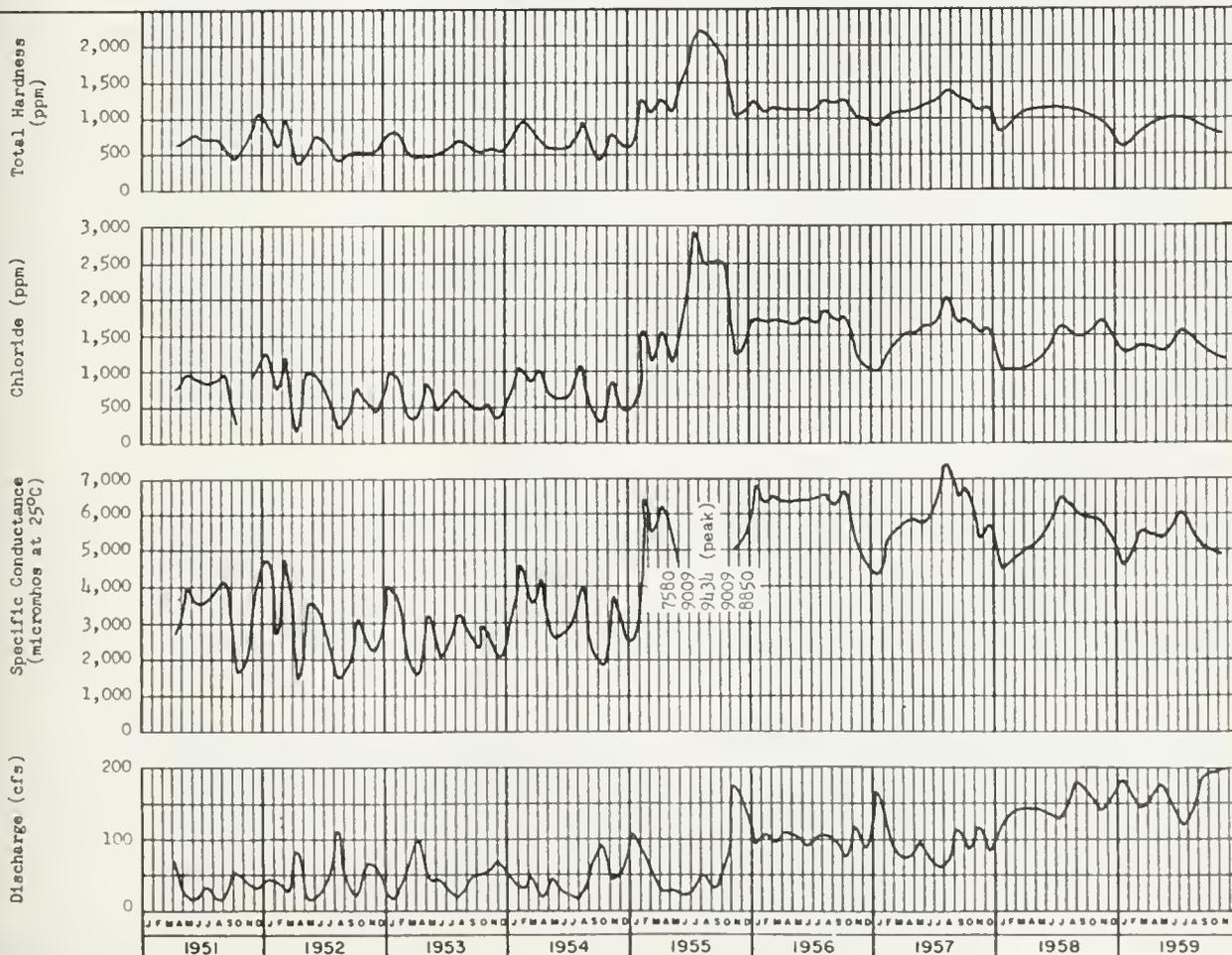
Water Quality Characteristics. The water at this station is sodium chloride in character and extremely hard. It is unsuitable for domestic uses and class 3 for irrigation use.

Significant Water Quality Changes. During 1959 total dissolved solids decreased slightly from 1958 values. Bacterial counts were high, with a median of 62,000 MPN/ml.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 9,434             | 1,310             | 6,100          | 4,651          |
| Temperature in °F  | 99                | 43                | 86             | 56             |
| Dissolved oxygen in parts per million                    | 12.5              | 0.0               | 12.5           | 2.4            |
| Percent saturation                                       | 145               | 0.0               | 145            | 32             |
| pH   | 8.6               | 6.8               | 8.2            | 7.9            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 438               | 123               | 200            | 212            |
| Magnesium (Mg)   | 224               | 60                | 101            | 100            |
| Sodium (Na)  | 1,350             | 220               | 867            | 749            |
| Potassium (K)  | 38                | 1.5               | 38             | 30             |
| Carbonate (CO <sub>3</sub> )                             | 24                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                          | 744               | 154               | 276            | 232            |
| Sulfate (SO <sub>4</sub> )                               | 1,138             | 240               | 633            | 574            |
| Chloride (Cl)  | 2,815             | 181               | 1,580          | 1,210          |
| Nitrate (NO <sub>3</sub> )                               | 24                | 0.0               | 5.0            | 3.5            |
| Fluoride (F)   | 1.10              | 0.00              | 0.80           | 0.60           |
| Boron (B)  | 2.80              | 0.12              | 1.40           | 0.84           |
| Silice (SiO <sub>2</sub> )                               | 20                | 10                | 20             | 15             |
| Total dissolved solids in parts per million              | 6,689             | 1,620             | 3,420          | 3,203          |
| Percent sodium   | 74                | 49                | 74             | 63             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 2,299             | 396               | 1,000          | 607            |
| Noncarbonate   | 2,143             | 216               | 810            | 403            |
| Turbidity in parts per million                           | 200               | < 5               | 200            | 10             |
| Coliform in most probable number per milliliter          | 7,000,000         | 450               | 700,000        | 13,000         |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Dissolved alpha  | 0.24              | 0.00              | 0.08           | 0.00           |
| Solid alpha  | 1.24              | 0.00              | 0.45           | 0.17           |
| Dissolved beta   | 13.72             | 0.00              | 7.66           | 5.53           |
| Solid beta   | 15.96             | 0.00              | 1.66           | 0.00           |

## WATER QUALITY VARIATIONS



NEW RIVER AT INTERNATIONAL BOUNDARY  
(STA. 57)

NEW RIVER NEAR WESTMORLAND (STA. 58)

Sampling Point. Station 58 is located in Section 30 of Township 12 South, Range 13 East, San Bernardino Base and Meridian. Samples were collected from the right bank, 50 feet south of Vail Canal crossing which is 3 miles west of the Calipatria-Westmorland Highway and 0.6 mile downstream from No. 10 Road bridge (Imperial Irrigation District Station NR-17).

Period of Record. February 1951 through 1959.

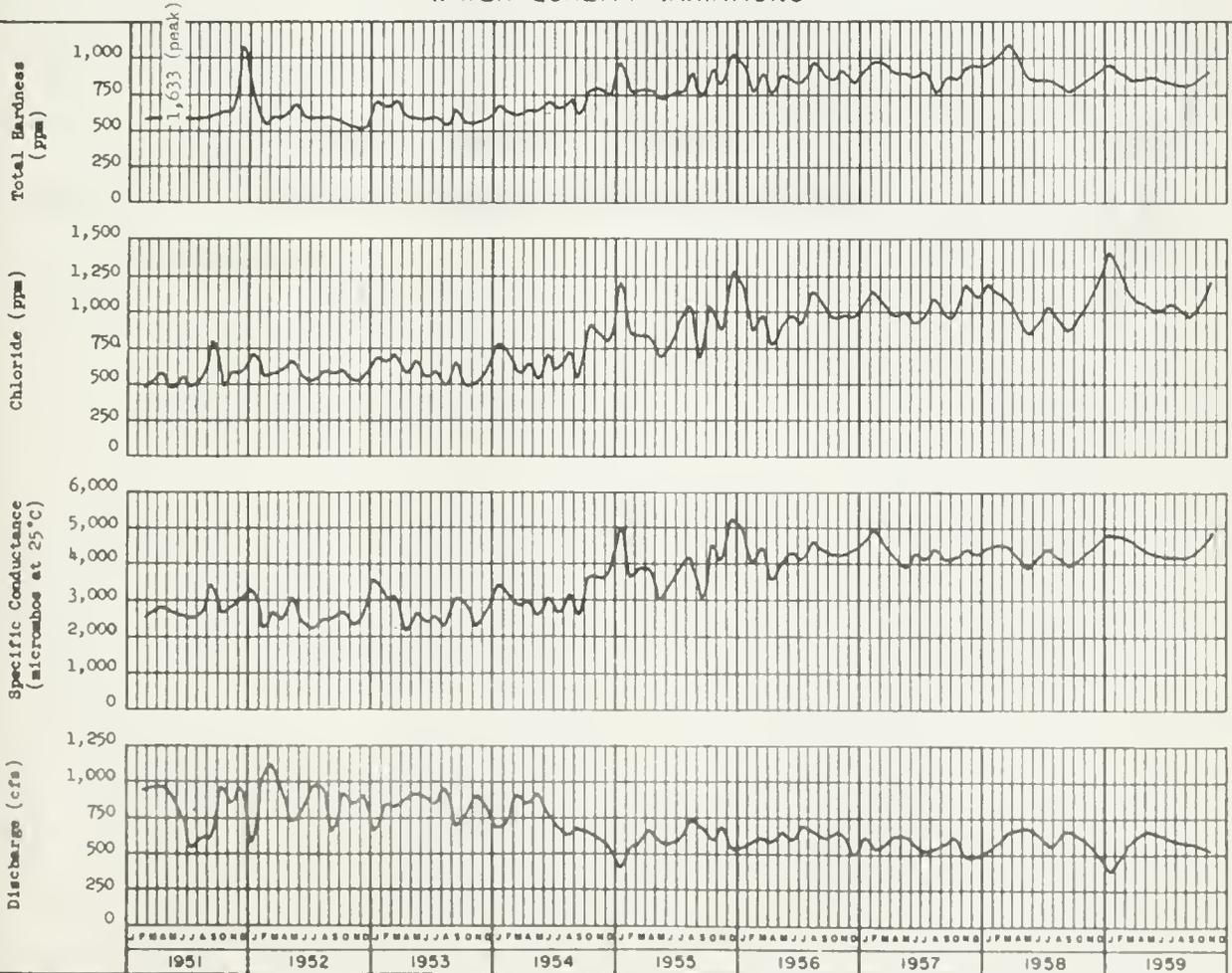
Water Quality Characteristics. Water at this station is unsuitable for domestic use and class 3 for irrigation. It is sodium chloride-sulfate in character and extremely hard.

Significant Water Quality Changes. In 1959 boron reached 2.30 ppm, a maximum for the nine years of record. Specific conductance was more than 4,000 micromhos throughout 1959.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 5,319             | 2,155             | 4,983          | 4,184          |
| Temperature in °F  | 86                | 48                | 85             | 58             |
| Disolved oxygen in parts per million                     | 13.0              | 4.8               | 13.0           | 4.8            |
| Percent saturation                                       | 136               | 60                | 136            | 62             |
| pH   | 8.4               | 7.2               | 8.1            | 7.6            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 210               | 121               | 200            | 185            |
| Magnesium (Mg)   | 100               | 57                | 92             | 87             |
| Sodium (Na)  | 749               | 332               | 749            | 600            |
| Potassium (K)  | 19                | 7.6               | 19             | 16             |
| Carbonate (CO <sub>3</sub> )                             | 17                | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                          | 452               | 140               | 256            | 224            |
| Sulfate (SO <sub>4</sub> )                               | 687               | 413               | 642            | 601            |
| Chloride (Cl)  | 1,320             | 486               | 1,320          | 950            |
| Nitrate (NO <sub>3</sub> )                               | 14                | 1.5               | 7.5            | 7.5            |
| Fluoride (F)   | 0.8               | 0.4               | 0.8            | 0.8            |
| Boron (B)  | 2.30              | 0.34              | 2.3            | 0.76           |
| Silica (SiO <sub>2</sub> )                               | 23                | 7.6               | 10             | 10             |
| <b>Total dissolved solids in parts per million</b>       | <b>3,391</b>      | <b>1,560</b>      | <b>2,920</b>   | <b>2,671</b>   |
| Percent sodium   | 66                | 53                | 65             | 61             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 1,633             | 522               | 965            | 819            |
| Noncarbonate   | 759               | 390               | 759            | 633            |
| Turbidity in parts per million                           | 1,200             | 15                | 1,200          | 250            |
| Coliform in most probable number per milliliter          | 700,000           | 60                | 24,000         | 1,300          |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Disolved alpha   | 0.59              | 0.00              | 0.25           | 0.00           |
| Solid alpha  | 1.25              | 0.00              | 0.41           | 0.36           |
| Disolved beta  | 12.18             | 0.00              | 7.08           | 0.40           |
| Solid beta   | 8.19              | 0.00              | 3.83           | 0.75           |

### WATER QUALITY VARIATIONS



NEW RIVER NEAR WESTMORLAND (STA. 58)



## Salton Sea

The Salton Sea lies in the south-central portion of the Colorado River Basin Region. It occupies the depression between Imperial Valley and Coachella Valley, and receives all the irrigation return and waste water discharges from these areas. The sea is approximately 33 miles long and 12 miles wide. It is very shallow; the greatest depth is about 45 feet at the north end. The water surface elevations ranged from 233.75 feet below sea level in May 1959, to 234.45 feet below sea level in September 1959.

In spite of the saline characteristics of the waters of the Salton Sea and its warm temperature, imported salt-water game and feeder fish have been propagated with success. Recreational benefits provided by the sea have fostered the development of resort communities along its shores.

The one station currently maintained to monitor surface water quality in Salton Sea is Salton Sea at Salton Sea State Park. It is discussed on page 118.

SALTON SEA AT SALTON SEA STATE PARK (STA. 68a)

Sampling Point. Station 68a is located in Section 2 of Township 7 South, Range 10 East, San Bernardino Base and Meridian. Samples were collected from the northeast shore at the boat launching ramp of Salton Sea State Park.

Period of Record. March 1955 through 1959.

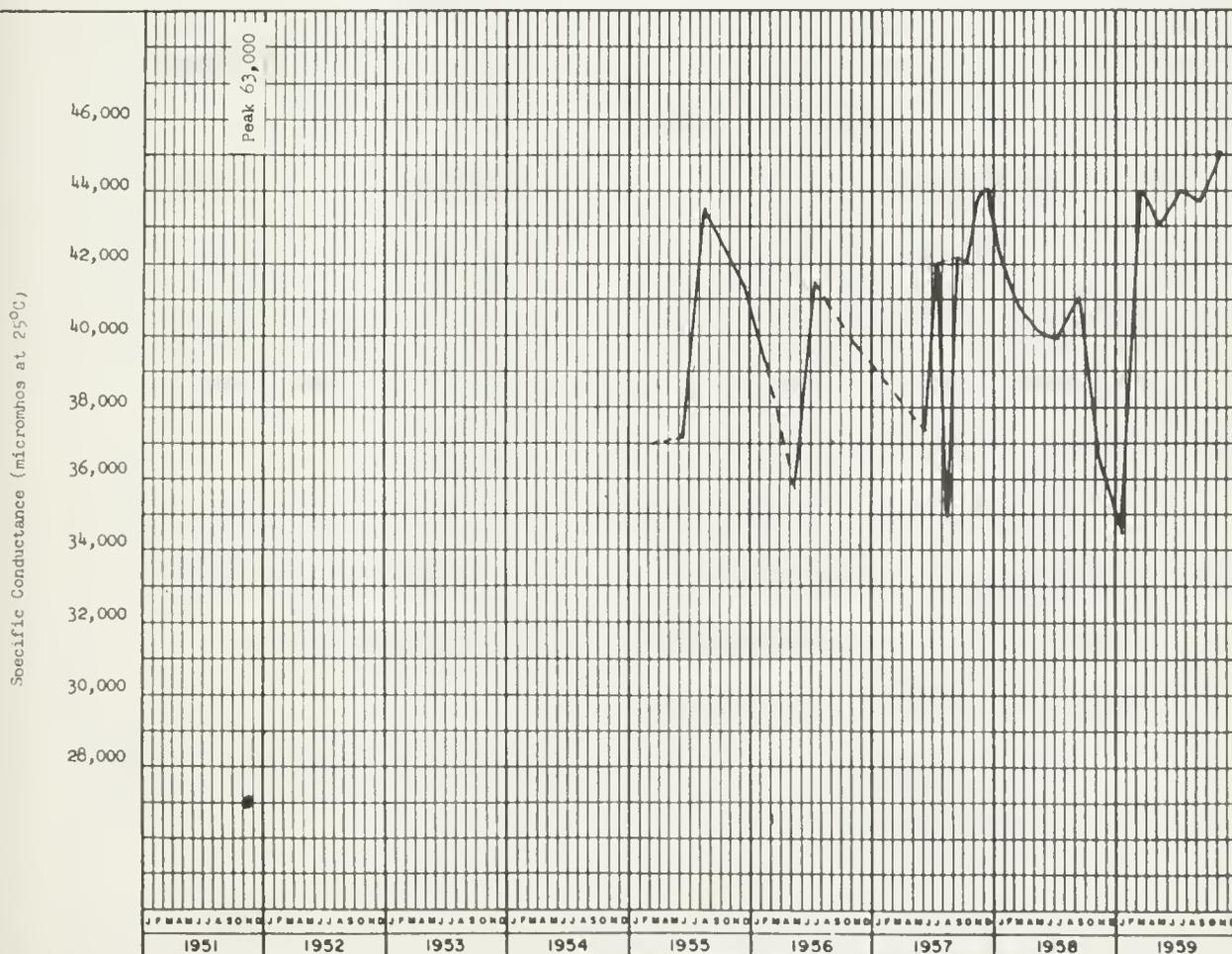
Water Quality Characteristics. Salton Sea water is sodium chloride in character and similar to ocean water, but with calcium and sulfate concentrations slightly higher than in ocean water and with chloride concentrations slightly lower. The water is unsuitable for either domestic or agricultural uses.

Significant Water Quality Changes. In 1959, total dissolved solids exceeded 35,000 ppm, slightly higher in concentration than in the previous four years of record.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 63,000            | 27,027            | 45,110         | 34,480         |
| Temperature in °F                                  | 98                | 57                | 92             | 63             |
| Dissolved oxygen in parts per million              | 13.5              | 1.6               | 11.2           | 5.8            |
| Percent saturation                                 | 200               | 18                | 116            | 82             |
| pH   | 8.6               | 6.9               | 8.5            | 8.0            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 950               | 456               | 818            | 816            |
| Magnesium (Mg)                                     | 1,125             | 581               | 985            | 928            |
| Sodium (Na)  | 10,500            | 5,800             | 10,500         | 9,850          |
| Potassium (K)                                      | 170               | 140               | 156            | 156            |
| Carbonate (CO <sub>3</sub> )                       | 31                | 0.00              | 12             | 0.00           |
| Bicarbonata (HCO <sub>3</sub> )                    | 403               | 146               | 220            | 161            |
| Sulfate (SO <sub>4</sub> )                         | 7,766             | 3,758             | 7,414          | 7,200          |
| Chloride (Cl)                                      | 16,900            | 8,300             | 15,000         | 13,750         |
| Nitrate (NO <sub>3</sub> )                         | 50.5              | 0.00              | 2.0            | 0              |
| Fluoride (F)                                       | 4.0               | 2.3               | 3.5            | 2.7            |
| Boron (B)  | 9.40              | 3.75              | 8.4            | 6.6            |
| Silica (SiO <sub>2</sub> )                         | 15                | 0                 | 5              | 5              |
| Total dissolved solids in parts per million        | 38,763            | 19,960            | 35,902         | 35,160         |
| Percent sodium                                     | 80                | 76                | 79             | 78             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 7,000             | 5,460             | 6,260          | 5,580          |
| Noncarbonate                                       | 6,700             | 5,428             | 6,080          | 5,428          |
| Turbidity in parts per million                     | 40                | < 5               | < 25           | < 5            |
| Coliform in most probable number per milliliter    | 2.3               | < 0.45            | 0.60           | < 0.45         |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.8               | 0.09              | 0.10           | 0.09           |
| Solid alpha  | 0.45              | 0.00              | 0.45           | 0.00           |
| Dissolved beta                                     | 11.24             | 0.04              | 11.24          | 0.04           |
| Solid beta   | 5.73              | 0.00              | 5.73           | 0.00           |

## WATER QUALITY VARIATIONS



SALTON SEA AT SALTON SEA STATE PARK  
(STA. 68a)

## Whitewater River Basin

The Whitewater River is located in the northwesterly portion of Colorado River Basin Region. Its drainage area lies between the Little San Bernardino Mountains on the northeast and the San Jacinto Mountains on the southwest. The river originates on the south slope of Mount San Gorgonio, and flows southeastward through Coachella Valley to the Salton Sea. The drainage area of the Whitewater River system is about 1,574 square miles, consisting of about 1,074 square miles of mountains and foothills and 500 square miles of valley and mesa lands. The mean annual natural runoff to the Whitewater River is estimated to be about 19,300 acre-feet.

Surface water is diverted from the upper reaches of the Whitewater River for export to an area north of Banning for electric power production and irrigation. Some flow is diverted near Whitewater to the City of Palm Springs by a pipeline, for irrigation only. In the reach from Whitewater to Indio the river is usually dry. From Indio to the Salton Sea irrigation return waters, and occasionally excess water from wasteways of the Coachella branch of the All American Canal, make up a persistent flow. Average annual flow of the Whitewater River to Salton Sea is estimated to be about 40,000 acre-feet.

Treated sewage effluent from the Indio Sanitary District (3.0 mgd) is discharged to Whitewater River. The effluent contains waste water from several food processing plants. Other sewage wastes discharged to Whitewater River are small.

The two stations maintained for surveillance of surface water quality in Whitewater River are:

| <u>Monitoring Station</u>           | <u>Page Number of<br/>Station Discussion</u> |
|-------------------------------------|--|
| Whitewater River near<br>Whitewater | 122  |
| Whitewater River near Mecca         | 124  |

WHITEWATER RIVER NEAR WHITEWATER (STA. 68)

Sampling Point. Station 68 is located in Section 2 of Township 3 South, Range 3 East, San Bernardino Base and Meridian. Samples were taken from the 8-foot Cipoletti Weir box at the United States Geological Survey gage on the weir, 1.6 miles upstream from Whitewater.

Period of Record. February 1951 through 1959.

Water Quality Characteristics. The surface water at this station is calcium bicarbonate in character, class 1 for irrigation, and moderately hard. It meets drinking water standards for mineral constituents.

Significant Water Quality Changes. Surface flow existed throughout 1959, being supplemented by pumped ground water discharged into the river channel upstream from Station 68 whenever the natural surface flow diminished. Fluorides reached a new maximum of 1.2 ppm for the period of record.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 653               | 212               | 424            | 368            |
| Temperature in °F                                  | 81                | 45                | 72             | 63             |
| Dissolved oxygen in parts per million              | 12.4              | 6.0               | 11.0           | 6.0            |
| Percent saturation                                 | 123               | 61                | 123            | 63             |
| pH   | 8.5               | 7.4               | 8.4            | 7.8            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 57                | 40                | 56             | 53             |
| Magnesium (Mg)                                     | 18                | 10                | 14             | 13             |
| Sodium (Na)  | 16                | 7                 | 15             | 13             |
| Potassium (K)                                      | 5.6               | 2.8               | 4.8            | 4.6            |
| Carbonate (CO <sub>3</sub> )                       | 30                | 0.00              | 14             | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 236               | 127               | 227            | 166            |
| Sulfate (SO <sub>4</sub> )                         | 49                | 21                | 36             | 35             |
| Chloride (Cl)                                      | 16                | 1                 | 16             | 3              |
| Nitrate (NO <sub>3</sub> )                         | 3.5               | 0.0               | 1.0            | 0.5            |
| Fluoride (F)                                       | 1.2               | 0.25              | 1.2            | 1.0            |
| Boron (B)  | 0.16              | 0.00              | 0.00           | 0.00           |
| Silica (SiO <sub>2</sub> )                         | 20                | 11                | 20             | 20             |
| Total dissolved solids in parts per million        | 285               | 212               | 275            | 241            |
| Percent sodium                                     | 20                | 7                 | 15             | 14             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 301               | 65                | 197            | 167            |
| Noncarbonate                                       | 109               | 0                 | 17             | 10             |
| Turbidity in parts per million                     | 2,000             | < 5               | 80             | < 5            |
| Coliform in most probable number per milliliter    | 24,000            | 0.23              | 62             | < 0.45         |
| Radiosactivity in micro-micro curies per liter     |                   |                   |                |                |
| Dissolved alpha                                    | 2.31              | 0.00              | 1.01           | 0.83           |
| Solid alpha  | 1.84              | 0.00              | 0.63           | 0.09           |
| Dissolved beta                                     | 25.51             | 0.00              | 11.05          | 10.45          |
| Solid beta   | 9.32              | 0.00              | 2.98           | 0.00           |

### WATER QUALITY VARIATIONS



WHITEWATER RIVER NEAR WHITEWATER (STA. 68)

WHITEWATER RIVER NEAR MECCA (STA. 68b)

Sampling Point. Station 68b is located in Section 31 of Township 7 South, Range 9 East, San Bernardino Base and Meridian. Samples were collected from the center of the river as the flow comes out of the road culvert at Lincoln Street crossing.

Period of Record. July 1957 through 1959.

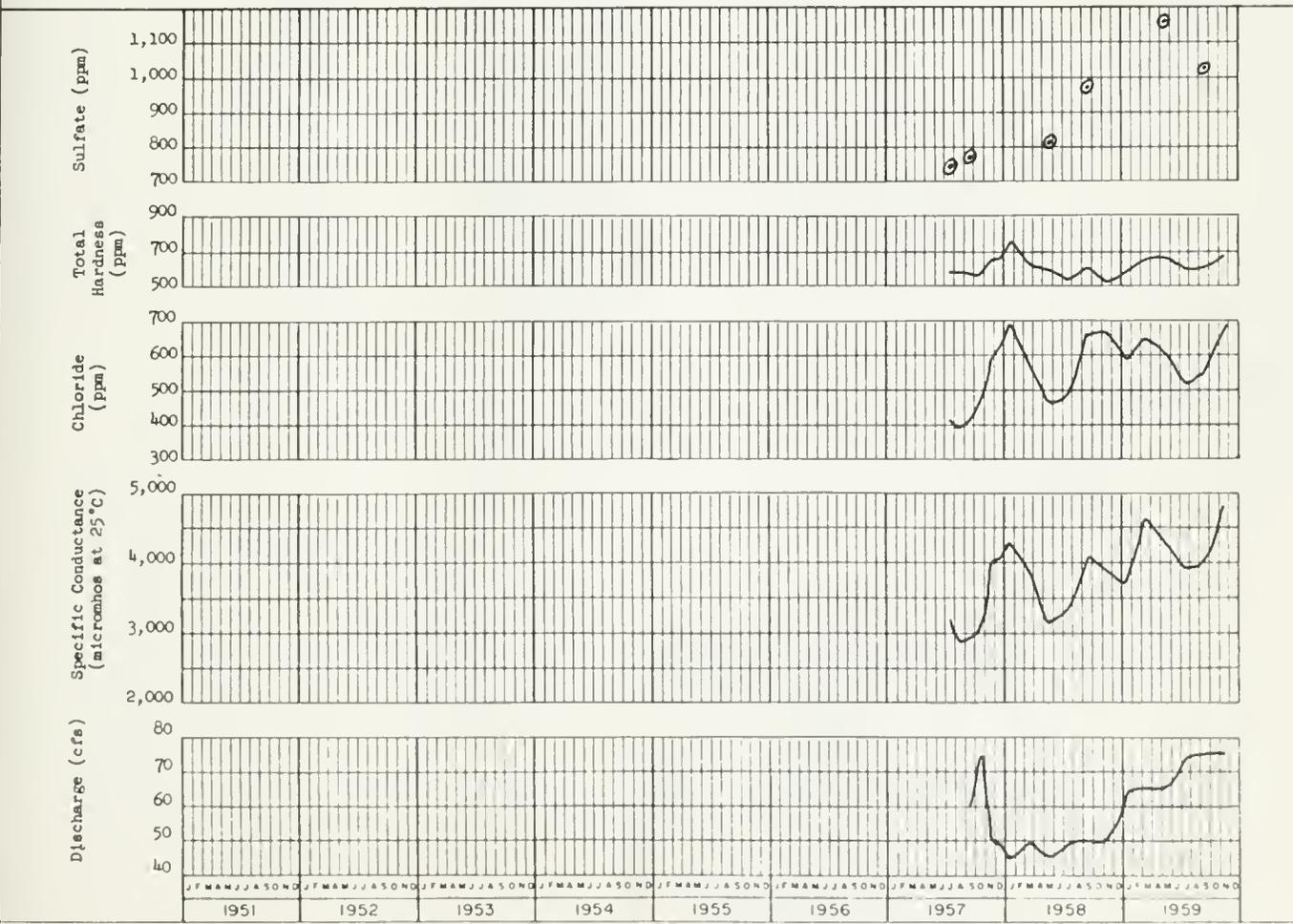
Water Quality Characteristics. The water at this station is sodium sulfate-chloride in character, class 3 for irrigation, and extremely hard. It does not meet drinking water standards for mineral content.

Significant Water Quality Changes. Total dissolved solids continued to increase in 1959, exceeding 3,000 ppm. Fluoride reached a new maximum of 4.0 ppm in 1959.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 4,798             | 3,134             | 4,798          | 3,690          |
| Temperature in °F                                  | 87                | 54                | 86             | 62             |
| Dissolved oxygen in parts per million              | 11.0              | 5.5               | 11.0           | 6.5            |
| Percent saturation                                 | 112               | 60                | 118            | 8.4            |
| pH   | 8.4               | 7.6               | 8.3            | 8.0            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 194               | 149               | 194            | 166            |
| Magnesium (Mg)                                     | 50                | 44                | 46             | 44             |
| Sodium (Na)  | 844               | 428               | 844            | 650            |
| Potassium (K)                                      | 15                | 11.5              | 15             | 13             |
| Carbonate (CO <sub>3</sub> )                       | 14                | 0                 | 14             | 0              |
| Bicarbonate (HCO <sub>3</sub> )                    | 378               | 256               | 378            | 315            |
| Sulfate (SO <sub>4</sub> )                         | 1,160             | 146               | 1,160          | 1,025          |
| Chloride (Cl)                                      | 690               | 387               | 680            | 518            |
| Nitrate (NO <sub>3</sub> )                         | 25                | 8                 | 25             | 24             |
| Fluoride (F)                                       | 4.0               | 1.2               | 4.0            | 3.2            |
| Boron (B)  | 1.85              | 0.56              | 1.85           | 1.20           |
| Silice (SiO <sub>2</sub> )                         | 20                | 15                | 20             | 20             |
| Total dissolved solids in parts per million        | 3,100             | 2,027             | 3,100          | 2,743          |
| Percent sodium                                     | 73                | 60                | 73             | 70             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 768               | 542               | 684            | 595            |
| Noncarbonate                                       | 497               | 311               | 384            | 331            |
| Turbidity in parts per million                     | 1,000             | 140               | 1,000          | 210            |
| Coliform in most probable number per milliliter    | 2,400             | 23                | 2,400          | 23             |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.62              | 0.00              | 0.30           | 0.0            |
| Solid alpha  | 1.77              | 0.00              | 0.56           | 0.18           |
| Dissolved beta                                     | 18.95             | 0.00              | 17.56          | 5.30           |
| Solid beta   | 8.65              | 0.00              | 8.65           | 0.00           |

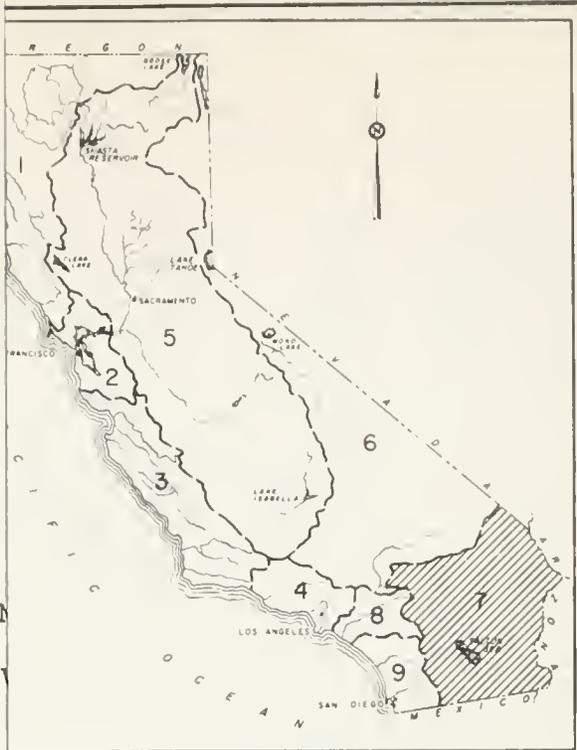
### WATER QUALITY VARIATIONS



WHITEWATER RIVER NEAR MECCA (STA 68b)



STREAM SAMPLING STATIONS  
 COLORADO RIVER BASIN



KEY MAP

Station Number

Station Name

|     |                    |
|-----|--------------------|
| 54  | Colorado River     |
| 55  | Colorado River     |
| 56  | Colorado River     |
| 56a | All American Canal |
| 56b | Colorado River     |
| 56c | Colorado River     |
| 56d | Colorado River     |
| 57  | New River          |
| 58  | New River          |
| 59  | Alamo River        |
| 60  | Alamo River        |
| 68  | Whitewater River   |
| 68a | Salton Sea         |
| 68b | Whitewater River   |

BASE LINE

LEGEND

- 56d SURFACE WATER MONITORING STATION
- SEWAGE WASTE DISCHARGE
- ▲ INDUSTRIAL OR IRRIGATION WASTE DISCHARGE

34° 00'

33° 30'

33° 00'

STATE OF CALIFORNIA  
 THE RESOURCES AGENCY OF CALIFORNIA  
 DEPARTMENT OF WATER RESOURCES  
 SOUTHERN DISTRICT

STATE SURFACE WATER QUALITY MONITORING  
 PROGRAM

STREAM SAMPLING STATIONS

COLORADO RIVER BASIN REGION (NO. 7)

1959

SCALE OF MILES



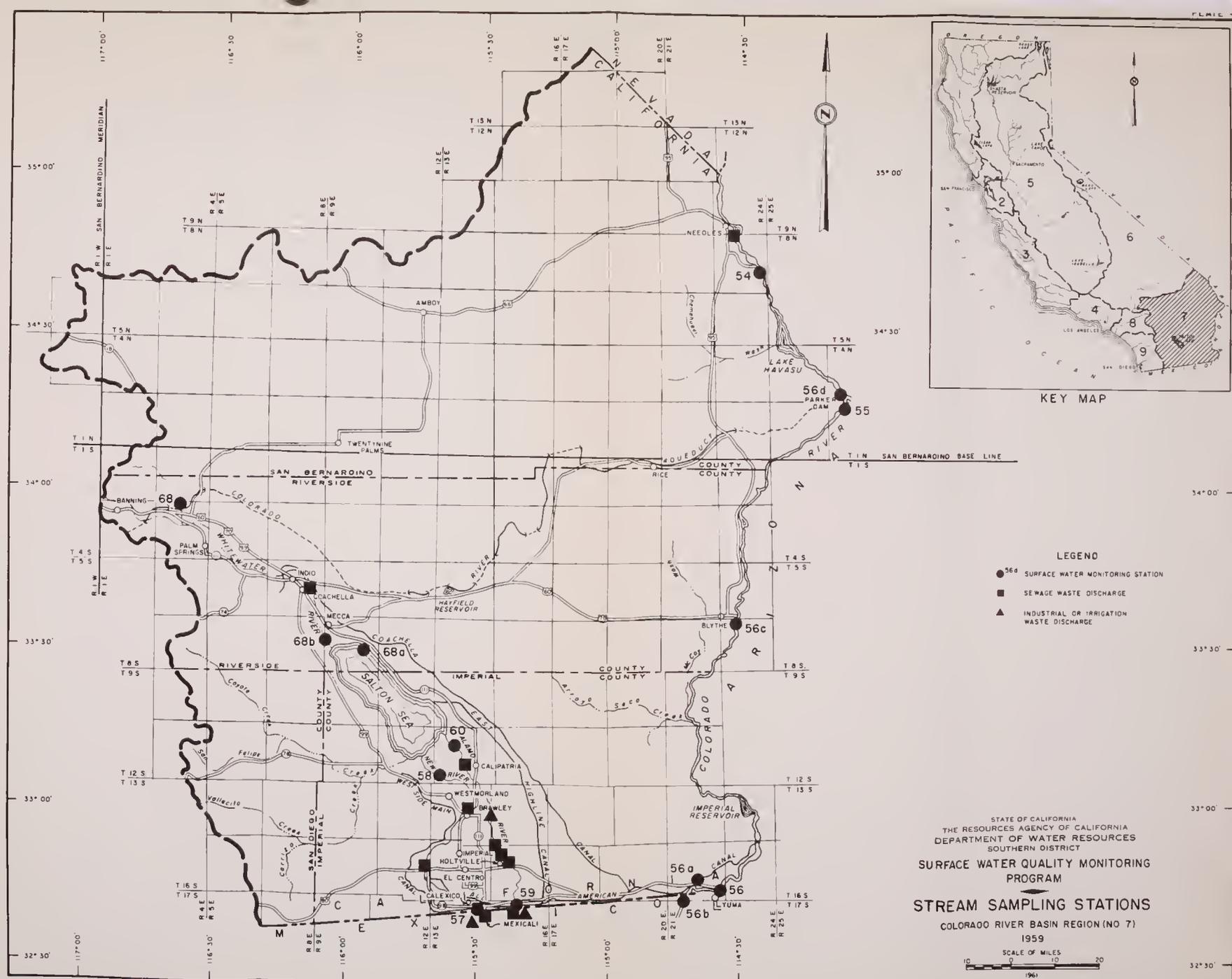
1961

32° 30'

STREAM SAMPLING STATIONS  
 COLORADO RIVER REGION (NO. 7)

Station Name

- Colorado River near Topock, Arizona
- Colorado River below Parker Dam
- Colorado River at Yuma, Arizona
- All American Canal near Pilot Knob
- Colorado River below Morelos Dam
- Colorado River near Blythe
- Colorado River Aqueduct at Intake
- New River at International Boundary
- New River near Westmorland
- Alamo River at International Boundary
- Alamo River near Calipatria
- Whitewater River near Whitewater
- Salton Sea at Salton Sea State Park
- Whitewater River near Mecca



- LEGEND**
- 56d SURFACE WATER MONITORING STATION
  - SEWAGE WASTE DISCHARGE
  - ▲ INDUSTRIAL OR IRRIGATION WASTE DISCHARGE

STATE OF CALIFORNIA  
 THE RESOURCES AGENCY OF CALIFORNIA  
 DEPARTMENT OF WATER RESOURCES  
 SOUTHERN DISTRICT

**SURFACE WATER QUALITY MONITORING PROGRAM**

**STREAM SAMPLING STATIONS**  
 COLORADO RIVER BASIN REGION (NO. 7)  
 1959

SCALE OF MILES  
 0 10 20

1961

Santa Ana Region (No. 8)

The Santa Ana Region (No. 8) is situated in the south coastal portion of California. It extends 25 miles along the coast from the Los Angeles County-Orange County line to the San Joaquin Hills, and projects inland from the ocean about 90 miles, expanding to a width of about 80 miles in the Upper Valley area. The area of the region is approximately 2,840 square miles, of which 1,830 square miles are mountainous and 1,010 square miles are valley lands, mesas, and coastal plain.

The region is composed of the coastal plain in Orange County and the drainage system of Santa Ana River in the inland portion. The mean annual runoff from the Santa Ana River drainage area is approximately 322,000 acre-feet, and from various minor coastal water sources in the Santa Ana Region about 6,100 acre-feet.

Eight stations have been established to maintain surveillance of surface water quality in this region. The names of the surface water sources and the number of stations on each (in parentheses) is shown in the following tabulation:

|                     |                   |
|---------------------|-------------------|
| Santa Ana River (4) | Chino Creek (1)   |
| Warm Creek (2)      | Lake Elsinore (1) |

In common with other regions in Southern California the Santa Ana Region experienced below normal precipitation and runoff to streams in the 1958-59 rainfall season. Slight but distinct impairment of surface water quality was apparent in comparison of 1959 analyses with those of the preceding year but, in general, the mineral content remained within the ranges for dissolved constituents for the ten year period of record.



## Santa Ana Region (No. 8)

The Santa Ana Region (No. 8) is situated in the south coastal portion of California. It extends 25 miles along the coast from the Los Angeles County-Orange County line to the San Joaquin Hills, and projects inland from the ocean about 90 miles, expanding to a width of about 80 miles in the Upper Valley area. The area of the region is approximately 2,840 square miles, of which 1,830 square miles are mountainous and 1,010 square miles are valley lands, mesas, and coastal plain.

The region is composed of the coastal plain in Orange County and the drainage system of Santa Ana River in the inland portion. The mean annual runoff from the Santa Ana River drainage area is approximately 322,000 acre-feet, and from various minor coastal water sources in the Santa Ana Region about 6,100 acre-feet.

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## Santa Ana River Basin

The Santa Ana River Basin occupies almost the entire area of Santa Ana Region. The source of the river is at Big Bear Lake in the San Bernardino Mountains. The river flows from the mountains to the southwest, and discharges to the ocean between Huntington Beach and Newport Beach. The drainage area of the Santa Ana River system is about 2,420 square miles comprised of 1,480 square miles of mountainous terrain and foothills, and 940 square miles of valley and mesa lands, and coastal plain. The mean annual runoff from the drainage area is estimated at 322,000 acre-feet.

Prado Flood Control Dam, located near the San Bernardino-Orange County line, is the principal dam on the Santa Ana River. Diversion works in the headwaters area at Big Bear Lake divert some of the surface flow for electrical power production near Mentone. Some of the water diverted is used for irrigation near Redlands and some is used in spreading operations for the artificial recharge of underground reservoirs. The principal use of Santa Ana River water is for recharge of the vast underground storage basins of the region. The ground waters from these basins supply most of the uses in the area. Colorado River water is discharged to spreading areas in Orange County to replenish ground water basins within the county. It is also used directly for irrigation and domestic purposes in portions of the Santa Ana Region.

Hemet Reservoir and Railroad Canyon Reservoir on the San Jacinto River, tributary to the Santa Ana River, store most of the flow of the tributary stream. Discharge of the San Jacinto River is to Lake Elsinore. The outlet of Lake Elsinore is Temescal Creek, which joins the

Santa Ana River near Prado Dam. There has seldom been any water in Lake Elsinore since the surface water quality monitoring program was established in 1953, and no observed flow in Temescal Creek in this period of record. Colorado River water is discharged to the San Jacinto River for storage in Railroad Canyon Reservoir.

Effluent waste water from the two sewage treatment plants of the City of San Bernardino (9.5 mgd) is discharged to Warm Creek and the Santa Ana River. Effluent from the City of Corona sewage treatment plant (1.0 mgd) is discharged to percolation ponds and to the Santa Ana River. City of Riverside sewage treatment plant effluent (8.0 mgd) is used for irrigation, but excess water, and irrigation return water, flow to the Santa Ana River channel. City of Redlands treated sewage effluent (2.0 mgd) is used for ground water recharge, with excess flowing to the river. All these effluent wastes are discharged to the river channel during ditch and pond clearing operations. A cement mill discharges waste water (between 2.0 and 3.0 mgd) to settling basins, but overflow reaches the river. There are a few other minor, and chiefly intermittent, waste water discharges to the streams of the system.

The economy of the basin is predominantly agricultural. Rapid population growth and increasing urbanization have followed the establishment of light manufacturing plants, particularly in the coastal area. There are several military and naval establishments in the basin. Heavy industry is represented by steel manufacture and cement milling in the vicinity of the City of San Bernardino. Petroleum is produced in the areas along the coast, and in the mountainous northern portion of Orange County.

The eight stations on the Santa Ana River and its tributaries established for surveillance of surface water quality are:

| <u>Monitoring Station</u>         | <u>Page Number of<br/>Station Discussion</u> |
|-----------------------------------|--|
| Santa Ana River near Mentone      | 132  |
| Santa Ana River near<br>Arlington | 134  |
| Santa Ana River near Norco        | 136  |
| Santa Ana River near Prado<br>Dam | 138  |
| Warm Creek at San Bernardino      | 140  |
| Warm Creek at Colton              | 142  |
| Chino Creek near Chino            | 144  |
| Lake Elsinore near Elsinore       | 146  |

SANTA ANA RIVER NEAR MENTONE (STA. 51b)

Sampling Point. Station 51b is located in Section 4 of Township 1 South, Range 2 West, San Bernardino Base and Meridian. Samples were collected at the tailrace of the Southern California Edison Company Santa Ana River No. 3 Power Plant, 3.5 miles northeast of Mentone near mouth of canyon.

Period of Record. April 1951 through December 1959.

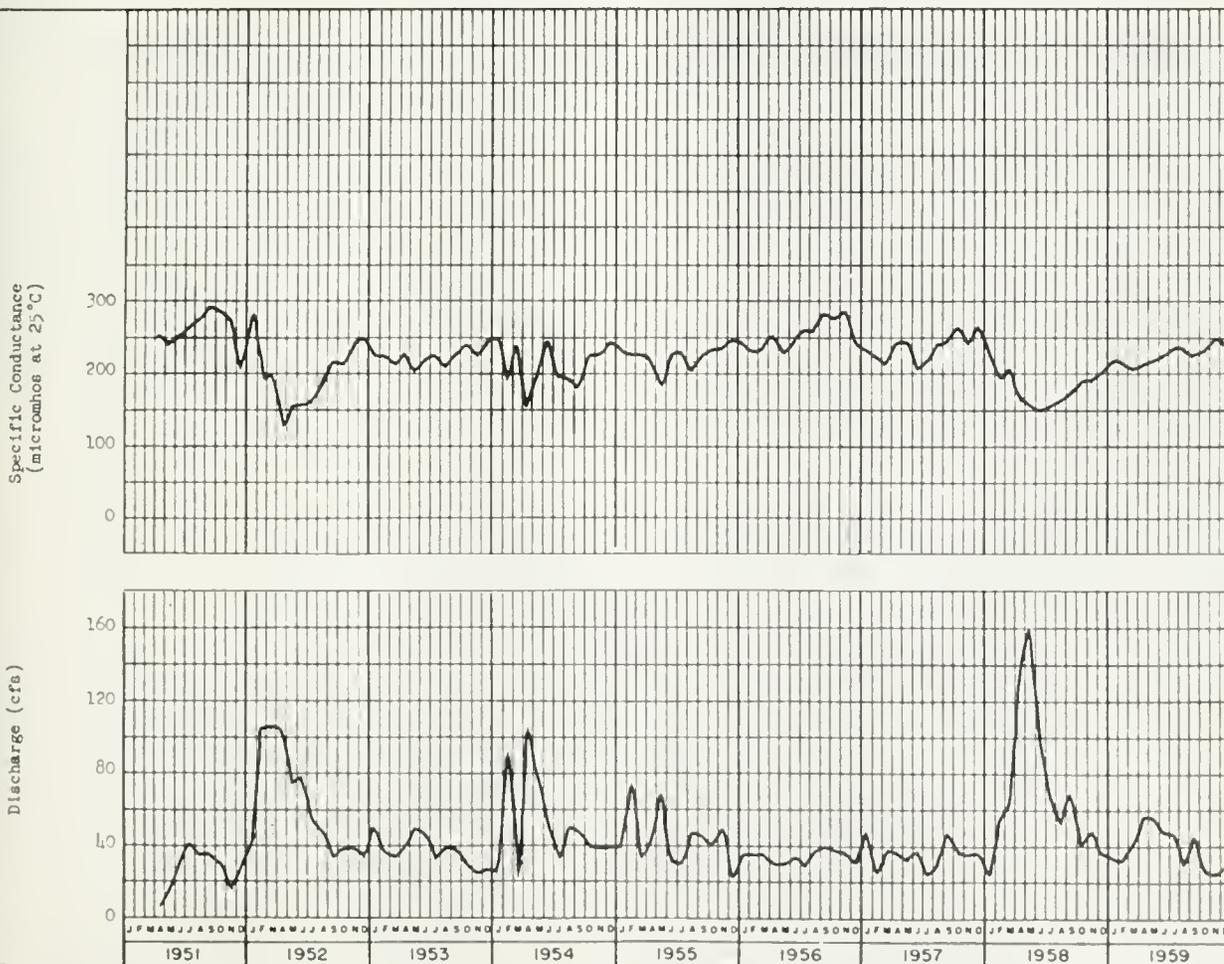
Water Quality Characteristics. Surface water in the Santa Ana River near Mentone is generally calcium bicarbonate in character, class 1 for irrigation, and meets drinking water standards for mineral content. The water is soft and of excellent quality.

Significant Water Quality Changes. The quality of the water has remained nearly uniform throughout the nine years of record.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 288               | 126               | 250            | 206            |
| Temperature in °F                                  | 75                | 39                | 63             | 44             |
| Dissolved oxygen in parts per million              | 13.6              | 7.2               | 13.5           | 7.2            |
| Percent saturation                                 | 128               | 74                | 128            | 74             |
| pH   | 8.7               | 7.2               | 8.3            | 7.8            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 33                | 16                | 23             | 17             |
| Magnesium (Mg)                                     | 11                | 1                 | 9              | 7              |
| Sodium (Na)  | 22                | 8                 | 15             | 11             |
| Potassium (K)                                      | 3.2               | 1.1               | 3.2            | 2.0            |
| Carbonate (CO <sub>3</sub> )                       | 10                | 0                 | 0              | 0              |
| Bicarbonate (HCO <sub>3</sub> )                    | 173               | 39                | 124            | 107            |
| Sulfate (SO <sub>4</sub> )                         | 26                | 8                 | 12             | 9.6            |
| Chloride (Cl)                                      | 16                | 1                 | 7.6            | 3.0            |
| Nitrate (NO <sub>3</sub> )                         | 2.4               | 0                 | 1.3            | 0              |
| Fluoride (F)                                       | 0.7               | 0.2               | 0.4            | 0.4            |
| Boron (B)  | 0.15              | 0                 | 0.11           | 0              |
| Silica (SiO <sub>2</sub> )                         | 30                | 5                 | 20             | 10             |
| Total dissolved solids in parts per million        | 195               | 95                | 150            | 134            |
| Percent sodium                                     | 33                | 18                | 29             | 20             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 118               | 54                | 93             | 73             |
| Noncarbonate                                       | 16                | 0                 | 0              | 0              |
| Turbidity in parts per million                     | < 25              | 3                 | < 25           | < 5            |
| Coliform in most probable number per milliliter    | 2,300             | < 0.45            | 23             | 0.45           |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 2.50              | 0.00              | 0.90           | 0.82           |
| Solid alpha  | 1.46              | 0.00              | 0.37           | 0.37           |
| Dissolved beta                                     | 28.05             | 0.00              | 11.30          | 1.73           |
| Solid beta   | 9.33              | 0.00              | 0.62           | 0.00           |

### WATER QUALITY VARIATIONS



SANTA ANA RIVER NEAR MENTONE (STA. 51b)

SANTA ANA RIVER NEAR ARLINGTON (STA. 51)

Sampling Point. Station 51 is located in Section 25 of Township 2 South, Range 6 West, San Bernardino Base and Meridian. Samples were collected at Pedley Road bridge, 1.8 miles downstream from the Union Pacific Railroad bridge, 3.3 miles north of Arlington.

Period of Record. January 1951 through December 1959.

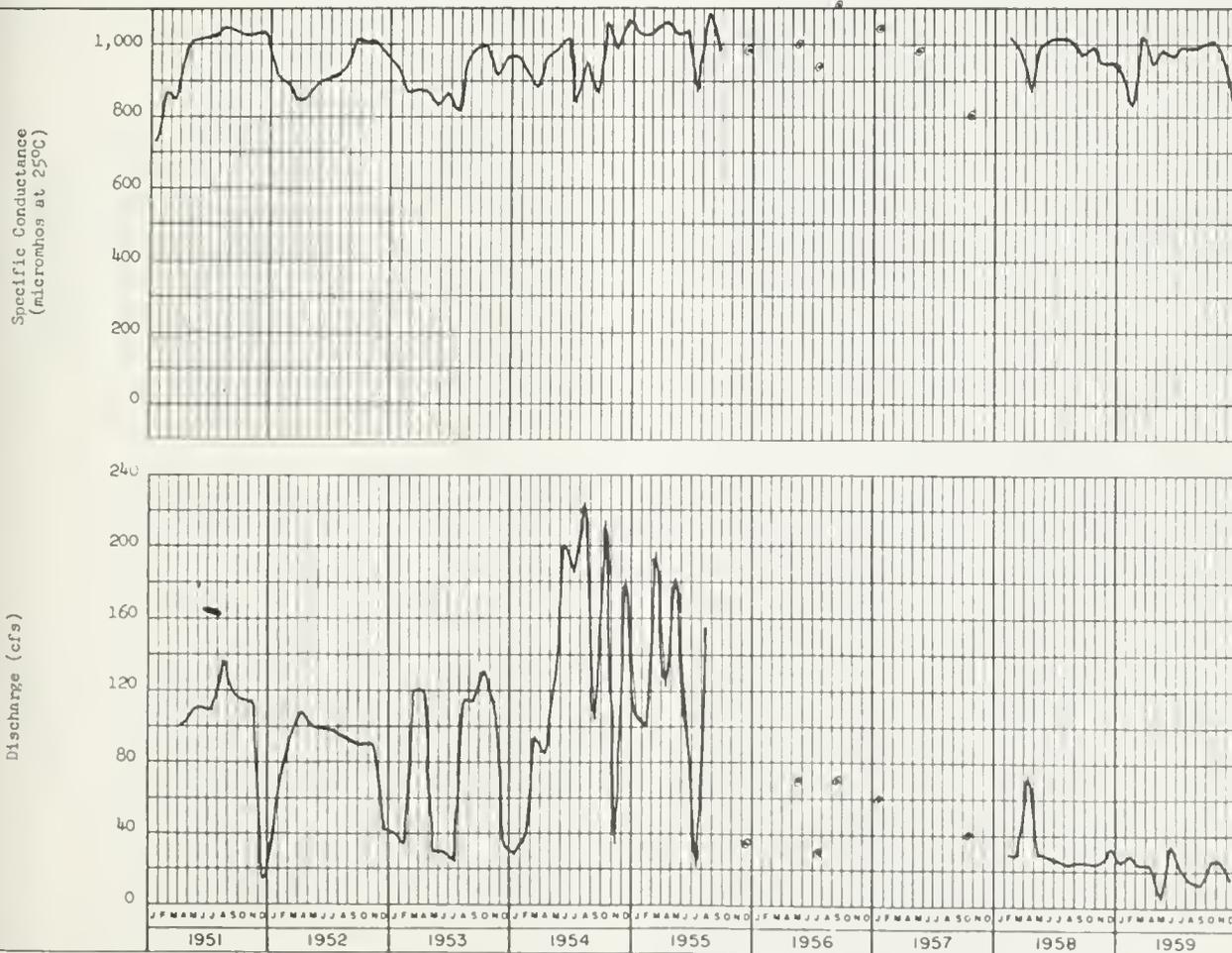
Water Quality Characteristics. The water at Station 51 is calcium-sodium bicarbonate in character, class 1 for irrigation, and very hard. It meets drinking water standards for mineral constituents. Effluent from the City of Riverside sewage treatment plant, which is normally used for irrigation, is occasionally discharged to the river one-half mile above this station.

Significant Water Quality Changes. None.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,121             | 463               | 1,052          | 833            |
| Temperature in °F                                  | 84                | 53                | 80             | 60             |
| Dissolved oxygen in parts per million              | 13.4              | 4.8               | 8.7            | 5.8            |
| Percent saturation                                 | 157               | 56                | 96             | 69             |
| pH   | 9.0               | 7.4               | 8.2            | 7.8            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 108               | 52                | 105            | 85             |
| Magnesium (Mg)                                     | 36                | 12                | 36             | 20             |
| Sodium (Na)  | 105               | 28                | 85             | 67             |
| Potassium (K)                                      | 22                | 4.2               | 7              | 4.4            |
| Carbonate (CO <sub>3</sub> )                       | 24                | 0                 | 0              | 0              |
| Bicarbonate (HCO <sub>3</sub> )                    | 339               | 146               | 339            | 278            |
| Sulfate (SO <sub>4</sub> )                         | 290               | 39                | 99             | 91             |
| Chloride (Cl)                                      | 203               | 31                | 106            | 97             |
| Nitrate (NO <sub>3</sub> )                         | 37                | 0.5               | 22             | 12             |
| Fluoride (F)                                       | 0.9               | 0.19              | 0.7            | 0.4            |
| Boron (B)  | 0.46              | 0.00              | 0.24           | 0.04           |
| Silica (SiO <sub>2</sub> )                         | 32                | 7.2               | 25             | 20             |
| Total dissolved solids in parts per million        | 830               | 288               | 657            | 607            |
| Percent sodium                                     | 48                | 22                | 34             | 29             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 376               | 178               | 363            | 325            |
| Noncarbonate                                       | 202               | 25                | 109            | 55             |
| Turbidity in parts per million                     | 1,600             | < 5               | 100            | < 5            |
| Coliform in most probable number per milliliter    | 2,400             | 0.45              | 700            | 0.45           |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.94              | 0.09              | 0.30           | 0.09           |
| Solid alpha  | 0.33              | 0.00              | 0.18           | 0.00           |
| Dissolved beta                                     | 14.44             | 4.94              | 14.44          | 4.94           |
| Solid beta   | 11.90             | 0.00              | 4.08           | 0.00           |

### WATER QUALITY VARIATIONS



SANTA ANA RIVER NEAR ARLINGTON (STA. 51)

Sampling Point. Station 51e is located in Section 36 of Township 2 South, Range 7 West, San Bernardino Base and Meridian. Samples were collected at the summer gage just downstream from Hammer Avenue bridge on the left bank, 5 miles north of Corona.

Period of Record. April 1951 through December 1959.

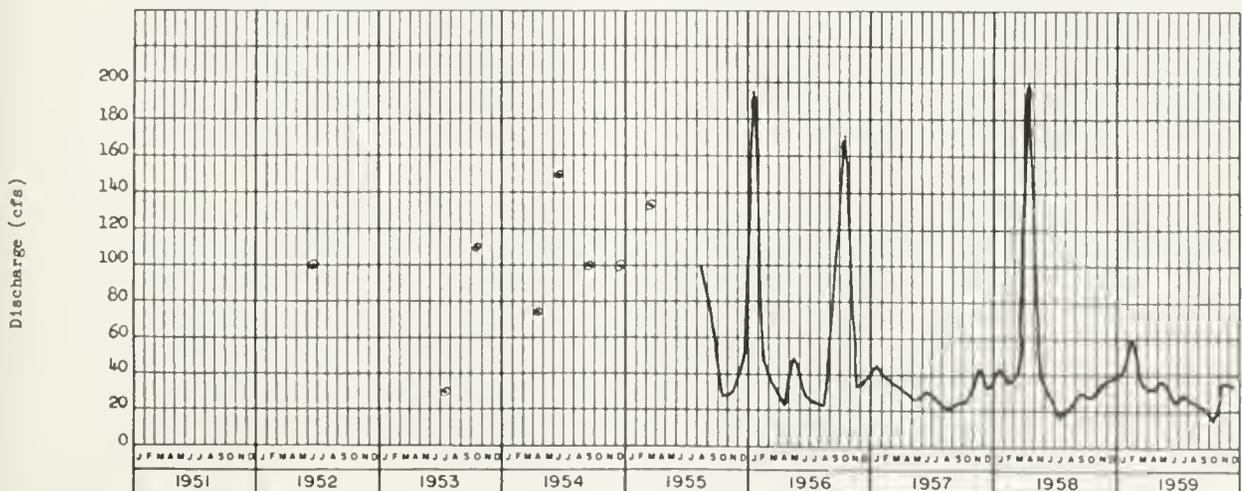
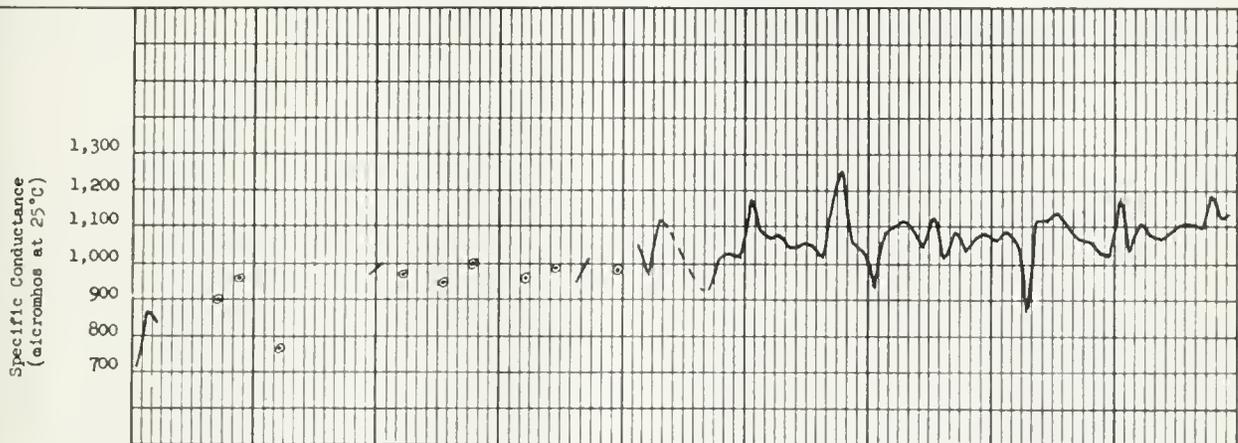
Water Quality Characteristics. Surface water at Station 51e is calcium-sodium bicarbonate in character and very hard. It meets mineral quality standards for domestic use. Boron concentrations and specific conductance values usually place this water in class 2 for irrigation.

Significant Water Quality Changes. Continuing dry weather conditions in 1959 caused mineral concentrations to increase slightly at this station. Boron concentration reached a maximum of 0.84 ppm in October, 1959.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,250             | 439               | 1,183          | 1,037          |
| Temperature in °F                                  | 88                | 52                | 82             | 52             |
| Dissolved oxygen in parts per million              | 10.8              | 2.8               | 8.5            | 2.8            |
| Percent saturation                                 | 117               | 31                | 89             | 31             |
| pH   | 8.6               | 5.9               | 8.2            | 7.2            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 109               | 53                | 106            | 96             |
| Magnesium (Mg)                                     | 33.3              | 9                 | 21             | 20             |
| Sodium (Na)  | 116               | 30                | 116            | 88             |
| Potassium (K)                                      | 10.5              | 4.3               | 8.2            | 6.7            |
| Carbonate (CO <sub>3</sub> )                       | 31                | 0.0               | 0.0            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                    | 359               | 171               | 359            | 300            |
| Sulfate (SO <sub>4</sub> )                         | 260               | 42                | 110            | 105            |
| Chloride (Cl)                                      | 137               | 18                | 137            | 119            |
| Nitrate (NO <sub>3</sub> )                         | 36                | 2                 | 36             | 11             |
| Fluoride (F)                                       | 1.1               | 0.1               | 0.8            | 0.7            |
| Boron (B)  | 0.84              | 0.02              | 0.84           | 0.21           |
| Silica (SiO <sub>2</sub> )                         | 30                | 13                | 30             | 20             |
| Total dissolved solids in parts per million        | 819               | 298               | 715            | 670            |
| Percent sodium                                     | 43                | 27                | 43             | 34             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 386               | 131               | 366            | 322            |
| Noncarbonate                                       | 204               | 11                | 92             | 45             |
| Turbidity in parts per million                     | 800               | < 5               | < 25           | < 5            |
| Coliform in most probable number per milliliter    | 2,400             | 2.3               | 2,400          | 6.0            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 2.15              | 0.00              | 0.81           | 0.46           |
| Solid alpha  | 0.92              | 0.00              | 0.37           | 0.00           |
| Dissolved beta                                     | 15.0              | 0.00              | 12.53          | 1.02           |
| Solid beta   | 15.44             | 0.00              | 15.44          | 4.66           |

### WATER QUALITY VARIATIONS



SANTA ANA RIVER NEAR NORCO (STA 51e)

SANTA ANA RIVER NEAR PRADO DAM (STA. 51a)

Sampling Point. Station 51a is located in Section 29 of Township 3 South, Range 7 West, San Bernardino Base and Meridian. Samples were collected from the left bank at the gaging station, 2,500 feet downstream from Prado Dam, 4 miles west of Corona and 1 mile southwest of Prado.

Period of Record. April 1951 through December 1959.

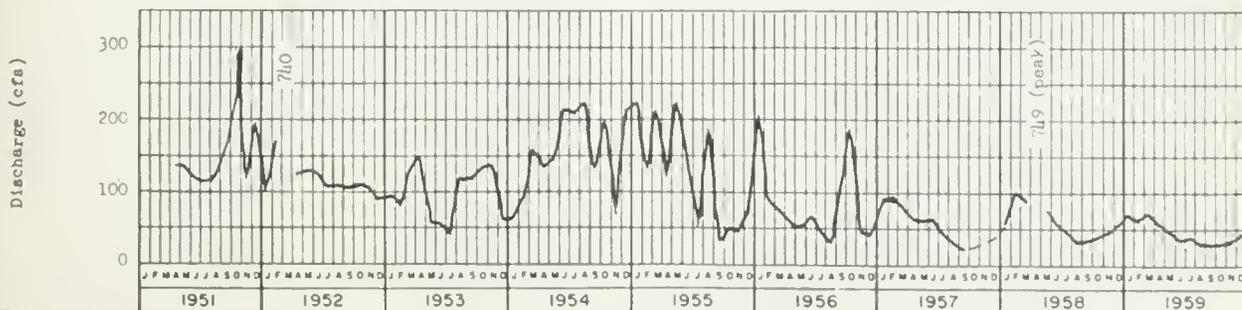
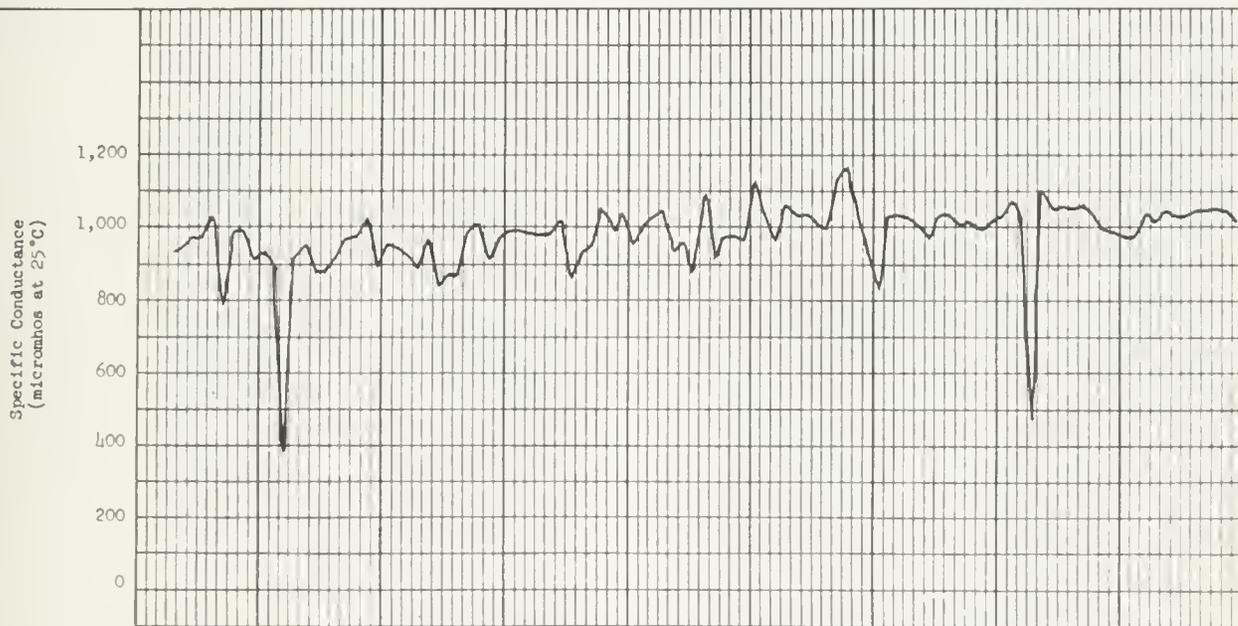
Water Quality Characteristics. The water is calcium-sodium bicarbonate in character, very hard, and meets drinking water mineral quality standards. The concentrations of total dissolved solids generally place this water in class 2 for irrigation. Data from past analyses indicate little change in mineral content between Station 51a and the upstream Station 51e.

Significant Water Quality Changes. None.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 1,165             | 378               | 1,051          | 971            |
| Temperature in °F  | 82                | 48                | 78             | 54             |
| Dissolved oxygen in parts per million                    | 17.4              | 6.0               | 9.7            | 6.0            |
| Percent saturation                                       | 121               | 65                | 101            | 65             |
| pH   | 8.5               | 6.8               | 8.3            | 7.6            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 120               | 38                | 103            | 80             |
| Magnesium (Mg)   | 41                | 9                 | 38             | 24             |
| Sodium (Na)  | 108               | 25                | 96             | 80             |
| Potassium (K)  | 10.6              | 3.8               | 7.2            | 4.7            |
| Carbonate (CO <sub>3</sub> )                             | 36                | 0                 | 17             | 0              |
| Bicarbonate (HCO <sub>3</sub> )                          | 351               | 125               | 334            | 265            |
| Sulfate (SO <sub>4</sub> )                               | 289               | 39                | 113            | 101            |
| Chloride (Cl)  | 120               | 27                | 119            | 99             |
| Nitrate (NO <sub>3</sub> )                               | 32                | 3.5               | 32             | 9.6            |
| Fluoride (F)   | 0.8               | 0.1               | 0.6            | 0.4            |
| Boron (B)  | 0.58              | 0.05              | 0.38           | 0.1            |
| Silica (SiO <sub>2</sub> )                               | 40                | 10                | 40             | 20             |
| Total dissolved solids in parts per million              | 816               | 243               | 687            | 600            |
| Percent sodium   | 42                | 26                | 37             | 32             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 408               | 142               | 362            | 338            |
| Noncarbonate   | 211               | 28                | 97             | 74             |
| Turbidity in parts per million                           | 3,600             | < 5               | < 25           | < 5            |
| Coliform in most probable number per milliliter          | 70,000            | 1.3               | 1,300          | 4.5            |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Dissolved alpha  | 1.22              | 0.00              | 0.71           | 0.46           |
| Solid alpha  | 1.08              | 0.00              | 0.18           | 0.09           |
| Dissolved beta   | 26.98             | 0.00              | 15.21          | 8.68           |
| Solid beta   | 9.99              | 0.00              | 3.35           | 2.36           |

### WATER QUALITY VARIATIONS



SANTA ANA RIVER BELOW PRADO DAM (STA 510)

WARM CREEK AT SAN BERNARDINO (STA. 50c)

Sampling Point. Station 50c is located in Section 15 of Township 1 South, Range 4 West, San Bernardino Base and Meridian. Samples were collected from the right bank beneath "E" Street bridge, 0.5 mile upstream from the City of San Bernardino sewage treatment plant.

Period of Record. April 1951 through 1959.

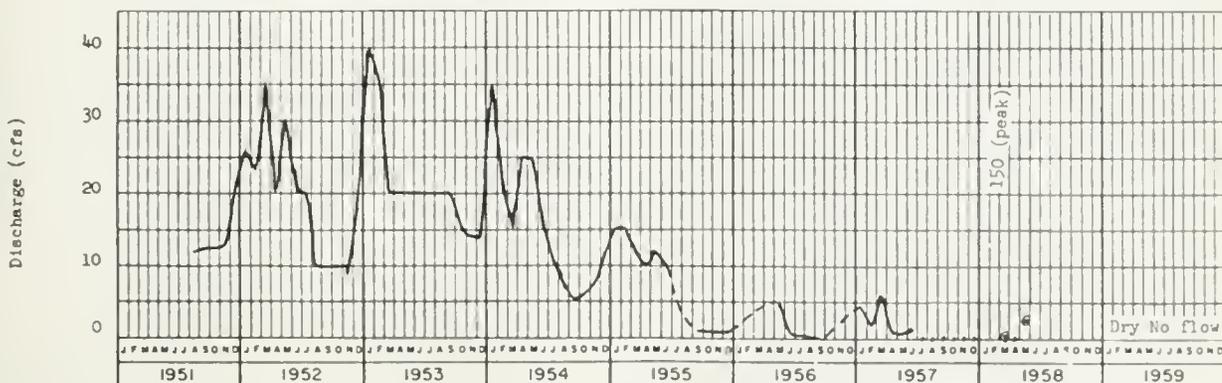
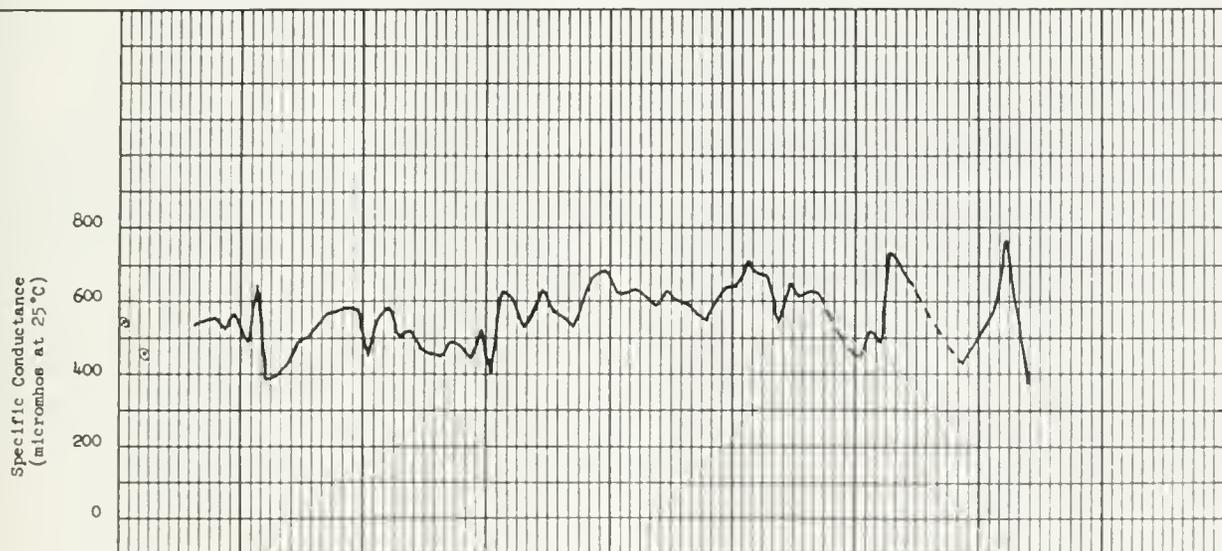
Water Quality Characteristics. The water is generally calcium carbonate in character, moderately hard to very hard, class 1 for irrigation, and meets drinking water mineral quality standards.

Significant Water Quality Changes. There has been no surface flow at this station since June 1958.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959                                   | Minimum - 1959 |
|--|-------------------|-------------------|--|----------------|
| Specific conductance (micromhos at 25°C)           | 766               | 373               | No flow at time<br>of monthly<br>Sampling visits |                |
| Temperature in °F                                  | 79                | 50                |  |                |
| Dissolved oxygen in parts per million              | 10.0              | 2.4               |  |                |
| Percent saturation                                 | 96                | 38                |  |                |
| pH   | 8.5               | 6.8               |  |                |
| Mineral constituents in parts per million          |                   |                   |  |                |
| Calcium (Ca)                                       | 108               | 37                |  |                |
| Magnesium (Mg)                                     | 41                | 6                 |  |                |
| Sodium (Na)  | 49                | 13                |  |                |
| Potassium (K)                                      | 7.2               | 2.7               |  |                |
| Carbonate (CO <sub>3</sub> )                       | 18                | 0                 |  |                |
| Bicarbonate (HCO <sub>3</sub> )                    | 306               | 129               |  |                |
| Sulfate (SO <sub>4</sub> )                         | 133               | 45                |  |                |
| Chloride (Cl)                                      | 52                | 7                 |  |                |
| Nitrate (NO <sub>3</sub> )                         | 23                | 1.5               |  |                |
| Fluoride (F)                                       | 1.2               | 0                 |  |                |
| Boron (B)  | 0.2               | 0                 |  |                |
| Silica (SiO <sub>2</sub> )                         | 35                | 13                |  |                |
| Total dissolved solids in parts per million        | 510               | 242               |  |                |
| Percent sodium                                     | 32                | 14                |  |                |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |  |                |
| Total  | 494               | 146               |  |                |
| Noncarbonate                                       | 103               | 13                |  |                |
| Turbidity in parts per million                     | 6,000             | 3                 |  |                |
| Coliform in most probable number per milliliter    | 24,000            | 2.3               |  |                |
| Radioactivity in micro-micro curies per liter      |                   |                   |  |                |
| Dissolved alpha                                    | 1.53              | 0                 |  |                |
| Solid alpha  | 2.46              | 0                 |  |                |
| Dissolved beta                                     | 12.3              | 0                 |  |                |
| Solid beta   | 0                 | 0                 |  |                |

### WATER QUALITY VARIATIONS



WARM CREEK NEAR SAN BERNARDINO (STA. 50c)

WARM CREEK AT COLTON (STA. 50b)

Sampling Point. Station 50b is located in Section 21 of Township 1 South, Range 4 West, San Bernardino Base and Meridian. Samples were taken from the right bank near the gage at "F" Street bridge, 0.25 mile north of U. S. Highway 99, and 0.4 mile east of Mr. Vernon, 1.2 miles east of Colton, and 0.3 mile below the City of San Bernardino sewage treatment plant.

Period of Record. April 1951 through December 1959.

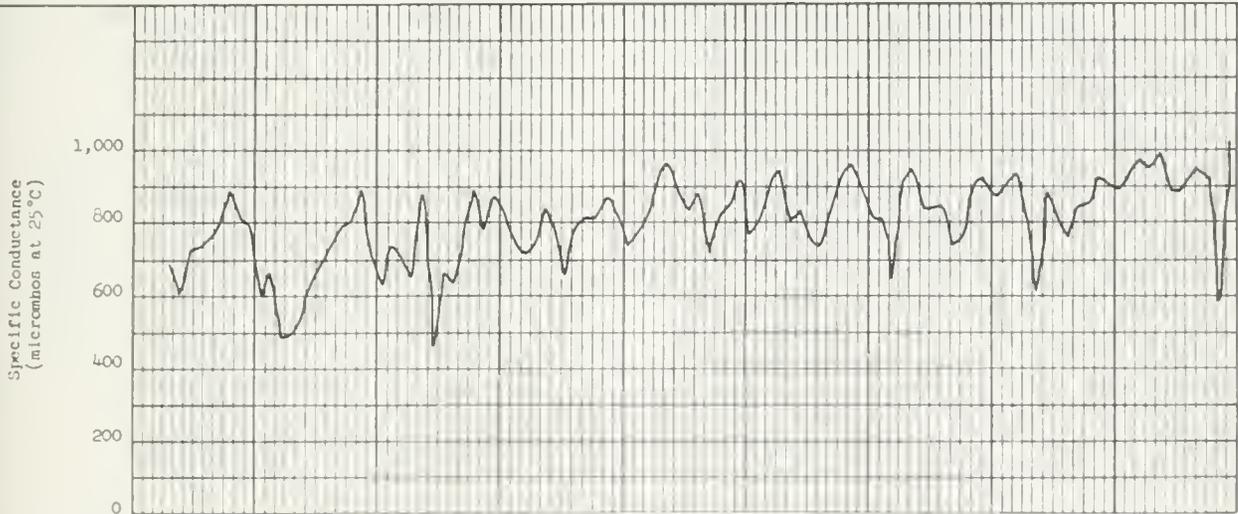
Water Quality Characteristics. The water at this station is sodium-calcium bicarbonate in character, moderately hard, and class 1 for irrigation. It is excellent in mineral quality for domestic use and meets mineral quality standards for drinking water. This station monitors the effects of the San Bernardino sewage treatment plant effluent on the quality of Warm Creek surface water.

Significant Water Quality Changes. There was a slight increase in mineral content in 1959 over the previous eight years of record. Bacterial counts ran high in 1959, with a median of 6,200 MPN/ml.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 1,018             | 446               | 1,018          | 877            |
| Temperature in °F  | 87                | 59                | 87             | 60             |
| Dissolved oxygen in parts per million                    | 10.2              | 0.0               | --             | --             |
| Percent saturation                                       | 107               | 0.00              | --             | --             |
| pH   | 8.4               | 6.6               | 7.4            | 6.8            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 76                | 30                | 76             | 30             |
| Magnesium (Mg)   | 24                | 4.5               | 24             | 4.5            |
| Sodium (Na)  | 118               | 43                | 118            | 48             |
| Potassium (K)  | 21                | 9.5               | 16             | 13.2           |
| Carbonate (CO <sub>3</sub> )                             | 0.0               | 0.0               | 0.0            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                          | 332               | 144               | 261            | 144            |
| Sulfate (SO <sub>4</sub> )                               | 97                | 51                | 96             | 52             |
| Chloride (Cl)  | 128               | 31                | 128            | 42             |
| Nitrate (NO <sub>3</sub> )                               | 94                | 10.3              | 90             | 43.4           |
| Fluoride (F)   | 2.0               | 0.6               | 1.4            | 0.6            |
| Boron (B)  | 1.08              | 0.02              | 0.76           | 0.23           |
| Silica (SiO <sub>2</sub> )                               | 50                | 20                | 50             | 20             |
| Total dissolved solids in parts per million              | 607               | 370               | 607            | 390            |
| Percent sodium   | 57                | 27                | 52             | 42             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 263               | 144               | 208            | 144            |
| Noncarbonate   | 91                | 0                 | 32             | 0              |
| Turbidity in parts per million                           | 2,000             | < 5               | 45             | < 5            |
| Coliform in most probable number per milliliter          | > 70,000          | 23                | > 70,000       | 230            |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Dissolved alpha  | 0.51              | 0.00              | 0.00           | 0.00           |
| Solid alpha  | 1.47              | 0.00              | 0.47           | 0.09           |
| Dissolved beta   | 26.22             | 0.00              | 8.51           | 1.76           |
| Solid beta   | 9.1               | 0.00              | 5.52           | 0.00           |

### WATER QUALITY VARIATIONS



WARM CREEK NEAR COLTON (STA 50b)

CHINO CREEK NEAR CHINO (STA. 86)

Sampling Point. Station 86 is located in Section 36 of Township 2 South, Range 8 West, San Bernardino Base and Meridian. Samples were collected from the right bank, 20 feet upstream from Pine Avenue bridge, approximately 5 miles southeast of Chino.

Period of Record. April 1952 through December 1959.

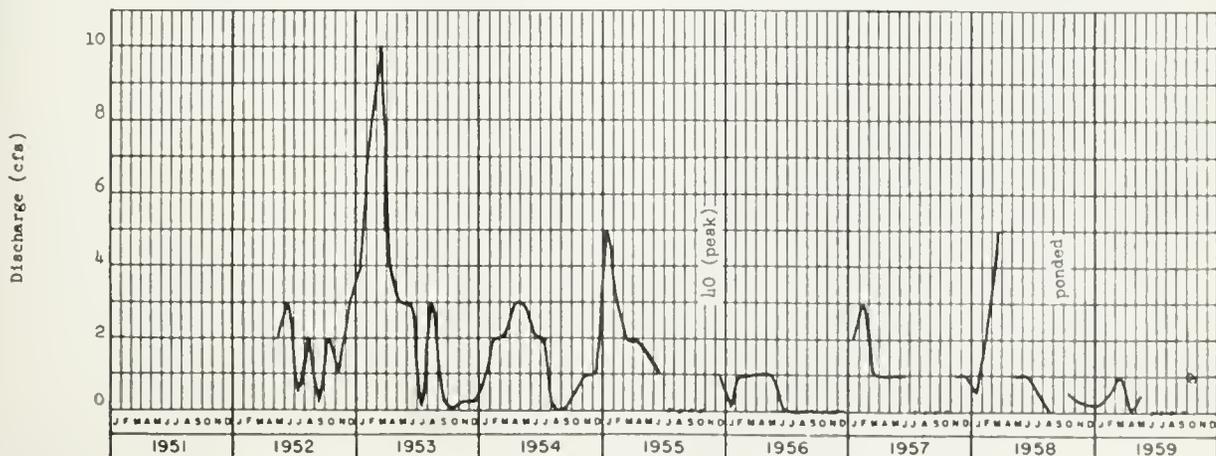
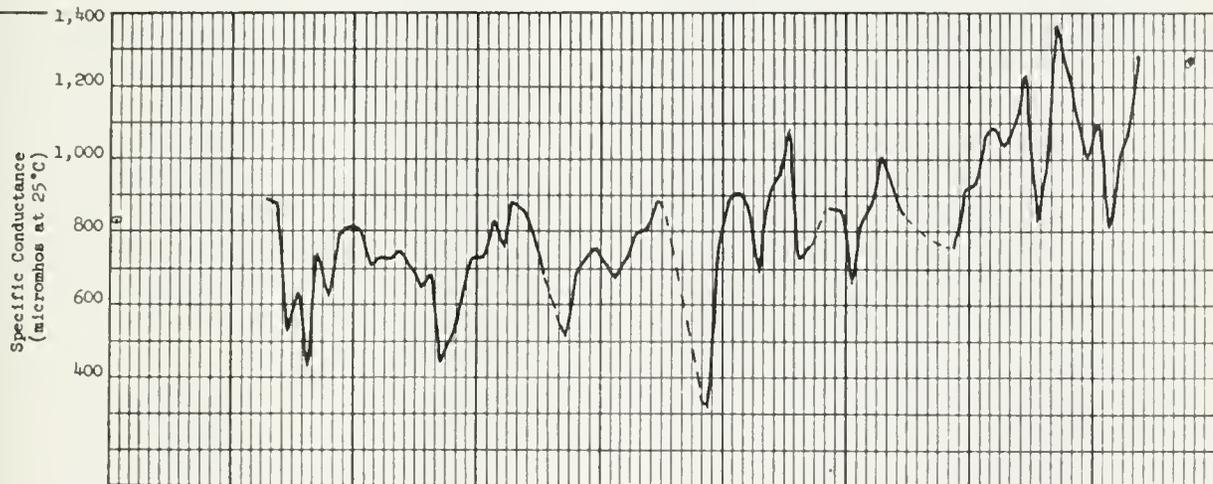
Water Quality Characteristics. At Station 86, Chino Creek water is calcium-sodium bicarbonate in character, class 1 to class 2 for irrigation, and very hard. Sulfate and fluoride generally exceed the recommended standards for drinking water. The flow at this station consists mostly of waste discharges from the City of Chino sewage treatment plant.

Significant Water Quality Changes. Fluorides in 1959 reached a new maximum for the period of record of 1.6 ppm, and boron attained a maximum of 0.72 ppm.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959            |
|--|-------------------|-------------------|----------------|---------------------------|
| Specific conductance (micromhos at 25°C)           | 1,366             | 235               | 1,280          | 331                       |
| Temperature in °F                                  | 86                | 48                | 72             | 61                        |
| Dissolved oxygen in parts per million              | 17.4              | 5.0               | 11.4           | 5.0                       |
| Percent saturation                                 | 228               | 57                | 124            | 57                        |
| pH   | 8.9               | 6.9               | 8.4            | 7.3                       |
| Mineral constituents in parts per million          |                   |                   |                |                           |
| Calcium (Ca)                                       | 143               | 25                | 143            | 25                        |
| Magnesium (Mg)                                     | 45                | 4                 | 42             | 11                        |
| Sodium (Na)  | 126               | 7                 | 96             | 19                        |
| Potassium (K)                                      | 32                | 4.1               | 14             | 6.8                       |
| Carbonate (CO <sub>3</sub> )                       | 38                | 0.00              | 0.00           | 0.00                      |
| Bicarbonate (HCO <sub>3</sub> )                    | 451               | 105               | 429            | 132                       |
| Sulfate (SO <sub>4</sub> )                         | 294               | 11                | 294            | 32                        |
| Chloride (Cl)                                      | 80                | 10                | 56             | 20                        |
| Nitrate (NO <sub>3</sub> )                         | 49                | 0.0               | 14.0           | 0.5                       |
| Fluoride (F)                                       | 1.6               | 0.0               | 1.6            | 0.5                       |
| Boron (B)  | 0.72              | 0.00              | 0.72           | 0.06                      |
| Silica (SiO <sub>2</sub> )                         | 50                | 5                 | 30             | 30                        |
| Total dissolved solids in parts per million        | 945               | 150               | 940            | 192                       |
| Percent sodium                                     | 39                | 13                | 38             | 25                        |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                           |
| Total  | 536               | 86                | 536            | 108                       |
| Noncarbonate                                       | 182               | 0                 | 182            | 0                         |
| Turbidity in parts per million                     | 3,500             | < 5               | 65             | < 5                       |
| Coliform in most probable number per milliliter    | 24,000            | 2.3               | 24,000         | 60                        |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                           |
| Dissolved alpha                                    | 0.94              | 0.0               | 0.40           | Station Dry<br>Sept. 1959 |
| Solid alpha  | 1.02              | 0.0               | 0.18           |                           |
| Dissolved beta                                     | 23.00             | 0.0               | 4.64           |                           |
| Solid beta   | 10.5              | 0.0               | 4.39           |                           |

### WATER QUALITY VARIATIONS



CHINO CREEK NEAR CHINO (STA. 86)

LAKE ELSINORE NEAR ELSINORE (STA. 89)

Sampling Point. Station 89 is located in Section 1 of Township 6 South, Range 5 West, San Bernardino Base and Meridian. Samples were collected from the north shore of the lake at the United States Geological Survey staff gage, approximately 0.5 mile south of the junction of Riverside Drive and State Highway 71.

Period of Record. February 1952 through December 1959.

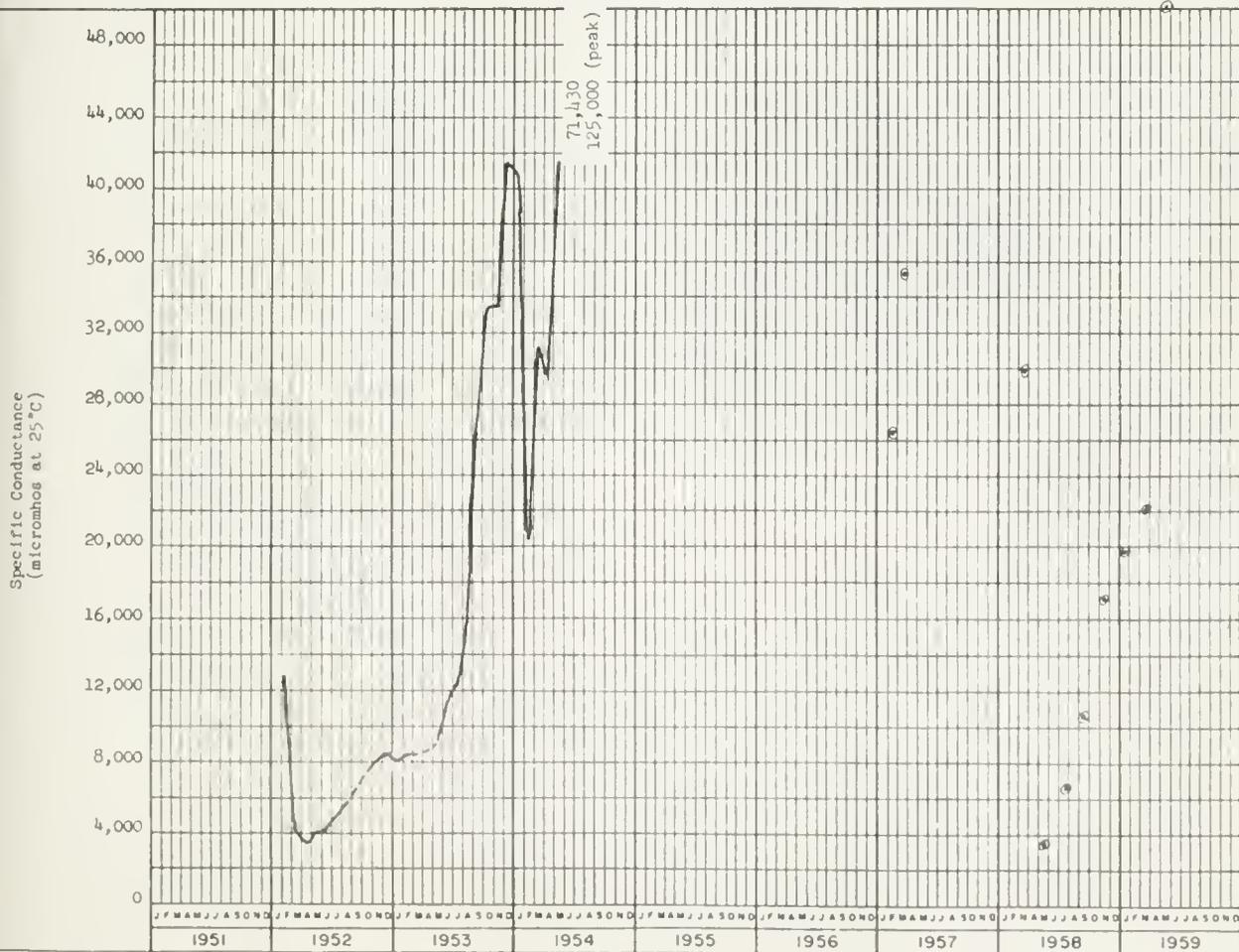
Water Quality Characteristics. Water at this station is unsuitable for recognized beneficial uses.

Significant Water Quality Changes. Water samples were collected during the first five months of 1959. During the remaining months of the year the lake was dry. Specific conductance ranged from 19,800 to 50,125 micromhos.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 125,000           | 3,497             | 50,125         | 19,800         |
| Temperature in °F                                  | 92                | 51                | 83             | 54             |
| Dissolved oxygen in parts per million              | 18.8              | 4.5               | 18.8           | 8.4            |
| Percent saturation                                 | 200               | 52                | 189            | 104            |
| pH   | 9.7               | 7.4               | 8.5            | 8.4            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 55                | 0                 | 47             | 47             |
| Magnesium (Mg)                                     | 80                | 5                 | 80             | 80             |
| Sodium (Na)  | 77,100            | 675               | 15,000         | 5,300          |
| Potassium (K)                                      | 320               | 19                | 200            | 200            |
| Carbonate (CO <sub>3</sub> )                       | 30,600            | 0                 | 759            | 199            |
| Bicarbonate (HCO <sub>3</sub> )                    | 29,041            | 256               | 2,360          | 820            |
| Sulfate (SO <sub>4</sub> )                         | 13,350            | 248               | 8,040          | 8,040          |
| Chloride (Cl)                                      | 79,000            | 768               | 15,600         | 5,800          |
| Nitrate (NO <sub>3</sub> )                         | 96                | 0                 | 20             | 20             |
| Fluoride (F)                                       | 8.4               | 0.6               | 2.4            | 2.4            |
| Boron (B)  | 88.0              | 0.75              | 15             | 15             |
| Silica (SiO <sub>2</sub> )                         | 40                | 1.0               | 5              | 5              |
| Total dissolved solids in parts per million        | 213,600           | 2,150             | 29,893         | 29,893         |
| Percent sodium                                     | 99.9              | 84                | 98             | 98             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 445               | 50                | 445            | 234            |
| Noncarbonate                                       | 129               | 0                 | 0              | 0              |
| Turbidity in parts per million                     | 500               | < 5               | 230            | 100            |
| Coliform in most probable number per milliliter    | 700+              | 0.06              | 0.45           | 0.45           |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.90              | 0.0               | 0.90           | No sample      |
| Solid alpha  | 5.94              | 0.0               | 0.28           | in Sept.       |
| Dissolved beta                                     | 127.38            | 0.0               | 4.90           |                |
| Solid beta   | 50.58             | 0.0               | 7.58           |                |

### WATER QUALITY VARIATIONS



LAKE ELSINORE NEAR ELSINORE (STA 89)



## STREAM SAMPLING STATIONS

SANTA ANA REGION (NO. 8)

| <u>Station<br/>Number</u> | <u>Station Name</u>             |
|---------------------------|---------------------------------|
| 50b                       | Warm Creek near Colton          |
| 50c                       | Warm Creek at San Bernardino    |
| 51                        | Santa Ana River near Arlington  |
| 51a                       | Santa Ana River below Prado Dam |
| 51b                       | Santa Ana River near Mentone    |
| 51e                       | Santa Ana River near Norco      |
| 86                        | Chino Creek near Chino          |
| 89                        | Lake Elsinore, North Shore      |





KEY MAP

LEGEND

- 51b SURFACE WATER MONITORING STATION
- SEWAGE WASTE DISCHARGE
- ▲ INDUSTRIAL WASTE DISCHARGE

SURFACE WATER QUALITY MONITORING PROGRAM

STREAM SAMPLING STATIONS

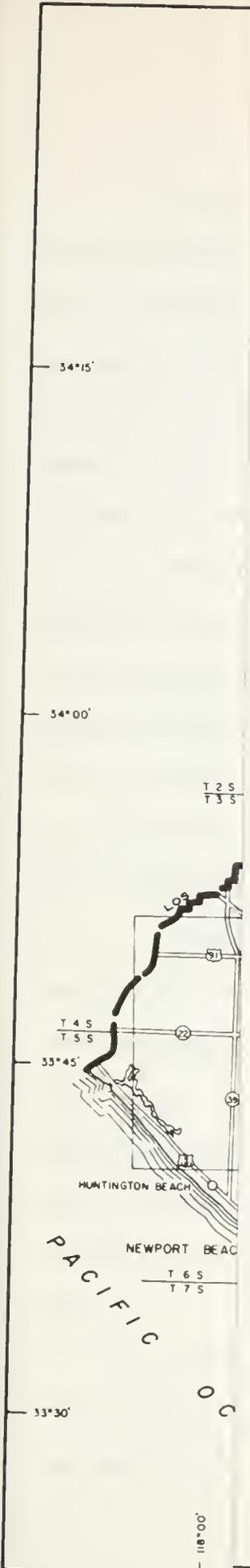
SANTA ANA REGION (NO. 8)

1959

SCALE OF MILES



1961





## San Diego Region (No. 9)

The San Diego Region (No. 9) comprises the drainage area of streams flowing to the Pacific Ocean in the 90-mile reach between the City of Corona Del Mar and the California-Mexico border. It has an average width of about 45 miles and includes portions of Orange, Riverside, and San Diego Counties. The area of the region is about 3,870 square miles, of which about 3,340 are mountains and foothills while only 530 square miles are valley and mesa lands.

The principal streams of the San Diego Region are the Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Rivers, and San Juan Creek. The San Luis Rey and Santa Margarita Rivers have the largest drainage basins wholly within the region; the largest basin is the Tia Juana River, which is about 27 percent in California and 73 percent in Mexico. The natural runoff from these eight principal streams averages about 280,000 acre-feet per year.

Steep slopes and sparse chaparral-type vegetation, with some conifers at the higher elevations, are characteristic features of the drainage basins. The climate is mild but relatively arid. The local water supply is insufficient to support the combined water demands of the urban, industrial, and agricultural developments in the region. Water imported through the facilities of The Metropolitan Water District of Southern California from the Colorado River supplements the local supply.

The seven stream basins monitored for surveillance of surface water quality in the San Diego Region and the number of stations maintained on each stream (in parentheses) are shown in the following



## San Diego Region (No. 9)

The San Diego Region (No. 9) comprises the drainage area of streams flowing to the Pacific Ocean in the 90-mile reach between the City of Corona Del Mar and the California-Mexico border. It has an average width of about 45 miles and includes portions of Orange, Riverside, and San Diego Counties. The area of the region is about 3,870 square miles, of which about 3,340 are mountains and foothills while only 530 square miles are valley and mesa lands.

The principal streams of the San Diego Region are the Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Rivers, and San Juan Creek. The San Luis Rey and Santa Margarita Rivers have the largest drainage basins wholly within the region; the largest basin is the Tia Juana River, which is about 27 percent in California and 73 percent in Mexico. The natural runoff from these eight principal streams averages about 280,000 acre-feet per year.

Steep slopes and sparse chaparral-type vegetation, with some conifers at the higher elevations, are characteristic features of the drainage basins. The climate is mild but relatively arid. The local water supply is insufficient to support the combined water demands of the urban, industrial, and agricultural developments in the region. Water imported through the facilities of The Metropolitan Water District of Southern California from the Colorado River supplements the local supply.

The seven stream basins monitored for surveillance of surface water quality in the San Diego Region and the number of stations maintained on each stream (in parentheses) are shown in the following

tabulation:

|                           |                         |
|---------------------------|-------------------------|
| Santa Margarita River (1) | San Diego River (1)     |
| San Luis Rey River (1)    | Forester Creek (1)      |
| Escondido Creek (1)       | Spring Valley Creek (1) |
| San Dieguito River (1)    |                         |

The quality of the natural stream flows in the region is variable, and ranges from good to very poor. At stations where flows consist primarily of sewage wastes, the quality ranges from good to unsatisfactory for either domestic or irrigation use. The less than normal rainfall in the winter of 1958-59 resulted in little or no runoff and many of the monitoring stations were dry for much of 1959. The continuing drought had no significant effect on the quality of surface waters in the region.

## Santa Margarita River Basin

The Santa Margarita River is the principal stream in the northern portion of the San Diego Region. It drains a watershed area of about 740 square miles between the San Jacinto and Palomar Mountain ranges. About 160 square miles of the basin are valley and mesa lands; 580 square miles are mountainous.

The Santa Rosa Plateau separates the basin into an inland unit drained by the Temecula Creek and Murrieta Creek, and a coastal unit drained by the Santa Margarita River. Mean annual runoff from the basin is estimated at 36,300 acre-feet.

Precipitation in the basin varies widely from year to year and occasional heavy winter storms cause flood damage. Rainfall rates are significantly heavier along the coast than in inland areas.

The economy of the basin is based principally on diversified agriculture. Most irrigation water is supplied from wells, although supplementary supplies are available from a number of surface reservoirs on the Santa Margarita River system. A United States Naval Reservation is an important activity in the coastal portion of the basin.

The one station established to maintain surveillance of surface water quality in the basin is Santa Margarita near Fallbrook. It is discussed on page 152.

SANTA MARGARITA RIVER NEAR FALLBROOK (STA. 51c)

Sampling Point. Station 51c is located in Section 12 of Township 9 South, Range 4 West, San Bernardino Base and Meridian. Samples were collected from the left bank, 2 miles north of the Fallbrook Public Utility District gage on the Santa Margarita River.

Period of Record. February 1951 through 1959.

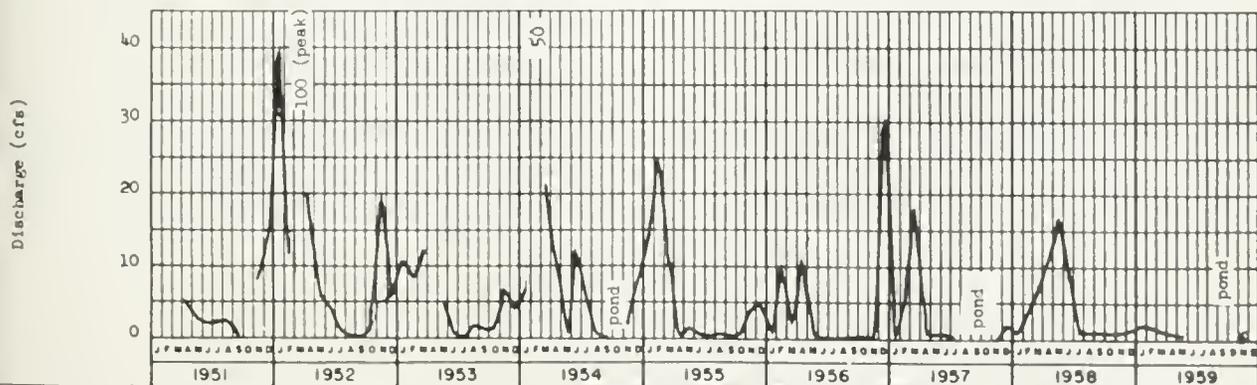
Water Quality Characteristics. The water at Station 51c is sodium bicarbonate-chloride in character, very hard, and meets mineral quality standards for drinking water. Specific conductance values place this water in class 2 for irrigation use.

Significant Water Quality Changes. Greater than normal precipitation in the 1957-58 rainfall season resulted in a large reduction in mineral concentrations, which in the preceding seven years had been gradually increasing. Dry weather in the 1958-59 season has caused a subsequent increase of mineral content.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 2,127             | 561               | 1,400          | 1,143          |
| Temperature in °F  | 87                | 46                | 79             | 55             |
| Dissolved oxygen in parts per million                    | 19                | 4.8               | 12.0           | 4.8            |
| Percent saturation                                       | 231               | 55                | 118            | 59             |
| pH   | 9.4               | 7.1               | 8.2            | 7.3            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 113               | 54                | 74             | 74             |
| Magnesium (Mg)   | 39                | 5                 | 34             | 34             |
| Sodium (Na)  | 224               | 23                | 194            | 128            |
| Potassium (K)  | 5.5               | 2.7               | 3.0            | 3.0            |
| Carbonate (CO <sub>3</sub> )                             | 34                | 0.0               | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                          | 495               | 116               | 473            | 317            |
| Sulfate (SO <sub>4</sub> )                               | 171               | 84                | 108            | 108            |
| Chloride (Cl)  | 468               | 97                | 185            | 139            |
| Nitrate (NO <sub>3</sub> )                               | 15                | 0.0               | 0.00           | 0.00           |
| Fluoride (F)   | 0.6               | 0.0               | 0.4            | 0.4            |
| Boron (B)  | 0.57              | 0.08              | 0.57           | 0.16           |
| Silica (SiO <sub>2</sub> )                               | 40                | 25                | 30             | 30             |
| Total dissolved solids in parts per million              | 977               | 520               | 713            | 713            |
| Percent sodium   | 68                | 42                | 53             | 45             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 447               | 142               | 368            | 325            |
| Noncarbonate   | 94                | 0                 | 78             | 0              |
| Turbidity in parts per million                           | 700               | 2                 | 40             | < 5            |
| Coliform in most probable number per milliliter          | 24,000            | 0.45              | 130            | 2.3            |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Dissolved alpha  | 0.60              | 0.00              | 0.60           | 0.00           |
| Solid alpha  | 0.83              | 0.00              | 0.28           | 0.00           |
| Dissolved beta   | 19.13             | 0.00              | 1.65           | 0.00           |
| Solid beta   | 10.69             | 0.00              | 0              | 0.00           |

## WATER QUALITY VARIATIONS



SANTA MARGARITA RIVER NEAR FALLBROOK  
(STA 51c)

## San Luis Rey River Basin

The San Luis Rey River Basin occupies the north central portion of the San Diego Region. Its drainage area is about 565 square miles, of which 505 square miles are mountainous and about 60 square miles are mesa and valley lands. It is bounded on the north by the Palomar Mountains, and on the south by the Merriam and San Marcos Mountains. The headwaters area of San Luis Rey River are in the mountains surrounding Lake Henshaw. From Lake Henshaw the river flows about 50 miles in a westerly direction to the ocean near Oceanside. The mean annual runoff of the San Luis Rey River is estimated at 62,200 acre-feet.

Rainfall is sparse, and usually occurs only in the winter and spring. Water rarely flows in the reach of the river from Pala to the ocean except after extremely heavy rainstorms. In 1959 the station at Pala was dry throughout the year. Above Pala, water is diverted from San Luis Rey River at a point 5 miles below Henshaw Dam and exported from the basin to Lake Wohlford on Escondido Creek from where it supplies the communities of Escondido and Vista. Lake Henshaw has never filled since its construction in 1922; in 1959 it stored very little water. Lake Henshaw is the only body of water available for recreational use in the river basin.

The economy of the basin is based on irrigated agriculture. The surface water supplies are not sufficient to meet the water requirements in the basin. Most of the irrigation water is drawn from wells. In 1959 a portion of the basin's water requirements downstream from Pala was supplied by the importation of Colorado River water. There are no

significant waste discharges to the stream system above the sampling station.

The one station established to maintain surveillance of surface water quality in San Luis Rey River is San Luis Rey near Pala. It is discussed on page 156.

SAN LUIS REY RIVER NEAR PALA (STA. 62)

Sampling Point. Station 62 is located in Section 36 of Township 9 South, Range 2 West, San Bernardino Base and Meridian. Samples were collected from the right bank below Pala Diversion Dam and the United States Geological Survey summer gage, 1.8 miles east of Pala.

Period of Record. March 1951 through 1959.

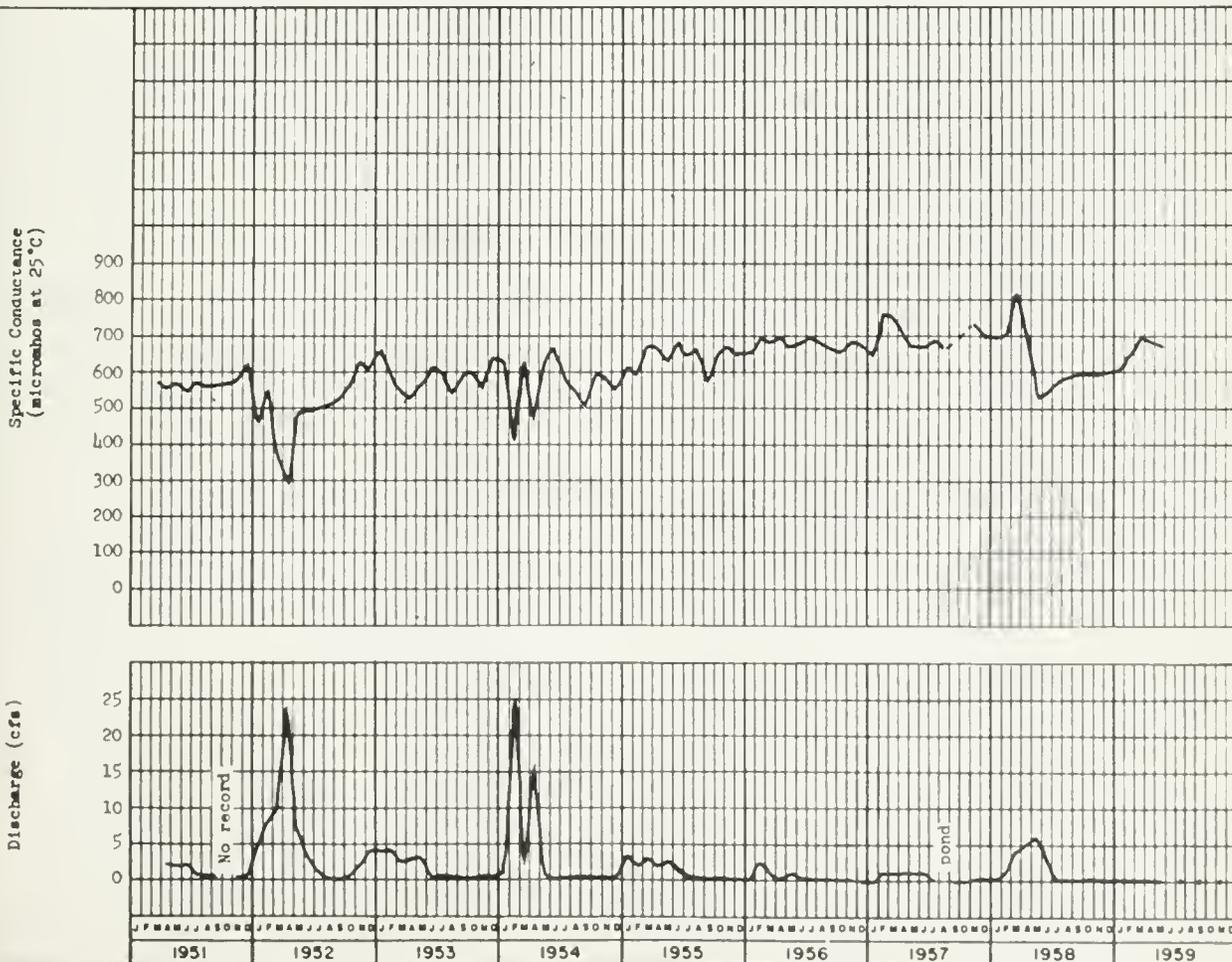
Water Quality Characteristics. The water at this station is calcium-sodium bicarbonate-sulfate in character and very hard. It is class 1 for irrigation and meets drinking water standards for mineral quality.

Significant Water Quality Changes. The mineral content in 1959 increased slightly over that of 1958, but has remained nearly uniform for the nine year period of record. There was little flow from January to June 1959 and the station was dry the remainder of the year.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)                 | 818               | 296               | 697            | 610            |
| Temperature in °F  | 75                | 50                | 66             | 61             |
| Dissolved oxygen in parts per million                    | 10.8              | 5                 | 10.5           | 6.4            |
| Percent saturation                                       | 109               | 48                | 106            | 66             |
| pH   | 8.5               | 7.0               | 7.4            | 7.2            |
| <b>Mineral constituents in parts per million</b>         |                   |                   |                |                |
| Calcium (Ca)   | 66                | 34                | 62             | 62             |
| Magnesium (Mg)   | 26                | 15                | 22             | 22             |
| Sodium (Na)  | 50                | 32                | 50             | 42             |
| Potassium (K)  | 5                 | 3.8               | 4.6            | 4.6            |
| Carbonate (CO <sub>3</sub> )                             | 14                | 0.0               | 0.0            | 0.0            |
| Bicarbonate (HCO <sub>3</sub> )                          | 250               | 100               | 156            | 151            |
| Sulfate (SO <sub>4</sub> )                               | 152               | 45                | 152            | 152            |
| Chloride (Cl)  | 94                | 20                | 45             | 38             |
| Nitrate (NO <sub>3</sub> )                               | 6.5               | 0.0               | 0.0            | 0.0            |
| Fluoride (F)   | 0.6               | 0.1               | 0.1            | 0.1            |
| Boron (B)  | 0.27              | 0.0               | 0.00           | 0.00           |
| Silica (SiO <sub>2</sub> )                               | 50                | 15                | 35             | 35             |
| Total dissolved solids in parts per million              | 500               | 318               | 500            | 500            |
| Percent sodium   | 44                | 12                | 30             | 27             |
| <b>Hardness as CaCO<sub>3</sub> in parts per million</b> |                   |                   |                |                |
| Total  | 272               | 118               | 247            | 228            |
| Noncarbonate   | 122               | 48                | 121            | 100            |
| Turbidity in parts per million                           | 29                | 2                 | < 5            | < 5            |
| Coliform in most probable number per milliliter          | 2,400             | .45               | 700            | 4.5            |
| <b>Radioactivity in micro-micro curies per liter</b>     |                   |                   |                |                |
| Dissolved alpha  | 1.44              | 0.00              | 0.00           | 0.00           |
| Solid alpha  | 0.82              | 0.00              | 0.09           | 0.00           |
| Dissolved beta   | 19.90             | 0.00              | 0.17           | 0.00           |
| Solid beta   | 31.33             | 0.00              | 2.73           | 0.00           |

### WATER QUALITY VARIATIONS



SAN LUIS REY RIVER NEAR PALA (STA. 62)



## Escondido Creek Basin

Escondido Creek Basin is located in the central portion of the San Diego Region. The watershed area of 215 square miles consists of 165 square miles of mountainous terrain and about 50 square miles of valley and foothill lands. Escondido Creek extends about 20 miles southwesterly from Lake Wohlford to the ocean at San Elijo Lagoon. The mean annual runoff of Escondido Creek is estimated to be about 4,000 acre-feet.

Lake Wohlford Reservoir stores local surface water and waters imported from the San Luis Rey River and the Colorado River. Water from Lake Wohlford is used for municipal purposes in the City of Escondido and at Vista, and for irrigation in the Escondido Valley and around Vista. The use at Vista constitutes an export. The reservoir is also used for electric power production and recreation.

Agriculture is highly developed in the valley and foothill areas and water for irrigation is obtained from both surface and underground sources.

The major discharge of waste water to Escondido Creek is effluent from the City of Escondido's sewage treatment plant (1.0 mgd). A granite quarry discharges cutting-waste water and mud to the stream near Harmony Grove at various times.

The one station established to maintain surveillance of surface water quality in Escondido Creek is Escondido Creek near Harmony Grove. It is discussed on page 160.

ESCONDIDO CREEK NEAR HARMONY GROVE (STA. 63)

Sampling Point. Station 63 is located in Section 30 of Township 12 South, Range 2 West, San Bernardino Base and Meridian. Samples were collected at the Harmony Grove Road crossing at the culvert, 4 miles south of Escondido.

Period of Record. March 1951 through 1959.

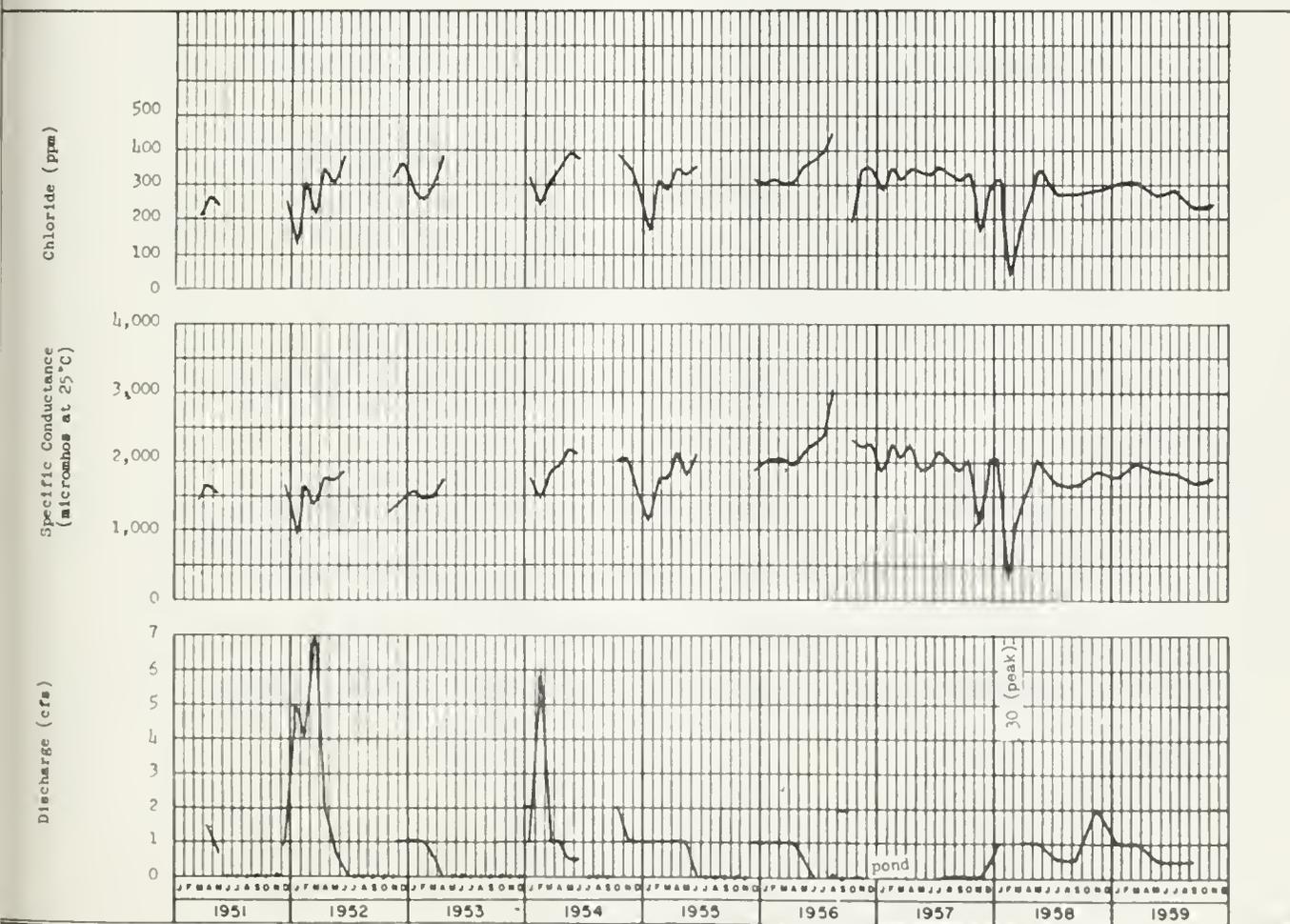
Water Quality Characteristics. The flow of Escondido Creek is primarily effluent from the City of Escondido sewage treatment plant. The water is sodium chloride-sulfate in character, very hard, class 2 for irrigation, and generally does not meet drinking water mineral quality standards. Boron is usually present in quantities greater than 0.5 ppm.

Significant Water Quality Changes. None.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 3,012             | 338               | 1,970          | 1,668          |
| Temperature in °F                                  | 83                | 46                | 74             | 54             |
| Dissolved oxygen in parts per million              | 22                | 0.4               | 10.0           | 3.4            |
| Percent saturation                                 | 161               | 4.0               | 100            | 31             |
| pH   | 8.7               | 6.8               | 8.4            | 7.2            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 89                | 17                | 87             | 64             |
| Magnesium (Mg)                                     | 61                | 6                 | 39             | 35             |
| Sodium (Na)  | 304               | 38                | 259            | 217            |
| Potassium (K)                                      | 18.4              | 8.5               | 17             | 14             |
| Carbonate (CO <sub>3</sub> )                       | 31                | 0.0               | 12             | 0.0            |
| Bicarbonates (HCO <sub>3</sub> )                   | 351               | 62                | 299            | 235            |
| Sulfate (SO <sub>4</sub> )                         | 335               | 40                | 293            | 261            |
| Chloride (Cl)                                      | 450               | 45                | 312            | 236            |
| Nitrate (NO <sub>3</sub> )                         | 52.1              | 0                 | 21             | 18             |
| Fluoride (F)                                       | 1.2               | 0.2               | 0.5            | 0.4            |
| Boron (B)  | 1.68              | 0.2               | 0.62           | 0.50           |
| Silica (SiO <sub>2</sub> )                         | 30                | 7                 | 20             | 20             |
| Total dissolved solids in parts per million        | 1,375             | 200               | 1,151          | 1,034          |
| Percent sodium                                     | 69                | 44                | 62             | 58             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 881               | 67                | 369            | 320            |
| Noncarbonate                                       | 179               | 15                | 153            | 118            |
| Turbidity in parts per million                     | 3,500             | < 5               | 300            | < 5            |
| Coliform in most probable number per milliliter    | 70,000            | 0.45              | 6,200          | 0.45           |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.65              | 0.00              | 0.10           | 0.08           |
| Solid alpha  | 0.09              | 0.00              | 0.09           | 0.08           |
| Dissolved beta                                     | 12.90             | 0.00              | 12.90          | 0.08           |
| Solid beta   | 15.84             | 0.00              | 6.68           | 0.00           |

### WATER QUALITY VARIATIONS



ESCONDIDO CREEK NEAR HARMONY GROVE  
(STA. 63)

## San Dieguito River Basin

The San Dieguito River Basin is located in the central part of the San Diego Region. The watershed area of 327 square miles consists of 294 square miles of mountainous terrain, and about 33 square miles of foothills and valley plain. San Dieguito River flows a distance of about 53 miles in a southwesterly direction from the Volcan Mountains to the ocean near Del Mar. Above its confluence with its principal tributary, Santa Maria Creek, it is named Santa Ysabel Creek. Mean annual runoff of the basin has been estimated at 43,800 acre feet.

Precipitation is extremely variable, and most of the stream flow ceases soon after winter storms. Two reservoirs store the greater part of the surface flow; Southerland Reservoir on Santa Ysabel Creek, and Lake Hodges on San Dieguito River. In recent years there has been no flow recorded in the reach between Lake Hodges and the ocean. Lake Hodges in 1959 stored only Colorado River water conveyed by the San Diego Aqueduct of the Metropolitan Water District of Southern California to San Diego County Water Authorities distribution system. Southerland Reservoir has stored very little water since its construction was completed in 1954. Both reservoirs are used for limited recreational purposes.

The economy of the basin is agricultural, and the valley lands are used for cattle grazing, dry farming, and irrigated orchards and crops. The local water supplies are insufficient for present development and supplemental water supplies are imported from the Colorado River.

There are no significant waste discharges entering the stream channels of the San Dieguito River system.

The one station established in the San Dieguito River Basin to maintain surveillance of surface water quality is San Dieguito River below San Pasqual Valley. It is discussed on page 164.

SAN DIEGUITO RIVER BELOW SAN PASQUAL VALLEY (STA. 64)

Sampling Point. Station 64 is located in Section 1 of Township 13 South, Range 2 West, San Bernardino Base and Meridian. Samples were collected from the right bank, 75 yards upstream from the United States Geological Survey gage which is 2.5 miles upstream from the Highway 395 bridge or 4.5 miles southeast of Escondido and 5 miles west of San Pasqual.

Period of Record. April 1951 through 1959.

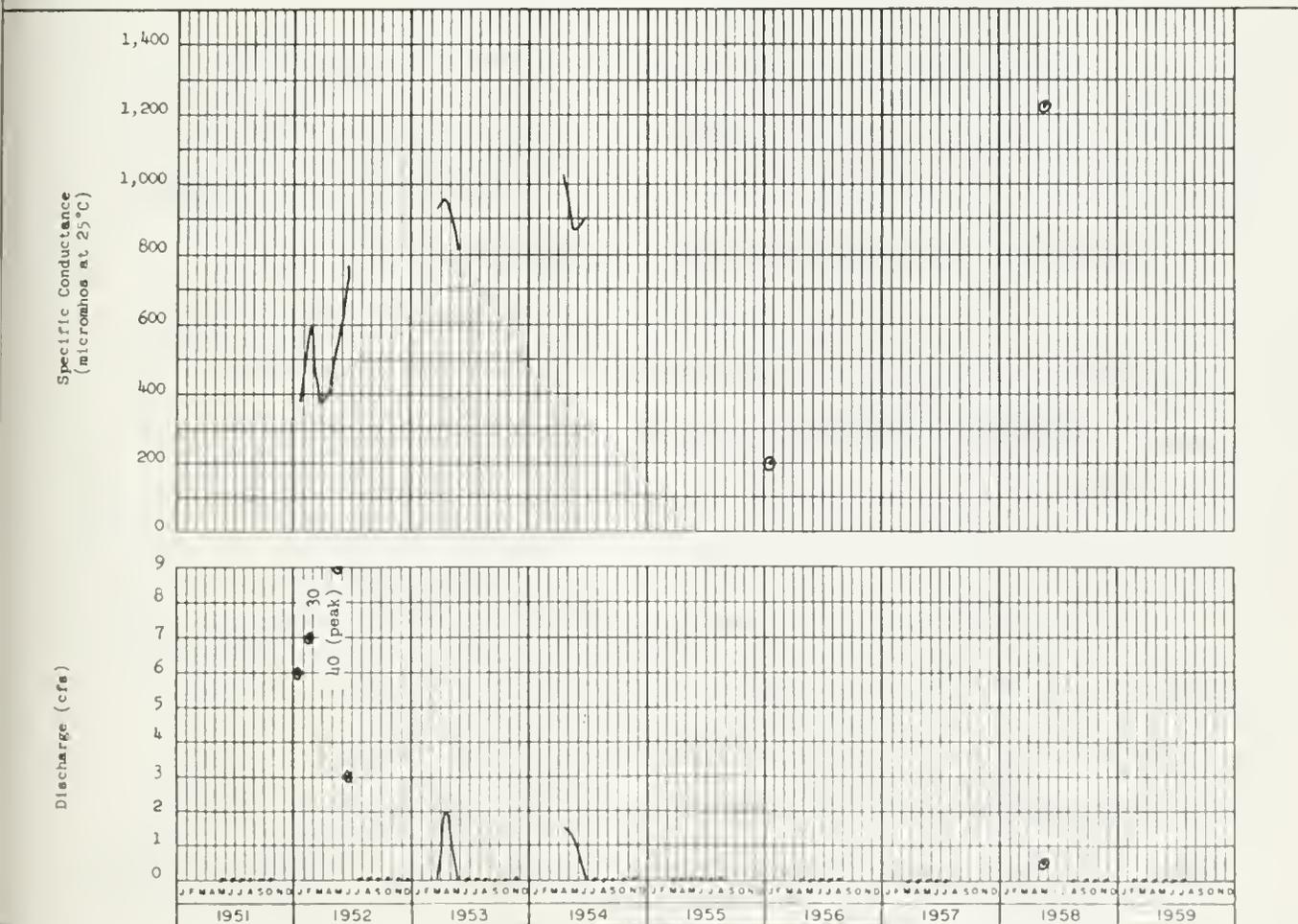
Water Quality Characteristics. The water at this station is predominantly a sodium-chloride or sodium-bicarbonate type, with calcium, or sometimes magnesium, as the secondary cation. It is moderately hard to very hard water, usually class 1 for irrigation use, and meets drinking water mineral quality standards.

Significant Water Quality Changes. None.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 1,235             | 192               | No Flow during | 1959           |
| Temperature in °F                                  | 95                | 50                |                |                |
| Dissolved oxygen in parts per million              | 10.8              | 6.0               |                |                |
| Percent saturation                                 | 133               | 75                |                |                |
| pH   | 8.4               | 7.2               |                |                |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 69                | 19                |                |                |
| Magnesium (Mg)                                     | 47                | 7                 |                |                |
| Sodium (Na)  | 140               | 10                |                |                |
| Potassium (K)                                      | 7.2               | 2.2               |                |                |
| Carbonate (CO <sub>3</sub> )                       | 17                | 0                 |                |                |
| Bicarbonate (HCO <sub>3</sub> )                    | 349               | 83                |                |                |
| Sulfate (SO <sub>4</sub> )                         | 136               | 11                |                |                |
| Chloride (Cl)                                      | 187               | 12                |                |                |
| Nitrate (NO <sub>3</sub> )                         | 1.8               | 0.00              |                |                |
| Fluoride (F)                                       | 0.60              | 0.40              |                |                |
| Boron (B)  | 0.14              | 0.00              |                |                |
| Silica (SiO <sub>2</sub> )                         | 40                | 20                |                |                |
| Total dissolved solids in parts per million        | 760               | 130               |                |                |
| Percent sodium                                     | 67                | 38                |                |                |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 367               | 112               |                |                |
| Noncarbonate                                       | 120               | 15                |                |                |
| Turbidity in parts per million                     | 1,750             | 2                 |                |                |
| Coliform in most probable number per milliliter    | 24,000            | 2.3               |                |                |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.26              | 0.00              |                |                |
| Solid alpha  | 0.00              | 0.00              |                |                |
| Dissolved beta                                     | 33.72             | 11.31             |                |                |
| Solid beta   | 8.53              | 0.00              |                |                |

### WATER QUALITY VARIATIONS



SAN DIEGUITO RIVER NEAR SAN PASQUAL VALLEY  
(STA. 64)

## San Diego River Basin

The San Diego River Basin is located in the south central part of the San Diego Region. The watershed has an area of 439 square miles, consisting of 393 square miles of mountainous terrain and about 42 square miles of mesa and valley lands. The headwater area lies in the Cuyamaca Mountains near Julian. The river system, about 45 miles long, drains two inland valley basins and coastal Mission Valley before discharging into Mission Bay, near San Diego. The mean annual runoff of the San Diego River is estimated at 54,600 acre-feet.

Precipitation in the basin is highly variable and occurs principally as rainfall in the winter and spring and infrequently as summer storms of high intensity. Precipitation in the coastal area is somewhat lighter than in the interior areas.

Stream flow is conserved at three principal reservoirs: Cuyamaca, El Capitan, and San Vicente. Cuyamaca Reservoir is located in the headwater area on Boulder Creek. El Capitan Reservoir is situated about midway on the main stem of the San Diego River. San Vicente Reservoir is located on San Vicente Creek, a tributary to the San Diego River downstream from El Capitan Reservoir. There are also a number of smaller reservoirs on the stream system. San Vicente Reservoir stores Colorado River water imported for municipal use in the City of San Diego. All reservoirs are open for fishing.

Economic activity in San Diego River Basin has been agricultural but it is rapidly being urbanized. Residential, commercial, and light industrial activities are increasing as the City of San Diego expands. Irrigated agriculture utilizes ground water supplies primarily, supplemented in some areas by surface supplies of both local and imported waters.

Urban water supplies in the lower basin are primarily imported while ground water supplies these needs in the upper basin. Current use of imported water exceeds the average annual natural supply.

The major waste water discharges to the stream channels are effluents from sewage treatment plants. The largest waste discharge is that of the City of El Cajon, amounting to about 2.1 mgd. Some of it is used for irrigation of a golf course and a ball park, but the greater part of the flow is discharged to Forester Creek, tributary to San Diego River. Other waste water discharges are sewage plant effluents from the Santee County Water District (0.7 mgd), San Diego County's Gillespie Field (0.04 mgd) to Forester Creek, and Camp Elliot (0.4 mgd) to Murphy Canyon.

Natural flows in the lower reaches of the river occur only after heavy rainstorms. In 1959 the station at Old Mission Dam was a pond during most of the year. Forester Creek flows consisted almost entirely of sewage.

The two stations established to maintain surveillance of surface water quality in the San Diego River Basin are:

| <u>Monitoring Station</u>               | <u>Page Number of<br/>Station Discussion</u> |
|---|--|
| San Diego River<br>at Old Mission Dam   | 168  |
| Forester Creek<br>at Mission Gorge Road | 170  |

SAN DIEGO RIVER AT OLD MISSION DAM (STA. 65)

Sampling Point. Station 65 is located in Section 25 of Township 15 South, Range 2 West, San Bernardino Base and Meridian. Samples were collected from the left bank just below Old Mission Dam, 3 miles west of Santee.

Period of Record. April 1951 through 1959.

Water Quality Characteristics. The water at this station is characterized as a sodium chloride-sulfate type, and exceeds the recommended limits for mineral constituents in drinking water. Chloride concentrations have generally placed this water in class 2 or class 3 for irrigation use throughout the period of record. Boron content often exceeds 0.5 ppm.

Significant Water Quality Changes. The water at Station 65 was ponded above and below the dam most of the year of 1959. The water quality remained essentially the same as that of 1958, but continued to indicate a general degradation over the eight years of record. Manganese was reported high in May 1959 (0.6 ppm).

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 4,098             | 360               | 2,400          | 2,012          |
| Temperature in °F                                  | 87                | 48                | 84             | 58             |
| Dissolved oxygen in parts per million              | 27                | 2.8               | 16.0           | 2.8            |
| Percent saturation                                 | 354               | 27                | 182            | 27             |
| pH   | 9.0               | 6.6               | 8.5            | 7.4            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 156               | 16                | 103            | 99             |
| Magnesium (Mg)                                     | 120               | 7                 | 60             | 50             |
| Sodium (Na)  | 492               | 42                | 332            | 278            |
| Potassium (K)                                      | 14                | 2.7               | 14             | 13             |
| Carbonate (CO <sub>3</sub> )                       | 26                | 0                 | 0              | 0              |
| Bicarbonate (HCO <sub>3</sub> )                    | 683               | 57                | 354            | 222            |
| Sulfate (SO <sub>4</sub> )                         | 314               | 14                | 253            | 252            |
| Chloride (Cl)                                      | 1,060             | 54                | 490            | 385            |
| Nitrate (NO <sub>3</sub> )                         | 45                | 0                 | 5              | 3              |
| Fluoride (F)                                       | 7.3               | 0                 | 0.7            | 0.6            |
| Boron (B)  | 0.66              | 0.06              | 0.65           | 0.5            |
| Silica (SiO <sub>2</sub> )                         | 50                | 5                 | 20             | 15             |
| Total dissolved solids in parts per million        | 2,779             | 241               | 1,439          | 1,388          |
| Percent sodium                                     | 59                | 43                | 59             | 56             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 983               | 70                | 496            | 451            |
| Noncarbonate                                       | 610               | 23                | 313            | 174            |
| Turbidity in parts per million                     | 2,000             | < 5               | 400            | < 5            |
| Coliform in most probable number per milliliter    | 700               | 5                 | 700            | 13             |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.81              | 0.00              | 0.49           | 0.20           |
| Solid alpha  | 1.35              | 0.00              | 0.28           | 0.16           |
| Dissolved beta                                     | 13.58             | 0.00              | 5.00           | 1.28           |
| Solid beta   | 15.23             | 0.00              | 6.42           | 2.10           |

## WATER QUALITY VARIATIONS



SAN DIEGO RIVER AT MISSION DAM (STA. 65)

FORESTER CREEK AT MISSION GORGE ROAD (STA. 65a)

Sampling Point. Station 65a is located in Section 28 of Township 15 South, Range 1 West, San Bernardino Base and Meridian. Samples were collected from the center of the stream just upstream from Mission Gorge Road.

Period of Record. March 1954 through 1959.

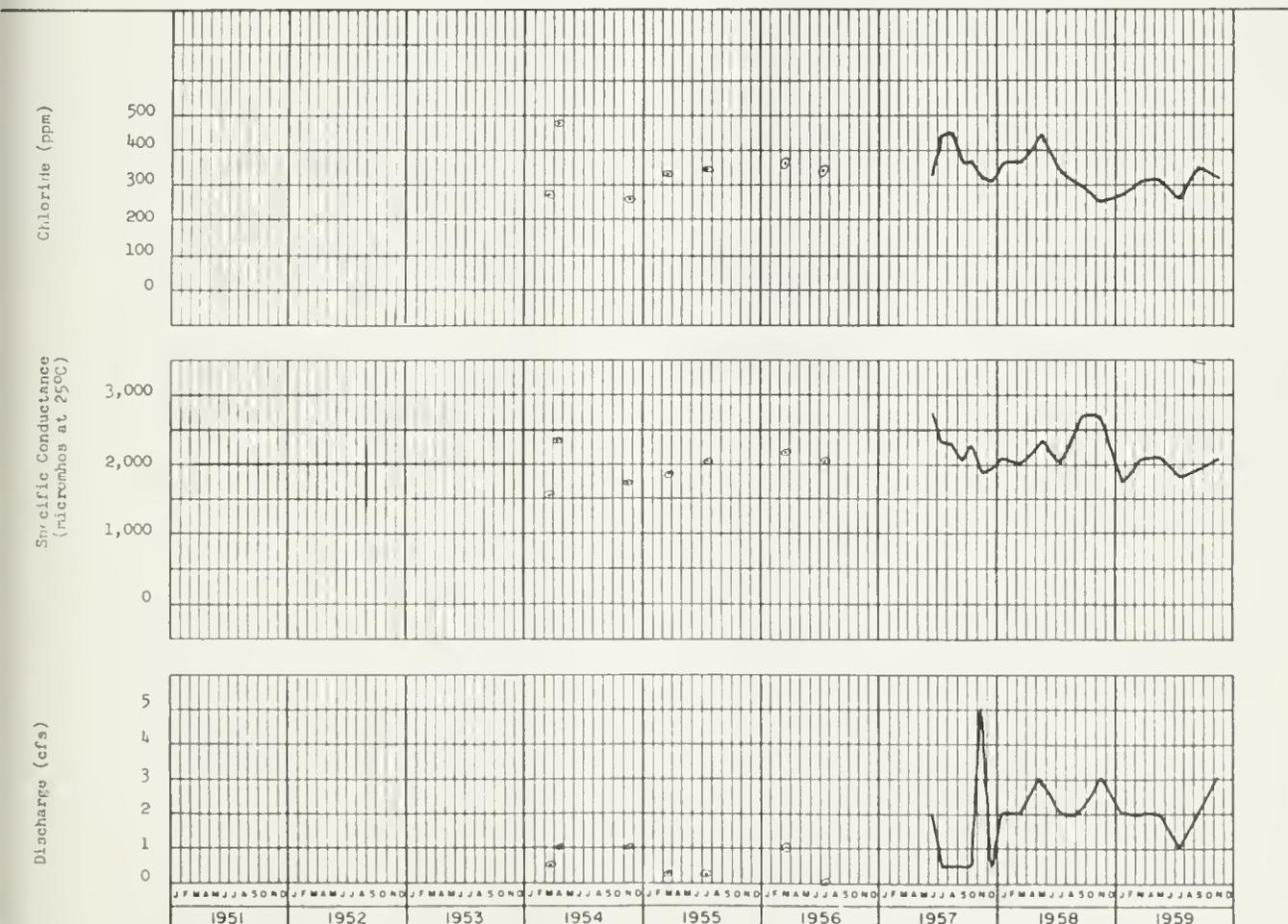
Water Quality Characteristics. The water at Station 65a is sodium chloride-sulfate in character, class 2 for irrigation, and very hard. It does not meet drinking water standards for mineral constituents.

Significant Water Quality Changes. Bacterial counts were high in 1959, reaching a maximum of 62,000 MPN/ml.

## WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 2,381             | 1,531             | 2,100          | 1,742          |
| Temperature in °F                                  | 84                | 57                | 84             | 67             |
| Dissolved oxygen in parts per million              | 15.0              | 0.0               | 14.0           | 0.00           |
| Percent saturation                                 | 179               | 0.0               | 159            | 0.00           |
| pH   | 8.1               | 6.8               | 8.1            | 7.3            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 111               | 52                | 85             | 69             |
| Magnesium (Mg)                                     | 65                | 34                | 40             | 34             |
| Sodium (Na)  | 320               | 180               | 253            | 204            |
| Potassium (K)                                      | 22                | 15                | 18             | 16             |
| Carbonate (CO <sub>3</sub> )                       | 0.00              | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 459               | 110               | 459            | 305            |
| Sulfate (SO <sub>4</sub> )                         | 337               | 123               | 255            | 255            |
| Chloride (Cl)                                      | 482               | 251               | 329            | 262            |
| Nitrate (NO <sub>3</sub> )                         | 129               | 0.00              | 0.00           | 0.00           |
| Fluoride (F)                                       | 1.0               | 0.4               | 0.7            | 0.4            |
| Boron (B)  | 1.08              | 0.24              | 0.82           | 0.45           |
| Silica (SiO <sub>2</sub> )                         | 25                | 5                 | 20             | 20             |
| Total dissolved solids in parts per million        | 1,510             | 929               | 1,193          | 1,050          |
| Percent sodium                                     | 63                | 49                | 63             | 49             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 451               | 210               | 376            | 310            |
| Noncarbonate                                       | 278               | 0                 | 97             | 0              |
| Turbidity in parts per million                     | 400               | < 5               | 40             | < 5            |
| Coliform in most probable number per milliliter    | 62,000            | 45                | 62,000         | 230            |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.40              | 0.00              | 0.40           | 0.00           |
| Solid alpha  | 0.47              | 0.00              | 0.47           | 0.00           |
| Dissolved beta                                     | 18.50             | 0.00              | 3.39           | 2.10           |
| Solid beta   | 15.45             | 0.00              | 9.18           | 2.24           |

## WATER QUALITY VARIATIONS



FORESTER CREEK AT MISSION GORGE ROAD  
(STA 650)



## Sweetwater River Basin

Sweetwater River Basin is located in the southern portion of the San Diego Region. The drainage area consists of about 180 square miles of mountainous terrain. The source of the Sweetwater River is the western slopes of the Cuyamaca and Laguna Mountains, from which the river flows southwesterly 57 miles to San Diego Bay, near National City. The mean annual runoff is estimated to be about 17,700 acre-feet.

Sweetwater Reservoir, near La Pressa, and Loveland Lake Reservoir, upstream near Alpine, conserve most of the surface water flow. Imported Colorado River water is also stored in Sweetwater Reservoir.

Surface water supplies are used for irrigation, municipal, and industrial purposes. The lower Sweetwater River Basin is rapidly changing from agriculture to an urban complex.

The only waste water discharge to the stream system of significant magnitude is effluent from the Spring Valley sewage treatment plant (0.7 mgd). The waste is discharged to Spring Valley Creek, tributary to Sweetwater River below Sweetwater Dam.

The one station established to maintain surveillance of surface water quality on the Sweetwater River system is Spring Valley Creek near La Pressa. It is discussed on page 174.

SPRING VALLEY CREEK NEAR LA PRESSA (STA. 65b)

Sampling Point. Station 65b is located in Section 17 of Township 17 South, Range 1 West, San Bernardino Base and Meridian. Samples were collected downstream from the Spring Valley Sewage Treatment Plant near La Pressa.

Period of Record. March 1958 through 1959.

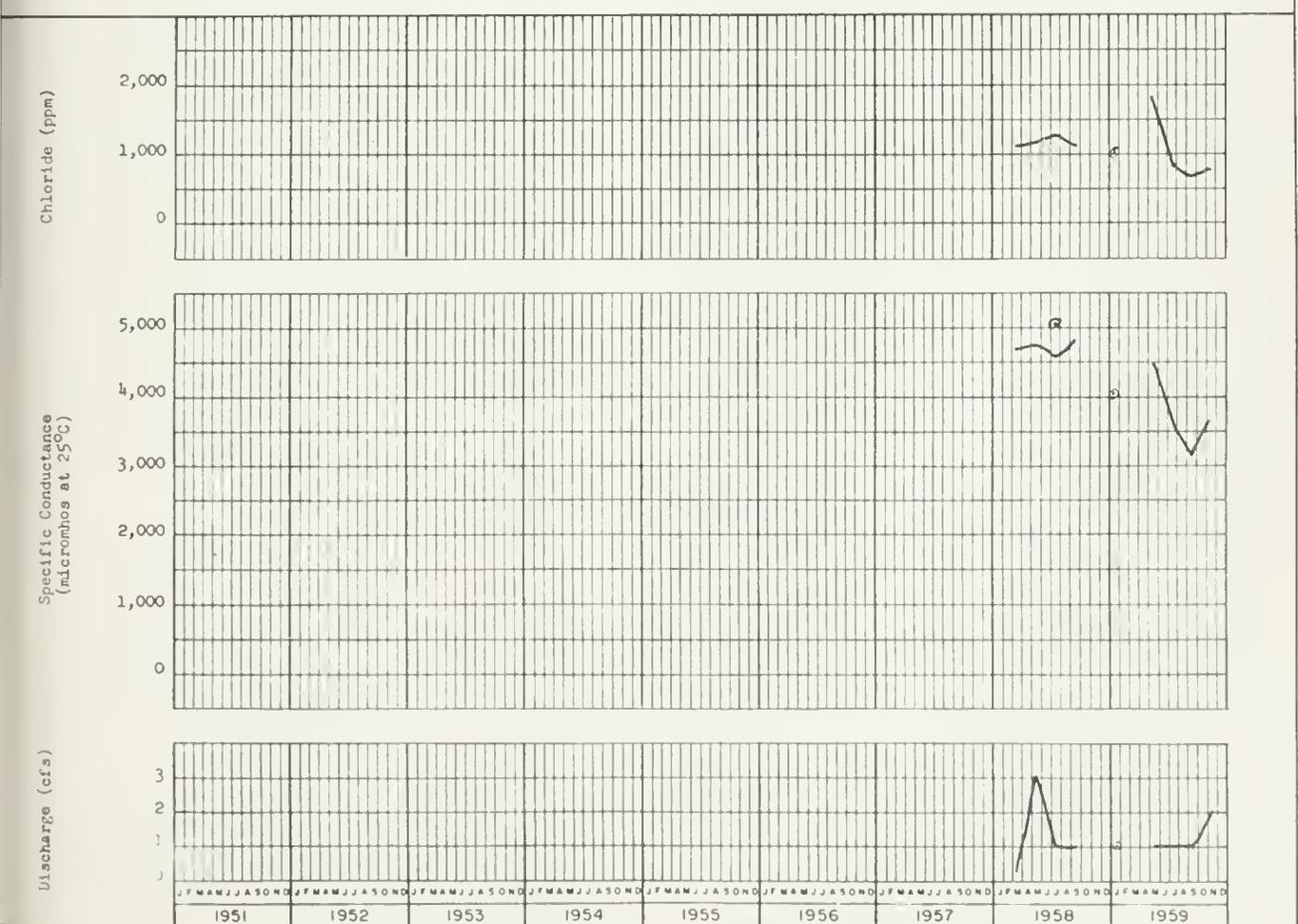
Water Quality Characteristics. The water at this station is sodium chloride in character and extremely hard. It is unsuitable for recognized beneficial uses.

Significant Water Quality Changes. Although the quality of the water was very poor in 1959, it showed a slight improvement over that of 1958. The specific conductance values varied from 3,172 to 4,484 micromhos and total dissolved solids ranged from 2,014 to 3,036 ppm in 1959.

### WATER QUALITY RANGES

| Item   | Maximum of Record | Minimum of Record | Maximum - 1959 | Minimum - 1959 |
|--|-------------------|-------------------|----------------|----------------|
| Specific conductance (micromhos at 25°C)           | 5,058             | 3,172             | 4,484          | 3,172          |
| Temperature in °F                                  | 84                | 59                | 84             | 62             |
| Dissolved oxygen in parts per million              | 17.0              | 7.6               | 11.0           | 7.6            |
| Percent saturation                                 | 210               | 80                | 135            | 90             |
| pH   | 8.4               | 7.6               | 8.2            | 7.6            |
| Mineral constituents in parts per million          |                   |                   |                |                |
| Calcium (Ca)                                       | 215               | 121               | 206            | 121            |
| Magnesium (Mg)                                     | 140               | 78                | 105            | 78             |
| Sodium (Na)  | 684               | 426               | 612            | 426            |
| Potassium (K)                                      | 13                | 3.0               | 13             | 1.0            |
| Carbonate (CO <sub>3</sub> )                       | 0.00              | 0.00              | 0.00           | 0.00           |
| Bicarbonate (HCO <sub>3</sub> )                    | 449               | 320               | 429            | 320            |
| Sulfate (SO <sub>4</sub> )                         | 485               | 350               | 427            | 350            |
| Chloride (Cl)                                      | 1,260             | 673               | 1,080          | 673            |
| Nitrate (NO <sub>3</sub> )                         | 645               | 26                | 48             | 26             |
| Fluoride (F)                                       | 1.0               | 0.4               | 0.6            | 0.5            |
| Boron (B)  | 0.75              | 0.52              | 0.75           | 0.54           |
| Silica (SiO <sub>2</sub> )                         | 30                | 10                | 30             | 30             |
| Total dissolved solids in parts per million        | 3,280             | 2,014             | 3,036          | 2,014          |
| Percent sodium                                     | 59                | 56                | 59             | 57             |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |                |                |
| Total  | 1,108             | 625               | 966            | 625            |
| Noncarbonate                                       | 740               | 355               | 654            | 355            |
| Turbidity in parts per million                     | 30                | < 5               | 30             | < 5            |
| Coliform in most probable number per milliliter    | 700               | 23                | 700            | 23             |
| Radioactivity in micro-micro curies per liter      |                   |                   |                |                |
| Dissolved alpha                                    | 0.51              | 0.17              | 0.51           | 0.17           |
| Solid alpha  | 0.24              | 0.09              | 0.09           | 0.09           |
| Dissolved beta                                     | 6.71              | 0.25              | 3.27           | 0.25           |
| Solid beta   | 14.15             | 0.00              | 0.67           | 0.00           |

### WATER QUALITY VARIATIONS



SPRING VALLEY CREEK NEAR LA PRESSA  
(STA. 65b)



## Tia Juana River Basin

The Tia Juana River Basin is located both in Mexico and the United States. The portion in the United States is adjacent to the southern boundary of the San Diego Region. The total watershed area is about 1,645 square miles of which only about 510 square miles are in the United States. The major portion of the area in the United States is the Cottonwood Creek drainage which originates in the Laguna Mountains and flows westerly and southerly into Mexico to join the Tia Juana River. The Tia Juana River then flows back into the United States and discharges into the ocean about one-quarter of a mile north of the International Boundary.

The mean annual runoff of Cottonwood Creek at the International Boundary is estimated to be about 39,000 acre-feet. The mean annual flow of the Tia Juana River at the International Boundary including flow from both countries is estimated to be about 90,000 acre-feet. The flow of Cottonwood Creek is essentially developed by Morena and Barrett Dams in the United States. The flow of the major portion of the Tia Juana River watershed in Mexico is regulated by Rodriguez Reservoir. Surface water flow in the Tia Juana River in California is rare and only occurs after heavy rains.

The development in the Cottonwood Creek drainage area consists of sparsely settled ranches and some recreational areas. The Tia Juana River Valley in California is primarily agricultural with urban encroachment occurring. Water for irrigation is developed by wells.

The one station established for surveillance of surface water quality in the Tia Juana River Basin is Tia Juana River at International Boundary. It is discussed on page 178.

THE QUALITY OF THE NATIONAL OLD DARY (STA. 66)

Sampling Point. Station 66 is located in Section 7 of Township 19 North, Range 2 West, San Fernando Base and Meridian. Samples were collected from the right bank at the Conifer in Water and Telephone Company gate, 2.5 miles upstream from Lester Bridge.

Period of Record. April 1957 through 1959.

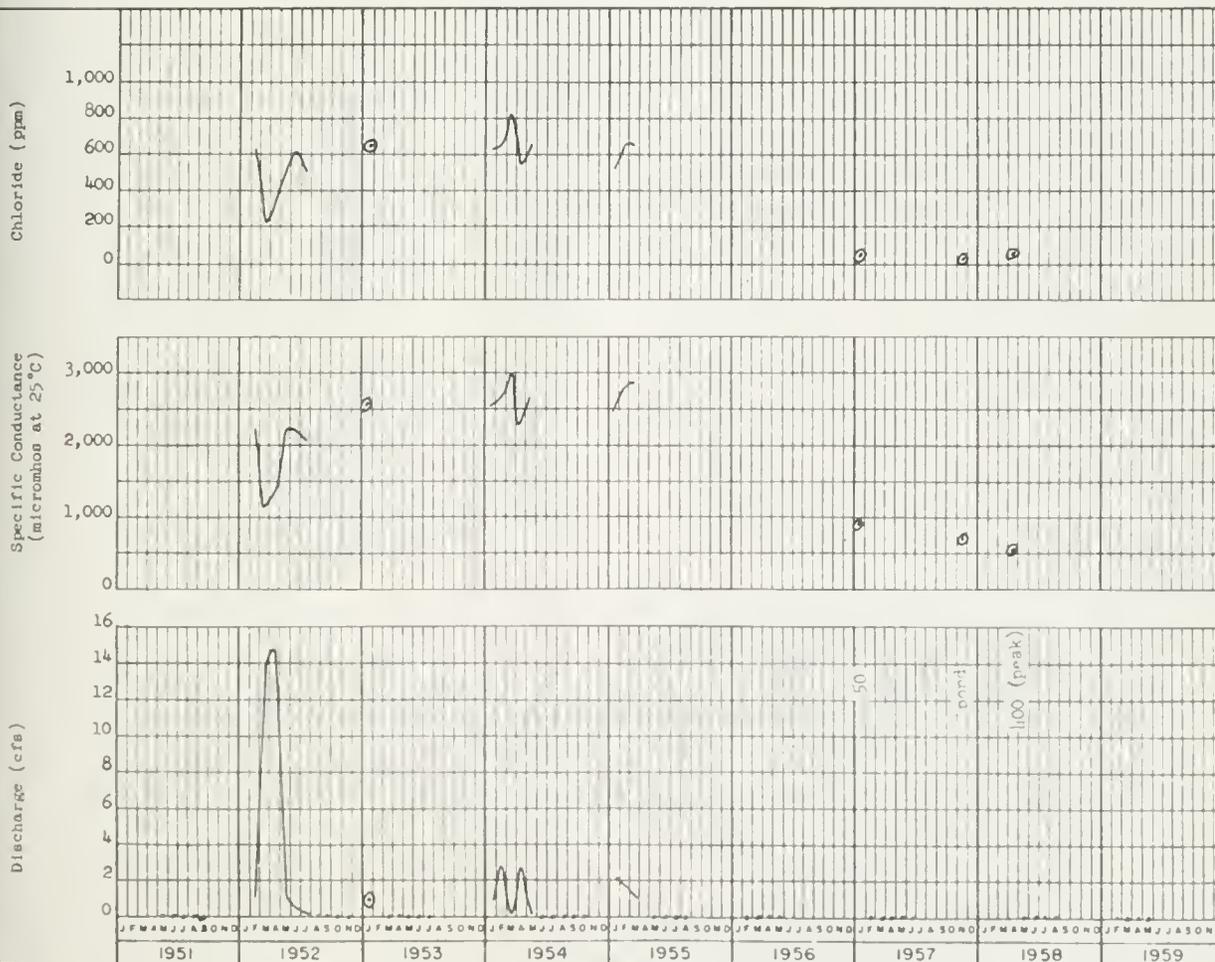
Water Quality Characteristics. The water at this station is sodium chloride-bicarbonate in character. Mineral quality varies with the highly variable quantities of flow, ranging from excellent, to unsuitable for recognized beneficial uses.

Significant Water Quality Changes. This station was dry at all times visited in 1959.

### WATER QUALITY RANGES

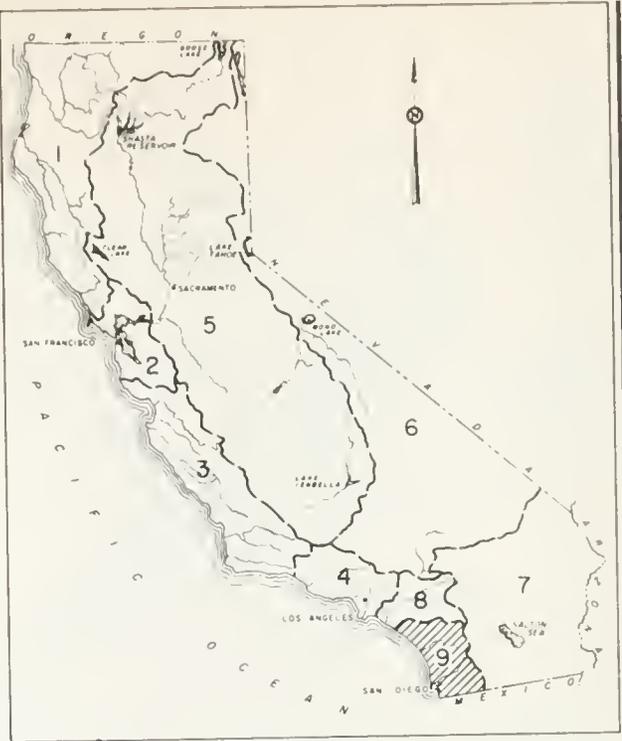
| Item   | Maximum of Record | Minimum of Record | Maximum - 1959  | Minimum - 1959 |
|--|-------------------|-------------------|---|----------------|
| Specific conductance (micromhos at 25°C)           | 3,076             | 519               |   |                |
| Temperature in °F                                  | 95                | 57                | Station Dry with no flow<br>at the times of the 1959<br>Bi-monthly visits |                |
| Dissolved oxygen in parts per million              | 21.0              | 4.0               |   |                |
| Percent saturation                                 | 244               | 39                |   |                |
| pH   | 8.7               | 7.4               |   |                |
| Mineral constituents in parts per million          |                   |                   |   |                |
| Calcium (Ca)                                       | 131               | 26                |   |                |
| Magnesium (Mg)                                     | 62                | 10                |   |                |
| Sodium (Na)  | 350               | 67                |   |                |
| Potassium (K)                                      | 13.2              | 3.3               |   |                |
| Carbonate (CO <sub>3</sub> )                       | 36                | 0.00              |   |                |
| Bicarbonate (HCO <sub>3</sub> )                    | 627               | 103               |   |                |
| Sulfate (SO <sub>4</sub> )                         | 174               | 43                |   |                |
| Chloride (Cl)                                      | 843               | 75                |   |                |
| Nitrate (NO <sub>3</sub> )                         | 6.4               | 0.5               |   |                |
| Fluoride (F)                                       | 0.8               | 0.4               |   |                |
| Boron (B)  | 0.48              | 0.00              |   |                |
| Silica (SiO <sub>2</sub> )                         | 21                | 20                |   |                |
| Total dissolved solids in parts per million        | 1,625             | 338               |   |                |
| Percent sodium                                     | 64                | 55                |   |                |
| Hardness as CaCO <sub>3</sub> in parts per million |                   |                   |   |                |
| Total  | 574               | 102               |   |                |
| Noncarbonate                                       | 292               | 17                |   |                |
| Turbidity in parts per million                     | 5,000             | 10                |   |                |
| Coliform in most probable number per milliliter    | 700,000           | 45                |   |                |
| Radioactivity in micro-micro curies per liter      |                   |                   |   |                |
| Dissolved alpha                                    | 0.21              | 0.21              |   |                |
| Solid alpha  | 0.00              | 0.00              |   |                |
| Dissolved beta                                     | 0.00              | 0.00              |   |                |
| Solid beta   | 10.52             | 10.52             |   |                |

### WATER QUALITY VARIATIONS



TIA JUANA RIVER AT INTERNATIONAL BOUNDARY  
(STA. 66)





KEY MAP

10'  
S  
S

33° 15'

Station Number

51c  
62  
63  
64

Sa  
Sa  
Es  
Sa

65  
65a  
65b  
66

Sa  
Fo  
Sp  
Ti

LEGEND

- 65a SURFACE WATER MONITORING STATION
- SEWAGE WASTE DISCHARGE
- ▲ INDUSTRIAL WASTE DISCHARGE

33° 00'

32° 45'

STATE OF CALIFORNIA  
THE RESOURCES AGENCY OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES  
SOUTHERN DISTRICT

SURFACE WATER QUALITY MONITORING PROGRAM

STREAM SAMPLING STATIONS

SAN DIEGO REGION (NO. 9)  
1959

SCALE OF MILES



1961

32° 30'

STREAM SAMPLING STATIONS  
SAN DIEGO REGION (NO. 9)

Station  
Number

Station Name

|     |  |
|-----|--|
| 51c | Santa Margarita River near Fallbrook       |
| 62  | San Luis Rey River near Pala               |
| 63  | Eacondido Creek at Harmony Grove           |
| 64  | San Dieguito River near San Pasqual Valley |
| 65  | San Diego River at Old Mission Dam         |
| 65a | Forester Creek at Mission Gorge Road       |
| 65b | Spring Valley Creek near La Presaa         |
| 66  | Tia Juana River at International Boundary  |



APPENDIX A  
METHODS, PROCEDURES, AND CRITERIA



APPENDIX A  
METHODS, PROCEDURES, AND CRITERIA



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## Field Methods and Procedures

Agencies which participated in the field sampling program during 1959 together with the number of stations sampled by each agency are:

| <u>Agency</u>   | <u>Number of<br/>stations<br/>sampled</u> |
|---|---|
| Department of Water Resources                             | 47  |
| The Metropolitan Water District of<br>Southern California | 2   |
| Los Angeles City Health Department                        | 1   |
| Los Angeles Department of Water<br>and Power              | 1   |
| Long Beach City Health Department                         | 1   |
| City of San Bernardino                                    | <u>2</u>                                  |
| Total   | 54  |

Water samples are collected in May and September for mineral, radiological, bacteriological, and heavy metals analyses. In the northern portion of the Southern District water samples are collected monthly, and in the southern portion bimonthly for partial mineral and bacteriological analyses. Colorado River stations are sampled only twice a year. Cooperating agencies supply analyses of water samples collected monthly at five program stations. The water samples collected for bacteriological examination are kept in portable ice boxes until delivered to the laboratory. All water samples are transported to the laboratories as expeditiously as possible.

At the time the samples are collected for laboratory examination field determinations are made for dissolved oxygen (DO), by the modified Winkler method; water temperature; and pH. Visual inspection is made of the stream or lake and the physical conditions are noted.

Where possible, the sampling stations have been selected so as to be at or near stream gaging stations so that gage heights can also be recorded at the time the water samples are collected. Instantaneous stream discharges at the time of sample collection are then obtained.

#### Laboratory Methods and Procedures

Methods of mineral and bacterial analysis, in general, are those described in the American Public Health Association publication "Standard Methods for the Examination of Water and Sewage," 10th Edition, 1955. In some cases, the methods described in the following publications also have been employed:

U. S. Geological Survey, "Methods of Water Analysis," 1950.

California Department of Public Works, Division of Water Resources, "Methods of Analysis," October 1955.

Table A-1 indicates the constituents analyzed for in the various types of analysis performed in connection with this program.

TABLE A-1

## TYPES OF ANALYSIS

| Constituent                      | :Standard:<br>:mineral : | Partial :<br>: mineral : | Bacterial : | Radiological |
|----------------------------------|--------------------------|--------------------------|-------------|--------------|
| Specific Conductance             | X                        | X                        |             |              |
| pH <sup>a</sup>                  | X                        | X                        |             |              |
| Total dissolved solids           | X                        |                          |             |              |
| Percent Sodium                   | X                        | X                        |             |              |
| Hardness                         | X                        | X                        |             |              |
| Turbidity                        | X                        | X                        |             |              |
| Coliform                         |                          |                          | X           |              |
| Temperature <sup>b</sup>         | X                        | X                        |             |              |
| Dissolved oxygen <sup>b</sup>    | X                        | X                        |             |              |
| Calcium                          | X                        |                          |             |              |
| Magnesium                        | X                        |                          |             |              |
| Sodium                           | X                        |                          |             |              |
| Potassium                        | X                        |                          |             |              |
| Carbonate                        | X                        | X                        |             |              |
| Bicarbonate                      | X                        | X                        |             |              |
| Sulfate                          | X                        |                          |             |              |
| Chloride                         | X                        | X                        |             |              |
| Nitrate                          | X                        |                          |             |              |
| Fluoride                         | X                        |                          |             |              |
| Boron                            | X                        | X                        |             |              |
| Silica                           | X                        |                          |             |              |
| Phosphate                        | X                        |                          |             |              |
| Zinc <sup>c</sup>                | X                        |                          |             |              |
| Iron <sup>c</sup>                | X                        |                          |             |              |
| Copper <sup>c</sup>              | X                        |                          |             |              |
| Aluminum <sup>c</sup>            | X                        |                          |             |              |
| Manganese <sup>c</sup>           | X                        |                          |             |              |
| Arsenic <sup>c</sup>             | X                        |                          |             |              |
| Hexavalent chromium <sup>c</sup> | X                        |                          |             |              |
| Dissolved alpha                  |                          |                          |             | X            |
| Solid alpha                      |                          |                          |             | X            |
| Dissolved beta                   |                          |                          |             | X            |
| Solid beta                       |                          |                          |             | X            |

a pH is determined both in the field and in the laboratory.

b Field determination.

c These constituents are normally designated as heavy metals.

The methods and procedures of sample preparation and determination of radioactivity in surface waters are as follows:

### I. Sample Preparation

- A. On receipt in the laboratory, each sample is well mixed, and two 250-ml portions taken. Each is acidified with a few drops of glacial acetic acid, and two drops of colloidal graphite suspension (Aquadag) added.
- B. Each portion is filtered under suction through a membrane ("Millipore") filter, which retains suspended particles of approximately 0.2 microns diameter and larger. Filters are treated with an antistatic preparation (Merix Anti-Static No. 79-OL) to eliminate any extraneous electrostatic charge.
- C. The filtrate is placed in a 250-ml volumetric flask, inverted, and the mouth placed in a 1-3/4" x 1/4" aluminum culture dish in a "chicken-feeder" type arrangement. The flask is supported by a ring stand; the dish rests on a hotplate adjusted so that the sample is taken to dryness at a temperature well below boiling.
- D. At this point, there are duplicate samples of both suspended solids and dissolved material from each original water sample ready for determination of radioactive content.

### II. Determination of Radioactivity

- A. Two determinations are made on each sample, one for gross beta, one for gross alpha radioactivity. This represents a total of eight determinations for each original sample.
- B. Beta activity is determined with an internal gas flow counter operating in the proportional region, using argon-methane mixture as a flow gas. Background determinations are made before the first sample count each day, and then after each two sample counts throughout the day. Determinations of counter efficiency are made with a reference standard (thallium - 204) at least twice daily. Each determination of sample and background count rate is made for a total of 1,000 counts.
- C. Alpha activity is determined with a scintillation counter utilizing an activated zinc sulfide phosphor. Sample, background and efficiency measurements are made in the same manner as are the beta measurements. Uranium 238 is used as an alpha reference standard. Each determination of sample and background count rate is made for a preset time of 32 minutes.

### III. Calculations

- A. Results are expressed as micro-micro curies per liter (uuc/l). One micro-micro curie is equivalent to 2.22 disintegrations per minute. Four values are reported for each sample:
  - (a) beta activity in the solids retained on the filter,
  - (b) beta activity in the filtrate (dissolved material),
  - (c) alpha activity in the solids, and (d) alpha activity in the filtrate.
- B. Sample counts are corrected for background and geometric efficiency.
- C. Standard statistical procedures are utilized to compute the 0.9 error. The final result is expressed (symbolically) as  $x \pm y$  uuc/l. This means that in a series of determinations on the same sample, the value of  $x$  should fall between  $x - y$  and  $x + y$ , 90% of the time.

### Water Quality Criteria

Criteria used by the Department of Water Resources in the evaluation of the acceptability of water for the most common beneficial uses are described hereinafter. In general, the values presented herein should be considered only as guides to judgment, and not as absolute limiting standards.

### Criteria for Drinking Water

Chapter 7 of the California Health and Safety Code contains laws and standards relating to domestic water supply. Section 4010.5 of this code refers to the drinking water standards promulgated by the United States Public Health Service for water used on interstate carriers. These criteria have been adopted by the State of California. They are set forth in detail in United States Public Health Report, Volume 61, No. 11, March 15, 1946, reissued in March 1956.

According to Section 4.2 of the above-named report, chemical substances in drinking water, either natural or treated, should not exceed the concentrations shown in Table A-2.

TABLE A-2  
 LIMITING CONCENTRATIONS OF MINERAL  
 CONSTITUENTS IN DRINKING WATER  
 United States Public Health Service  
 Drinking Water Standards, 1946

| Constituent                                | : | Parts per<br>million |
|--|---|----------------------|
| <u>Mandatory</u>                           |   |                      |
| Fluoride (F)                               |   | 1.5                  |
| Lead (Pb)                                  |   | 0.1                  |
| Selenium (Se)                              |   | 0.05                 |
| Hexavalent chromium (Cr <sup>+6</sup> )    |   | 0.05                 |
| Arsenic (As)                               |   | 0.05                 |
| <u>Nonmandatory but Recommended Values</u> |   |                      |
| Iron (Fe) and manganese (Mn) together      |   | 0.3                  |
| Magnesium (Mg)                             |   | 125                  |
| Chloride (Cl)                              |   | 250                  |
| Sulfate (SO <sub>4</sub> )                 |   | 250                  |
| Copper (Cu)                                |   | 3.0                  |
| Zinc (Zn)                                  |   | 15                   |
| Phenolic compounds in terms of phenol      |   | 0.001                |
| Total solids - desirable                   |   | 500                  |
| - permitted                                |   | 1,000                |

Interim standards for certain mineral constituents have recently been adopted by the California State Board of Public Health. Based on these standards, temporary permits may be issued for drinking water failing to meet the United States Public Health Service Drinking Water Standards, provided the mineral constituents in the following tabulation are not exceeded.

UPPER LIMITS OF TOTAL SOLIDS AND SELECTED MINERALS IN  
DRINKING WATER AS DELIVERED TO THE CONSUMER

|                             | <u>Permit</u> | <u>Temporary Permit</u> |
|-----------------------------|---------------|-------------------------|
| Total solids                | 500 (1000)*   | 1500 ppm                |
| Sulfates (SO <sub>4</sub> ) | 250 (500)*    | 600 ppm                 |
| Chlorides (Cl)              | 250 (500)*    | 600 ppm                 |
| Magnesium (Mg)              | 125 (125)*    | 150 ppm                 |

\*Numbers in parentheses are maximum permissible, to be used only where no other more suitable waters are available in sufficient quantity for use in the system.

The California State Board of Health recently has defined the maximum safe amounts of fluoride ion in drinking water in relation to mean annual temperature.

| <u>Mean annual<br/>temperature<br/>in °F</u> | <u>Mean monthly maximum<br/>fluoride ion concentration<br/>in ppm</u> |
|--|---|
| 50   | 1.5   |
| 60   | 1.0   |
| 70 - above                                   | 0.7   |

The relationship of infant methomoglobinemia (a reduction of oxygen content in the blood, constituting a form of asphyxia) to nitrates in the water supply has led to limitation of nitrates in drinking water. The California State Department of Public Health has recommended a tentative limit of 10 ppm nitrogen (44 ppm nitrates) for domestic waters. Water containing higher concentrations of nitrates may be considered to be of questionable quality for domestic and municipal use.

Limits may be established for other organic mineral substances if their presence in water renders it hazardous, in the judgment of state or local health authorities.

An additional factor with which water users are concerned is hardness. Hardness is due principally to calcium and magnesium salts and is generally evidenced by inability to develop suds when using soap. The United States Geological Survey has suggested the following four degrees of hardness:

TABLE A-3  
HARDNESS CLASSIFICATION OF WATERS  
U. S. GEOLOGICAL SURVEY

| Range of hardness<br>in parts per million | : | Relative<br>classification |
|---|---|----------------------------|
| 0 - 55                                    | : | Soft                       |
| 56 - 100                                  | : | Slightly hard              |
| 101 - 200                                 | : | Moderately hard            |
| Greater than 200                          | : | Very hard                  |

According to the International Commission on Radiological Protection<sup>1</sup>, tentatively concurred in by the National Committee on Radiation Protection<sup>2</sup>, if the Radium - 226 and Radium - 228 activity in water is substantially less than 10 uuc/l, the maximum permissible concentration of otherwise unidentified radionuclides in water for individuals in the population at large may be considered to be 100 uuc/l.

For the purpose of the environmental survey of surface water made for this report, it has been assumed that the total dissolved and solid alpha activity is derived from Ra<sup>226</sup> and Ra<sup>228</sup>.

1 "Report on Decisions of the 1959 Meeting of the International Committee on Radiological Protection (ICRP)". Radiology, Vol. 74, No. 1, January 1960, pp. 116-119.

2 Somatic Radiation Dose for the General Population, Ad Hoc Committee of the National Committee on Radiation Protection and Measurements. Science, Vol. 131, No. 3399, February 19, 1960, pp. 482-486.

During the 1959 reporting year, the highest alpha activity observed in monitored surface waters was 1.86 uuc/l. Consequently, it is believed that the maximum permissible concentration of 100 uuc/l, as recommended by the I.C.R.P., was met by all stations sampled in the Surface Water Monitoring Program during 1959.

#### Criteria for Irrigation Water

Because of the diverse climatological conditions, crops, soils, and irrigation practices in California, criteria which may be set up to evaluate the suitability of water for irrigation use must necessarily be of a general nature, and judgment must be used in their application to individual cases. Suggested limiting values for total dissolved solids, chloride concentration, percent sodium and boron concentration for three general classes of irrigation water are shown in Table A-4.

#### Criteria for Industrial Water

The water quality criteria for the diversified uses of water in industry range from the exacting requirements for make-up water for high pressure boilers to the minimum requirements for water washdown and metallurgical processing.

Because of the large number of industrial uses of water and widely varied quality requirements, it is practicable to suggest only very broad criteria of quality. These variable conditions make it desirable to consider water quality requirements in broad and general terms only, and, where possible, for groups of related industries rather than individually. The general quality requirements of several individual and major groups of water uses are listed in Table A-5.

TABLE A-4

## QUALITATIVE CLASSIFICATION OF IRRIGATION WATERS

|  | Class 1  | Class 2  | Class 3   |
|--|--|--|---|
| Chemical properties                    | Excellent to good<br>(Suitable for most plants under any conditions of soil and climate) | Good to injurious<br>(Possibly harmful for some crops under certain soil conditions) | Injurious to unsatisfactory<br>(Harmful to most crops and unsatisfactory for all but the most tolerant) |
| Total dissolved solids                 |  |  |   |
| In ppm                                 | Less than 700  | 700 - 2,000  | More than 2,000   |
| In conductance, EC x 10 <sup>6</sup>   | Less than 1,000  | 1,000 - 3,000  | More than 3,000   |
| Chloride ion concentration             |  |  |   |
| In milliequivalents per liter          | Less than 5  | 5 - 10   | More than 10  |
| In ppm                                 | Less than 175  | 175 - 350  | More than 350   |
| Sodium in percent of base constituents |  |  |   |
|  | Less than 60   | 60 - 75  | More than 75  |
| Boron in ppm                           |  |  |   |
|  | Less than 0.5  | 0.5 - 2.0  | More than 2.0   |

The values shown in this table are those suggested in the Progress Report of the Committee on Quality of Tolerance of Water for Industrial Uses in the Journal of the New England Water Works Association, Volume 54, 1940.

#### Criteria for Fish and Aquatic Life

Water of suitable quality and quantity is a fundamental requirement for the existence of an abundant supply of fish and aquatic life.

It is very important that water quality conditions be such as to maintain an abundant supply of food required by fish and other desirable forms of aquatic life. Streams utilized for the propagation of fish and aquatic life should be free of toxic or harmful concentrations of mineral and

TABLE A-5

WATER QUALITY TOLERANCE FOR INDUSTRIAL USES<sup>a</sup>

Allowable limits in parts per million

| Use                  | Turbidity | Color  | Hardness as CaCO <sub>3</sub> | Iron <sup>0</sup> as Fe | Manganese as Mn | Total solids | Alkalinity as CaCO <sub>3</sub> | Odor, taste | Hydrogen sulfide | Miscellaneous Requirements |  |
|----------------------|-----------|--------|-------------------------------|-------------------------|-----------------|--------------|---------------------------------|-------------|------------------|----------------------------|--|
|                      |           |        |                               |                         |                 |              |                                 |             |                  | Health                     | Other  |
| Air conditioning     | -         | -      | -                             | 0.5                     | 0.5             | -            | -                               | Low         | 1                | -                          | No corrosiveness, slime formation  |
| Baking               | 10        | 10     | -                             | 0.2                     | 0.2             | -            | -                               | Low         | 0.2              | Potable <sup>b</sup>       |  |
| Brewing              |           |        |                               |                         |                 |              |                                 |             |                  |                            |  |
| Light Beer           | 10        | -      | -                             | 0.1                     | 0.1             | 500          | 75                              | Low         | 0.2              | Potable <sup>b</sup>       | NaCl less than 275 ppm (pH 6.5-7.0).   |
| Dark Beer            | 10        | -      | -                             | 0.1                     | 0.1             | 1,000        | 150                             | Low         | 0.2              | Potable <sup>b</sup>       | NaCl less than 275 ppm (pH 7.0 or more)  |
| Canning              |           |        |                               |                         |                 |              |                                 |             |                  |                            |  |
| Legumes              | 10        | -      | 25-75                         | 0.2                     | 0.2             | -            | -                               | Low         | 1                | Potable <sup>b</sup>       |  |
| General              | 10        | -      | -                             | 0.2                     | 0.2             | -            | -                               | Low         | 1                | Potable <sup>b</sup>       |  |
| Carbonated beverages | 2         | 10     | 250                           | 0.2                     | 0.2             | 850          | 50-100                          | Low         | 0.2              | Potable <sup>b</sup>       | Organic color plus oxygen consumed less than 10 ppm.   |
| Confectionery        | -         | -      | -                             | 0.2                     | 0.2             | 100          | -                               | Low         | 0.2              | Potable <sup>b</sup>       | pH above 7.0 for hard candy.   |
| Cooling              | 50        | -      | 50                            | 0.5                     | 0.5             | -            | -                               | -           | 5                | -                          | No corrosiveness, slime formation.   |
| Food: General        | 10        | -      | -                             | 0.2                     | 0.2             | -            | -                               | Low         | -                | Potable <sup>b</sup>       |  |
| Ice                  | 5         | 5      | -                             | 0.2                     | 0.2             | -            | -                               | Low         | -                | Potable <sup>b</sup>       | SiO <sub>2</sub> less than 10 ppm.   |
| Laundrying           | -         | -      | 50                            | 0.2                     | 0.2             | -            | -                               | -           | -                | -                          |  |
| Plastics, oleary     | -         | -      | -                             | -                       | -               | -            | -                               | -           | -                | -                          |  |
| Uncolored            | 2         | 2      | -                             | 0.02                    | 0.02            | 200          | -                               | -           | -                | -                          |  |
| Paper and pulp:      |           |        |                               |                         |                 |              |                                 |             |                  |                            |  |
| Groundwood           | 50        | 20     | 180                           | 1.0                     | 0.5             | -            | -                               | -           | -                | -                          | No Grit, corrosiveness.  |
| Draft pulp           | 25        | 15     | 100                           | 0.2                     | 0.1             | 300          | -                               | -           | -                | -                          |  |
| Soda and sulfide     | 15        | 10     | 100                           | 0.1                     | 0.05            | 200          | -                               | -           | -                | -                          |  |
| High-grade           |           |        |                               |                         |                 |              |                                 |             |                  |                            |  |
| light papers         | 5         | 5      | 50                            | 0.1                     | 0.05            | 200          | -                               | -           | -                | -                          |  |
| Rayon (viscose):     |           |        |                               |                         |                 |              |                                 |             |                  |                            |  |
| Pulp production      | 5         | 5      | 8                             | 0.05                    | 0.03            | 100          | total 50;                       | -           | -                | -                          | Al <sub>2</sub> O <sub>3</sub> less than 8 ppm, SiO <sub>2</sub> less than 25 ppm, Cu less than 5 ppm. |
| Manufacture          | 0.3       | -      | 55                            | 0.0                     | 0.0             | -            | hydroxide 8                     | -           | -                | -                          |  |
| Tanning              | 20        | 10-100 | 50-135                        | 0.2                     | 0.2             | -            | total 135;                      | -           | -                | -                          |  |
| hydroxide 8          |           |        |                               |                         |                 |              | hydroxide 8                     | -           | -                | -                          |  |
| Textiles: General    | 5         | 20     | -                             | 0.25                    | 0.25            | -            | -                               | -           | -                | -                          | Constant composition. Residual alumina less than 0.5 ppm.  |
| Dyeing               | 5         | 5-20   | -                             | 0.25                    | 0.25            | 200          | -                               | -           | -                | -                          |  |
| Wool scouring        | -         | -      | -                             | 1.0                     | 1.0             | -            | -                               | -           | -                | -                          |  |
| Cotton bandage       | 5         | 5      | -                             | 0.2                     | 0.2             | -            | -                               | Low         | -                | -                          |  |

<sup>a</sup>-Moore, E. W., Progress Report of the Committee on Quality Tolerances of Water for Industrial Uses: Journal New England Water Works Association, Volume 54, Page 271, 1940.

<sup>b</sup>-Potable water, conforming to U. S. P. H. S. standards, is necessary.

<sup>c</sup>-Limit given applies to both iron alone and the sum of iron and manganese.

organic substances and excessive turbidity. Extensive field and laboratory studies conducted by the United States Fish and Wildlife Service show that, among other things, the water in streams supporting a mixed fauna of fresh water fish such as bluegill, bass, crappie and catfish should have the following properties:

- (a) Dissolved oxygen not less than 5 ppm (at least 6 ppm for Salmonids),
- (b) pH range between 6.5 and 8.5,
- (c) Ionizable salts, as indicated by conductivity, between 150 and 500 micromhos at 25° Centigrade, and in general not exceeding 1,000 micromhos,
- (d) Ammonia not exceeding 1.5 ppm.

Mineral salts of high toxicity to fish are those of silver, mercury, copper, zinc, lead, cadmium, nickel, trivalent and hexavalent chromium, and others. Some pairs of toxicants, such as copper and zinc (also copper and cadmium, nickel and zinc) are far more toxic when combined than when they occur individually. Other toxic substances, when combined neutralize each other through antagonism or chemical reaction (e.g., free cyanide combines with toxic heavy metal cations, such as nickel and copper ions, to form relatively harmless metalocyanide complexes).

The increasing use of household and industrial detergents, as well as the expansion in the manufacture and use of agriculture insecticides, poses serious hazards to fish and aquatic life. Preliminary studies, for example, indicate that one of the most common household detergents is lethal to relatively hardy fish at very low concentrations. This detergent was lethal to fish in fresh water at concentrations below

0.1 ppm and below 0.005 ppm in salt water. The increase in toxicity in salt water can probably be attributed to the fact that marine fishes must ingest water to maintain their osmotic balance.

Development and use of water resources, including the construction of dams for storage of water, frequently affects water temperatures which in turn affect fish and other aquatic life. Optimum water temperatures for cold water fish, such as trout and salmon, normally lie between 32° and 65° Fahrenheit. The cold water species are generally intolerant of temperatures above 75° Fahrenheit and will seek the lower temperature where possible. Warm water fish such as minnows, carp, catfish, perch, sunfish, and bass normally live in water having temperatures ranging from near 32° to 86° Fahrenheit. Acclimatization enables certain warm water species to live in waters having temperatures as high as 90° Fahrenheit, although they will migrate, where possible, to waters below 86° Fahrenheit.

APPENDIX B

BASIC DATA



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APPENDIX B

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## ANALYSES OF SURFACE WATER

CENTRAL COASTAL REGION (NO. 3)

SANTA YNEZ RIVER AT CACHUMA RESERVOIR (STA. 44b)

| Date and time sampled P.S.T. | Discharge in cfs | Temp in °F | Dissolved oxygen ppm | Specific conductance (micromhos at 25°C) | pH  | parts per million |                |             |               |                              |                                 |                            |               |                            |              | Total dissolved solids in ppm | Per cent calcium | Hardness as CaCO <sub>3</sub> Total ppm | Turbidity in ppm | Coliform MPN/ml | Analyzed by                       |           |
|------------------------------|------------------|------------|----------------------|--|-----|-------------------|----------------|-------------|---------------|------------------------------|---------------------------------|----------------------------|---------------|----------------------------|--------------|-------------------------------|------------------|---|------------------|-----------------|-----------------------------------|-----------|
|                              |                  |            |                      |  |     | Calcium (Ca)      | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Nitrate (NO <sub>3</sub> ) | Fluoride (F) |                               |                  |   |                  |                 |                                   | Boron (B) |
| 1959                         |                  |            |                      |  |     |                   |                |             |               |                              |                                 |                            |               |                            |              |                               |                  |   |                  |                 |                                   |           |
| 1-15 0900                    |                  | 56         | 8.7                  | 82                                       | 727 | 7.1 <sup>a</sup>  |                |             |               | 0.00                         | 207<br>3.10                     |                            | 15<br>0.12    |                            | 0.30         |                               |                  | 330                                     | 160              | < 5             | Median<br>0.45                    | DWR       |
| 2-5 1130                     |                  | 54         | 9.2                  | 85                                       | 717 | 8.1 <sup>a</sup>  |                |             |               | 0.00                         | 212<br>3.47                     |                            | 15<br>0.12    |                            | 0.28         |                               |                  | 330                                     | 156              | < 25            | Maximum<br>2.3                    | DWR       |
| 2-17                         |                  | 59         |                      |  | 750 | 7.9 <sup>b</sup>  |                |             |               | 0.00                         | 201<br>3.30                     | 208<br>4.32                | 14<br>0.10    | 1.7<br>0.028               | 0.21         |                               |                  | 328                                     | 163              |                 | Minimum<br>0.45                   | DWR       |
| 3-12 0945                    | 1/2 ft. to spill | 60         | 9.8                  | 93                                       | 749 | 8.4 <sup>a</sup>  |                |             |               | 0.00                         | 215<br>3.52                     |                            | 17<br>0.12    |                            | 0.58         |                               |                  | 327                                     | 151              | < 5             |                                   | DWR       |
| 4-9 1140                     | 1.1 ft. to spill | 60         | 10.2                 | 100                                      | 746 | 8.4 <sup>a</sup>  |                |             |               | 0.00                         | 209<br>3.42                     |                            | 17<br>0.12    |                            | 0.34         |                               |                  | 327                                     | 156              | < 5             |                                   | DWR       |
| 5-6 1000                     | 3/4 ft. to spill | 64         | 7.1                  | 74                                       | 728 | 7.1 <sup>a</sup>  |                |             |               | 0.00                         | 202<br>3.32                     | 214<br>4.45                | 17<br>0.12    | 0.0<br>0.000               | 0.35         |                               |                  | 325                                     | 159              | < 5             | PO <sub>4</sub> = 0.0<br>Sn = 0.0 | DWR       |
| 6-11 1430                    | 2 ft. to spill   | 68         | 8.6                  | 94                                       | 727 | 8.4 <sup>a</sup>  |                |             |               | 0.00                         | 190<br>3.12                     |                            | 17<br>0.12    |                            | 0.34         |                               |                  | 327                                     | 171              | < 5             |                                   | DWR       |
| 7-9 0900                     | 3 ft. to spill   | 71         | 11.0                 | 126                                      | 703 | 8.4 <sup>a</sup>  |                |             |               | 0.00                         | 168<br>2.76                     |                            | 17<br>0.12    |                            | 0.34         |                               |                  | 307                                     | 169              | < 5             |                                   | DWR       |
| 8-6 0900                     | 4 ft. to spill   | 72         | 7.8                  | 89                                       | 716 | 8.3 <sup>a</sup>  |                |             |               | 0.00                         | 176<br>2.88                     |                            | 15<br>0.12    |                            | 0.30         |                               |                  | 310                                     | 166              | < 5             |                                   | DWR       |
| 9-2 0830                     | 5 ft. to spill   | 70         | 9.4                  | 103                                      | 744 | 8.4 <sup>a</sup>  |                |             |               | 0.00                         | 168<br>2.76                     | 222<br>4.63                | 15<br>0.12    | 0.0<br>0.000               | 0.36         |                               |                  | 310                                     | 172              | < 25            | PO <sub>4</sub> = 0.1<br>Sn = 0.0 | DWR       |
| 10-8 1015                    | 6 ft. to spill   | 68         | 7.6                  | 84                                       | 728 | 8.4 <sup>a</sup>  |                |             |               | 0.00                         | 174<br>2.80                     |                            | 14<br>0.39    |                            | 0.31         |                               |                  | 309                                     | 169              | < 5             |                                   | DWR       |
| 11-5 1040                    | 7 ft. to spill   | 64         | 5.8                  | 60                                       | 736 | 7.7 <sup>a</sup>  |                |             |               | 0.00                         | 178<br>2.92                     |                            | 14<br>0.39    |                            | 0.37         |                               |                  | 311                                     | 165              | < 5             |                                   | DWR       |
| 12-10 1005                   | 8 ft. to spill   | 58         | 6.8                  | 66                                       | 752 | 7.8 <sup>a</sup>  |                |             |               | 0.00                         | 183<br>3.00                     |                            | 12<br>0.34    |                            | 0.38         |                               |                  | 321                                     | 171              | < 5             |                                   | DWR       |

<sup>a</sup> Field pH.<sup>b</sup> Laboratory pH.<sup>c</sup> Sum of calcium and magnesium in ppm.<sup>d</sup> Iron (Fe), aluminum (Al), arsenic (As), copper (Cu), lead (Pb), manganese (Mn), zinc (Zn), and hexavalent chromium (Cr<sup>6+</sup>), reported here as 0.0 except as shown.<sup>e</sup> Derived from conductivity vs TDS curves.<sup>f</sup> Determined by addition of analyzed constituents.<sup>g</sup> Gravimetric determination.<sup>h</sup> Annual median and range, respectively. Calculated from analyses of duplicate monthly samples made by California Department of Public Health, Division of Laboratories, or United States Public Health Service.<sup>i</sup> Mineral analyses made by United States Geological Survey, Quality of Water Branch (USGS); United States Department of the Interior, Bureau of Reclamation (USBR); United States Public Health Service (USPHS); San Bernardino County Flood Control District (SBCFCD); Metropolitan Water District of Southern California (MWD); Los Angeles Department of Water and Power (LADWP); City of Los Angeles, Department of Public Health (LADPH); City of Long Beach, Department of Public Health (LBDPH); Terminal Testing Laboratories, Inc. (TTL); or California Department of Water Resources (DWR); as indicated.<sup>\*</sup> Note: Distances from crest of spillway to water surface.





















































# ANALYSES OF SURFACE WATER

COLORADO RIVER BASIN REGION (NO. 7)

ALL AMERICAN CANAL NEAR PILOT KNOB (STA. 56a)

| Date and time sampled P.S.T. | Discharge in cfs | Temp in °F | Dissolved oxygen |       | Specific conductance (micromhos at 25°C) | pH               | Mineral constituents in parts per million |                |             |               |                              |                                 |                            |               |                            |              | Total dissolved solids in ppm | Percent sodium | Hardness as CaCO <sub>3</sub> in ppm             | Turbidity in ppm | Coliform MPN/ml | Analyzed by |           |                                 |                    |
|------------------------------|------------------|------------|------------------|-------|--|------------------|---|----------------|-------------|---------------|------------------------------|---------------------------------|----------------------------|---------------|----------------------------|--------------|-------------------------------|----------------|--|------------------|-----------------|-------------|-----------|---------------------------------|--------------------|
|                              |                  |            | ppm              | % Sat |  |                  | Calcium (Ca)                              | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Nitrate (NO <sub>3</sub> ) | Fluoride (F) |                               |                |  |                  |                 |             | Boron (B) | Silica (SiO <sub>2</sub> )      | Other constituents |
| 1959                         | 5660             | 65         | 8.2              | 86    | 1116                                     | 8.2 <sup>a</sup> | 92<br>4.59                                | 28<br>2.30     | 108<br>4.70 | 4.3<br>0.110  | 0<br>0.00                    | 171<br>2.80                     | 292<br>6.08                | 101<br>2.85   | 1.5<br>0.024               | 0.5<br>0.026 | 0.12                          | 10             | PO <sub>4</sub> = 0.04 <sup>d</sup><br>Sn = 0.10 | 785              | 4.0             | 345         | 205       | 12.7                            | DMR                |
| 5-5<br>0705                  | 6860             | 84         | 5.5              | 71    | 1095                                     | 8.2 <sup>a</sup> | 87<br>4.34                                | 28<br>2.30     | 108<br>4.70 | 4.6<br>0.118  | 0<br>0.00                    | 159<br>2.60                     | 280<br>5.84                | 108<br>3.05   | 1.0<br>0.016               | 0.5<br>0.026 | 0.12                          | 20             | PO <sub>4</sub> = 0.15 <sup>d</sup><br>Sn = 0.10 | 726              | 4.1             | 332         | 202       | Maximum<br>23<br>Minimum<br>2.3 | DMR                |

a Field pH

b Laboratory pH

c Sum of calcium and magnesium in epm.

d Iron (Fe), aluminum (Al), arsenic (As), copper (Cu), lead (Pb), manganese (Mn), zinc (Zn), and hexavalent chromium (Cr<sup>6+</sup>), reported here as 0.0 except as shown.

e Derived from conductivity vs TDS curves

f Determined by addition of analyzed constituents.

g Gravimetric determination

h Annual median and range, respectively. Calculated from analyses of duplicate monthly samples made by California Department of Public Health, Division of Laboratories, or United States Public Health Service.

i Mineral analyses made by United States Geological Survey, Quality of Water Branch (USGS); United States Department of the Interior, Bureau of Reclamation (USBR); United States Public Health Service (USPHS); San Bernardino County Flood Control District (SBCFCD); Metropolitan Water District of Southern California (MWD); Los Angeles Department of Water and Power (LADWP); City of Los Angeles, Department of Public Health (LADPH); City of Long Beach, Department of Public Health (LBPH); Terminal Testing Laboratories, Inc. (TTL); or California Department of Water Resources (DWR), as indicated.





















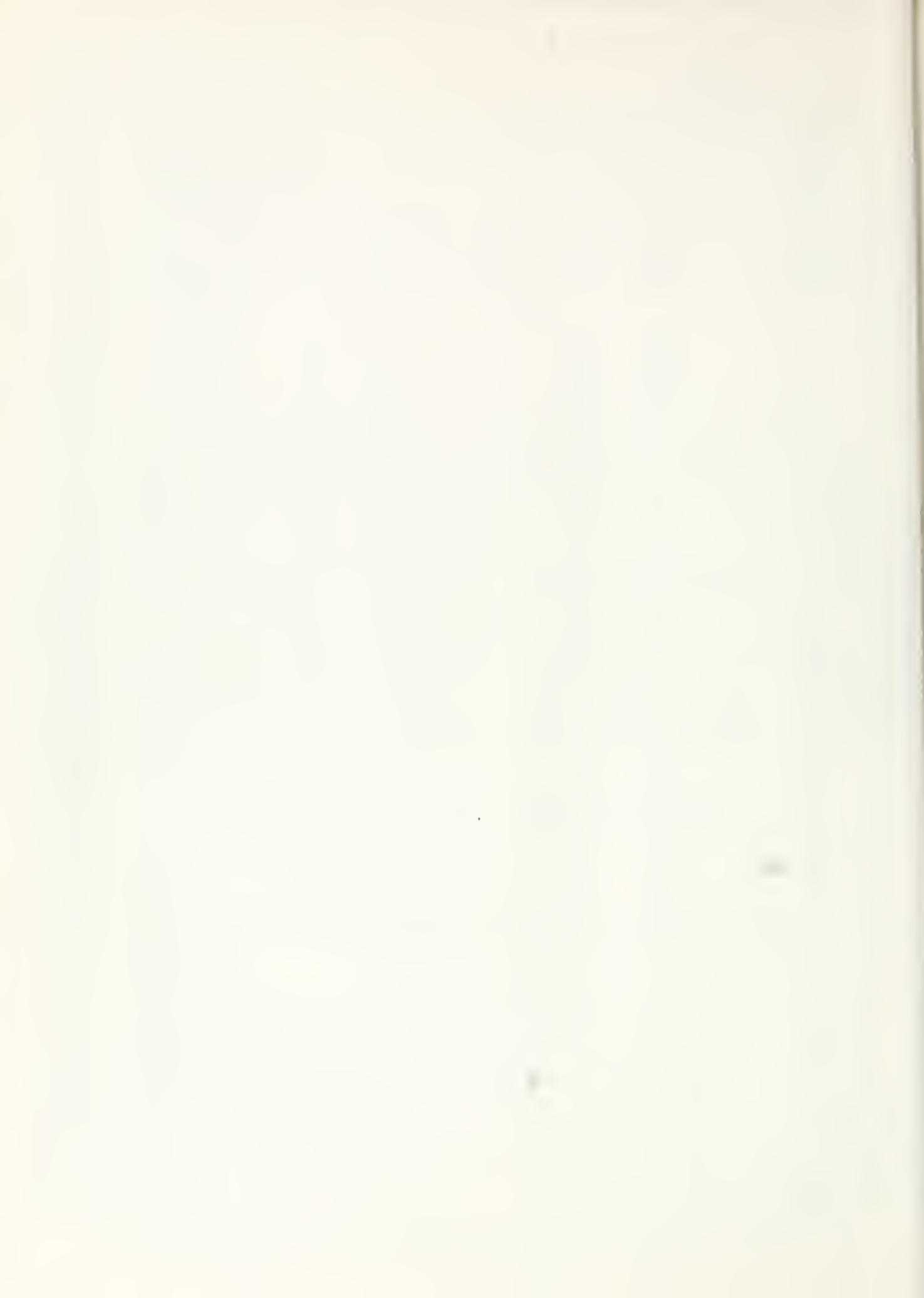






































TABLE B-7

## RADIOASSAY OF SURFACE WATERS

CENTRAL COASTAL REGION (NO. 3)

| Sta. No. | Stream            | Near              | Date        | Micro-micro curies per liter |             |                 |             |
|----------|-------------------|-------------------|-------------|------------------------------|-------------|-----------------|-------------|
|          |                   |                   |             | Dissolved Beta               | Solid Beta  | Dissolved Alpha | Solid Alpha |
| 44a      | Cuyama River      | Garey             | 1959        |                              |             |                 |             |
|          |                   |                   | 5-6         | 0.71 ± 4.16                  | 0.81 ± 4.67 | 0.20 ± 0.43     | 0.31 ± 0.45 |
|          |                   |                   | Dry<br>9-59 |                              |             |                 |             |
| 43b      | Nacimiento River  | San Miguel        | 5-6         | 11.14 ± 4.35                 | 2.51 ± 4.41 | 0.52 ± 0.55     | 0.20 ± 0.48 |
|          |                   |                   | 9-2         | 3.19 ± 3.57                  | 2.59 ± 3.57 | 0.00 ± 0.42     | 0.27 ± 0.47 |
| 43d      | San Antonio River | Pleyto            | 5-6         | 0.94 ± 4.16                  | 3.86 ± 4.65 | 0.20 ± 0.30     | 0.62 ± 0.56 |
|          |                   |                   | Dry         |                              |             |                 |             |
|          |                   |                   | 9-59        |                              |             |                 |             |
| 43c      | Salinas River     | Bradley           | 5-6         | 2.50 ± 3.18                  | 6.56 ± 4.70 | 0.00 ± 0.25     | 0.41 ± 0.55 |
|          |                   |                   | 9-2         | 0.00 ± 3.72                  | 3.71 ± 3.72 | 0.09 ± 0.29     | 0.18 ± 0.47 |
| 43a      | Salinas River     | Paso Robles       | Dry         |                              |             |                 |             |
|          |                   |                   | 5-59        |                              |             |                 |             |
|          |                   |                   | Dry<br>9-59 |                              |             |                 |             |
| 44b      | Santa Ynez        | Cachuma Reservoir | 5-6         | 6.67 ± 4.30                  | 0.00 ± 4.59 | 0.20 ± 0.30     | 1.04 ± 0.56 |
|          |                   |                   |             | 4.88 ± 3.62                  | 7.12 ± 3.67 | 0.44 ± 0.52     | 0.27 ± 0.43 |
| 45a      | Santa Ynez        | Solvang           | 5-6         | 0.71 ± 4.16                  | 0.81 ± 4.67 | 0.00 ± 0.22     | 0.31 ± 0.43 |
|          |                   |                   | Dry<br>9-59 |                              |             |                 |             |



TABLE B-8

## RADIOASSAY OF SURFACE WATERS

LOS ANGELES REGION (NO. 4)

| Sta. No. | Stream               | Near                                  | Date               | Micro-micro curies per liter |                            |                            |                            |
|----------|----------------------|---------------------------------------|--------------------|------------------------------|----------------------------|----------------------------|----------------------------|
|          |                      |                                       |                    | Dissolved Beta               | Solid Beta                 | Dissolved Alpha            | Solid Alpha                |
| 1959     |                      |                                       |                    |                              |                            |                            |                            |
| 48       | Los Angeles River    | Hwy. 101                              | 5-20<br>9-4        | 6.95 + 3.35<br>6.18 ± 4.38   | 5.97 + 4.45<br>1.34 ± 4.22 | 0.58 + 0.40<br>0.00 ± 0.37 | 0.34 + 0.50<br>0.46 ± 0.50 |
| 47       | Los Angeles River    | Los Angeles                           | 5-20<br>9-4        | 1.48 + 3.70<br>6.58 ± 4.58   | 8.54 + 4.47<br>0.00 ± 4.38 | 0.11 + 0.23<br>0.09 ± 0.39 | 0.59 + 0.49<br>0.00 ± 0.26 |
| 45b      | Matilija Creek       |                                       | 5-4<br>9-1         | 1.59 + 4.40<br>0.73 ± 3.60   | 2.25 + 4.64<br>8.40 ± 3.81 | 0.46 + 0.43<br>0.16 ± 0.29 | 0.70 + 0.70<br>0.18 ± 0.46 |
| 49a      | Mission Creek        | Whittier<br>Narrows                   | 5-5<br>9-4         | 3.93 + 4.30<br>2.94 ± 4.63   | 2.28 + 4.08<br>8.65 ± 4.07 | 0.58 + 0.45<br>0.00 ± 0.30 | 0.47 + 0.47<br>0.09 ± 0.33 |
| 46c      | Piru Creek           | Piru                                  | 5-4<br>9-1         | 4.78 + 3.82<br>9.97 ± 2.94   | 0.53 + 4.62<br>5.43 ± 4.73 | 0.93 + 0.45<br>0.00 ± 0.28 | 0.34 + 0.50<br>0.00 ± 0.28 |
| 49       | Rio Hondo            | Whittier<br>Narrows                   | 5-5<br>9-4         | 6.09 + 4.00<br>16.66 ± 4.42  | 8.59 + 3.60<br>5.77 ± 4.12 | 0.00 + 0.30<br>0.09 ± 0.15 | 0.47 + 0.47<br>0.09 ± 0.26 |
| 50       | San Gabriel<br>River | Whittier<br>Narrows                   | 5-5<br>Dry<br>9-59 | 9.69 + 4.12                  | 2.14 + 4.05                | 0.11 + 0.49                | 0.59 + 0.49                |
| 50d      | San Gabriel<br>River | Azusa                                 | 5-5<br>9-4         | 5.90 + 4.43<br>2.08 ± 3.51   | 1.80 + 3.30<br>0.00 ± 3.46 | 0.30 + 0.26<br>0.17 ± 0.28 | 0.28 + 0.25<br>0.00 ± 0.20 |
| 46       | Santa Clara<br>River | Los Angeles<br>Ventura County<br>Line | 5-4<br>9-1         | 0.68 + 4.90<br>0.00 ± 4.78   | 0.00 + 4.54<br>0.00 ± 4.68 | 0.46 + 0.47<br>0.09 ± 0.33 | 0.59 + 0.64<br>0.00 ± 0.36 |

TABLE B-8  
 RADIOASSAY OF SURFACE WATERS

LOS ANGELES REGION (NO. 4)  
 (continued)

| Sta. No.    | Stream                     | Near                      | Date       | Micro-micro curies per liter             |                            |                            |                            |
|-------------|----------------------------|---------------------------|------------|--|----------------------------|----------------------------|----------------------------|
|             |                            |                           |            | Dissolved Beta                           | Solid Beta                 | Dissolved Alpha            | Solid Alpha                |
| <u>1959</u> |                            |                           |            |  |                            |                            |                            |
| 46a         | Santa Clara River          | Santa Paula               | 5-4<br>9-1 | 0.80 + 4.35<br>5.20 ± 4.89               | 0.00 + 4.55<br>0.00 ± 4.68 | 0.58 + 0.45<br>0.18 ± 0.39 | 0.70 + 0.58<br>0.18 ± 0.29 |
| 46e         | Santa Paula Creek          | Santa Paula               | 5-4<br>9-1 | 3.53 + 3.75<br>5.63 ± 4.68               | 5.86 + 4.47<br>1.87 ± 4.52 | 0.46 + 0.38<br>0.09 ± 0.33 | 0.94 + 0.56<br>0.00 ± 0.30 |
| 46d         | Sespe Creek                | Fillmore                  | 5-4<br>9-1 | 5.75 + 3.73<br>4.25 ± 4.58               | 5.21 + 4.42<br>1.28 ± 4.48 | 0.23 + 0.43<br>0.09 ± 0.37 | 0.94 + 0.56<br>0.17 ± 0.28 |
| 61          | Ventura River              | Ventura                   | 5-4        | 4.61 + 3.90<br>3.30 ± 4.68               | 3.66 + 4.06<br>0.00 ± 4.58 | 0.58 + 0.51<br>0.09 ± 0.39 | 0.50 + 0.51<br>0.36 ± 0.47 |
| 69          | Colorado River<br>Aqueduct | La Verne                  |            | See page B-69 for Radiological Analyses. |                            |                            |                            |
| 70          | Los Angeles<br>Aqueduct    | Upper Van Norman<br>Inlet |            | See page B-70 for Radiological Analyses. |                            |                            |                            |

TABLE B-8

RADIOASSAY OF SURFACE WATERS  
LOS ANGELES REGION (NO. 4)

Analyses Received from the Sanitary Engineering  
Division, Department of Water and Power of the  
City of Los Angeles

| Source and sampling point | : | Date sampled | : | Micro-micro curies/liter<br>Beta-Gama count |
|---------------------------|---|--------------|---|---|
|                           |   | <u>1959</u>  |   |   |
| Los Angeles Aqueduct      |   | 1- 6         |   | 1.02 $\pm$ 4.4                              |
| Upper Van Norman Inlet    |   | 1-12         |   | 17.7 $\pm$ 4.7                              |
| Station 70                |   | 1-23         |   | 8.2 $\pm$ 4.6                               |
|                           |   | 2- 2         |   | 11.3 $\pm$ 4.5                              |
|                           |   | 2-18         |   | 7.0 $\pm$ 9.2                               |
|                           |   | 3-18         |   | 25.8 $\pm$ 4.0                              |
|                           |   | 4-15         |   | 8.7 $\pm$ 3.5                               |
|                           |   | 5-19         |   | 10.5 $\pm$ 3.3                              |
|                           |   | 6-17         |   | 6.6 $\pm$ 3.2                               |
|                           |   | 7-17         |   | 6.4 $\pm$ 3.2                               |
|                           |   | 8-18         |   | 4.9 $\pm$ 3.1                               |
|                           |   | 9-17         |   | 6.6 $\pm$ 3.1                               |
|                           |   | 10-12        |   | 11.2 $\pm$ 3.4                              |
|                           |   | 11-23        |   | 5.5 $\pm$ 3.4                               |
|                           |   | 12-14        |   | 9.0 $\pm$ 3.4                               |

TABLE B-8

## RADIOASSAY OF SURFACE WATERS

LOS ANGELES REGION (NO. 4)

Analyses Received From The Metropolitan  
Water District of Southern California

| Source and sampling point  | Date sampled | Date of analysis | Gross Alpha<br>uuc/l.* | Gross Beta<br>uuc/l.* |
|--|--------------|------------------|------------------------|-----------------------|
| Colorado River at La Verne<br>Influent F. E. Weymouth<br>Softening and Filtration<br>Plant | Sept. 1952   | 10-13-52         | 6.9±0.7                | 10.4±3.4              |
| (Colorado River Aqueduct<br>at La Verne, Sta. 69)  | Oct. 1952    | 11-19-52         | 6.4                    | 7.8±2.1               |
|  | Nov. 1952    | 12-20-52         | 5.4                    | 9.6±4.2               |
|  | Jan. 1953    | 2-13-53          | 6.3                    | 6.3±2.7               |
|  | Feb. 1953    | 4-7-53           | 3.8                    | 12.3±2.0              |
|  | Mar. 1953    | 4-27-53          | 6.8                    | 7.4±2.3               |
|  | Apr. 1953    | 6-12-53          | 6.3                    | 8.6                   |
|  | May 1953     | 6-19-53          | 5.0                    | 9.8                   |
|  | June 1953    | 7-15-53          | 4.6                    | 4.8                   |
|  | July 1953    | 8-22-53          | 4.6                    | 10.0                  |
|  | Aug. 1953    | 10-5-53          | 4.7                    | 13.8                  |
|  | Sept. 1953   | 10-14-53         | 4.1                    | 8.0                   |
|  | Oct. 1953    | 11-25-53         | 5.8                    | 11.9                  |
|  | Nov. 1953    | 12-15-53         | 4.7                    | 7.3                   |
|  | Dec. 1953    | 1-23-54          | 6.1                    | 5.4                   |
|  | Jan. 1954    | 2-18-54          | 5.2                    | 7.7                   |
|  | Feb. 1954    | 3-29-54          | 5.3                    | 10.6                  |
|  | Mar. 1954    | 4-10-54          | 5.5                    | 12.0                  |
|  | Apr. 1954    | 5-13-54          | 6.4                    | 11.5                  |

TABLE B-8

## RADIOASSAY OF SURFACE WATERS

LOS ANGELES REGION (NO. 4)  
(continued)Analyses Received From The Metropolitan  
Water District of Southern California

| Source and sampling point   | Date sampled | Date of analysis | Gross Alpha uuc/l.* | Gross Beta uuc/l.* |
|---|--------------|------------------|---------------------|--------------------|
| Colorado River at La Verne<br>Influent F. E. Weymouth<br>Softening and Filtration<br>Plant<br>(continued) | May 1954     | 6-16-54          | 5.0                 | 9.3                |
|   | June 1954    | 7- 9-54          | 6.2                 | 11.2               |
| (Colorado River Aqueduct<br>at La Verne, Sta. 69)<br>(continued)  | July 1954    | 8-26-54          | 4.1                 | 10.4               |
|   | Aug. 1954    | 9-28-54          | 4.0                 | 19.7               |
|   | Sept. 1954   | 11-15-54         | 4.4                 | 17.4               |
|   | Oct. 1954    | 11-20-54         | 3.9                 | 7.2                |
|   | Nov. 1954    | 1-14-55          | 5.1                 | 16.7               |
|   | Dec. 1954    | 1-19-55          | 4.1                 | 9.8                |
|   | Jan. 1955    | 2-25-55          | 2.4                 | 10.1               |
|   | Feb. 1955    | 4- 1-55          | 5.4                 | 5.4                |
|   | Mar. 1955    | 4- 7-55          | 5.0                 | 22.8               |
|   | Apr. 1955    | 5-10-55          | 2.6                 | 6.0                |
|   | May 1955     | 6-10-55          | 2.7                 | 13.9               |
|   | June 1955    | 7- 8-55          | 4.4                 | 15.8               |
|   | July 1955    | 8- 9-55          | 2.4                 | 18.6               |
|   | Aug. 1955    | 9-12-55          | 3.9                 | 9.7                |
|   | Sept. 1955   | 10-23-55         | 2.7                 | 10.7               |
|   | Oct. 1955    | 11-15-55         | 5.5                 | 15.3               |
|   | Nov. 1955    | 12-20-55         | 3.7                 | 10.5               |

TABLE B-8

## RADIOASSAY OF SURFACE WATERS

LOS ANGELES REGION (NO. 4)  
(continued)Analyses Received From The Metropolitan  
Water District of Southern California

| Source and sampling point   | Date sampled | Date of analysis | Gross Alpha uuc/l.* | Gross Beta uuc/l.* |
|---|--------------|------------------|---------------------|--------------------|
| Colorado River at La Verne<br>Influent F. E. Weymouth<br>Softening and Filtration<br>Plant<br>(continued) | Dec. 1955    | 1-31-56          | 5.0                 | 12.4               |
|   | Jan. 1956    | 2-14-56          | 5.2                 | 13.4               |
| (Colorado River Aqueduct<br>at La Verne, Sta. 69)<br>(continued)  | Feb. 1956    | 3- 9-56          | 3.7                 | 18.2+2.0           |
|   | Mar. 1956    | 4-10-56          | 3.4                 | 11.2               |
|   | Apr. 1956    | 5-12-56          | 2.6                 | 11.3               |
|   | May 1956     | 6- 9-56          | 4.2                 | 14.8               |
|   | June 1956    | 7-10-56          | 3.3                 | 2.1                |
|   | July 1956    | 8-29-56          | 4.9                 | 15.4               |
|   | Aug. 1956    | 9-15-56          | 4.5                 | 9.1                |
|   | Sept. 1956   | 10-10-56         | 4.6                 | 14.3               |
|   | Oct. 1956    | 11-11-56         | 4.6                 | 23.1               |
|   | Nov. 1956    | 12-10-56         | 3.8                 | 6.2                |
|   | Dec. 1956    | 1-18-57          | 5.2                 | 11.7               |
|   | Jan. 1957    | 2- 9-57          | 5.6                 | 27.5               |
|   | Feb. 1957    | 3-28-57          | 5.1                 | 20.9               |
|   | Mar. 1957    | 4-16-57          | 5.5                 | 14.6               |
|   | Apr. 1957    | 5-22-57          | 4.5                 | 33.0               |
|   | May 1957     | 6-13-57          | 2.9                 | 32.4               |
|   | June 1957    | 8- 7-57          | 3.9                 | 24.6               |

TABLE B-8  
 RADIOASSAY OF SURFACE WATERS  
 LOS ANGELES REGION (NO. 4)  
 (continued)

Analyses Received From The Metropolitan  
 Water District of Southern California

| Source and sampling point   | Date<br>sampled | Date of<br>analysis | Gross Alpha<br>uuc/l.* | Gross Beta<br>uuc/l.* |
|---|-----------------|---------------------|------------------------|-----------------------|
| Colorado River at La Verne<br>Influent F. E. Weymouth<br>Softening and Filtration<br>Plant<br>(continued) | July 1957       | 8- 9-57             | 4.0                    | 15.0                  |
|   | Aug. 1957       | 12- 3-57            | 4.5                    | 22.2                  |
| (Colorado River Aqueduct<br>at La Verne, Sta. 69)<br>(continued)  | Sept. 1957      | 12-18-57            | 5.3                    | 18.7                  |
|   | Oct. 1957       | 12-19-57            | 5.8                    | 18.7                  |
|   | Nov. 1957       | 1-10-58             | 4.0                    | 14.9                  |
|   | Dec. 1957       | 1-14-58             | 4.4                    | 23.4                  |
|   | Jan. 1958       | 4-12-58             | 3.5                    | 10.9                  |
|   | Feb. 1958       | 4-15-58             | 4.6                    | 13.3                  |
|   | Mar. 1958       | 4-10-58             | 5.4                    | 14.4                  |
|   | Apr. 1958       | 5- 9-58             | 4.7                    | 16.1                  |
|   | May 1958        | 6-14-58             | 5.0                    | 9.6                   |
|   | June 1958       | 7-10-58             | 4.5                    | 7.7                   |
|   | July 1958       | 8- 8-58             | 5.4                    | 11.5                  |
|   | Aug. 1958       | 9- 9-58             | 4.5                    | 11.1                  |
| Sept. 1958  | 10-10-58        | 5.6                 | 10.8                   |                       |
| Oct. 1958   | 11- 6-58        | 5.0                 | 31.4                   |                       |
| Nov. 1958   | 12- 4-58        | 3.4                 | 22.9                   |                       |
| Dec. 1958   | 1-10-59         | 3.1                 | 22.1                   |                       |
| Jan. 1959   | 2-11-59         | 4.6                 | 13.6                   |                       |

TABLE B-8

## RADIOASSAY OF SURFACE WATERS

LOS ANGELES REGION (NO. 4)  
(continued)Analyses Received From The Metropolitan  
Water District of Southern California

| Source and sampling point   | Date sampled | Date of analysis | Gross Alpha uuc/l.* | Gross Beta uuc/l.* |
|---|--------------|------------------|---------------------|--------------------|
| Colorado River at La Verne<br>Influent F. E. Weymouth<br>Softening and Filtration<br>Plant<br>(continued) | Feb. 1959    | 3-12-59          | 4.1                 | 20.4               |
|   | Mar. 1959    | 4-17-59          | 3.7                 | 15.2               |
| (Colorado River Aqueduct<br>at La Verne, Sta. 69)<br>(continued)  | Apr. 1959    | 5-15-59          | 4.4                 | 13.4               |
|   | May 1959     | 6-11-59          | 4.0                 | 15.8               |
|   | June 1959    | 7-17-59          | 4.1                 | 8.9                |
|   | July 1959    | 8-12-59          | 4.6                 | 9.4                |
|   | Aug. 1959    | 9-17-59          | 4.8                 | 9.6                |
|   | Sept. 1959   | 10-15-59         | 3.9                 | 17.9               |
|   | Oct. 1959    | 11-11-59         | 2.9                 | 16.7               |
|   | Nov. 1959    | 12-18-59         | 3.2                 | 9.4                |
|   | Dec. 1959    | 1-13-59          | 3.5                 | 7.7                |

\*Unit = micromicrocuries per liter. Unless otherwise stated, the maximum statistical deviation in counting at the 90 percent confidence level for alpha is  $\pm 0.7$  uuc/l. and for beta is  $\pm 2.6$  uuc/l.

TABLE B-9

## RADIOASSAY OF SURFACE WATERS

LAHONTIAN REGION (NO. 6)

| Sta. No. | Stream       | Near        | Date        | Micro-micro curies per liter |             |                 |             |
|----------|--------------|-------------|-------------|------------------------------|-------------|-----------------|-------------|
|          |              |             |             | Dissolved Beta               | Solid Beta  | Dissolved Alpha | Solid Alpha |
|          |              |             | <u>1959</u> |                              |             |                 |             |
| 67a      | Mojave River | The Forks   | 5-5         | 0.00 + 3.45                  | 3.97 + 3.30 | 0.61 + 0.48     | 0.36 + 0.42 |
|          |              |             | 9-8         | 4.69 ± 4.07                  | 0.00 ± 3.90 | 0.17 ± 0.49     | 0.35 ± 0.49 |
| 67       | Mojave River | Victorville | 5-5         | 12.85 + 4.29                 | 1.74 + 3.80 | 0.30 + 0.41     | 0.54 + 0.55 |
|          |              |             | 9-8         | 6.21 ± 4.07                  | 3.31 ± 4.00 | 0.18 ± 0.36     | 0.00 ± 0.21 |



TABLE B-10

## RADIOASSAY OF SURFACE WATERS

COLORADO RIVER BASIN REGION (NO. 7)

| Sta. No. | Stream                | Near                      | Date         | Micro-micro curies per liter |                            |                            |                            |
|----------|-----------------------|---------------------------|--------------|------------------------------|----------------------------|----------------------------|----------------------------|
|          |                       |                           |              | Dissolved Beta               | Solid Beta                 | Solid Alpha                |                            |
|          |                       |                           | 1959         |                              |                            |                            |                            |
| 60       | Alamo River           | Calipatria                | 5-5<br>9-2   | 5.07 ± 3.32<br>2.38 ± 4.33   | 1.97 ± 3.31<br>0.81 ± 4.27 | 0.20 ± 0.34<br>0.00 ± 0.31 | 0.09 ± 0.33<br>0.27 ± 0.40 |
| 59       | Alamo River           | International<br>Boundary | 5-5<br>9-1   | 1.42 ± 3.30<br>10.48 ± 4.01  | 0.17 ± 3.30<br>6.23 ± 3.90 | 0.83 ± 0.67<br>0.00 ± 0.19 | 0.36 ± 0.47<br>0.16 ± 0.27 |
| 56a      | All American<br>Canal | Pilot Knob                | 5-5<br>9-2   | 9.29 ± 5.25<br>9.58 ± 4.34   | 3.66 ± 3.75<br>2.02 ± 4.13 | 0.83 ± 0.56<br>0.25 ± 0.42 | 0.36 ± 0.47<br>0.34 ± 0.45 |
| 56c      | Colorado River        | Blythe                    | 5-17<br>9-11 | 10.71 ± 5.07<br>5.28 ± 3.63  | 0.00 ± 3.00<br>1.88 ± 3.56 | 0.51 ± 0.56<br>0.17 ± 0.39 | 0.00 ± 0.42<br>0.34 ± 0.34 |
| 56b      | Colorado River        | Morales Dam               | 5-5<br>9-2   | 12.91 ± 5.90<br>7.75 ± 4.02  | 2.79 ± 3.25<br>0.00 ± 3.63 | 0.83 ± 0.57<br>0.26 ± 0.47 | 0.37 ± 0.42<br>0.51 ± 0.53 |
| 55       | Colorado River        | Parker Dam                | 5-17<br>9-10 | 2.05 ± 5.02<br>0.06 ± 4.31   | 7.24 ± 3.95<br>0.00 ± 4.29 | 0.72 ± 0.57<br>0.36 ± 0.51 | 0.54 ± 0.55<br>0.62 ± 0.57 |
| 54       | Colorado River        | Topock, Arizona           | 5-17<br>9-10 | 4.75 ± 5.05<br>13.96 ± 4.34  | 1.41 ± 3.72<br>1.37 ± 4.00 | 0.72 ± 0.63<br>0.08 ± 0.50 | 0.18 ± 0.42<br>0.00 ± 0.39 |
| 56       | Colorado River        | Yuma                      | 5-5<br>9-2   | 7.63 ± 5.20<br>2.67 ± 4.34   | 1.35 ± 4.13<br>0.00 ± 4.08 | 0.41 ± 0.46<br>0.44 ± 0.53 | 0.45 ± 0.54<br>0.44 ± 0.57 |

Additional analyses from United States Public Health Service on page B-79.

See page B-83 for Radiological Analyses.

56d Colorado River Lake Havasu at Intake

TABLE B-10

## RADIOASSAY OF SURFACE WATERS

COLORADO RIVER BASIN REGION (No. 7 )

| Sta. No.    | Stream            | Near                   | Date | Micro-micro curies per liter |             |                 |             |
|-------------|-------------------|------------------------|------|------------------------------|-------------|-----------------|-------------|
|             |                   |                        |      | Dissolved Beta               | Solid Beta  | Dissolved Alpha | Solid Alpha |
| <u>1959</u> |                   |                        |      |                              |             |                 |             |
| 57          | New River         | International Boundary | 5-5  | 7.66 ± 5.07                  | 1.66 ± 3.92 | 0.00 ± 0.53     | 0.45 ± 0.54 |
|             |                   |                        | 9-1  | 5.53 ± 3.59                  | 0.00 ± 3.42 | 0.08 ± 0.31     | 0.17 ± 0.39 |
| 58          | New River         | Westmorland            | 5-5  | 9.40 ± 3.57                  | 3.83 ± 3.41 | 0.00 ± 0.37     | 0.36 ± 0.42 |
|             |                   |                        | 9-2  | 7.08 ± 3.79                  | 0.75 ± 3.62 | 0.25 ± 0.30     | 0.41 ± 0.35 |
| 68a         | Salton Sea        | Salton Sea State Park  | 5-5  | 0.04 ± 3.75                  | 0.00 ± 3.71 | 0.10 ± 0.20     | 0.45 ± 0.44 |
|             |                   |                        | 9-2  | 11.24 ± 4.54                 | 5.73 ± 4.39 | 0.09 ± 0.52     | 0.00 ± 0.49 |
| 68b         | White Water River | Mecca                  | 5-5  | 5.30 ± 4.43                  | 8.65 ± 4.06 | 0.30 ± 0.41     | 0.56 ± 0.52 |
|             |                   |                        | 9-2  | 17.56 ± 4.44                 | 0.00 ± 3.35 | 0.00 ± 0.20     | 0.18 ± 0.41 |
| 68          | White Water River | White Water            | 5-5  | 11.05 ± 4.01                 | 0.00 ± 3.35 | 0.83 ± 0.48     | 0.63 ± 0.44 |
|             |                   |                        | 9-3  | 10.45 ± 4.59                 | 2.98 ± 4.39 | 1.01 ± 0.58     | 0.09 ± 0.40 |

RADIOASSAY OF SURFACE WATERS  
 COLORADO RIVER BASIN REGION (NO. 7)  
 COLORADO RIVER NEAR YUMA (STA. 56)

Analyses Received From The United States  
 Public Health Service

| Date  | Micro-micro curies per liter |                 |             |  |
|-------|------------------------------|-----------------|-------------|--|
|       | Suspended Alpha              | Dissolved Alpha | Total Alpha | Suspended Beta : Dissolved Beta : Total Beta |
| 1958  |                              |                 |             |  |
| 6-18  |                              |                 | 3+1         | 35+1   |
| 9-2   |                              |                 | 3+1         | 34+1   |
| 9-15  |                              |                 | 0+1         | 19+1   |
| 9-22  |                              |                 | 0+1         | 14+1   |
| 9-29  | 5+0                          |                 | 3+1         | 12+1   |
| 10-6  |                              |                 | 4+1         | 40   |
| 10-13 |                              |                 | 4+1         | 7+1  |
| 10-20 |                              |                 | 1+0         | 62+1   |
| 10-27 |                              |                 | 0+1         | 13+1   |
| 11-3  |                              |                 | 13+1        | 62+1   |
| 11-10 |                              |                 | 4+1         | 22+1   |
| 11-17 |                              |                 | 0+1         | 41+1   |
| 11-24 | 5+1                          |                 | 1+1         | 20+1   |
| 12-1  | 6+0                          |                 | 0+1         | 20+1   |
| 12-8  |                              |                 | 22+1        | 40+2   |
| 1959  |                              |                 |             |  |
| 1-19  |                              |                 | +1          | 9+1  |
| 2-9   |                              | 2               | 0+1         | 3+2  |
| 2-16  |                              |                 | 4+1         | 41+2   |
| 2-24  | 5+1                          |                 | 5+1         | 28+2   |
| 3-2   | 6+1                          |                 | 15+1        | 29+2   |
| 3-9   |                              |                 | 7+2         | 15+2   |
| 3-17  | 8+1                          |                 | 35+1        | 276+4  |
| 3-30  | 14                           |                 | 16+2        | 60+3   |
| 4-6   | 10+1                         |                 | 13+2        | 60+3   |
| 4-20  | 5+1                          |                 | +2          | 57+3   |

TABLE B-10

RADIOASSAY OF SURFACE WATERS  
 COLORADO RIVER BASIN REGION (NO. 7)

COLORADO RIVER NEAR YUMA (STA. 56)  
 (continued)

Analyses Received From The United States  
 Public Health Service

| Date  | Micro-micro curies per liter |                 |             |                |                |            |
|-------|------------------------------|-----------------|-------------|----------------|----------------|------------|
|       | Suspended Alpha              | Dissolved Alpha | Total Alpha | Suspended Beta | Dissolved Beta | Total Beta |
| 1959  |                              |                 |             |                |                |            |
| 4-27  | 2+0                          | 3+1             | 5+1         | 19+2           | 37+3           | 66+4       |
| 5- 4  | +1                           | +1              | +1          | 12+6           | 178+7          | 190+9      |
| 5-11  |                              | +1              |             | 28+2           | 62             | 90+2       |
| 5-18  |                              | 6+1             | 6+1         | 3+2            | 60+3           | 63+4       |
| 5-25  | 5+0                          | 7+1             | 12+1        | 13+3           | 51+4           | 64+5       |
| 6- 1  |                              | +1              | +1          | +3             | +4             | +6         |
| 6-15  | 49+1                         | 64+2            | 113+3       | 152+7          | 435+10         | 587+12     |
| 6-29  |                              |                 |             | 25+2           | +3             | 25+4       |
| 7- 6  |                              | 4+1             | 4+1         | +3             | 6+4            | 6+4        |
| 7- 6  |                              | +4              | +4          | +2             | +3             | +4         |
| 7-13  | +2                           | 2+1             | 2+1         | +2             | +3             | +4         |
| 7-20  |                              | 2+1             | 2+1         | +2             | +3             | +4         |
| 7-27  |                              | 7+1             | 7+1         |                | 7+1            | 7+1        |
| 8-10  | 1+0                          | 2+0             | 3+0         | 16+2           | 33+4           | 49+4       |
| 8-17  |                              | 4+1             | 4+1         | 23+2           | +3             | 23+3       |
| 8-31  | 1+0                          | 5+1             | 6+1         | 2+2            | 5+3            | 7+4        |
| 9- 7  |                              | 6               | 6+1         | +3             | 7+3            | 7+4        |
| 9-14  | 1                            | 7+1             | 8+1         | 6+2            | 30+3           | 36+3       |
| 12-28 |                              |                 |             | 21+2           | 43+3           | 64+4       |
|       |                              |                 |             | 0              | 0              | 0          |

TABLE B-10

RADIOASSAY OF SURFACE WATERS  
 COLORADO RIVER BASIN REGION (NO. 7)

COLORADO RIVER NEAR PARKER DAM (STA. 56d)

Analyses Received From The United States  
 Public Health Service

| Date<br>sampled | Micro-micro curies per liter |           |           |           |
|-----------------|------------------------------|-----------|-----------|-----------|
|                 | Dissolved                    | Suspended | Dissolved | Suspended |
|                 | Beta                         | Beta      | Alpha     | Alpha     |
| <u>1959</u>     |                              |           |           |           |
| 1- 7            | 44 ± 2                       | 4 ± 1     |           |           |
| 1-14            | 34 ± 2                       | 472 ± 2   |           |           |
| 1-21            | 42 ± 1                       | 5 ± 1     |           |           |
| 1-28            | 43 ± 2                       | 0 ± 1     | 3 ± 0     | 0 ± 0     |
| 2- 5            | 23 ± 2                       | 24 ± 1    | 4         | 4         |
| 2-11            | 11 ± 1                       | 8 ± 1     | 6 ± 1     | 6 ± 1     |
| 2-25            | 31 ± 2                       |           | 10 ± 1    |           |
| 3- 4            | 55 ± 2                       |           | 8 ± 1     |           |
| 3-11            | 50 ± 2                       | 8 ± 1     | 0 ± 0     | 0 ± 0     |
| 3-18            | 19 ± 2                       | 1 ± 1     | 3 ± 1     | 0 ± 0     |
| 3-24            | 45 ± 2                       | 8 ± 1     | 15 ± 1    | 1 ± 0     |
| 4- 1            | 36 ± 3                       | 4 ± 2     | 4 ± 0     | 0 ± 0     |
| 4- 6            | 97 ± 3                       | 14 ± 2    | 0 ± 0     | 0 ± 0     |
| 4-14            | 55 ± 3                       | 30 ± 2    |           |           |
| 4-20            | 65 ± 3                       | 6 ± 2     |           |           |
| 4-29            | 87 ± 3                       | 8 ± 2     |           |           |
| 5- 6            | 74 ± 3                       |           | 1 ± 1     |           |
| 5-13            | 10 ± 4                       |           | 8 ± 1     |           |
| 5-20            | 103 ± 3                      | 90 ± 2    | 3 ± 1     |           |

TABLE B-10

RADIOASSAY OF SURFACE WATERS  
COLORADO RIVER BASIN REGION (NO. 7)

COLORADO RIVER NEAR PARKER DAM (STA. 56d)  
(continued)

Analyses Received From The United States  
Public Health Service

| Date<br>sampled | Micro-micro curies per liter |                   |                    |                    |
|-----------------|------------------------------|-------------------|--------------------|--------------------|
|                 | Dissolved<br>Beta            | Suspended<br>Beta | Dissolved<br>Alpha | Suspended<br>Alpha |
| 1959 (cont.)    |                              |                   |                    |                    |
| 5-27            | 1 ± 2                        | 2 ± 2             | 3 ±                |                    |
| 6- 1            | 7 ± 1                        |                   |                    |                    |
| 6- 8            |                              | 14 ± 2            |                    |                    |
| 6-15            | 21 ± 4                       | 13 ± 3            |                    |                    |
| 6-22            |                              |                   |                    |                    |
| 6-29            | 12 ± 2                       |                   |                    |                    |
| 7- 6            |                              |                   |                    |                    |
| 7-13            | 1 ± 1                        | 21 ± 1            | 18 ± 1             | 1 ± 0              |
| 7-22            | 43 ± 2                       | 1 ± 1             | 4 ± 0              | 7 ± 0              |
| 7-28            | 6 ± 2                        | 11 ± 1            | 5 ± 1              |                    |
| 8- 6            |                              |                   |                    | 1 ± 0              |
| 8-13            | 48 ± 2                       |                   | 5                  |                    |
| 8-28            | 24 ± 3                       |                   | 3 ± 0              |                    |
| 9- 2            |                              | 6 ± 3             | 2 ± 1              |                    |

TABLE B-10

## RADIOASSAY OF SURFACE WATERS

## COLORADO RIVER BASIN REGION (NO. 7)

Analyses Received From The Metropolitan  
Water District of Southern California

| Source and sampling point           | Date sampled | Date of analysis | Gross Alpha<br>uuc/l.* | Gross Beta<br>uuc/l.* |
|-------------------------------------|--------------|------------------|------------------------|-----------------------|
| Colorado River                      |              |                  |                        |                       |
| Lake Havasu at Intake               |              |                  |                        |                       |
| Pumping Plant                       | 10-21-52     | 10-31-52         | 3.5                    | 7.8 $\pm$ 3.6         |
| (Lake Havasu at Colorado            | 10-28-52     | 11-15-52         | 3.5                    | 3.9 $\pm$ 3.2         |
| River Aqueduct Intake,<br>Sta. 56d) | 11-25-52     | 1-13-53          | 3.4                    | 4.4 $\pm$ 3.3         |
|                                     | 12-22-52     | 1-22-53          | 3.1                    | 3.0 $\pm$ 3.2         |
|                                     | 1- 6-53      | 1-30-53          | -                      | 10.8 $\pm$ 3.1        |
|                                     | 2- 3-53      | 2-13-53          | 4.1                    | 5.6 $\pm$ 2.1         |
|                                     | 3- 3-53      | 3-26-53          | 2.5                    | 7.5 $\pm$ 3.3         |
|                                     | 4-14-53      | 4-23-53          | 3.2                    | 9.2 $\pm$ 2.6         |
|                                     | 5-12-53      | 5-29-53          | 3.2                    | 7.0 $\pm$ 2.8         |
|                                     | 6-16-53      | 6-24-53          | 3.7                    | 6.3 $\pm$ 2.2         |
|                                     | 7-14-53      | 8-24-53          | 3.1                    | 9.3 $\pm$ 2.3         |
|                                     | 8-18-53      | 9-29-53          | 4.3                    | 7.5                   |
|                                     | 9-22-53      | 10-11-53         | 2.6                    | 4.3                   |
|                                     | 10-20-53     | 11-27-53         | 3.3                    | 10.6                  |
|                                     | 11-24-53     | 12-18-53         | 4.4                    | 7.6                   |
|                                     | 1-19-54      | 2-17-54          | 4.1                    | 5.0                   |
|                                     | 2-16-54      | 3-20-54          | 3.7                    | 12.4                  |
|                                     | 4-13-54      | 4-23-54          | 2.6                    | 13.0                  |

TABLE B-10

## RADIOASSAY OF SURFACE WATERS

COLORADO RIVER BASIN REGION (NO. 7)  
(continued)Analyses Received From The Metropolitan  
Water District of Southern California

| Source and sampling point                                 | Date sampled | Date of analysis | Gross Alpha uuc/l.* | Gross Beta uuc/l.* |
|---|--------------|------------------|---------------------|--------------------|
| Colorado River  |              |                  |                     |                    |
| Lake Havasu at Intake Pumping Plant (continued)           | 5-11-54      | 5-25-54          | 4.5                 | 14.4               |
|   | 6-15-54      | 6-29-54          | 3.5                 | 14.2               |
| (Lake Havasu at Colorado River Aqueduct Intake, Sta. 56d) | 7-27-54      | 8-24-54          | 2.9                 | 9.1                |
|   | 8-24-54      | 9-26-54          | 3.5                 | 9.1                |
|   | 9-21-54      | 11-12-54         | 2.8                 | 7.6                |
|   | 10-26-54     | 11-29-54         | 4.0                 | 10.6               |
|   | 11-30-54     | 1-18-55          | 2.9                 | 7.6                |
|   | 1-11-55      | 2-23-55          | 3.8                 | 11.5               |
|   | 2-22-55      | 3- 4-55          | 3.5                 | 11.1               |
|   | 3-22-55      | 3-30-55          | 4.2                 | -                  |
|   | 5- 3-55      | 5-12-55          | 2.6                 | 9.2                |
|   | 5-17-55      | 6- 3-55          | 2.5                 | 136.5±3.0          |
|   | 6-14-55      | 6-28-55          | 3.0                 | 6.2                |
|   | 7-12-55      | 7-27-55          | 4.7                 | 8.1                |
|   | 8-16-55      | 8-27-55          | 3.6                 | 9.0                |
|   | 9-13-55      | 10- 8-55         | 3.2                 | 15.3               |
|   | 10-25-55     | 11-13-55         | 4.0                 | 6.1                |
|   | 11-29-55     | 12-10-55         | 3.2                 | 10.4               |
|   | 12-27-55     | 1-31-56          | 1.9                 | 9.9                |

TABLE B-10

## RADIOASSAY OF SURFACE WATERS

COLORADO RIVER BASIN REGION (NO. 7)  
(continued)Analyses Received From The Metropolitan  
Water District of Southern California

| Source and sampling point                                 | Date sampled | Date of analysis | Gross Alpha uuc/l.* | Gross Beta uuc/l.* |
|---|--------------|------------------|---------------------|--------------------|
| Colorado River  |              |                  |                     |                    |
| Lake Havasu at Intake Pumping Plant                       | 1-24-56      | 2-13-56          | 3.9                 | 14.7               |
| (continued)   | 2-21-56      | 3- 8-56          | 3.0                 | 10.4               |
| (Lake Havasu at Colorado River Aqueduct Intake, Sta. 56d) | 3-20-56      | 4- 9-56          | 4.2                 | 14.4               |
|   | 5- 8-56      | 5-19-56          | 4.7                 | 9.8                |
|   | 6- 5-56      | 6-21-56          | 4.0                 | 9.2                |
|   | 7-17-56      | 8-28-56          | 3.7                 | 15.1               |
|   | 8-14-56      | 9-14-56          | 3.5                 | 7.9                |
|   | 9-18-56      | 9-28-56          | 3.7                 | 11.9               |
|   | 11- 6-56     | 12- 1-56         | 4.4                 | 23.5               |
|   | 12-11-56     | 12-28-56         | 5.9                 | 15.4               |
|   | 1- 1-57      | 1-22-57          | 5.7                 | 17.6               |
|   | 2-19-57      | 3-27-57          | 5.5                 | 19.7               |
|   | 4- 4-57      | 4-18-57          | 5.1                 | 26.0               |
|   | 4-30-57      | 5-24-57          | 4.0                 | 19.6               |
|   | 5-14-57      | 6- 2-57          | 3.5                 | 28.3               |
|   | 6- 4-57      | 6-15-57          | 2.0                 | 31.9               |
|   | 7- 9-57      | 8-11-57          | 3.6                 | 26.2               |
|   | 9- 3-57      | 12- 5-57         | 3.5                 | 36.4               |
|   | 9-17-57      | 12- 6-57         | 4.6                 | 25.4               |

TABLE B-10

## RADIOASSAY OF SURFACE WATERS

COLORADO RIVER BASIN REGION (NO. 7)  
(continued)Analyses Received From The Metropolitan  
Water District of Southern California

| Source and sampling point                                 | Date sampled | Date of analysis | Gross Alpha uuc/l.* | Gross Beta uuc/l.* |
|---|--------------|------------------|---------------------|--------------------|
| Colorado River  |              |                  |                     |                    |
| Lake Havasu at Intake Pumping Plant (continued)           | 10-15-57     | 12-17-57         | 5.2                 | 13.1               |
|   | 11-12-57     | 12-20-57         | 5.6                 | 14.3               |
| (Lake Havasu at Colorado River Aqueduct Intake, Sta. 56d) | 12-10-57     | 1- 9-58          | 3.4                 | 11.7               |
|   | 1- 7-58      | 1-17-58          | 3.7                 | 22.3               |
|   | 3- 4-58      | 4-18-58          | 4.7                 | 8.9                |
|   | 3-12-58      | 4-19-58          | 5.2                 | 12.0               |
|   | 4-29-58      | 5-12-58          | 3.4                 | 15.1               |
|   | 5-27-58      | 6- 6-58          | 4.1                 | 17.5               |
|   | 6-24-58      | 7- 9-58          | 4.0                 | 15.0               |
|   | 7- 8-58      | 7-16-58          | 3.4                 | 9.3                |
|   | 9- 2-58      | 9-11-58          | 3.2                 | 21.0               |
|   | 10-14-58     | 10-21-58         | 3.3                 | 17.1               |
|   | 11-24-58     | 12- 2-58         | 3.9                 | 13.8               |
|   | 12-30-58     | 1- 9-59          | 4.1                 | 26.6               |
|   | 1-27-59      | 2-12-59          | 3.0                 | 14.2               |
|   | 2-24-59      | 3-11-59          | 5.4                 | 16.0               |
|   | 3-24-59      | 3-31-59          | 4.8                 | 13.0               |
|   | 4-21-59      | 4-29-59          | 4.4                 | 21.2               |
|   | 5-19-59      | 6- 9-59          | 3.4                 | 13.1               |

TABLE B-10

RADIOASSAY OF SURFACE WATERS

COLORADO RIVER BASIN REGION (NO. 7)  
(continued)

Analyses Received From The Metropolitan  
Water District of Southern California

| Source and sampling point                                 | Date sampled | Date of analysis | Gross Alpha uuc/l.* | Gross Beta uuc/l.* |
|---|--------------|------------------|---------------------|--------------------|
| Colorado River  |              |                  |                     |                    |
| Lake Havasu at Intake Pumping Plant (continued)           | 6-16-59      | 7-16-59          | 3.6                 | 13.9               |
|   | 8- 4-59      | 8-14-59          | 3.7                 | 14.9               |
| (Lake Havasu at Colorado River Aqueduct Intake, Sta. 56d) | 8-18-59      | 9-16-59          | 3.9                 | 13.9               |
|   | 9- 8-59      | 9-19-59          | 3.1                 | 13.0               |
|   | 10-13-59     | 10-26-59         | 3.6                 | 10.1               |
|   | 11-10-59     | 11-21-59         | 3.5                 | 17.3               |
|   | 12- 8-59     | 12-23-59         | 4.2                 | 14.2               |

\*Unit = micromicrocuries per liter. Unless otherwise stated, the maximum statistical deviation in counting at the 90 percent confidence level for alpha is  $\pm 0.7$  uuc/l. and for beta is  $\pm 2.6$  uuc/l.

TABLE B-11

## RADIOASSAY OF SURFACE WATERS

SANTA ANA REGION (NO. 8)

| Sta. No. | Stream          | Near           | Date                       | Micro-micro curies per liter |                             |                            |                            |  |
|----------|-----------------|----------------|----------------------------|------------------------------|-----------------------------|----------------------------|----------------------------|--|
|          |                 |                |                            | Dissolved Beta               | Solid Beta                  | Dissolved Alpha            | Solid Alpha                |  |
|          |                 |                |                            |                              |                             |                            |                            |  |
|          |                 |                | <u>1959</u>                |                              |                             |                            |                            |  |
| 86       | Chino Creek     | Chino          | 5-5<br>Dry<br>9-59         | 4.64 ± 3.90                  | 4.39 ± 4.30                 | 0.40 ± 0.48                | 0.18 ± 0.47                |  |
| 89       | Lake Elsinore   | North Shore    | 5-5<br>Dry<br>9-59         | 4.90 ± 4.70                  | 7.58 ± 3.50                 | 0.90 ± 0.56                | 0.28 ± 0.49                |  |
| 51       | Santa Ana River | Arlington      | 5-5<br>9-8                 | 14.44 ± 4.96<br>4.94 ± 3.87  | 4.08 ± 3.50<br>0.00 ± 3.67  | 0.30 ± 0.26<br>0.09 ± 0.40 | 0.19 ± 0.21<br>0.00 ± 0.44 |  |
| 51c      | Santa Ana River | Mentone        | 5-5<br>9-8                 | 1.73 ± 4.08<br>11.30 ± 4.47  | 0.62 ± 3.50<br>0.00 ± 4.16  | 0.30 ± 0.56<br>0.52 ± 3.58 | 0.37 ± 0.42<br>0.37 ± 0.37 |  |
| 51e      | Santa Ana River | Norco          | 5-5<br>9-8                 | 1.02 ± 3.87<br>12.53 ± 4.46  | 15.44 ± 4.49<br>4.66 ± 4.27 | 0.91 ± 0.54<br>0.46 ± 0.40 | 0.37 ± 0.47<br>0.01 ± 0.37 |  |
| 51a      | Santa Ana River | Prado          | 5-5<br>9-8                 | 15.21 ± 4.96<br>6.68 ± 4.32  | 5.35 ± 3.50<br>2.36 ± 4.13  | 0.71 ± 0.56<br>0.46 ± 0.40 | 0.10 ± 0.46<br>0.01 ± 0.26 |  |
| 50f      | Warm Creek      | Colton         | 5-11<br>9-15               | 1.76 ± 3.06<br>8.51 ± 3.82   | 5.52 ± 3.35<br>0.00 ± 3.57  | 0.00 ± 0.2<br>0.15 ± 0.14  | 0.47 ± 0.44<br>0.00 ± 0.25 |  |
| 50c      | Warm Creek      | San Bernardino | Dry<br>5-59<br>Dry<br>9-59 |                              |                             |                            |                            |  |

TABLE B-12

## RADIOASSAY OF SURFACE WATERS

SAN DIEGO REGION (NO. 9)

| Sta. No. | Stream                | Near                   | Date                       | Micro-micro curies per liter |                            |                            |                            |
|----------|-----------------------|------------------------|----------------------------|------------------------------|----------------------------|----------------------------|----------------------------|
|          |                       |                        |                            | Dissolved Beta               | Solid Beta                 | Dissolved Alpha            | Solid Alpha                |
|          |                       |                        | 1959                       |                              |                            |                            |                            |
| 63       | Escondido Creek       | Harmony Grove          | 5-4<br>9-1                 | 0.06 ± 3.90<br>12.90 ± 4.60  | 6.68 ± 4.14<br>0.00 ± 4.23 | 0.10 ± 0.51<br>0.08 ± 0.23 | 0.07 ± 0.32<br>0.08 ± 0.41 |
| 65a      | Forester Creek        | El Cajon               | 5-4<br>9-1                 | 3.39 ± 4.06<br>2.10 ± 4.58   | 9.18 ± 4.12<br>2.24 ± 4.59 | 0.40 ± 0.62<br>0.00 ± 0.49 | 0.47 ± 0.54<br>0.00 ± 0.45 |
| 65       | San Diego River       | Old Mission Dam        | 5-4<br>9-1                 | 1.28 ± 3.93<br>5.00 ± 4.38   | 6.42 ± 4.11<br>2.10 ± 4.28 | 0.20 ± 0.53<br>0.49 ± 0.33 | 0.28 ± 0.39<br>0.16 ± 0.19 |
| 64       | San Dieguito River    | San Pasqual Valley     | Dry<br>5-59<br>Dry<br>9-59 |                              |                            |                            |                            |
| 62       | San Luis Rey River    | Pala                   | 5-4<br>Dry<br>9-59         | 0.17 ± 3.94                  | 2.73 ± 4.04                | 0.00 ± 0.41                | 0.09 ± 0.39                |
| 51c      | Santa Margarita River | Fallbrook              | 5-4<br>Dry<br>9-59         | 1.65 ± 3.88                  | 0.00 ± 3.30                | 0.60 ± 0.48                | 0.28 ± 0.39                |
| 65b      | Spring Valley Creek   | La Pressa              | 5-4<br>9-1                 | 3.27 ± 4.00<br>0.25 ± 4.77   | 0.67 ± 4.01<br>0.00 ± 4.77 | 0.51 ± 0.63<br>0.17 ± 0.29 | 0.9 ± 0.39<br>0.09 ± 0.14  |
| 66       | Tia Juana River       | International Boundary | Dry<br>5-59<br>and<br>9-59 |                              |                            |                            |                            |

















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