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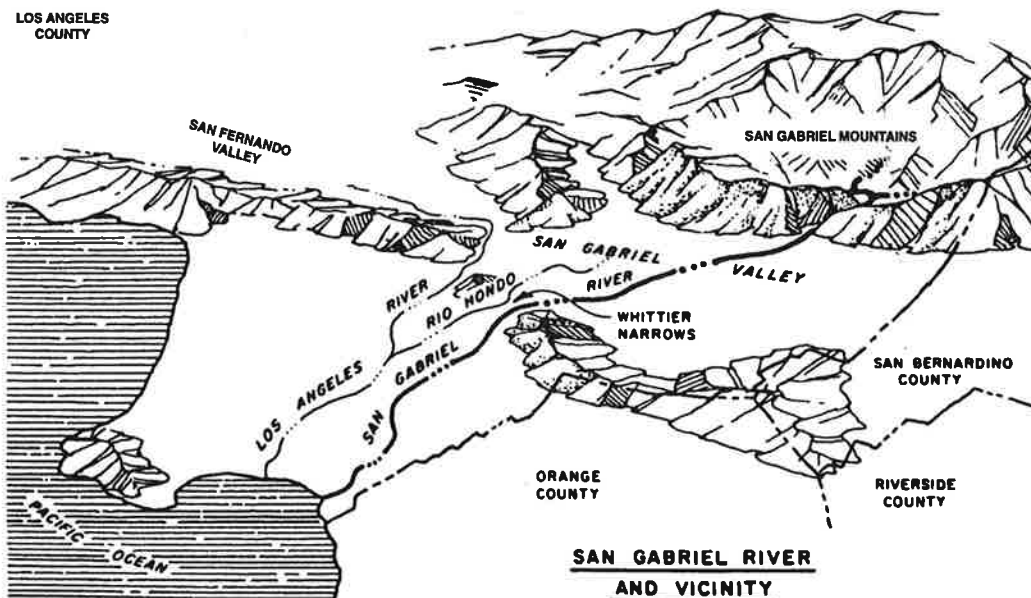
FIFTY-FIFTH ANNUAL REPORT

OF THE

SAN GABRIEL RIVER WATERMASTER

FOR

WATER YEAR 2017 - 18



City of Long Beach, et al., vs. San Gabriel Valley Water Co., et al.
Case No. 722647 – Los Angeles County

February 28, 2019

SAN GABRIEL RIVER WATERMASTER

FOR
CITY OF LONG BEACH ET AL VS SAN GABRIEL VALLEY WATER CO. ET AL
CASE NO. 722647-LOS ANGELES COUNTY

WATERMASTERS
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February 28, 2019

To: Clerk of Superior Court of Los Angeles
County and All Parties

Re: Watermaster Report for Water Year 2017-18

Gentlemen:

We have the honor of submitting the Fifty-fifth Annual Report of the San Gabriel River Watermaster for water year 2017-18, in accordance with the Judgment in Case No. 722647 entered September 24, 1965. A complete summary of Watermaster findings is contained in this Report.

The average precipitation at the four stations used to represent the San Gabriel Valley rainfall for 2017-18 was 7.0 inches or 38 percent of the long-term average annual rainfall of 18.52 inches as defined in the Judgment. The ten-year average rainfall from 2008-09 through 2017-18 amounted to 13.4 inches, which, according to Table A of the Judgment, established the Lower Area Annual Entitlement at 59,600 acre-feet for 2017-18.

The principal findings of the Watermaster under annual accounting for the water year 2017-18 are as follows:

	<u>Acre-Feet</u>
1. Lower Area Entitlement	59,600
2. Usable Water received by Lower Area in 2017-18	44,853
3. Upper Area Debit for Water Year 2017-18	(14,747)
4. Accrued Credit of Upper Area as of September 30, 2017	150,803

- | | | |
|----|--|---------|
| 5. | Amount of Make-up Water received by
Lower Area in 2017-18 | 0 |
| 6. | Accrued Credit of Upper Area as of
September 30, 2018 | 136,056 |
| 7. | Amount of Make-up Water required to
be delivered prior to October 1, 2019 | 0 |

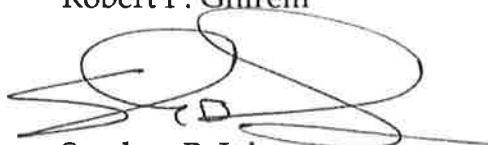
A complete summary of Watermaster findings is contained in Chapter IV of this Report.

The majority of the data required by the Watermaster is furnished by the Los Angeles County Department of Public Works. The cooperation and assistance furnished by the County and other agencies is gratefully acknowledged.

Sincerely,

SAN GABRIEL RIVER WATERMASTER

By: 
Robert P. Ghirelli


Stephen B. Johnson


Richard A. Rhone

Enclosures

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CHAPTER I. ACTIVITIES OF WATERMASTER

This Report is for the fifty-fifth year of operations under the Judgment in Case No. 722647 (the Long Beach case). Parties to the Judgment are listed on page A-1 of the Appendix of this Report. The Judgment declared that the Lower Area of the San Gabriel River System, the area downstream of Whittier Narrows, is entitled to receive a long-term annual average of 98,415 acre-feet of Usable Water from the Upper Area, the area upstream of Whittier Narrows. The history of the litigation, the Judgment and related activities were described in the forty-sixth annual report on the occasion of the Third Long-term Accounting. Therefore, they will not be restated in this Report.

The activities of the Watermaster include administration of operations under the Judgment, performance of field inspections, collection of data and maintenance of records, analyses of data, preparation of the Report presenting the required determinations and findings, evaluation and maintenance of monitoring locations, and maintenance of records of transfers of defendants' water rights. All operations and reports are based on the "Water Year," which is from October 1 through September 30.

Administration

The official office and depository of records of the Watermaster is 99 S. Lake Avenue, Suite 300, Pasadena, California 91101.

An audit of income and expenditures of the Watermaster for water year 2017-18 was performed by the firm of Dillon and Avedissian, Accountancy Corporation (Dillon). Table 1 is the Statement of Income and Expenditures for water year 2017-18 based on the Dillon letter of January 22, 2019, which is included commencing on page A-2 of the Appendix of this Report.

TABLE 1

STATEMENT OF INCOME AND EXPENDITURES
FOR THE WATER YEAR 2017-18

Carried forward from water year 16-17	13,197.97
Income from 2017-18 assessments	202,000.00
Interest Income	<u>34.08</u>
Total Income	215,232.05
Expenditures:	
1. Administrative fees and general operating expenses	26,499.70
2. Collection of data, field inspections and maintenance of records	90,318.14
3. Calculations and preparation of Watermaster Report for water year 2016-17	88,773.63
4. Printing and reproduction costs	4,550.93
5. Conservancy and Master Planning	1,911.88
Total expenditures	212,054.28
Balance	3,177.77

The tentative budget for the current water year 2018-19 was mailed to all Parties on July 20, 2018. Following a period of 15 days after service of the tentative budget, there being no objections received, the tentative budget became the final budget. The annual budget for water year 2018-19 and proration of costs for payment thereof are shown in Table 2.

TABLE 2
WATERMASTER BUDGET
FOR
WATER YEAR 2018-19

1.	Administrative costs and general operating expenses	\$30,000.00
2.	Hydrologic analyses, collection of data and field inspection	85,000.00
3.	Additionally needed facilities	15,000.00
4.	Calculations and preparation of Watermaster Report for Water Year 2017-18	70,000.00
5.	San Gabriel River Conservancy and Master Planning	4,000.00
6.	Printing and reproduction costs	4,000.00
7.	Contingencies	<u>2,000.00</u>
	Total	\$210,000.00
	Surplus carried forward from 2017-18	5,000.00
	Less estimated interest income	<u>0.00</u>
	Amount to be financed for 2018-19	\$205,000.00

Proration to Parties for Payment

Upper San Gabriel Valley Municipal Water District	50.0%	\$102,500.00
Central Basin Municipal Water District	41.2%	84,460.00
City of Long Beach	7.125%	14,606.25
City of Compton	<u>1.675%</u>	<u>3,433.75</u>
Total	100%	\$205,000.00

Watermaster Personnel

The Judgment provided for the appointment of a three-member Watermaster, one to represent the Upper Area, one to represent the Lower Area, and the third to represent both areas. On November 12, 1965, the three-member Watermaster was appointed and certified by the Court, namely Thomas M. Stetson representing the Upper Area, Max Bookman representing the Lower Area, and M. E. Salsbury representing both areas.

Upper Area Watermaster

Mr. Stetson passed away on April 14, 2011. Mr. Stephen B. Johnson (Stetson Engineers Inc.) was nominated by the Upper Area Parties. On September 15, 2011, Mr. Johnson was appointed by the Court to replace Mr. Stetson as a member of Watermaster.

Lower Area Watermaster

Mr. Bookman elected to conclude his years of service in 1986 and upon nomination by the Lower Area Parties, the Court on January 14, 1986, appointed Richard A. Rhone (GEI Consultants, Inc.) to replace Mr. Bookman. This appointment was effective in February 1986.

Upper Area/Lower Area Watermaster

Mr. Salsbury elected to conclude his years of service in 1985 and upon nomination from Upper San Gabriel Valley Municipal Water District (Upper District) and Central Basin Municipal Water District (Central Municipal), the Court appointed Howard H. Haile as his replacement effective February 7, 1985.

Mr. Haile passed away on December 9, 2001. Pursuant to the Judgment, Mr. Glenn A. Brown was jointly nominated by Central Municipal and Upper District as the third member of Watermaster. On July 26, 2002, Mr. Glenn A. Brown was appointed by the Court as the

third member of Watermaster.

Mr. Brown passed away on February 22, 2015. Pursuant to the Judgment, Mr. Robert P. Ghirelli was jointly nominated by Central Municipal and Upper District as the third member of the Watermaster. On March 4, 2016 Mr. Robert P. Ghirelli was appointed by the Court as the third member of Watermaster.

The staff work for this Report was conducted by Richard Anderson for GEI Consultants, Inc. and Kevin Smead and Jenny Savron for Stetson Engineers Inc.

Data Collection

The Watermaster collects data on streamflow, rainfall, water quality, ground water levels, export of ground water through Whittier Narrows, recycled water, imported replenishment water and other information as required. The principal source of data is the Los Angeles County Department of Public Works (hereinafter County). Copies of records were obtained from the County and conferences were held between County personnel and Watermaster personnel in order that the Watermaster would be fully informed on the facts necessary to make the determinations required by the Judgment. The Watermaster acknowledges the County personnel for its emphasis on the quality of the records it produces. Other data were obtained from the Metropolitan Water District of Southern California (Metropolitan), the County Sanitation Districts of Los Angeles County (County Sanitation District), the Water Replenishment District of Southern California (Water Replenishment District), the Upper District, the San Gabriel Valley Municipal Water District, the Central Municipal, the San Gabriel Valley Water Company, the Main San Gabriel Basin Watermaster, the U. S. Army Corps of Engineers, California Department of Toxic Substances Control (DTSC) and the U. S. Geological Survey (USGS). The

Watermaster makes use of water level measurements in wells collected by University of Southern California staff on behalf of the San Gabriel Valley Protective Association.

The collected surface flow data are summarized in a daily operation computer model. This model, developed by Watermaster personnel, aids in the efficiency and accuracy of the analyses.

Quarterly Field Inspections

During water year 2017-18, Watermaster staff made quarterly field inspections of gaging stations and other facilities. Facilities inspected included the spreading grounds, stream gaging stations, imported water delivery points and river channels in the San Gabriel River system. Watermaster staff also measured the depth to water in a number of wells in the Whittier Narrows area to obtain data for the calculation of annual subsurface flow through Whittier Narrows. The quarterly inspections are coordinated with the water level measuring program conducted on behalf of San Gabriel Valley Protective Association. Watermaster staff began taking stream flow measurements in July 2008 to supplement stream flow records collected by the County through the Whittier Narrows.

Preparation of Annual Report

One of the required responsibilities of the Watermaster is the preparation of the Annual Report presenting the findings required by the Judgment. The Judgment provides that a report be prepared and submitted within five months after the end of each water year, and copies of the Report are to be filed with the Court and furnished to each of the Parties. Copies are also furnished to others upon request.

Terminology

The Judgment defines numerous terms and those defined terms used in this Report are capitalized. The Judgment defines the term “Reclaimed Water” and this Report uses that defined term when referring to accounting provisions of the Judgment. Otherwise, this Report uses the term “recycled water” (based on current terminology, but synonymous with reclaimed water) when referring to the product water from a water reclamation plant.

Planning Activities of the San Gabriel River Watermaster

Increasing interest in the environment of the San Gabriel River system has resulted in several efforts to study, change and improve the area of the San Gabriel River system. Some of these efforts have resulted in the involvement of the San Gabriel River Watermaster.

San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy

The California State Legislature in 1999 (SB 216) formed the San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy. The Conservancy is empowered to acquire and manage specified lands within the Main San Gabriel Basin, the watershed of the San Gabriel River and its tributaries, the Lower Los Angeles River and its tributaries, and the San Gabriel Mountains, to carryout the management, powers, and duties of the Conservancy, as specified by the legislation. The enabling legislation establishing the Conservancy created a Board of Directors of 13 voting members and seven ex officio non-voting members. The legislation specified that a member of the San Gabriel River Watermaster be appointed as one of the non-voting members. Mr. Stephen Johnson was appointed by the Watermaster as its representative on the Conservancy. Mr. Stan Chen was appointed as alternate.

Stream Gaging Stations

The County and the USGS operate the stream gaging stations on the San Gabriel River System. Data from these operations are essential for determinations required of the Watermaster.

The accuracy of these gaging station measurements, at some of the higher surface water flows, is at times questionable. Also, physical changes occur in the channel sections at several of the stream gaging stations. These problems and their resolutions are discussed in Chapter III.

Plate 1, entitled "Stream Gaging Stations, Rio Hondo - San Gabriel River System," shows the general vicinity of the Whittier Narrows area. Plate 2, entitled "Map of Whittier Narrows," shows in greater detail certain features in Whittier Narrows, including wells used for calculating subsurface flow.

Memorandum of Understanding (1982)

On May 13, 1982, a Memorandum of Understanding (MOU) was executed by representatives of Upper and Lower Area Parties. That document recognizes the need for a continuing cooperative working relationship between the Upper and Lower Area Parties. The purpose of the MOU was to institute, under then present conditions, certain practical accommodations which are not intended to constitute interpretations of or additions to the Judgment. The MOU is still in effect and is included in the Appendix to the Forty-sixth Annual Watermaster Report.

Transfer of Water Rights, Change of Address and Change of Name of Parties

During water year 2017-18, there were no transfers of defendants' water rights, changes of address, and changes of names of Parties reported to the Watermaster.

The Watermaster's official office and repository is located at 99 S. Lake Avenue,
Suite 300, Pasadena, California 91101.

CHAPTER II. LOWER AREA ANNUAL ENTITLEMENT

The Lower Area Annual Entitlement for water year 2017-18 is based on the average annual rainfall which occurred in the 10-year period ending September 30, 2018 and the corresponding entitlement shown in Table A of the Judgment. Four precipitation stations are utilized to determine the annual precipitation for San Gabriel Valley. The four stations are located at San Dimas, Pomona, El Monte and Pasadena.

Rainfall

Rainfall records at Stations 95 (San Dimas) and 108D (El Monte) were determined to be inaccurate in years prior to water year 2007-08 when compared to other adjacent rainfall stations and required adjustments as noted in prior reports. During water year 2006-07, Watermaster provided funds for the County to construct two automatic rain gages located adjacent to Stations 95 and 108D to insure more complete and accurate records.

Station 95 (San Dimas) was relocated by approximately 0.1 miles in August 2017. The station was renumbered to be Station 95A and adopted by the County as part of its four-station index for the San Gabriel Valley. This is documented in the memorandum "Replacement of Station 95" dated December 28, 2018, which is available at the Watermaster office and included by reference.

In a memorandum dated December 20, 2018 titled "Recommended Modifications to Reported Rainfall Records for Water Year 2017-18" the inspection of rainfall data for Station 610B for water year 2017-18 indicated a storm event was missing based on records at other stations in the San Gabriel Valley. The Watermaster made a revision to Station 610B by adding 0.84 inches to its rainfall total.

Rainfall during water year 2017-18 at the four stations was measured as follows:

<u>Station Number</u>	<u>Location</u>	<u>Depth of Rainfall in Inches</u>
95A†	198 Pony Express Way, San Dimas	7.35
108D†	3615 North Santa Anita Avenue, El Monte	6.09
356D†	Pomona Fire Station	5.77
610B	City Hall, Pasadena	8.74 *
Four Station Average Rainfall		6.99

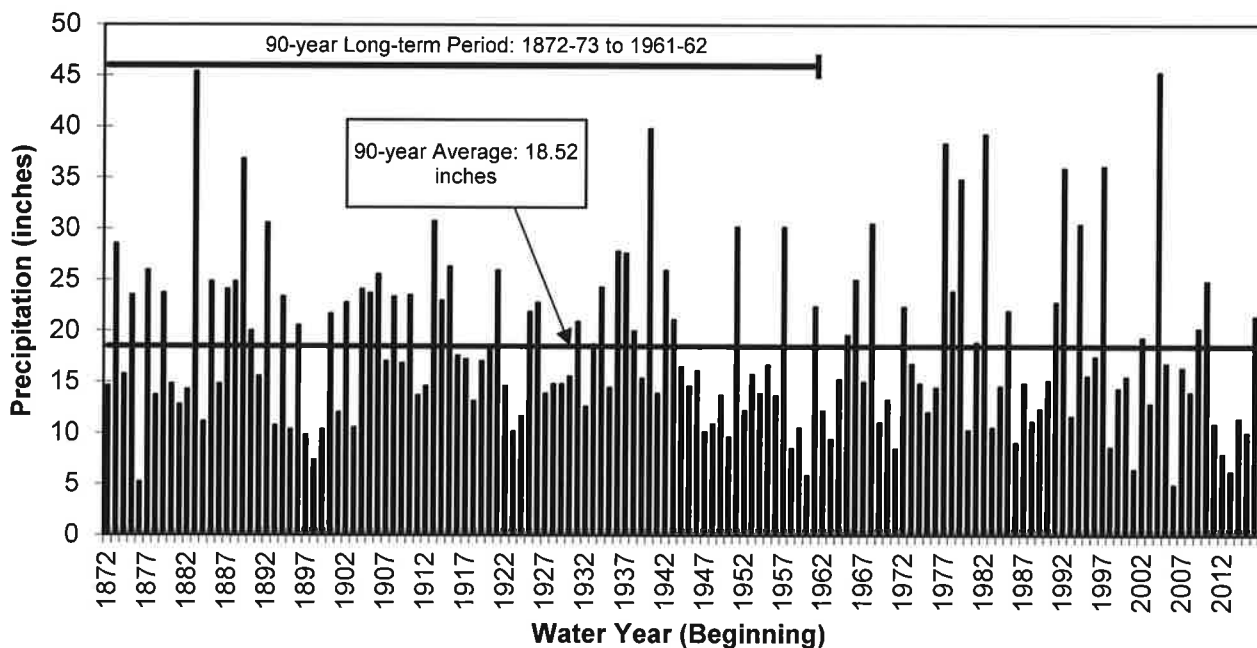
* Data adjusted from recorded amounts to correct apparent inaccurate records

† Station 102D was replaced in 2000-01 by 356C (see Thirty-Eighth Annual Report). Station 356C was replaced by Station 356D in 2014-15. Station 95 was moved in 2016-17 and renumbered Station 95A.

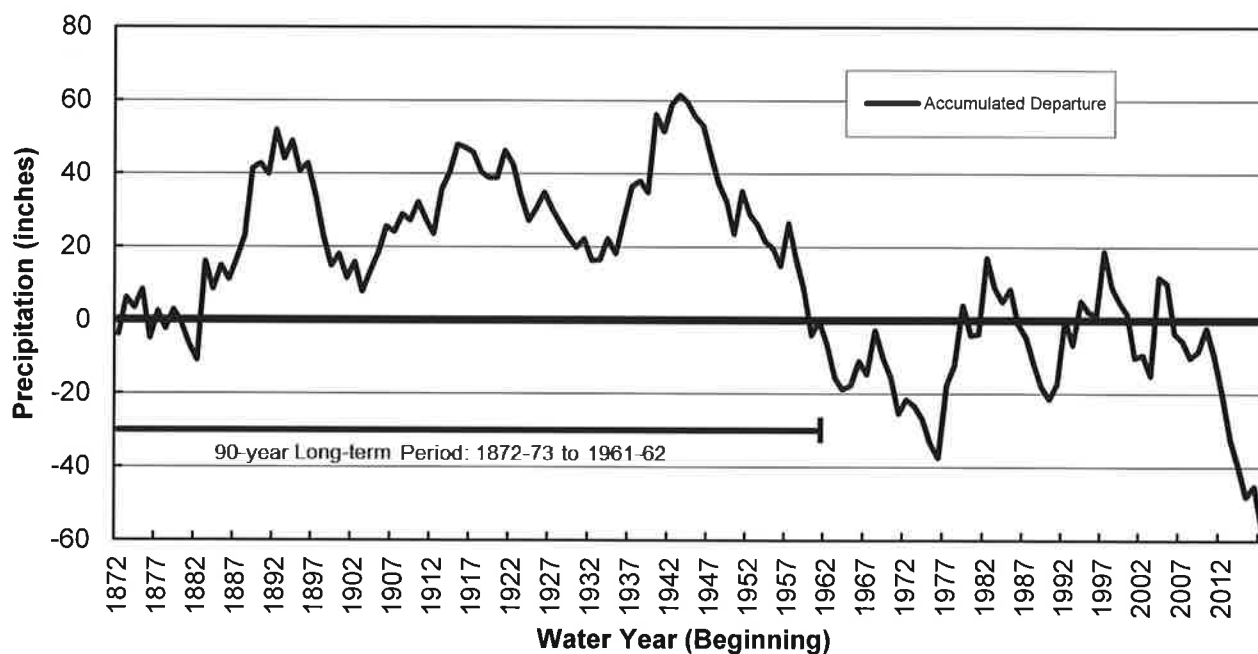
Measured rainfall during water year 2017-18 averaged 6.99 inches in the San Gabriel Valley, or 38 percent of the long-term average. Shown in the top graph of Figure 1 is a graphical representation of the annual measured rainfall since water year 1872-73. The Judgment is based on an average annual rainfall of 18.52 inches for the 90-year period from 1872-73 through 1961-62, which is also shown in the top graph in Figure 1. Presented in the lower graph of Figure 1 is the accumulated departure from the average annual rainfall. The graph shows when extended periods of above and below average annual precipitation occurred. An example of an extended period of above average annual precipitation is water years 1977-78 through 1982-83. An example of an extended below average annual precipitation is water years 1943-44 through

FIGURE 1

SAN GABRIEL VALLEY PRECIPITATION 1872-73 THROUGH 2017-18



SAN GABRIEL VALLEY PRECIPITATION 1872-73 THROUGH 2017-18



HISTORICAL PRECIPITATION IN THE SAN GABRIEL VALLEY

1976-77. During this dry period, the average rainfall was 15.69 inches, or 85 percent of the 90-year period. The San Gabriel Valley experienced the lowest average annual rainfall during the 5-year period of water years 2011-12 through 2015-16 and the 10-year period of water years 2006-07 through 2015-16. During that 5-year period, the average annual rainfall was 9.33 inches, or 50 percent of the 90-year period; and during that 10-year period the average annual rainfall was 12.71 inches, or 69 percent of the 90-year period. The average rainfall during the operational period of the Watermaster, water years 1963-64 through 2017-18, was 17.61 inches, or 95 percent of the 90-year period. This shows that the average annual precipitation since 1963-64 is consistent with the 90-year period used for the Judgment. Table 3 presents the calculation of the 10-year average rainfall in the San Gabriel Valley for the water years 2008-09 through 2017-18, as 13.4 inches.

TABLE 3

**AVERAGE ANNUAL RAINFALL IN SAN GABRIEL VALLEY
2008-09 THROUGH 2017-18**

Water Year	Annual Precipitation Rainfall
2008-09	14.0
2009-10	20.2
2010-11	24.9
2011-12	10.9
2012-13	8.0
2013-14	6.3
2014-15	11.4
2015-16	10.1
2016-17	21.4
2017-18	<u>7.0</u>
Total	134.2
10-Year Average*	13.4

*The 10-year average is 72 percent of the 90-year average of 18.52 inches.

Lower Area Annual Entitlement

Based on the 10-Year average rainfall of 13.4 inches, the Lower Area Annual Entitlement for the water year 2017-18 is 59,600 acre-feet, determined from Table A of the Judgment.

CHAPTER III. USABLE WATER RECEIVED BY LOWER AREA

Presented in this Chapter is the determination of the quantity of Usable Water received by the Lower Area during water year 2017-18. Also included is a discussion of the quality of water of the San Gabriel River system.

Surface Flow

The items to be included in Surface Flow through Whittier Narrows are set forth in Section III.A of Exhibit B of the Judgment. The gaging station measured flows and estimated flows are described below. The Judgment provides for adjustments to the measured flows where applicable. Some measurements during water year 2017-18 were found to be unreliable, questionable, or in error and appropriate adjustments were made by Watermaster. These adjustments are discussed later in this chapter, under the heading "Adjustments to Surface Flow."

Rio Hondo Above Mission Bridge, Station F64

In August of 1978, the flow recorder at this station was removed by the County due to high maintenance costs and very poor hydraulic control caused by a shifting sand bottom at the station. Also, the use of Whittier Narrows debris pool for storage of storm waters for conservation purposes causes frequent backwater at the station during storm operations. After reinstallation of the gaging station in 1985, the County again removed the recorder at this station in 1995. Since 1995, the County hydrographer schedules periodic current-meter measurements at this station. Using these measurements and upstream measurements, a record of flow has been developed over the years that is considered to be more accurate than the recorder. This is due to the poor conditions of the channel section at the station and

backwater conditions from Whittier Narrows Dam and Whittier Narrows Water Reclamation Plant discharges.

During water year 2017-18, the County hydrographer did not perform any current-meter measurements. During water year 2017-18 the Watermaster staff performed 14 current-meter measurements.

The Watermaster has determined that a synthesized flow at Station F64 should be used for the entire year. Using data provided by the County and by the USGS, the Watermaster synthesized flow at the station as being equal to the sum of the flow at Garvey Avenue (E326-R), Alhambra Wash (F81D-R), plus an estimate of the quantity of rising water. The synthesized flow at Station F64 is utilized for the entire water year and it is considered to be reasonably accurate. This resulted in a total flow at Station F64 for water year 2017-18 of 6,237acre-feet.

Additional analyses balancing all inflow stations with the outflow stations and the amount of water spread indicated some inconsistencies during days of very high flow. In those cases, appropriate adjustments were made, which are described later in this chapter, under the heading "Adjustments to Surface Flow."

Mission Creek at San Gabriel Boulevard, Station F83

The recorder was removed by the County from this station during water year 1977-78 because of construction work by the Los Angeles County Road Department and the designation of the station was changed from "F83-R" to "F83", a non-recording station. Historically, the majority of the water carried in Mission Creek was rising water. For a number of years there was no flow observed at this station during quarterly field inspection. During quarterly field inspections Watermaster staff observed flow in Mission Creek

beginning in February 2013 and continuing through the end of May 2015. The flow in Mission Creek is attributed to the discharge of treated water from the Department of Toxic Substances Control (DTSC) Whittier Narrows Operable Unit Treatment Facility to Legg Lake beginning February 2, 2013. The increased discharge to Legg Lake resulted in an outflow from Legg Lake and subsequent flow into Mission Creek. Beginning in June 2016 measured flow resumed in Mission Creek and continued into water year 2017-18 until July 5, 2018 at which time a traffic accident disrupted operations of the Whittier Narrow Operable Unit (WNOU). During the period of July 6 to 14, 2018 the wells for the WNOU were operated intermittently resulting in no flow to Mission Creek. Flow resumed on July 15, 2018 and continued through the end of water year 2017-18.

In a letter dated November 4, 2015, the Main San Gabriel Basin Watermaster and the Water Replenishment District agreed to the accounting of flows in Mission Creek which Watermaster measures at Station F83. (The letter agreement is included in the fifty-third Annual Report.) Such flows will be considered “Lower Area Replenishment Water”, as described later in this Report.

During water year 2017-18, Watermaster staff performed 14 streamflow measurements on Mission Creek at the former location of Station F83. In addition, Watermaster staff obtained data on the treated water discharge to Legg Lake for water year 2017-18 from DTSC. The stream flow measurements were correlated with the discharge of treated water to Legg Lake. This relationship was used to develop an estimate of daily flow in Mission Creek for water year 2017-18. The total flow in Mission Creek, Station F83, for water year 2017-18 due to discharge of treated effluent from the Whittier Narrows Operable Unit was determined to be 1,466 acre-feet.

Rio Hondo By-Pass Channel (Zone I Ditch), Station F313B-R

The Zone I Ditch, Station F313B-R, is equipped with a Parshall flume. The measured flow at Zone I Ditch for water year 2017-18 was 7,660 acre-feet. An adjustment to the record was made based on upon a correlation with other measured flows in the Zone I Ditch. The Watermaster adjusted the flow to 7,736 acre-feet for water year 2017-18.

Whittier Narrows Flood Channel, Station G44B-R (formerly F337-R)

Station F337-R was located on the Rosemead Boulevard Bridge. Construction work in 1978-79 removed a levee which directed flow past this station and made the rating curve at this station questionable. Poor communication existed between the channel and the stilling well. In addition, the station was subject to backwater from the Rio Hondo side of Whittier Narrows Reservoir. However, water entering the Flood Channel crosses over a stabilizer weir. The County, in 1993, established a gaging station utilizing the stabilizer weir with a recorder and has designated the Whittier Narrows Flood Channel as station G44B-R. Typically, the Watermaster utilizes records developed by the County and verifies the data utilizing a weir formula and records of reservoir stage obtained from the Corps of Engineers, operators of Whittier Narrows Reservoir. In general, these comparisons have provided reasonably accurate data. During February 2018, the mean daily discharge measurements indicated flow at Station G44B-R. However, the calculations using the weir formula determined that no flow occurred at Station G44B-R during the month. A comparison of the two results with other stations during this period indicated that the weir calculations were more accurate. Therefore, the weir calculations were used for the month of February 2018. The flow through the Flood Channel, Station G44B-R, for water year 2017-18 was measured

by the County as 2,461 acre-feet. Using the weir flow calculations for the Flood Channel for February 2018, the Watermaster revised the flow to 3,332 acre-feet for water year 2017-18.

Sycamore Canyon

The determination of runoff from Sycamore Canyon, which flows through Whittier Narrows, is based on a correlation with rainfall at Potrero Heights (Station 170F). Sycamore Canyon is located in the La Merced Hills, northwesterly of Whittier Narrows, and enters the Rio Hondo below Station F64 (Rio Hondo above Mission Bridge). During water year 2017-18, the County notified Watermaster staff rainfall records at Station 170F were discontinued as of the end of August 2017. Rainfall for the month of September 2017 was estimated based on surrounding stations within the vicinity of Station 170F. The memorandum "Replacement of Measuring Station – Precipitation Station 170F" provides a recommendation of Station 1114B as the replacement for Station 170F. Watermaster selected Station 1114B to be the replacement station for Station 170F. During water year 2017-18, rainfall at Sycamore Canyon, Station 1114B, was measured at 4.63 inches. Table 6 of Exhibit B to the Judgment, presents the runoff at Sycamore Canyon for rainfall of 6 inches and above. Based upon Table 6 of Exhibit B of the Judgment and interpolation between 0 and 6 inches, the runoff from Sycamore Canyon was determined to be 4 acre-feet.

San Gabriel River Below Parkway Bridge, Station F263C-R

The flow in the San Gabriel River below Parkway Bridge, Station F263C-R, for water year 2017-18 was recorded by the County to be 5,077 acre-feet.

San Gabriel River at Florence Avenue, Station F262C-R

The station is located about one mile downstream from Station F262B-R at the beginning of the lined portion of the San Gabriel River. The County, with Watermaster

concurrence, relocated this station to provide a more accurate measurement of flow to the ocean.

No flow in the San Gabriel River at Florence Avenue, Station F262C-R, for water year 2017-18 was recorded by the County.

Rio Hondo Spreading Grounds Intake (Headworks)

The County constructed a low level intake to the Rio Hondo East Side Spreading Grounds in 1987. This intake supplements the original higher level intake and allows water to be diverted into the spreading grounds when the radial gates on the Rio Hondo are raised. The spreading grounds inflow data were historically used to verify other records of inflow and to make adjustments.

Metering of the new low level intake was to be provided by means of an acoustical meter. When the low level installation was made a number of years ago, the County specified an Accusonic meter located in the 102-inch diameter pipe downstream from the undershot slide gate assembly. Because of turbulence and air entrainment, the meter did not work properly and was moved to the intake channel located between the Rio Hondo channel and the diversion structures. Metering of the low level intake has not yet been performed successfully. There were periods of time during which the records of Spreading Grounds inflow did not exist or were not accurate. The County installed a Flodar measuring device in February 2006. However, the measuring device is inaccurate when flow in the pipe is less than three feet. The County intended to replace this device in 2007 with a Flodar measuring device with a full operating range for the 102-inch diameter pipe at a location downstream of the turbulence. The County installed a Flodar measuring device in 2011, which began

service on September 14, 2011. However, as a result of insufficient flow and subsequent vandalism, the Flodar measuring device was never placed into service.

When the low level intake meter is inoperative, the mean daily flow is estimated by County personnel using a rating table of the slide gate and forebay pool elevation. The Watermaster continues to evaluate records for the low level intake. Other intakes to the Spreading Grounds are equipped with Parshall flumes and recorders.

Reclaimed Water Delivered to Rio Hondo Below Station F64

Reclaimed Water from the Whittier Narrows Water Reclamation Plant can be delivered to the San Gabriel River, the Rio Hondo below Station F64, or the Rio Hondo Bypass Channel (Zone I Ditch). The total water production from this plant was 7,906 acre-feet during water year 2017-18, of which 1,555 acre-feet was used at other sites near the plant site resulting in net release for groundwater replenishment of 6,351 acre-feet. Of this quantity, 4,256 acre-feet was delivered directly to the Rio Hondo below Station F64 and is added as Surface Flow.

In addition, 583 acre-feet of Reclaimed Water from the Whittier Narrows Plant was delivered to the San Gabriel River and accounted for in the recorded flows at the Parkway Bridge, Station F263C-R.

As mentioned above, Reclaimed Water from the Whittier Narrows Plant can also be delivered to the Zone I Ditch. In 1984, the location of the gaging station on the Zone I Ditch was moved from upstream of the point of delivery to downstream of the point of delivery. Thus, Reclaimed Water now delivered to the Zone I Ditch is included with the water measured at Station F313B-R. During water year 2017-18, 1,512 acre-feet of Reclaimed Water was delivered to the Zone I Ditch.

Reclaimed Water Delivered to San Gabriel River Below Station F263C-R

The San Jose Creek Water Reclamation Plant is located near the intersection of San Gabriel River and San Jose Diversion Channel, as shown on Plate 1. Reclaimed Water from this plant is carried in an outfall pipeline which generally parallels the San Gabriel River to a point south of Florence Avenue, where the flow can be released to the lined channel of the San Gabriel River. At the San Gabriel River Spreading Grounds Headworks, there is a turnout from this outfall pipeline so that Reclaimed Water can be delivered to the San Gabriel River Spreading Grounds or the unlined portion of the San Gabriel River for ground water replenishment. This outlet is located downstream of Station F263C-R and is equipped with a propeller meter.

During water year 2017-18, 39,638 acre-feet of Reclaimed Water from the San Jose Creek Water Reclamation Plant was delivered via this outfall pipeline to the San Gabriel River Spreading Grounds Headworks for replenishment purposes.

The flow in the San Jose Creek outfall pipeline which is not diverted for replenishment use is delivered to the lined portion of the San Gabriel River and flows to the ocean. During water year 2017-18, such flow amounted to approximately 4,144 acre-feet, and is not included as Surface Flow under the Judgment.

A second turnout for replenishment purposes from the San Jose Creek Water Reclamation Plant was first used in December 1986 to provide the option of releasing Reclaimed Water directly to the San Jose Diversion Channel. San Jose Creek Water Reclamation Plant Reclaimed Water released through this second turnout may be diverted to the Rio Hondo via the Zone I Ditch or to the San Gabriel River. For water year 2017-18, 6,522 acre-feet of Reclaimed Water was released through the San Jose Creek Water Reclamation Plant Stages I and II for replenishment by the Lower Area.

A third turnout for replenishment purposes from the San Jose Plant was installed with expansion of Stage III of the San Jose Creek Water Reclamation Plant. Effluent from Stage III can be delivered to the aforementioned outfall pipeline or delivered directly to the San Gabriel River at the Plant. This flow will commingle with Reclaimed Water delivered to the San Jose Creek and can be diverted to the Rio Hondo via the Zone I Ditch or to the San Gabriel River where it would be measured at Parkway Bridge. For water year 2017-18 164 acre-feet of Reclaimed Water was released to the San Gabriel River at this location. For water year 2017-18, a total of 46,324 acre-feet of Reclaimed Water was released from the San Jose Creek Water Reclamation Plant for groundwater replenishment. A part of this Reclaimed Water may flow to the ocean and is then accounted for as described in the section "Unusable Surface Flow". During water year 2017-18 no Reclaimed Water flowed to the ocean.

Adjustments to Surface Flow

The quantity of Surface Flow is, essentially, based upon streamflow measurements made by the County. The method set forth in the Judgment is to measure the surface inflow to the Lower Area through Whittier Narrows and deduct that portion of surface flow which leaves the Montebello Forebay at its lower end. The difference in these measurements represents determination of the quantity of Surface Flow which infiltrates to the Montebello Forebay as Usable Water.

High runoff conditions occur during and following certain storms. Certain inconsistencies can result from the inflow minus outflow calculations. While the stream gaging measurements may be within the accuracy of normal stream gaging measurements during periods of high flow, the amount of Usable Surface Flow is only a small portion of the total flow. Inaccuracies in the gaging of total flow will affect the determination of Usable

Surface Flow. It also should be noted that storm runoff through Whittier Narrows has increased as a result of urbanization which tends to produce higher peak flows of shorter duration.

Accordingly, the Watermaster, after evaluating the available data, determined that for certain periods of time adjustments should be made in the quantities of Surface Flow, as derived from the measurements. An alternative method of determining Surface Flow for the Rio Hondo was outlined in the Fifth Annual Watermaster Report. In this method, an adjustment is made by first determining the amount delivered to Rio Hondo Spreading Grounds and adding thereto the estimated amount of water infiltrated in the Rio Hondo portion of the Whittier Narrows Reservoir. This is compared to the measured inflow minus the outflow and a determination is made as to the most reliable quantities.

Changes in the method of determining Surface Flow can be made under the terms of the Judgment. Reference is made to Exhibit B of the Judgment, Article III, Section A entitled, "Surface Water Measurements and Calculations," which reads in part:

"In the event that any of the aforementioned gaging stations are inoperative for any reason and for any period of time the Watermaster shall estimate the quantity that would have been measured at the station had it been operative. The estimate shall be based on correlation to nearby operative measuring stations or on other reasonable engineering methods."

The Watermaster considers that stations are inoperative for the purposes of the Judgment when the measurements obtained are not of sufficient accuracy to produce reasonable results. For water year 2017-18, Watermaster determined it was appropriate to apply the alternative method during certain periods of time to the Rio Hondo side of Whittier Narrows.

Presented in Table 4 is an adjustment to Rio Hondo inflow. This table presents a summary of the calculations utilizing the alternative method. Analysis of the daily inflow

and outflow data indicated that the alternative method should be applied during 6 days of water year 2017-18. These days were January 8, 9; and March 14, 15, 21 and 22. The unadjusted inflow to the Lower Area in the Rio Hondo as set forth in Table 4 was 7,832 acre-feet during those 6 days. There was 1,484 acre-feet of outflow to the ocean during the same 6 days (calculated on a daily basis from stream gaging measurements as provided in the Judgment). (This latter value is Unusable Surface Flow from the Upper Area.) In making the adjustment, the unusable outflow as measured at the Rio Hondo Headworks and compared to flow at Station F45B-R (Stewart and Gray Road) was accepted.

The infiltration during the 6 days was calculated to be 4,287 acre-feet. This included the amount of water delivered to the spreading grounds and the water infiltrated in the Whittier Narrows Reservoir westerly of Rosemead Boulevard. In addition, 381 acre-feet of water was stored on the Rio Hondo side of the Reservoir during those 6 days. The inflow is therefore adjusted by adding the quantity of infiltration (4,287 acre-feet) to the outflow (1,484 acre-feet) and adding storage (381 acre-feet) to determine the adjusted inflow in the amount of 6,152 acre-feet.

TABLE 4

**LOWER AREA INFLOW AND OUTFLOW
ADJUSTMENT TO RIO HONDO INFLOW**

Item	:	Amounts in Acre-Feet For 6 Days ^(a) of the Water Year 2017-18
A. UNADJUSTED INFLOW		
Rio Hondo Above Mission Bridge, F64		4,347
Mission Creek at San Gabriel Boulevard, F83		21
Rio Hondo By-Pass Channel (Zone I Ditch)		0
Whittier Narrows Flood Channel		3,332
Sycamore Canyon		2
Ungaged Recycled Water (WNWRP)		130
Total Unadjusted Inflow		7,832
B. ADJUSTED INFLOW		
Infiltration		
Spreading grounds infiltration		3,573
Reservoir area infiltration		714
Total infiltration		4,287
Change in Reservoir Storage		+ 381
Outflow at Stewart and Gray Road		1,484
Total Adjusted Inflow		6,152
C. ADJUSTMENT		
Adjustment to Rio Hondo Inflow		-1,680
(a) Days adjusted were January 8, 9; and March 14, 15, 21 and 22.		

As shown on Table 4, the adjustment to the Rio Hondo inflow is minus 1,680 acre-feet. This adjustment relies on the spreading grounds inflow and estimated infiltration in Whittier Narrows Reservoir. These latter values provide a more accurate determination of Usable Water during high flows as opposed to taking the difference between inflows and outflows from stream gaging stations during periods of storm flows.

Summary of Surface Flow

A total of 66,066 acre-feet of surface water flowed through Whittier Narrows during water year 2017-18. Table 5 shows the components and the total Surface Flow.

TABLE 5**SUMMARY OF SURFACE FLOW THROUGH WHITTIER NARROWS
FOR WATER YEAR 2017-18**

	<u>Amount in Acre-Feet</u>
Rio Hondo above Mission Bridge, Station F64	6,237
Mission Creek at San Gabriel Boulevard, Station F83	1,466
Rio Hondo By-Pass Channel, Station F313B-R	7,736
Whittier Narrows Flood Channel	3,332
Sycamore Canyon	4
San Gabriel River below Parkway Bridge, Station F263C-R	5,077
Reclaimed Water from Whittier Narrows Plant Delivered to Rio Hondo below Station F64	4,256
Reclaimed Water from San Jose Plant Delivered to San Gabriel River below Station F263C-R	39,638
Less Adjustment to Rio Hondo Inflow (Table 4)	<u>-1,680</u>
Total Surface Flow	66,066

Subsurface Flow

The method utilized to determine Subsurface Flow through Whittier Narrows is set forth in Exhibit B of the Judgment. The data used for computing Subsurface Flow are the spring and fall ground water elevations in Whittier Narrows. The measurement well locations are shown on Plate 2.

To prepare estimates of Subsurface Flow through Whittier Narrows the Watermaster prepares contour maps of water levels in wells for the spring and fall of each year. To prepare these maps the Watermaster uses water level measurements collected by the University of Southern California (USC), Cross Connection Laboratory, on behalf of the San Gabriel Valley Protective Association. The Watermaster also measures a number of wells on a quarterly basis, coordinating the efforts with USC. In addition, the Watermaster has replaced 8 wells in critical areas and also placed a casing in a collapsing well that was at a critical location.

The Subsurface Flow for any year is the average of the six spring and fall computations of Subsurface Flow for the three years ending with the year of calculation. Shown in the following tabulation is the result of the calculation of Subsurface Flow for the water year 2017-18 which amounted to 24,800 acre-feet.

Time	Subsurface Flow in Acre-Feet
Spring 2016	25,000
Fall 2016	23,400
Spring 2017	18,400
Fall 2017	20,600
Spring 2018	27,700
Fall 2018	<u>33,400</u>
Subsurface Flow 2017-18	24,800

Export to Lower Area

The Watermaster is required to determine the amount of water which is pumped from groundwater or diverted from surface streams in the Upper Area and transported in conduits through Whittier Narrows and used in Lower Area.

During the water year 2017-18, there were four entities which transported water by pipeline through Whittier Narrows. All of the water exported through the Narrows was groundwater produced in the San Gabriel Valley. The annual export for each of the four exporters is shown below:

Exporter	Acre-Feet
California Domestic Water Company	20,100
San Gabriel Valley Water Company	4,070
Suburban Water Systems	10,896
City of Whittier	<u>3,634</u>
Total	38,700

The Judgment provides that the maximum annual credit for export in the determination of Usable Water shall not exceed 23,395 acre-feet.

Lower Area Replenishment Water

The Lower Area purchases imported replenishment water from Metropolitan. This imported water may be delivered at two Metropolitan connections: (1) Foothill Feeder at San Dimas Wash (CenB-48) and (2) Upper Feeder at Thompson Creek (CenB-28). Both connections are metered and delivered amounts are recorded by Metropolitan. These amounts are verified by the County.

During water year 2017-18, the total amount of imported water purchased from Metropolitan for replenishment was 9,791 acre-feet on behalf of the Lower Area.

MWD Connection	Imported Water (Acre-Feet)
San Dimas Wash (CenB-48)	9,791
Thompson Creek (CenB-28)	<u>0</u>
Total	9,791

Provision is made in the Judgment for the deduction of evaporation losses upstream of Whittier Narrows occurring during conveyance of Lower Area Replenishment Water through the San Gabriel Valley to Whittier Narrows. The total calculated evaporation during water year 2017-18 was 23 acre-feet.

In addition, pursuant to an agreement between the Main San Gabriel Basin Watermaster and the Water Replenishment District, 1,466 acre-feet of flow from the WNOU treatment plant will be accounted for as Lower Area Replenishment Water.

Analysis of daily flows indicated that there was no imported water loss to the ocean for water year 2017-18. After evaporative losses, the net amount of Lower Area Replenishment Water amounted to 11,234 (9,791-23+1,466) acre-feet.

Reclaimed Water

Recycled water used for replenishment of the Montebello Forebay came from three separate plants, each of which is operated by the County Sanitation Districts. Effective July 1, 2013, the County Sanitation District and the Water Replenishment District entered into a long-term contract for delivery of recycled water from the three plants.

Whittier Narrows Water Reclamation Plant

The total amount of recycled water produced at the Whittier Narrows Water Reclamation Plant during the water year 2017-18, and delivered to stream channels, was 6,351 acre-feet. During water year 2017-18, no Whittier Narrows effluent was bypassed to the ocean during storm operations. Therefore, a total of 6,351 acre-feet of Reclaimed Water

from the Whittier Narrows Water Reclamation Plant was purchased by the Water Replenishment District of Southern California for replenishment in the Montebello Forebay.

Pomona Water Reclamation Plant

The total production at the Pomona Water Reclamation Plant during the water year 2017-18 was 6,915 acre-feet. A portion of the effluent was delivered to the City of Pomona for resale. The undelivered portion, amounting to 4,015 acre-feet, was delivered to San Jose Creek. It was determined that no Reclaimed Water was bypassed to the ocean, 3,591 acre-feet was replenished in the San Gabriel Valley, and 424 acre-feet was replenished in the Montebello Forebay. The portion of this Reclaimed Water which was generated within the watershed of the San Gabriel River System was calculated to be 271 acre-feet, which historically had been accounted for as Reclaimed Water. However, effective July 1, 2013 a new long-term contract was entered into between County Sanitation District and the Water Replenishment District whereby the Water Replenishment District has agreed to pay for all recycled water from the Pomona Plant that is released to San Jose Wash and is not lost to the ocean. For the purpose of reporting, it is assumed all recycled water released from the Pomona Plant for the entire water year 2017-18 is accounted for as Reclaimed Water, which totals 4,015 acre-feet. However, the accounting of recycled water released from the Pomona Plant between October 1, 2017 and September 30, 2018 will be reevaluated in the Annual Report for water year 2018-19 and a revised calculation will be applied retroactively to water year 2017-18 calculations based on the Judgment.

San Jose Creek Water Reclamation Plant

The Water Replenishment District of Southern California purchases Reclaimed Water from the San Jose Creek Water Reclamation Plant. During the water year 2017-18, 46,324

acre-feet of Reclaimed Water from the San Jose Creek Water Reclamation Plant was delivered to the Lower Area for replenishment. None of the Reclaimed Water delivered for replenishment was lost to the ocean during the water year 2017-18. Therefore, a total of 46,324 acre-feet of such Reclaimed Water was purchased by the Lower Area for replenishment in the Montebello Forebay. Total plant effluent for the water year 2017-18 was about 57,000 acre-feet.

Summary of Reclaimed Water

The total amount of Reclaimed Water deducted from the inflow is 56,690 acre-feet for the water year 2017-18. This is comprised of 6,351 acre-feet from the Whittier Narrows Water Reclamation Plant, 4,015 acre-feet from the Pomona Water Reclamation Plant, and 46,324 acre-feet from the San Jose Creek Water Reclamation Plant.

Make-up Water by Surface Flow Delivery

During water year 2017-18, the Upper Area did not supply any Make-Up Water by surface flow delivery or otherwise since there was no Make-up Water requirement to be delivered for that year.

Recirculation of Measured Water

There was no recirculation of measured water as defined in Paragraph 3(1) (6) of the Judgment during the water year 2017-18.

Unusable Surface Flow

The water from the San Gabriel Valley which leaves Montebello Forebay as surface flow is called Unusable Surface Flow and is determined in accordance with Exhibit B of the Judgment. Surface outflow from the Montebello Forebay is accounted for in the Rio Hondo at Stewart and Gray Road, Station F45B-R, and in the San Gabriel River at Florence Avenue,

Station F262C-R. This surface outflow may be comprised of water from the San Gabriel Valley and local storm water which enters the channels downstream of Whittier Narrows.

Measured surface outflow from the Montebello Forebay in the Rio Hondo at Station F45B-R was 1,850 acre-feet. Records were determined to be inaccurate on days of storm flow and the record was adjusted by using County records of flow past the Rio Hondo Headworks radial gates. The adjusted outflow is 3,431 acre-feet. This included water from the San Gabriel Valley, Local Storm Inflow originating downstream of Whittier Narrows and in some cases Lower Area replenishment water. The Local Storm Outflow on days when the radial gates at the Rio Hondo Headworks were open was estimated by correlating the drainage areas of the unmeasured storm drains with a synthesized Montebello Storm Drain flow. The Montebello Storm Drain flow is synthesized using the record at Alhambra Wash, Station F81D-R. By analysis of flows on days when the radial gates were open, it was possible to segregate the flow at Stewart and Gray Road, Station F45B-R, into Local Storm Outflow, Unusable Surface Flow and replenishment water. Based on a review of data, Stewart and Gray Road, Station F45B-R, was not functioning accurately on certain days and Watermaster made an adjustment. The Watermaster revised the total flow to the ocean on such days to be 3,005 acre-feet. It was determined that the Local Storm Outflow was 1,521 acre-feet and the Unusable Surface Outflow in the Rio Hondo was 1,484 acre-feet. Unusable Surface Outflow included no Reclaimed Water. Local Inflow for water year 2017-18 was calculated to be 6,222 acre-feet.

There was no flow on the San Gabriel River as measured at Florence Ave., Station F262C-R. Generally, flow consists of Local Storm Inflow through storm drains located in the Montebello Forebay and surface inflow from the San Gabriel Valley. Most of the storm

water in the San Gabriel River entering the Whittier Narrows Reservoir in excess of the spreading capacity in the San Gabriel River below Whittier Narrows Dam was conveyed by the Flood Channel to the Rio Hondo. The Local Storm Inflow was calculated to be 3,942 acre-feet based on correlation with the Montebello Storm Drain. There was no Local Storm Outflow on the San Gabriel River to the ocean during water year 2017-18. Analysis of daily flows indicated there was no Unusable Surface Flow from the Montebello Forebay in the San Gabriel River during water year 2017-18.

The total Unusable Surface Flow passing through the Montebello Forebay in the Rio Hondo and San Gabriel River during water year 2017-18 was 1,484 acre-feet.

Determination of Usable Water

Usable Water under the terms of the Judgment is defined as the sum of Surface Flow, Subsurface Flow and Credited Export to Lower Area less the sum of Lower Area Replenishment Water, Reclaimed Water, Make-up Water by Surface Flow Delivery and Unusable Surface Flow. Table 6 presents the determination of Usable Water for the water year 2017-18.

TABLE 6**USABLE WATER FOR WATER YEAR 2017-18**

	<u>Amount in Acre-Feet</u>	
Surface Flow	66,066	
Subsurface Flow	24,800	
Credit for Export to Lower Area	<u>23,395</u>	
Subtotal		114,261
Less:		
Lower Area Replenishment Water	11,234	
Reclaimed Water	56,690	
Make-Up Water by Surface Flow Delivery	0	
Recirculation of Measured Water	0	
Unusable Surface Flow	<u>1,484</u>	
Subtotal		<u>69,408</u>
Usable Water		<u>44,853</u>

Quality of Water

The Judgment (Exhibit B, Section IV.E) provides that the Watermaster gather readily available data from public and private agencies relating to the quality of water. During the water year, quality data were obtained from the County Sanitation Districts, the County and Metropolitan. Ground water quality data were also obtained from programs of the Main San Gabriel Basin Watermaster, Central Basin Municipal Water District, and Water Replenishment District of Southern California. In the last few years increasing concern has developed over the trace constituents found in drinking water. Table 7 includes these constituents for illustrating both the quality of different sources of water supply and the increasing number of regulated constituents. Shown in Figures 3, 4 and 5 are graphical trends of salinity, hardness and nitrogen of the sources of imported and Recycled Water for replenishment in the San Gabriel River System.

TABLE 7 (A)

WATER QUALITY ANALYSES REPRESENTATIVE OF SOURCES OF WATER PASSING THROUGH WHITTIER NARROWS WATER YEAR 2017-18 (a)									
CATEGORY	DRINKING WATER STANDARDS	IMPORTED WATER		RECLAIMED WATER				RUNOFF WATER	
		UNTREATED STATE PROJECT WATER (b)	UNTREATED COLORADO RIVER WATER (c)	WHITTIER NARROWS PLANT	SAN JOSE CREEK PLANT (E)	SAN JOSE CREEK PLANT STAGE III (W)	POMONA PLANT	STORM FLOW (d)	SUBSURFACE FLOW (e)
DATE		April-18	April-18	April-18	April-18	April-18	April-18	March-18	March-18
pH	6.5-8.5	8.4	8.1	7.3	7.0	7.3	7.4	NA	NA
EC x 10 ⁶ (umho/cm)		490.0	1010.0	NA	NA	NA	NA	NA	NA
CATIONS									
Calcium		21.0	69.0	61.2	53.1	51.7	66.6	23	NA
Magnesium		12.0	26.0	18.3	15.3	14.7	13.8	5.8	NA
Sodium		55.0	93.0	123	120	108.0	97.1	NA	NA
Potassium		2.8	4.6	15.1	17.2	15.4	15.2	NA	NA
ANIONS									
Carbonate		1.0	0.0	ND	ND	ND	ND	NA	NA
Bicarbonate		88.0	150.0	151	140	173	169	NA	NA
Sulfate	250	39.0	240.0	99.3	89.5	68.9	60.7	NA	NA
Chloride	250	76.0	95.0	117	140	109	136	NA	NA
Fluoride	1.8	<0.1	0.3	0.72	0.44	0.69	0.28	NA	NA
Total Dissolved Solids	500-1500	262.0	612.0	590	594	538	594	NA	NA
Total Hardness as CaCO ₃		100.0	278.0	217	209	208	226	81.2	NA
Boron		0.15	0.13	0.28	0.29	0.32	0.26	NA	NA
INORGANIC TRACE CONSTITUENTS									
Arsenic	0.01	0.002	0.002	NA	NA	NA	NA	NA	NA
Barium	1	0.032	0.120	NA	NA	NA	NA	NA	NA
Cadmium	0.005	ND	ND	ND	NA	NA	NA	NA	NA
Chromium, Total	0.05	ND	ND	0.0009	NA	NA	NA	NA	NA
Copper, Total		ND	ND	0.004	NA	NA	NA	35.9	NA
Lead		ND	ND	ND	ND	ND	0.0004	0.009	NA
Mercury	0.002	ND	ND	0.0000	NA	NA	NA	NA	NA
Perchlorate	0.006	NA	NA	0.0003	0.0004	0.0004	0.0001	NA	NA
Selenium	0.05	ND	ND	NA	ND	ND	ND	NA	NA
Silver	0.1	ND	ND	NA	NA	NA	NA	NA	NA
NUTRIENTS as N									
Ammonia		NA	NA	1.2	1.2	1.8	1.7	NA	NA
Nitrate	10	2.0	0.8	7.7	6.3	5.3	5.8	NA	NA
Nitrite	1	NA	NA	ND	ND	0.12	0.12	NA	NA
Organic Nitrogen		NA	NA	0.9	1.8	1.6	1.8	NA	NA

(a) All constituents in mg/l unless noted. ND = None Detected. NA = Not Analyzed or Not Available.

(b) Sampled at Lake Silverwood.

(c) Sampled at Lake Mathews.

(d) At San Gabriel River Parkway.

(e) From Well 2947LM.

TABLE 7 (B)

WATER QUALITY ANALYSES REPRESENTATIVE OF SOURCES OF WATER PASSING THROUGH WHITTIER NARROWS WATER YEAR 2017-18 (a)									
CATEGORY	DRINKING WATER STANDARDS	IMPORTED WATER		RECYCLED WATER				RUNOFF WATER	
		UNTREATED STATE PROJECT WATER (b)	UNTREATED COLORADO RIVER WATER (c)	WHITTIER NARROWS PLANT	SAN JOSE CREEK PLANT (E)	SAN JOSE CREEK PLANT STAGE III (W)	POMONA PLANT	STORM FLOW (d)	SUBSURFACE FLOW (e)
DATE		October-18	October-18	April-18	April-18	April-18	April-18	March-18	March-18
PURGEABLE ORGANICS									
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	NA	NA
Chloroform	80 (f)	NA	NA	10.6	29.9	29.6	25.4	NA	NA
Bromodichloromethane	80 (f)	NA	NA	6.2	19.0	16.0	10.7	NA	NA
Dibromochloromethane	80 (f)	NA	NA	1.8	5.5	3.4	2.2	NA	NA
Bromoform	80 (f)	NA	NA	ND	ND	ND	ND	NA	NA
Carbon Tetrachloride	0.5	ND	ND	ND	ND	ND	ND	NA	NA
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	NA	NA
1,2-Dichloroethane	0.5	ND	ND	ND	ND	ND	ND	NA	NA
1,1,1-Trichloroethane	200	ND	ND	ND	ND	ND	ND	NA	NA
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND	ND	NA	NA
1,1-Dichloroethylene	6	ND	ND	ND	ND	ND	ND	NA	NA
Trichloroethylene	5	ND	ND	ND	ND	ND	ND	NA	NA
Tetrachloroethylene	5	ND	ND	ND	ND	ND	ND	NA	NA
Methyl Tertiary-Butyl Ether	13	ND	ND	NA	NA	NA	NA	NA	NA
Benzene	1	ND	ND	ND	ND	ND	ND	NA	NA
Toluene	100	ND	ND	ND	ND	ND	ND	NA	NA
Chlorobenzene	30	ND	ND	ND	ND	ND	ND	NA	NA
O-Dichlorobenzene	130 (g)	NA	NA	ND	ND	ND	ND	NA	NA
M-Dichlorobenzene	130 (g)	NA	NA	ND	ND	ND	ND	NA	NA
P-Dichlorobenzene	5	NA	NA	ND	ND	ND	ND	NA	NA
Cis-1,2-Dichloroethylene	6	ND	ND	ND	ND	ND	ND	NA	NA
Trans-1,2-Dichloroethylene	10	ND	ND	ND	ND	ND	ND	NA	NA
Bromomethane	NA	NA	NA	ND	ND	ND	ND	NA	NA
Chloroethane	NA	NA	NA	ND	ND	ND	ND	NA	NA
2-Chloroethylvinylether	NA	NA	NA	ND	ND	ND	ND	NA	NA
Chloromethane	5	ND	ND	ND	ND	ND	ND	NA	NA
1,2-Dichloropropane	0.5(h)	ND	ND	ND	ND	ND	ND	NA	NA
Cis-1,3-Dichloropropene	0.5(h)	ND	ND	ND	ND	ND	ND	NA	NA
Trans-1,3-Dichloropropene	0.5(h)	ND	ND	ND	ND	ND	ND	NA	NA
1,1,2,2-Tetrachloroethane	1	ND	ND	ND	ND	ND	ND	NA	NA
Vinyl Chloride	0.5	ND	ND	ND	ND	ND	ND	NA	NA
NON-PURGEABLE ORGANICS									
Bis(2-ethylhexyl)phthalate	4	NA	NA	ND	ND	ND	ND	NA	NA
1,2,4-Trichlorobenzene	5	ND	ND	ND	ND	ND	ND	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	ND	ND	ND	ND	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	ND	ND	ND	ND	NA	NA
2,3,4-Trichlorophenol	NA	NA	NA	ND	ND	ND	ND	NA	NA
2,3,6-Trichlorophenol	NA	NA	NA	ND	ND	ND	ND	NA	NA
3,4,5-Trichlorophenol	NA	NA	NA	ND	ND	ND	ND	NA	NA
Pentachlorophenol	1	NA	NA	ND	ND	ND	ND	NA	NA
Phenanthrene	NA	NA	NA	ND	ND	ND	ND	NA	NA
Fluoranthene	NA	NA	NA	ND	ND	ND	ND	NA	NA
Atrazine	1	NA	NA	ND	ND	ND	ND	NA	NA
Simazine	4	NA	NA	ND	ND	ND	ND	NA	NA
Phenylacetic Acid	NA	NA	NA	ND	ND	ND	ND	NA	NA
Phenol	1	NA	NA	ND	ND	ND	ND	NA	NA
CHLORINATED HYDROCARBONS									
DDT	0.3-0.7	NA	NA	ND	ND	ND	ND	NA	NA
BHC	0.2	NA	NA	ND	ND	ND	ND	NA	NA
Lindane	0.01	NA	NA	ND	ND	ND	ND	NA	NA
Heptachlor	0.01	NA	NA	ND	ND	ND	ND	NA	NA
Heptachlor Epoxide	0.05	NA	NA	ND	ND	ND	ND	NA	NA
Aldrin	0.05	NA	NA	ND	ND	ND	ND	NA	NA
Dieldrin	0.05	NA	NA	ND	ND	ND	ND	NA	NA

(a) All constituents in ug/l unless noted. ND = None Detected. NA = Not Analyzed or Not Available.

(b) Sampled at Lake Silverwood.

(c) Sampled at Lake Mathews.

(d) At San Gabriel River Parkway.

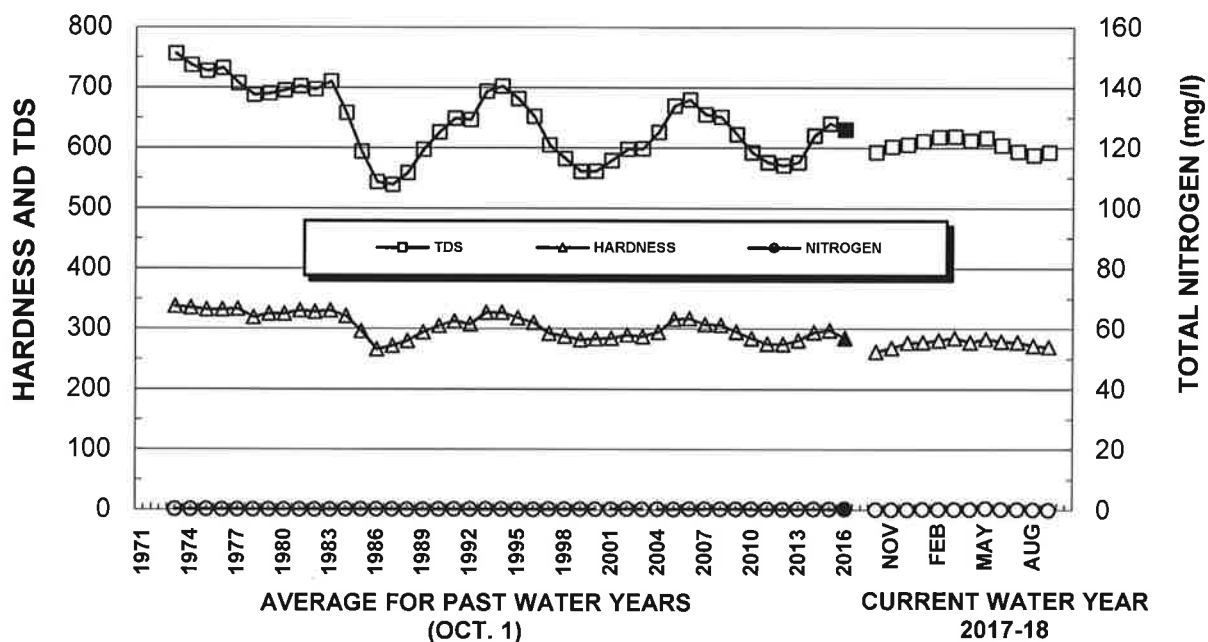
(e) From Well 2947LM.

(f) Total Trihalomethanes is not to exceed 80 ug/l.

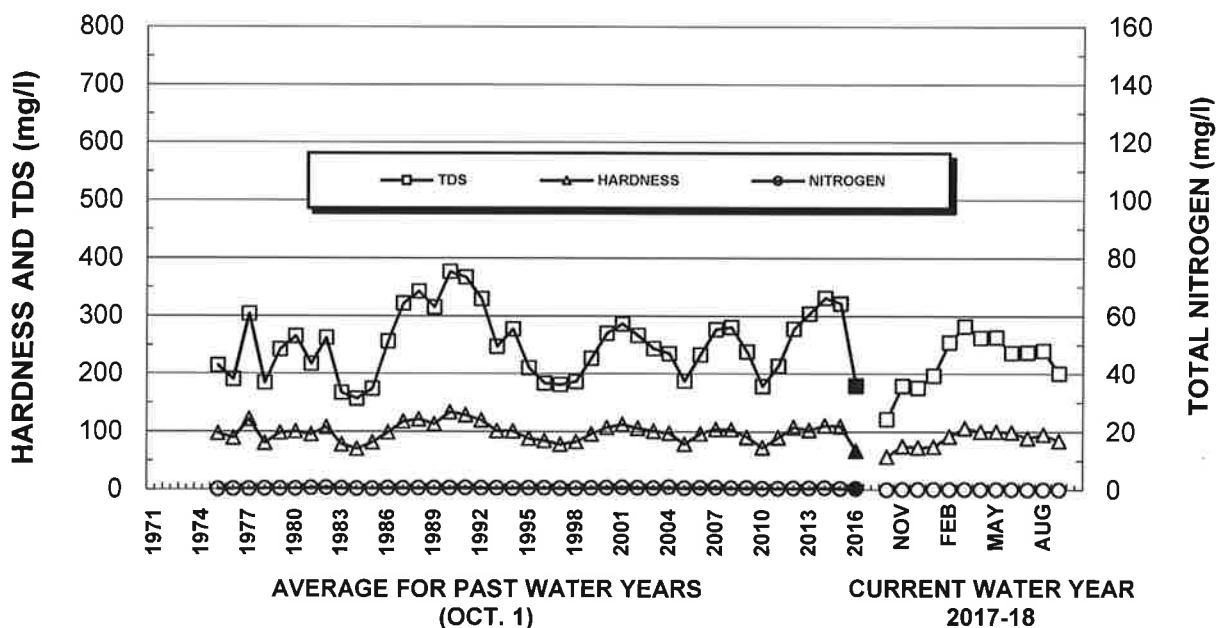
(g) Notification Level. Sum not to exceed 130.0 ug/l.

(h) Sum not to exceed 0.5 ug/l.

UNTREATED COLORADO RIVER WATER LAKE MATTHEWS



STATE WATER PROJECT EAST BRANCH - SILVERWOOD LAKE



▲ ● ■ Previous Water Year 2016-17

SELECTED WATER QUALITY PARAMETERS OF IMPORTED WATER

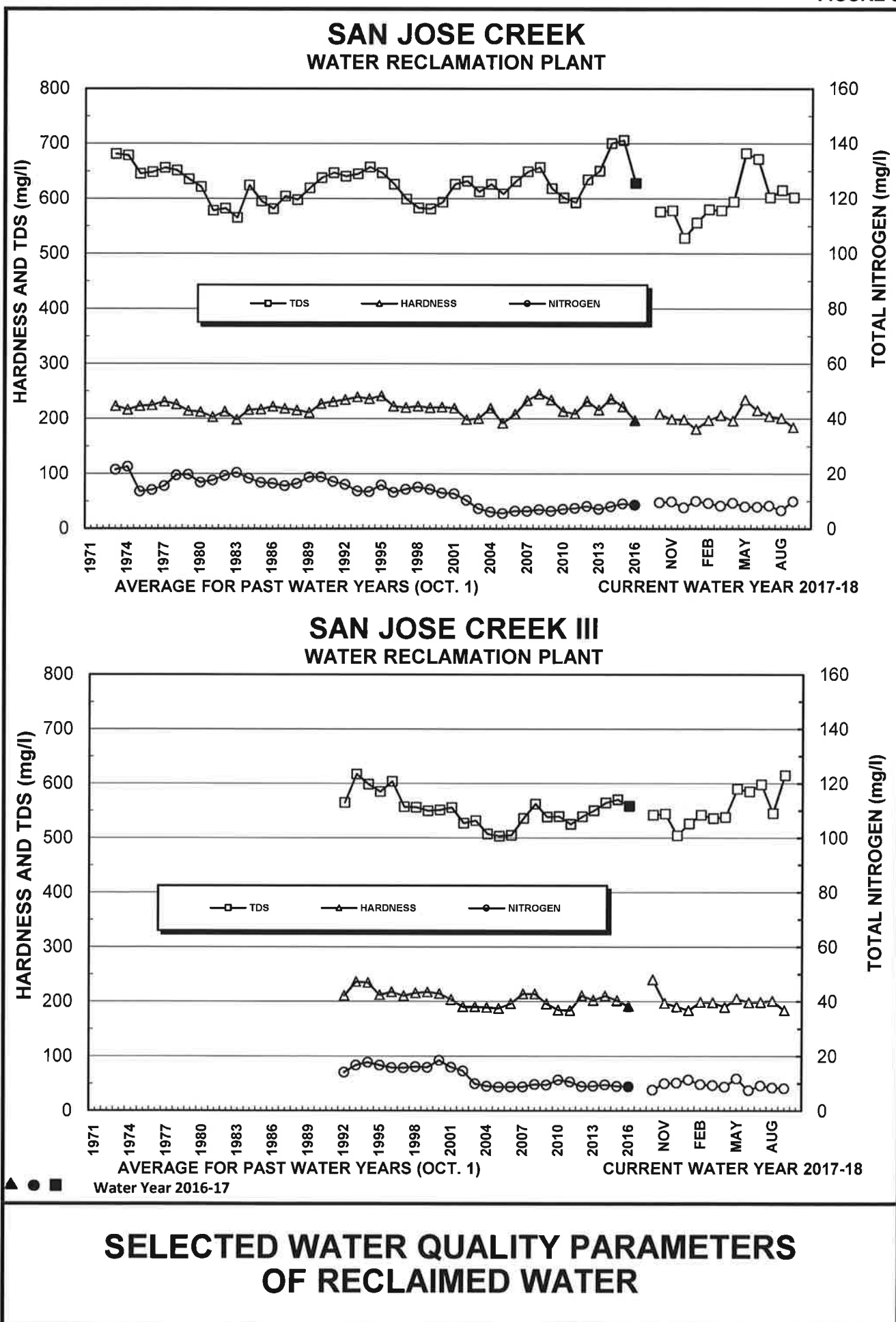
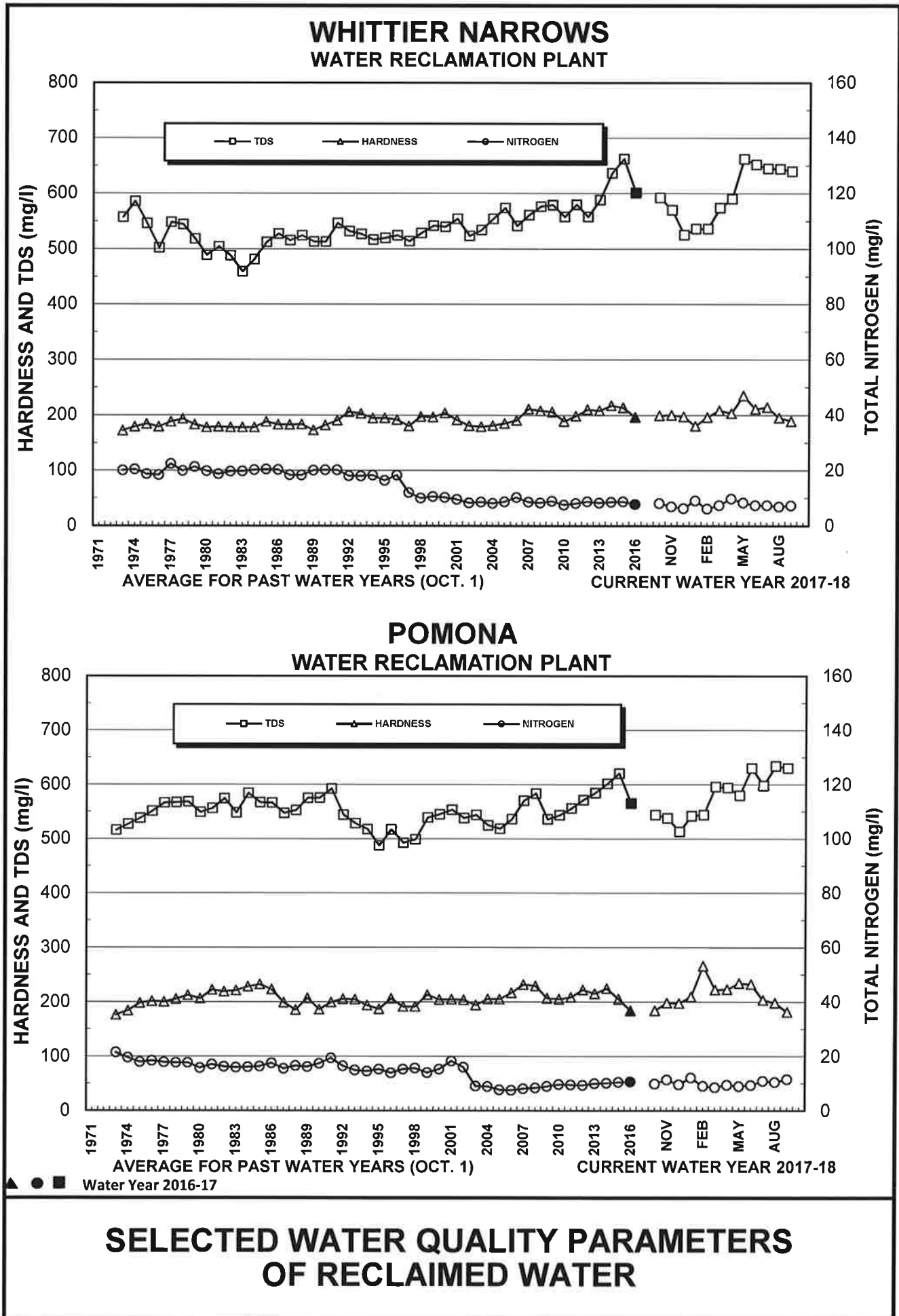


FIGURE 4



CHAPTER IV. ANNUAL ACCOUNTING AND MAKE-UP WATER REQUIREMENTS

Under the terms of the Judgment, the Watermaster is required to annually determine the Accrued Debit or Credit of the Upper Area and the obligations, if any, of the Upper Area to deliver Make-up Water during the ensuing water year.

Delivery of Make-up Water During 2017-18

Because of the existence of an Accrued Credit at the end of 2016-17, the Upper Area made no Make-up Water delivery to the Lower Area during the water year 2017-18.

Accrued Credit as of September 30, 2018

The Lower Area Annual Entitlement as heretofore determined for the water year 2017-18 was 59,600 acre-feet. The Usable Water received was 44,853 acre-feet, which resulted in a debit to the Upper Area for the water year of 14,747 acre-feet. The Upper Area had an Accrued Credit as of September 30, 2017 of 150,803 acre-feet. Thus the total Accrued Credit of the Upper Area as of September 30, 2018 is 136,056 acre-feet.

Requirement for Make-up Water Delivery in 2017-18

Because of the existence of an Accrued Credit on September 30, 2018, the Upper Area is under no obligation to deliver Make-up Water to the Lower Area during water year 2018-19.

Summary

Table 8 presents a summary of the findings of the Watermaster for the water year 2017-18.

TABLE 8**SUMMARY OF FINDINGS FOR WATER YEAR 2017-18**

	:	Quantities In Acre-Feet
1. Rainfall 2017-18, 7.0 inches		
2. Ten-year average rainfall, 13.4 inches		
3. Lower Area Annual Entitlement		59,600
4. Surface flow through Whittier Narrows		66,066
5. Subsurface Flow through Whittier Narrows		24,800
6. Credited export through Whittier Narrows		23,395
7. Total Flow through Whittier Narrows		114,261
8. Lower Area Replenishment Water		11,234
9. Reclaimed Water		56,690
10. Make-up Water (Surface Flow Delivery)		0
11. Recirculation of Measured Water		0
12. Unusable Surface Flow		1,484
13. Usable Water Received by Lower Area		44,853
14. Debit for Water Year 2017-18		14,747
15. Accrued Credit of Upper Area as of September 30, 2017		150,803
16. Amount of Make-up Water delivered during Water Year 2017-18		
a. Payment for Recycled Water		0
b. Surface Flow Delivery		0
Total		0
17. Adjusted Accrued Credit of Upper Area as of September 30, 2017		150,803
18. Accrued Credit of Upper Area as of September 30, 2018		136,056
19. Required Make-up Water to be delivered during Water Year 2018-19		0

CHAPTER V. LONG-TERM ACCOUNTING

Long-term Accounting is required by paragraph 5(h) of the Judgment. The Third Long-term Accounting Period was for the 15 water years from 1993-94 through 2008-09. The Long-term Accounting Periods are discussed in this Chapter and are shown in Table 9.

The Watermaster is required from time to time, but not sooner than 15 years nor more than 25 years after September 30, 1963 and after the close of each Long-term Accounting period, thereafter, to make a Long-term Accounting of the aggregate amount of Usable Water and Make-up Water received by the Lower Area. A Long-term Accounting is to be made sooner than 25 years if the average annual rainfall for a period of 15 or more years is at least 18 inches but not more than 19 inches.

The quantity of Usable Water and Make-up Water received during a Long-term Accounting period is compared to a quantity based upon the annual entitlement (98,415 acre-feet) multiplied by the number of years in the period and then adjusted by the ratio of the average annual rainfall for that period to the long-term average annual rainfall (18.52 inches). The difference in the amount of water received and the total annual entitlements is carried forward as either a credit or debit of the Upper Area. A summary of the annual amount received for each year of each Long-term Accounting is shown in the Appendix to this report.

First Long-term Accounting Period

As reported in the Sixteenth Annual Report, the First Long-term Accounting under the Judgment occurred as of September 30, 1979 for the period of 16 water years 1963-64 through 1978-79. The rainfall for the period averaged 18.16 inches resulting in a total entitlement of 1,544,031 acre-feet for the 16-year period. The amount of Usable Water and Make-up Water received was 1,376,090 acre-feet resulting in a Long-term Accounting Debit of 167,941 acre-feet. The annual summary for each year of the First Long-term Accounting Period is in the Appendix in Table 12.

TABLE 9

**SUMMARY OF WATER DELIVERED
UNDER LONG BEACH JUDGMENT
Water Years 1963-2018
(values in acre-feet)**

Long-term Accounting Period	Lower Area Entitlement^(a)	Water Received by Lower Area	Accrued Credit or (Debit)
1 (16 Water Years 1963-64 through 1978-79)	1,544,031	1,376,090	(167,941)
2 (15 Water Years 1979-80 through 1993-94)	1,505,718	1,799,097 ^(b)	125,438
Subtotal	3,049,749	3,175,187	125,438
3 (15 Water Years 1993-94 through 2008-09)	1,457,892	1,477,004	19,112
Subtotal	4,507,641	4,652,191	144,550 ^(c)
4 (9 Water Years 2009-10 through 2017-18)	699,300	690,806	(8,494)
Total	5,206,941	5,342,997	136,056

(a) Long-term Lower Area Entitlement calculated in accordance with paragraph 5(h) of the Judgment except for the Fourth Long-term which is an accumulation of annual entitlement for the Accounting Period.

(b) Includes 167,941 acre-feet of Make-up Water to reimburse debit from the end of First Long-term Accounting.

(c) Carried over to the Fourth Long-term Accounting Period.

Make-up Water Deliveries

The Judgment provides that the debit under Long-term Accounting be made up over a three-year period. Representatives of the Upper Area and Lower Area agreed that Make-up Water for the first Long-term Accounting Period could be delivered over a five-year period, requiring not less than one-fifth be delivered each year. Use of annual credit for Recycled Water, however, was limited to the first three years of the repayment period.

During the five years 1979-80 through 1983-84, the Upper Area delivered 167,941 acre-feet of Make-up Water to the Lower Area to satisfy the First Long-term Accounting. Thus, the Make-up Water delivery for the First Long-term Accounting Period was fully satisfied. A detailed description of the deliveries is contained in the Twenty-Second Annual Report.

Second Long-term Accounting Period

As reported in the Thirty-first Annual Report, the Second Long-term Accounting under the Judgment occurred as of September 30, 1994 for the period of 15 water years 1979-80 through 1993-94. The rainfall for the period averaged 18.89 inches resulting in a total entitlement of 1,505,718 acre-feet for the 15-year period. The amount of Usable Water and Make-up Water received was 1,631,156 acre-feet resulting in a Long-term Accounting Credit of 125,438 acre-feet to be carried over to the Third Long-term Accounting Period. An annual summary for the Second Long-term Accounting Period is in the Appendix in Table 13.

Make-up Water Deliveries

A Long-term Accounting Credit of 125,438 acre-feet existed at the end of the Second Long-term Accounting Period. Therefore, no Make-up Water delivery for the Second Long-term Accounting was required.

Third Long-term Accounting Period

As reported in the Forty-sixth Annual Report, the Third Long-term Accounting under the Judgment occurred as of September 30, 2009 for the period of 15 water years 1994-95 through 2008-09. The rainfall for the period averaged 18.29 inches resulting in a total entitlement of

1,457,892 acre-feet for the 15-year period. The amount of Usable Water and Make-up Water received was 1,477,004 acre-feet resulting in a credit for the period of 19,112 acre-feet. This credit was added to the accumulated carryover from the Second Long-term Accounting Period resulting in a Long-term Accounting Credit of 144,550 acre-feet to be carried over to the Fourth Long-term Accounting Period. An annual summary for the Third Long-term Accounting Period is in the Appendix in Table 14.

Make-up Water Deliveries

A Long-term Accounting Credit of 144,550 acre-feet existed at the end of the Third Long-term Accounting Period. Therefore, no Make-up Water delivery for the Third Long-term Accounting was required.

Fourth Long-term Accounting Period

Table 10 is a summary of operations under the Judgment showing Lower Area Annual Entitlement, Usable Water and Make-up Water received by the Lower Area and the Accrued Debit or Credit of Upper Area for each year of operation during the Fourth Long-term Accounting Period beginning with water year 2009-10. Included in the Accrued Credit of the Upper Area at the start of the period is the carryover from the Third Long-term Accounting Period of 144,550 acre-feet.

Water year 2017-18 is the ninth year in the Fourth Long-term Accounting Period which, as explained above, occurs between the 15th and 25th year. Table 11 is a summary of operations under the Judgment showing data to be used for the Fourth Long-term Accounting.

TABLE 10
SUMMARY OF ANNUAL OPERATIONS
UNDER JUDGMENT DURING
FOURTH LONG-TERM ACCOUNTING PERIOD

(In Acre-Feet)

Water Year	Rainfall in Inches		Entitlement	Water Received by Lower Area			Annual Credit (+) or Debit (-)	Accrued Credit (+) or Debit (-)
	Amount	10-year Average		Usable	Make- Up ^(a)	Total		
2008-09			---					+144,550 ^(a)
2009-10	20.2	17.2	88,700	84,054	0	84,054	-4,646	+139,904
2010-11	24.9	18.1	95,300	148,085	0	148,085	+52,785	+192,689
2011-12	10.9	18.6	98,800	77,227	0	77,227	-21,573	+171,116
2012-13	8.0	17.4	90,200	57,187	0	57,187	-33,013	+138,103
2013-14	6.3	16.8	85,600	56,830	0	56,830	-28,770	+109,333
2014-15	11.4	13.4	59,600	69,448	0	69,448	+9,848	+119,181
2015-16	10.1	12.7	54,300	56,484	0	56,484	+2,184	+121,365
2016-17	21.4	14.4	67,200	96,638	0	96,638	+29,438	+150,803
2017-18	7.0	13.4	59,600	44,853	0	44,853	-14,747	+136,056
Totals			699,300	690,806	0	690,806		+136,056

(a) Carryover of credit from Third Long-term Accounting Period.

TABLE 11
DATA FOR FOURTH
LONG-TERM ACCOUNTING PERIOD

Number of Years	Water Year	<u>Rainfall in Inches</u>		<u>Water Received by Lower Area in Acre-Feet</u>				Long-Term Accounting Formula ^(b) in Acre-Feet
		Amount	Average Annual Amount	Usable	Make-Up	Total	Accumulated Total	
0	2008-09	---	---	---	---		144,550 ^(a)	-----
1	2009-10	20.23	20.23	84,054	0	84,054	228,604	107,502
2	2010-11	24.85	22.54	148,085	0	148,085	376,689	239,554
3	2011-12	10.91	18.66	77,227	0	77,227	453,916	297,477
4	2012-13	7.96	15.99	57,187	0	57,187	511,103	339,882
5	2013-14	6.30	14.05	56,830	0	56,830	567,933	373,307
6	2014-15	11.44	13.62	69,448	0	69,448	637,381	434,259
7	2015-16	10.05	13.11	56,484	0	56,484	693,865	487,664
8	2016-17	21.44	14.15	96,638	0	96,638	790,503	601,543
9	2017-18	6.99	13.35	44,853	0	44,853	835,356	638,475

(a) Carryover of credit from Third Long-term Accounting Period.

(b) The figures shown are for informational purposes only. The Fourth Long-term Accounting will be determined in accordance with paragraph 5(h) of the Judgment.

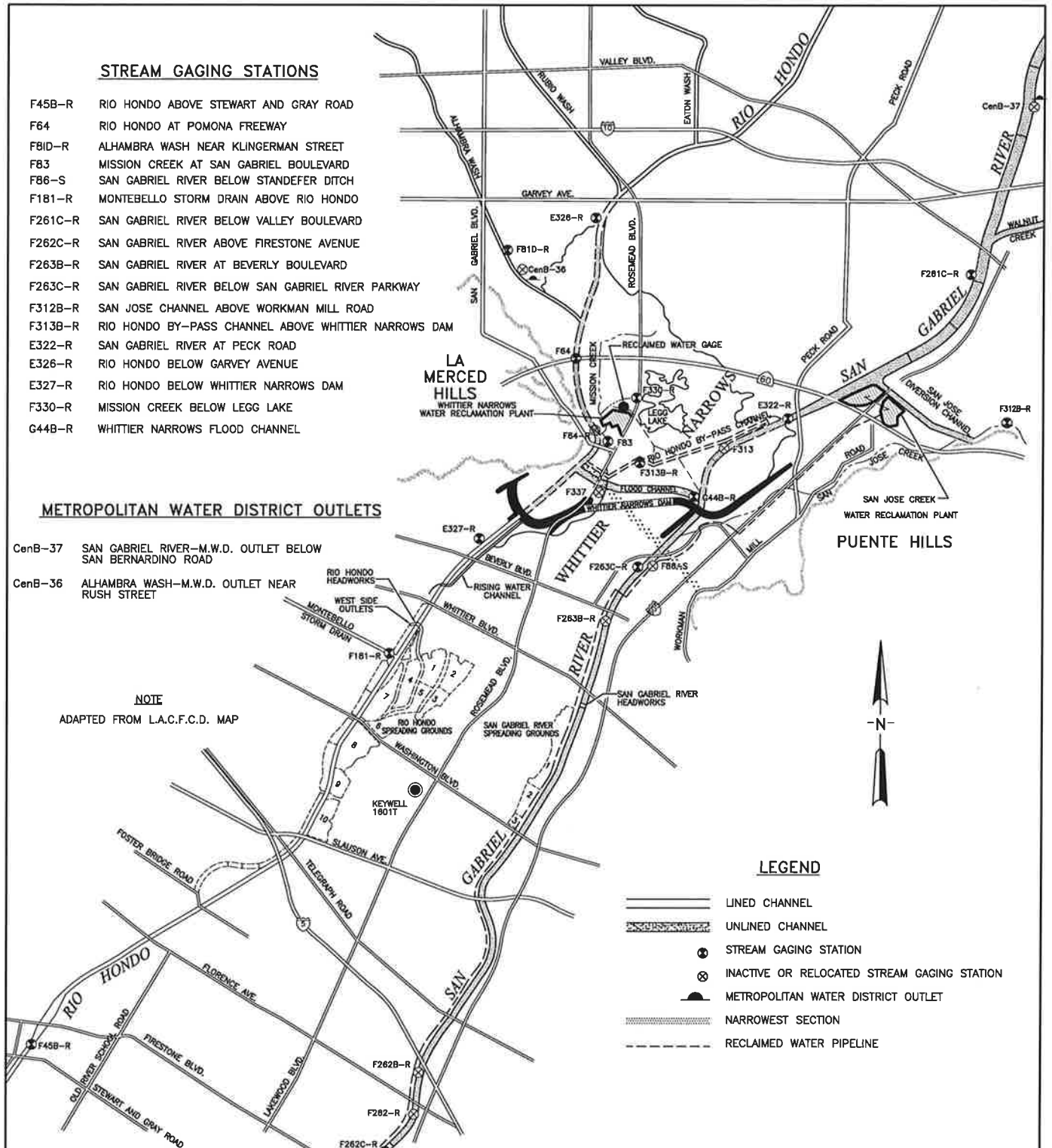
STREAM GAGING STATIONS

- F45B-R RIO HONDO ABOVE STEWART AND GRAY ROAD
- F64 RIO HONDO AT POMONA FREEWAY
- F81D-R ALHAMBRA WASH NEAR KLINGERMANN STREET
- F83 MISSION CREEK AT SAN GABRIEL BOULEVARD
- F86-S SAN GABRIEL RIVER BELOW STANDEFER DITCH
- F181-R MONTEBELLO STORM DRAIN ABOVE RIO HONDO
- F261C-R SAN GABRIEL RIVER BELOW VALLEY BOULEVARD
- F262C-R SAN GABRIEL RIVER ABOVE FIRESTONE AVENUE
- F263B-R SAN GABRIEL RIVER AT BEVERLY BOULEVARD
- F263C-R SAN GABRIEL RIVER BELOW SAN GABRIEL RIVER PARKWAY
- F312B-R SAN JOSE CHANNEL ABOVE WORKMAN MILL ROAD
- F313B-R RIO HONDO BY-PASS CHANNEL ABOVE WHITTIER NARROWS DAM
- E322-R SAN GABRIEL RIVER AT PECK ROAD
- E326-R RIO HONDO BELOW GARVEY AVENUE
- E327-R RIO HONDO BELOW WHITTIER NARROWS DAM
- F330-R MISSION CREEK BELOW LEGG LAKE
- G44B-R WHITTIER NARROWS FLOOD CHANNEL

METROPOLITAN WATER DISTRICT OUTLETS

- CenB-37 SAN GABRIEL RIVER-M.W.D. OUTLET BELOW SAN BERNARDINO ROAD
- CenB-36 ALHAMBRA WASH-M.W.D. OUTLET NEAR RUSH STREET

NOTE
ADAPTED FROM L.A.C.F.C.D. MAP



LEGEND

- LINED CHANNEL
- - - UNLINED CHANNEL
- ⊗ STREAM GAGING STATION
- ⊗ INACTIVE OR RELOCATED STREAM GAGING STATION
- METROPOLITAN WATER DISTRICT OUTLET
- NARROWEST SECTION
- - - RECLAIMED WATER PIPELINE

SAN GABRIEL RIVER WATERMASTER

CITY OF LONG BEACH Vs. SAN GABRIEL VALLEY WATER CO.
CASE No. 722647

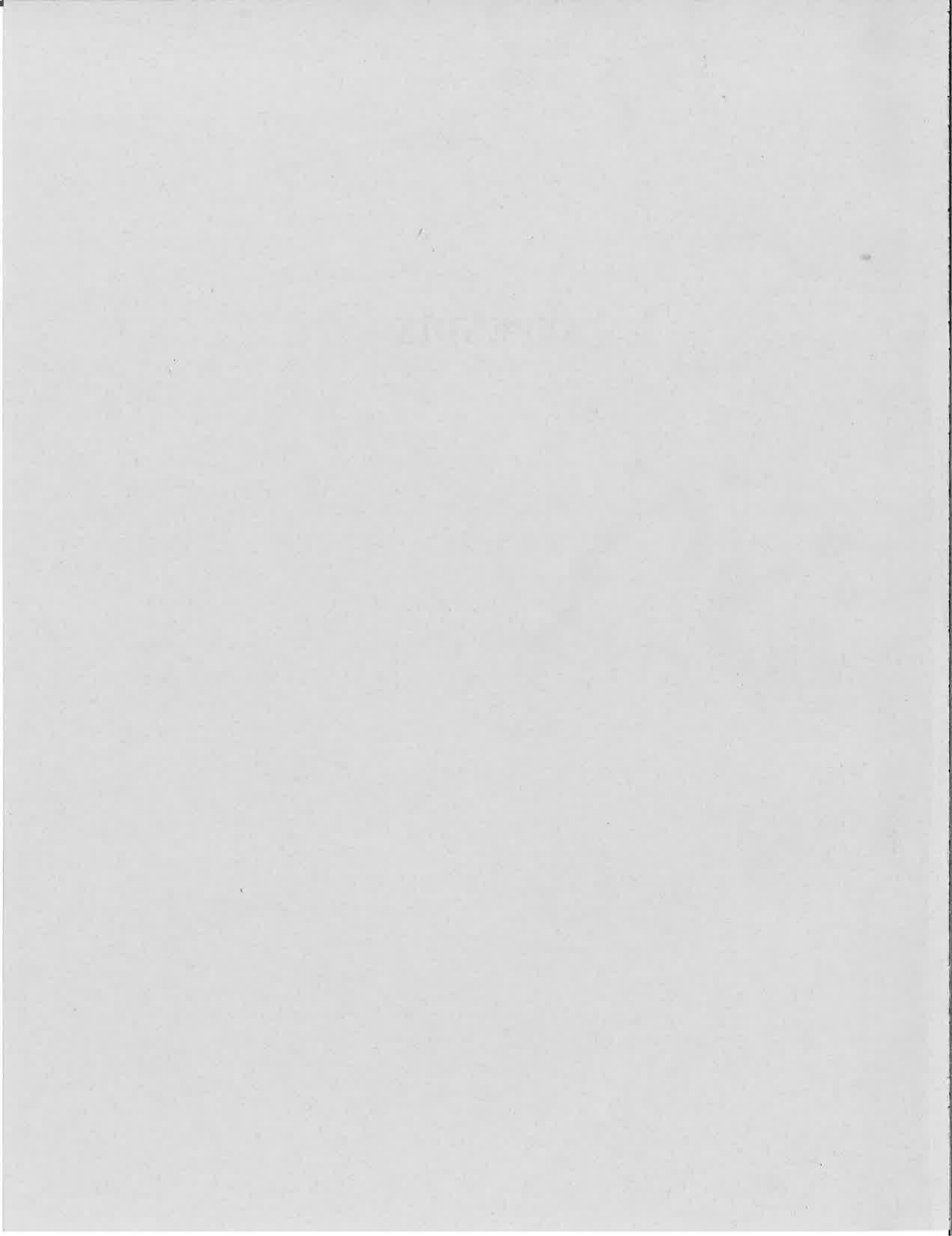
STREAM GAGING STATIONS RIO HONDO-SAN GABRIEL RIVER SYSTEM

WATERMASTERS
ROBERT P. GHIRELLI-STEPHEN B. JOHNSON-RICHARD A. RHONE

SCALE OF FEET
4000 0 4000 8000



APPENDIX



**PARTIES TO JUDGMENT
CITY OF LONG BEACH, ET AL, VS.
SAN GABRIEL VALLEY WATER CO., ET AL,
CASE NO. 722647 - LOS ANGELES COUNTY**

Court - Clerk of Superior Court (Case No. 722647)

Plaintiffs

Board of Water Commissioners of the City of Long Beach
Central Basin Municipal Water District
City of Compton

Defendants

San Gabriel Valley Water Company
(includes, by merger, Vallecito Water Company)
Azusa Agricultural Water Company
Azusa Valley Water Company
California-American Water Company
(successor to California Water and Telephone Company)
Covina Irrigating Company
East Pasadena Water Company, Ltd.
Glendora Irrigating Company (now City of Glendora)
Golden State Water Company (formerly known as Southern California
Water Company)
Suburban Water Systems
Sunny Slope Water Company
City of Alhambra
City of Arcadia
City of Azusa
City of Covina
City of El Monte
City of Glendora
City of Industry (successor to Cross Water Company)
City of Monrovia
City of Monterey Park
City of South Pasadena
San Gabriel County Water District
Valley County Water District
(formerly known as Baldwin Park County Water District)

Intervenors

Upper San Gabriel Valley Municipal Water District
California Domestic Water Company

DILLON & AVEDISSIAN/ACCOUNTANCY CORPORATION
CERTIFIED PUBLIC ACCOUNTANTS

995 East Green Street, #528

Pasadena, CA 91106

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TEL (626) 577-8885

FAX (626) 577-8889

INDEPENDENT AUDITORS' REPORT

San Gabriel River Watermaster
99 S. Lake Avenue, suite 300
Pasadena, California 91101

We have audited the accompanying statement of Income and Expenditures for the San Gabriel Watermaster for the water year ended 2017-2018. This financial statement is the responsibility of management. Our responsibility is to express an opinion on this financial statement based on our audit.

We conducted the audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the statement of income and expenditures. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the statement of income and expenditures referred to above presents fairly, in all material respects, the results of operations of San Gabriel River Watermaster for the water year ended 2017-2018 in conformity with accounting principles generally accepted in the United States of America.

 D. S. Avdian / Accountant
 Capone

Pasadena, California

January 22, 2019

**SAN GABRIEL RIVER WATERMASTER
STATEMENT OF INCOME AND EXPENDITURES
FOR THE WATER YEAR ENDED 2017-18**

Carried forward from water year 2016 - 2017		\$ 13,197.97
Income:		
Income		202,000.00
Interest income		<u>34.08</u>
		215,232.05
Expenditures:		
Administrative fees and general operating expenses	\$	26,499.70
Collection of data, field inspections, maintenance of records		90,318.14
Calculations and preparation of Watermaster Reports for water year 2016-2017		88,773.63
Conservancy		1,911.88
Printing and reproduction costs	<u>\$</u>	<u>4,550.93</u>
		<u>212,054.28</u>
Carried forward from water year 2017-2018		<u><u>\$ 3,177.77</u></u>

TABLE 12
SUMMARY OF ANNUAL FINDINGS FOR
FIRST LONG-TERM ACCOUNTING PERIOD
(acre-feet)

Water Year	Rainfall (inches)		Lower Area Annual Entitlement	Usable Water			Total Flow Through Whittier Narrows	Deduction from Usable Water			Unusable Surface Flow	Usable Water Received	Credit for Water Year	Accrued Credit (Debit)	Annual Make-up Water	
	Annual	Accumulated Average		Surface Inflow	Subsurface Inflow	Credit for Exported Water		Lower Area Replenishment Water	Reclaimed Water	Make-up Surface Flow					Payment for Reclaimed Water	Surface Flow Delivery
1963-64	9.45	9.45	67,200	112,679	21,000	29,024	162,703	104,842	13,258	0	3,628	40,975	(26,225)	(26,225)		
1964-65	15.24	12.34	68,000	171,597	18,800	30,139	220,536	160,027	14,528	0	11,240	34,741	(33,259)	(59,484)	0	0
1965-66	19.61	14.77	70,300	232,587	17,000	32,506	282,093	121,534	15,056	6,489	67,742	71,272	972	(24,238)	27,785	6,489
1966-67	25.03	17.33	78,700	176,672	17,500	23,395	217,567	84,156	16,224	0	36,534	80,653	1,953	(7,550)	14,735	0
1967-68	15.03	16.87	67,200	151,465	20,700	23,395	195,560	95,165	21,667	0	17,000	61,728	(5,472)	(5,597)	7,425	0
1968-69	30.50	19.14	84,000	637,344	24,400	23,395	685,139	17,748	17,130	0	488,033	162,228	78,228	78,228	5,597	0
1969-70	11.06	17.99	84,000	145,238	23,900	23,395	192,533	68,440	22,252	0	15,080	86,761	2,761	80,989	0	0
1970-71	13.27	17.40	90,200	137,462	22,900	23,395	183,757	71,815	23,754	0	16,266	71,922	(18,278)	62,711	0	0
1971-72	8.53	16.41	79,500	71,510	24,000	23,395	118,905	34,355	21,821	0	8,860	53,869	(25,631)	37,080	0	0
1972-73	22.38	17.01	87,100	174,352	25,900	23,395	223,647	91,614	26,341	0	27,217	78,475	(8,625)	28,455	0	0
1973-74	16.80	16.99	92,500	149,642	26,600	23,395	199,637	91,749	24,811	0	25,708	57,369	(35,131)	(6,676)	0	0
1974-75	14.88	16.82	92,500	112,783	25,600	23,395	161,778	71,359	24,511	0	7,129	58,779	(33,721)	(37,563)	2,834	0
1975-76	12.07	16.45	87,100	86,015	27,800	23,395	137,210	50,530	23,561	0	4,432	58,687	(28,413)	(51,339)	14,637	0
1976-77	14.47	16.31	78,700	73,493	31,700	23,395	128,588	16,239	23,520	14,507	4,206	70,116	(8,584)	(33,022)	12,394	14,507
1977-78	38.37	17.78	96,200	504,355	30,900	23,395	558,650	39,677	20,930	7,864	336,315	153,864	57,664	42,664	10,158	7,864
1978-79	23.87	18.16	--	175,654	27,400	23,395	226,449	65,006	25,696	0	25,521	110,226	--	--	0	0
Total	290.56		1,544,031	3,112,848	386,100	395,804	3,894,752	1,184,256	335,060	28,860	1,094,911	1,251,665	--	(167,941)	95,565	28,860

TABLE 13
SUMMARY OF ANNUAL FINDINGS FOR
SECOND LONG-TERM ACCOUNTING PERIOD
(acre-feet)

Water Year	Rainfall (Inches)		Lower Area Annual Entitlement	Usable Water			Total Flow Through Whittier Narrows	Deduction from Usable Water			Unusable Surface Flow	Usable Water Received	Credit for Water Year	Accrued Credit (Debit)	Long-term Make-up Water		Annual Make-up Water	
	Annual	Accumulated Average		Surface Inflow	Subsurface Inflow	Credit for Exported Water		Lower Area Replenishment Water	Reclaimed Water	Make-up Surface Flow					Payment for Reclaimed Water	Surface Flow Delivery	Payment for Reclaimed Water	Surface Flow Delivery
1978-79														(167,941)				
1979-80	34.85	34.85	107,600	493,851	25,300	23,395	542,546	10,196	26,652	10,843	357,680	137,175	29,575	29,575	10,716	0	10,843	0
1980-81	10.31	22.58	105,700	135,686	27,400	23,395	184,481	31,665	28,836	31,241	6,822	85,917	(19,783)	9,792	14,568	0	31,241	0
1981-82	18.88	21.35	111,900	124,268	29,900	23,395	177,563	4,595	31,151	30,716	16,278	94,823	(17,077)	(7,285)	11,464	0	30,716	0
1982-83	39.26	25.83	122,200	383,173	29,100	23,395	435,668	1,896	19,317	8,921	220,520	185,014	62,814	62,814	0	15,883	8,921	0
1983-84	10.56	22.77	118,600	123,719	28,200	23,395	175,314	1,478	30,068	33,589	10,454	99,725	(18,875)	43,939	0	0	33,589	0
1984-85	14.58	21.41	118,100	115,270	28,600	23,395	167,265	40,433	29,009	0	6,858	90,965	(27,135)	16,804	0	0	0	0
1985-86	21.96	21.48	123,900	140,444	30,500	23,395	194,339	21,383	26,827	0	26,672	119,457	(4,443)	12,361	0	0	0	0
1986-87	9.06	19.93	121,000	105,151	31,900	23,395	160,446	55,375	36,618	0	5,261	63,192	(57,808)	(45,447)	0	0	0	0
1987-88	14.88	19.37	106,300	105,413	33,200	23,395	162,008	23,226	39,919	5,712	7,900	85,251	(21,049)	(46,049)	0	0	0	0
1988-89	11.15	18.55	98,800	126,234	35,000	23,395	182,629	49,953	50,907	6,455	5,034	70,280	(28,520)	(53,379)	0	0	14,735	5,712
1989-90	12.35	17.99	81,800	138,309	32,100	23,395	193,804	54,011	49,759	13,544	8,781	67,709	(14,091)	(39,191)	0	0	14,735	6,455
1990-91	15.12	17.75	85,600	155,247	26,200	23,395	204,842	55,939	53,257	100	19,974	75,572	(10,028)	(34,384)	0	0	14,735	13,544
1991-92	22.80	18.14	88,700	182,796	22,700	23,395	228,891	42,889	45,420	0	34,592	105,990	(17,290)	(2,359)	0	0	14,735	100
1992-93	35.94	19.41	86,400	617,930	21,600	23,395	662,925	16,781	43,442	0	446,108	156,594	70,194	(2,359)	0	0	2,359	0
1993-94	11.64	18.89	--	115,544	24,000	23,395	162,939	20,242	54,134	0	4,201	84,362	--	--	0	0	0	0
Total	289.34		1,505,718	3,061,035	423,700	350,925	3,835,660	430,062	565,316	141,121	1,177,135	1,522,026	--	125,438	96,748	15,883	83,319	25,811

TABLE 14
SUMMARY OF ANNUAL FINDINGS FOR
THIRD LONG-TERM ACCOUNTING PERIOD
(acre-feet)

Water Year	Rainfall (inches)		Lower Area Annual Entitlement	Usable Water			Total Flow Through Whittier Narrows	Deduction from Usable Water			Unusable Surface Flow	Usable Water Received	Credit for Water Year	Accrued Credit (Debit)	Annual Make-up Water	
	Annual	Accumulated Average		Surface Inflow	Subsurface Inflow	Credit for Exported Water		Lower Area Replenishment Water	Reclaimed Water	Make-up Surface Flow					Payment for Reclaimed Water	Surface Flow Delivery
1993-94														125,438		
1994-95	30.44	30.44	98,300	283,784	25,300	23,395	332,479	21,710	30,995	0	139,671	140,103	41,803	167,241	0	0
1995-96	15.60	23.02	94,000	154,569	27,400	23,395	205,364	17,837	52,483	0	26,843	108,201	14,201	181,442	0	0
1996-97	17.49	21.18	99,500	144,423	28,100	23,395	195,918	22,551	48,560	0	17,772	107,035	7,535	188,977	0	0
1997-98	36.13	24.92	113,100	365,127	27,900	23,395	416,422	950	35,946	0	233,804	145,722	32,622	221,599	0	0
1998-99	8.63	21.66	111,300	80,604	27,000	23,395	130,999	0	47,228	0	1,653	82,118	(29,182)	192,417	0	0
1999-00	14.38	20.44	112,500	126,863	27,200	23,395	177,458	44,739	41,556	0	14,121	77,042	(35,458)	156,959	0	0
2000-01	15.50	19.74	112,500	117,972	27,900	23,395	169,267	23,328	44,817	0	15,537	85,585	(26,915)	130,044	0	0
2001-02	6.44	18.08	102,700	115,800	27,400	23,395	166,595	42,699	59,703	0	2,772	61,421	(41,279)	88,765	0	0
2002-03	19.36	18.22	91,500	142,787	24,000	23,395	190,182	22,298	41,761	0	34,031	92,092	592	89,357	0	0
2003-04	12.90	17.69	92,500	95,028	24,200	23,395	142,623	24,508	43,352	0	11,691	63,072	(29,428)	59,929	0	0
2004-05	45.32	20.20	102,700	617,636	21,600	23,395	662,631	24,250	28,475	0	439,536	170,370	67,670	127,599	0	0
2005-06	16.78	19.91	103,300	131,371	24,300	23,395	179,066	32,875	40,502	0	7,571	98,118	(5,182)	122,417	0	0
2006-07	4.94	18.76	94,800	96,291	26,400	23,395	146,086	39,970	43,629	0	369	62,118	(32,682)	89,735	0	0
2007-08	16.37	18.59	80,200	101,211	30,300	23,395	154,906	1,492	37,318	0	17,052	99,044	18,844	108,579	0	0
2008-09	14.00	18.29		68,027	31,300	23,395	122,722	0	36,229	0	1,530	84,963			0	0
Total	274.28		1,457,892	2,641,493	400,300	350,925	3,392,718	319,207	632,554	0	963,953	1,477,004		144,550	0	0

TABLE 15
SUMMARY OF ANNUAL FINDINGS FOR
FOURTH LONG-TERM ACCOUNTING PERIOD
(acre-feet)

Water Year	Rainfall (inches)		Lower Area Annual Entitlement	Usable Water			Total Flow Through Whittier Narrows	Deduction from Usable Water			Unusable Surface Flow	Usable Water Received	Credit for Water Year	Accrued Credit (Debit)	Annual Make-up Water	
	Annual	Accumulated Average		Surface Inflow	Subsurface Inflow	Credit for Exported Water		Lower Area Replenishment Water	Reclaimed Water	Make-up Surface Flow					Payment for Reclaimed Water	Surface Flow Delivery
2008-09																
2009-10	20.23	20.23	88,700	125,653	29,400	23,395	178,448	26,110	52,808	0	15,476	84,054	(4,646)	144,550	0	0
2010-11	24.85	22.54	95,300	215,561	25,400	23,395	264,356	36,960	34,341	0	44,970	148,085	52,785	139,904	0	0
2011-12	10.91	18.66	98,800	87,314	23,700	23,395	134,409	0	52,930	0	4,252	77,227	(21,573)	192,689	0	0
2012-13	7.96	15.99	90,200	62,696	27,200	23,395	113,291	0	55,508	0	596	57,187	(33,013)	171,116	0	0
2013-14	6.30	14.05	85,600	53,981	35,100	23,395	112,476	0	55,646	0	0	56,830	(28,770)	138,103	0	0
2014-15	11.44	13.62	59,600	73,134	35,700	23,395	132,229	18,433	44,348	0	0	69,448	9,848	109,333	0	0
2015-16	10.10	13.11	54,300	86,843	31,200	23,395	141,438	24,121	60,833	0	0	56,484	2,184	119,181	0	0
2016-17	21.44	14.15	67,200	161,754	23,500	23,395	208,649	34,042	58,067	0	19,902	96,638	29,438	121,365	0	0
2017-18	6.99	13.35	59,600	66,066	24,800	23,395	114,261	11,234	56,690	0	1,484	44,853	(14,747)	150,803	0	0
Total	120.22	--	699,300	933,002	256,000	210,555	1,399,557	150,900	471,171	0	86,680	690,806	--	136,056	0	0

