Original Copy

COOPERATIVE WATER RESOURCE MANAGEMENT AGREEMENT

between

CAMP PENDLETON

and

RANCHO CALIFORNIA WATER DISTRICT

March, 2002

COOPERATIVE WATER RESOURCE MANAGEMENT AGREEMENT

1. Purpose. This Cooperative Water Resources Management Agreement ("Agreement") is between the United States, on behalf of Camp Pendleton (sometimes "Camp Pendleton"), and the Rancho California Water District, ("District"), and is effective upon approval of the Court. Certain terms used in this Agreement are defined in Exhibit "A" hereto, including a map of the Santa Margarita River watershed. At the present time, two Judgments affect the rights of the parties with respect to water supplies from the Santa Margarita River watershed. The first is a Stipulated Judgment in the case of Rancho Santa Margarita v. Vail, San Diego Superior Court Action No. 42850 ("1940 Judgment"). The second is the Judgment in the case of United States v. Fallbrook Public Utility District, Civ. No. 1247, S.D. Cal. ("Fallbrook Case"). However, these Judgments do not fully meet the needs of the parties for effective water management under present conditions. The meanings of certain provisions of the 1940 Judgment are also in dispute. The parties, therefore, propose to manage these water resources in a practical way that will meet their needs, consistent with the essential rights and obligations of the two Judgments, while avoiding potential conflicts over disputed provisions.

2. Term. Unless sooner terminated because of an uncured default as set forth in Section 15 below, this Agreement shall remain in effect for a minimum of 10 years

from its effective date, and until either party exercises its right to terminate as set forth in Section 16 below.

3. Incorporation in Fallbrook Case and Continuing Jurisdiction. The Agreement will be submitted to the Court for approval and incorporated by stipulation into the Fallbrook Case, pursuant to the Court's continuing jurisdiction therein, and will be administered by the Watermaster appointed by the Federal District Court, Southern District of California, by order dated March 13, 1989, or subsequent order. The Court shall retain continuing jurisdiction to make such further orders as may be necessary to interpret or enforce this Agreement, provided that the Court shall not have the power to modify the terms of this Agreement or the 1940 Judgment. If either party believes there is a substantial change of circumstances, the parties shall attempt to reach agreement as may be appropriate in light of the changed circumstances, or shall engage in mediation if agreement is not reached.

4. 1940 Judgment. The United States is the successor in interest to the plaintiff Rancho Santa Margarita in the 1940 Judgment. The Rancho California Water District is a successor in interest to the defendants in the 1940 Judgment, and has certain rights and obligations under a 1978 Agreement between KACOR Realty and Rancho California Water District relative to Vail Lake. Both parties have certain rights and entitlements under the 1940 Judgment and are obligated to comply therewith. Without waiving their rights and entitlements under the 1940 Judgment, the parties

intend to forbear enforcing them for so long as this Agreement is in effect and being complied with. The parties realize that certain provisions of this Agreement differ from the 1940 Judgment. For example, the measurement of the flows required to be maintained under this Agreement will be accomplished at USGS Gage ID No. 11044000 on the Santa Margarita River near Temecula ("the Gorge"), and those guaranteed flows to Camp Pendleton are in terms of usable flows, including habitat maintenance flows, instead of total flows. Without waiving any of their rights and entitlements under the 1940 Judgment, the parties agree that, to the extent provisions of this Agreement are inconsistent with the 1940 Judgment, the provisions of this Agreement shall control for so long as this Agreement is in effect and being complied with. The parties agree further that, so long as this Agreement is in effect and is being complied with, neither party will undertake any proceeding with respect to the 1940 Judgment against the other, either judicially or administratively. Should either party fail to comply with this Agreement, or should it expire or be terminated, the parties preserve their respective rights to enforce the 1940 Judgment against each other, as each interprets it, and the provisions of this Agreement shall not be used to supply meaning to the 1940 Judgment.

5. Guaranteed Flows at the Gorge.

(a) The parties have developed a Groundwater Model, which indicates that the simulated total natural streamflow at the Gorge over the period 1935-1998 would have averaged 30.35 cfs, without diversions or pumping. For the purpose of establishing flow requirements, the daily natural streamflow at the Gorge was simulated using the Hydrologic Simulation Program Fortran (HSPF) model developed by Camp Pendleton and reviewed by both parties. Both models are more fully described in Exhibit "B" hereto. Flows at the Gorge, as set forth in the table on page 5, are based on two-thirds of the median natural flow during very wet, above normal, below normal, and critically dry conditions. Daily flow values for very wet and critically dry conditions are based on the daily median flows for the periods 1937 to 1946 and 1957 to 1966, respectively. Above normal flows are based on the mean of the median of very wet flows and the median of all flows for the period 1931-1996. Similarly, below normal flows are based on the mean of the median of critically dry flows and the median of all flows for the period 1931-1996. This methodology eliminates the large storm flows from the calculation of required flows for Camp Pendleton (two-thirds of natural flow), and results in average annual flows ranging from 3.6 cfs to 15.6 cfs, with a median flow of 8.8 cfs for the period 1931-1996. The results of the modeling efforts and the above calculations are shown on the following table:

	Critically Dry Flow	Below Normal Flow	Above Normal Flow	Very Wet Flow
Month	cfs	cfs	cfs	cfs
Jan - April	4.5	8.0	17.8	24.1
May	3.8	5.7	11.7	15.7
June	3.3	4.9	9.4	12.2
July	3.0	4.3	7.8	9.7
August	3.0	4.4	7.6	9.2
September	3.0	4.1	7.4	9.4
October	3.0	3.9	7.7	10.1
November	3.0	4.5	8.8	11.5
December	3.3	5.3	10.4	13.5

The hydrologic conditions described in the table above are derived from a hydrologic index combining the October through April natural streamflow at the Murrieta Creek gage, and the October through April natural streamflow at Vail Lake. Natural flow at Murrieta Creek is calculated using the rainfall/run-off relationship between rainfall at Wildomar and the HSPF natural flow at Murrieta Creek. Natural flow at Vail Lake is calculated using the run-off correlation between Aguanga streamflow and inflow to Vail Lake during the period water years 1958 to 1996.

On May 1st of each year the October through April rainfall at Wildomar is used to estimate natural flow at Murrieta, and the October through April measured

streamflow at Aguanga is used to estimate natural flow at Vail Lake. A simple computer spreadsheet, maintained and operated by the Technical Advisory Committee ("TAC"), adjusts for antecedent conditions and calculates the hydrologic index based on these input parameters. The computer spreadsheet is more fully described in Exhibit "C" hereto. Once the hydrologic condition is determined, the above table is then used to prescribe the flows at the Gorge.

Recognizing the seasonal variations in such flows that naturally occur under different hydrologic conditions, it is agreed that the District hereby guarantees winter and monthly minimum average flows at the Gorge as hereinafter provided. Full implementation of such guarantee requires the construction of certain facilities, which the District agrees to construct as expeditiously as possible. Any make-up obligations in excess of 3.0 cfs shall commence upon completion of such facilities, but in no event later than June 1, 2002, unless precluded by law.

(b) The winter period includes the months of January through April. For the winter period, minimum daily flow requirements are: 11.5 cfs for very wet and above normal conditions; 8.0 cfs for below normal conditions; and 4.5 cfs for critically dry conditions. Notwithstanding the foregoing, in the first winter period following the effective date of this Agreement, the minimum daily flow requirement is 11.5 cfs, calculated on a 10 day running average. The District shall provide whatever make-up water is needed to meet this requirement. On May 1st immediately following the first

winter period, and on each May 1st thereafter, the hydrologic condition for the immediately preceding October-April period shall be determined. Such condition, and the daily flow requirements set forth in this Section 5(b), shall be used to determine the actual flow requirement for the prior winter period, and whether this requirement was exceeded. In providing minimum daily flows of 11.5 cfs during the first winter period, if the District has provided make-up water in excess of its actual requirement, the District shall be entitled to a credit for such excess. The quantity of the excess flow shall be converted to a cfs equivalent, and applied during the following winter periods to reduce the 11.5 cfs requirement. In all years following the first winter period, the same procedure shall be followed, provided that the minimum daily flow requirement for each winter period shall be 11.5 cfs, less any credit unused in a previous year, and less any credit established by the May 1st accounting of the prior year.

(c) The non-winter period includes the remaining months of May through December. Minimum daily flow requirements, calculated on a 10 day running average, for the non-winter months are provided by the above table, based upon the particular hydrologic condition established on May 1st for the prior October-April period; provided that the 10 day average shall begin on the 11th day of each month. The District shall provide whatever make-up water is required to meet these monthly requirements.

(d) Notwithstanding any provision to the contrary, the District shall not be required to provide more than the equivalent of 11.5 cfs make-up water for any month.

(e) When the District is required under this Section to provide make-up water in any calendar year in excess of 4000 acre feet, measured at the Gorge, it shall be entitled to a credit for the excess, taking into account transmission losses, to be applied during the following two winter periods. Any deliveries pursuant to Section 17 are outside of, and in addition to, this subsection. The United States shall have the option of eliminating the District's credit in this subsection by the United States, or its designee, paying the District a cash amount equal to The Metropolitan Water District of Southern California's then current price for untreated water.

(f) Notwithstanding any provision to the contrary, the District guarantees that flows, based upon a 10 day running average, shall at no time be less than 3.0 cfs, and this obligation is independent of the construction of any facilities.

(g) Camp Pendleton, with the cooperation of the District, shall institute a monitoring program to assess the impacts of the parties' operations under this Agreement on the water supply, water quality and riparian habitat within Camp Pendleton. If adverse impacts are observed or if notice of such impacts is provided to Camp Pendleton by the Environmental Protection Agency, Fish and Wildlife Service, or other monitoring agencies, the District will cooperate with Camp Pendleton to assess operations under this Agreement to determine whether and what changes may be

needed to remedy such impacts. The District agrees to participate in good faith in appropriate watershed protection or watershed planning activities aimed at preserving water quality, enhancing watershed recharge, and encouraging watershed conservation within the Santa Margarita River watershed.

6. Makeup Water. Compliance with the requirements of Section 5 shall be based upon actual flow measurements as recorded by the USGS gage at the Gorge. Any losses of makeup water incurred between the point of discharge by the District and the Gorge shall be borne by the District, and shall not diminish the United States' entitlement, as measured at the Gorge. Makeup water which the District may be required to release at the Gorge in order to comply with the requirements of Section 5 may be supplied at its option from: (1) its wells upstream of the Gorge; (2) flows from its Live Stream Discharge Project subject to the provisions of the NPDES Permit and Section 9 below; (3) deliveries from its domestic water system; (4) deliveries of imported water from The Metropolitan Water District of Southern California; (5) or Vail Reservoir. With the consent of Camp Pendleton, the District may substitute treated water by exchange or direct delivery to Camp Pendleton for flow at the Gorge. Makeup water that the District releases to the stream shall meet all requirements of the California Water Quality Control Board, San Diego Region, and shall not cause a violation of any rule, regulation, standard or objective established by federal, state, or

local enforcement agencies, including but not limited to the federal and state Safe Drinking Water Acts.

7. Safe Yield Operation.

(a) The District agrees to manage its pumping of the "natural supply of groundwater" in the area upstream of the Gorge on a "safe yield" basis. The term "natural supply of groundwater" as it is used herein includes all return flows that recharge the groundwater supply, including return flows from imported and reclaimed water. "Safe yield" recognizes that groundwater levels will fluctuate during hydrologic cycles, and that amounts of pumping may also vary from year to year, but that the District's pumping over time will not cause damage to the aquifers. The District's demands in excess of safe yield will be met from imported or reclaimed water supplies.

(b) In addition to its pumping of the natural supply, the District shall be entitled to pump such amounts of direct import water recharge and direct reclaimed water recharge as may have been percolated and stored underground by way of the VDC operations or other direct recharge facilities.

(c) So long as the quantity of groundwater extracted by the District, including makeup and emergency water provided hereunder, does not exceed safe yield as set forth above, and subject to Section 19 of this Agreement, there are no restrictions on the number of wells which the District may operate, where they may be located, the

aquifers from which they may draw water, or the amounts of groundwater which may be pumped from each well.

(d) The District, with the cooperation of Camp Pendleton, shall install and maintain a multi-level monitoring network to obtain additional data which, when reviewed with the data from the surface monitoring system, may be used to assess safe-yield operations. The District, in consultation with Camp Pendleton, shall update the Groundwater Model from time to time but in no event less frequently than every five years. The Groundwater Model will be updated with current data and such other improvements as may be appropriate, and shall be utilized to monitor conditions, and to indicate whether adjustments to the District's pumping are required to operate within the safe yield of the basin.

8. Vail Dam and Reservoir.

(a) The District holds Permit 7032 from the State Water Resources Control Board for the construction and operation of Vail Dam and Reservoir. The Reservoir will be operated in accordance with such permit, as amended by the District's current application on file with the Board. The District's operations of the Reservoir are also constrained by its agreement with KACOR Realty, Inc., dated April 28, 1978, with respect to recreation levels in the Reservoir. The United States is not a party to this KACOR agreement and disputes the applicability of the Vail Lake recreational pool limit to the United States. The District agrees, in accord with the Mahlon Vail

letter dated October 6, 1947, that its yield from the Reservoir and all losses including net evaporation are chargeable against its one-third share under the 1940 Judgment. Moreover, the District agrees that the pumping of water that has been released from the Reservoir and has percolated underground downstream shall be a part of, and not an addition to, the natural supply and safe yield of the basin.

(b) The United States on behalf of Camp Pendleton only will withdraw without prejudice the protest filed with the State Water Resources Control Board to the District's Permit 7032 change petition, provided that if this Agreement should be terminated, the United States shall have the right to reinstitute its protest, and any Permit amendments shall be conditioned upon such right. The United States will also seek dismissal of the case entitled United States of America v. Rancho California Water District, Riverside County Superior Court, Case No. EO 14837, Court of Appeal, Fourth Judicial District, Case No. 229096, each side to bear its own costs and attorneys fees. Except as allowed under Permit 7032, or any license confirming such rights, the District agrees that it will not seek rights from the State Water Resources Control Board, or otherwise, to store natural surface water flows of the Santa Margarita River or its tributaries.

(c) On December 2, 1999 Vail Lake USA, LLC, as a claimed successor to KACOR Realty, Inc. under the April 28, 1978 Agreement with the District, gave notice to the District alleging that the District had failed to perform its obligations under

the Agreement; that Vail Lake USA, LLC was exercising its claimed right of reversion; and that it intended to retake possession of Vail Dam and Reservoir, among other properties. The District disputes this claim, and believes that it is without merit. However, the District's rights and obligations under this Agreement stem in part from the acquisition of Vail Dam and Reservoir pursuant to the April 28, 1978 Agreement, and should Vail Lake USA, LLC be successful in its claim, it may be necessary to modify this Agreement section accordingly. The District agrees to oppose, and the United States shall take such action as it deems appropriate, any effort by Vail Lake USA, LLC, or its successor, through amendment of Permit 7032 or otherwise, to export any waters subject to such permit for use outside of the Santa Margarita River watershed, or otherwise to interfere with the historic use of such stored waters.

9. Live Stream Discharge Project. Subject to the provisions of the Four Party Agreement, or any amendments thereto, flows discharged to the stream by the District from its Santa Rosa Water Reclamation Facility pursuant to and in compliance with Order No. 96-54, NPDES Permit No. CA0108821, or any amendments thereto or extension thereof, shall be considered part of the flows at the Gorge to which the United States is entitled, and may be used to provide any makeup water required to meet such entitlements.

10. Monitoring. In addition to the monitoring programs required under Section 5(g) hereunder, the Watermaster appointed in the Fallbrook Case shall measure

and monitor both water flows and water quality at the Gorge, and shall incorporate into his reports the results of all monitoring programs provided for in this Agreement.

11. Use of Flows. The flows at the Gorge guaranteed herein, and any make up obligation by the District, shall be subject to the reasonable and beneficial use requirements of federal and California law. It is expressly recognized that the minimum flows set forth in Section 5 may be used to meet the ecological habitat maintenance requirements for the riparian corridor below the Gorge, and that such use constitutes a reasonable and beneficial use.

12. Upstream Pumping by Others. To the extent that it is legally capable, the District shall be responsible for controlling, if necessary, any pumping or diversions by non-federal entities within its boundaries. Except for any actions undertaken by any Indian tribe, band or community or any federal agency, and further excepting any actions affecting federal lands or the trust resources of any Indian tribe, band or community located within the Santa Margarita River watershed, the parties agree to act jointly, by judicial means or otherwise, to prevent any pumping or diversion upstream of the Gorge by others located outside of the boundaries of the District from adversely affecting flows at the Gorge. In any event, none of the pumping upstream of the Gorge shall affect the District's obligations set forth in Sections 5 and 6.

13. Annual Report. By March 31 of each year, the Watermaster shall prepare an annual report for filing in the Fallbrook case on the performance of this Agreement

during the prior water year. He shall consult with the TAC on the contents of such report.

14. Technical Advisory Committee. The TAC, which shall continue to include the Watermaster, will serve as a forum for discussion and cooperation between the parties as to the performance of this Agreement. The TAC will conduct the reviews described in Sections 5 and 7, and may also, with the approval of the parties, undertake such studies as may be useful in implementing the Agreement. Such studies may include, but are not limited to, updating and reviewing the performance of the Groundwater Model and the HSPF Model; evaluating safe yield; calculating transmission losses; groundwater conditions and any changes in groundwater storage; comparing actual data with the assumptions used in negotiating this Agreement; identifying any substantially changed hydrologic conditions within the watershed; and determining losses of any groundwater stored for the account of Camp Pendleton.

15. Default. Should either party fail to perform any portion of this Agreement, or otherwise breach any of its respective obligations under this Agreement, and upon notice of such breach or failure to perform, the party which is alleged to be in default shall cure its default within thirty days of receipt of notice, or within a reasonable time in the event more time is required. In the event of a dispute over the default, either party may apply to the Federal Court in the Fallbrook case, under its continuing jurisdiction, to obtain appropriate judicial relief. During the pendency of the court

proceedings, the party alleged to be in default shall continue to cure the default, unless otherwise directed by the court. If the alleged default has been totally or partially cured, but an actual default is not finally established by the court, the curing party shall be entitled to appropriate relief to compensate it for the expense of its total or partial cure. If the default is not cured or excused by the court, the other party shall be entitled to terminate the Agreement without further notice, notwithstanding any provision in Section 16. Once terminated, the covenant to forbear from enforcing rights under the 1940 Judgment as set forth in Section 4 above will no longer apply and either party may then undertake judicial or administrative proceedings with respect to the 1940 Judgment.

16. Termination. In addition to the right to terminate upon an uncured default as set forth in the preceding Section, either party shall have the right to terminate this Agreement with or without cause upon two years written notice; provided, however, that in no event shall the right to terminate under this Section be exercised prior to ten years after the effective date of this Agreement, including the two years notice. Once terminated, the covenant to forbear from enforcing rights under the 1940 Judgment as set forth in Section 4 above will no longer apply, and either party may then undertake judicial or administrative proceedings with respect to the 1940 Judgment.

17. Emergency Supplies. In the event that the Commanding General of Camp Pendleton declares a water supply emergency based upon a drought affecting the water

supply to Camp Pendleton and its riparian habitat corridor, or upon mobilization demands requiring additional potable water supplies for Camp Pendleton, and upon agreement of the parties or approval of the Court, the District will: (1) work with Camp Pendleton to acquire untreated water from the San Diego Aqueduct of The Metropolitan Water District of Southern California, and discharging such water into the Santa Margarita River or its tributaries; (2) deliver water in the amount of any groundwater held by Camp Pendleton in the basin upstream of the Gorge into the Santa Margarita River at the Gorge; or (3) assist in supplying treated water directly or by exchange to Camp Pendleton. Camp Pendleton may acquire rights to such groundwater above the Gorge by foregoing its right to makeup water from the District; or to the extent that the District's actual flow maintenance requirements are less than the flows in the table in Section 5; provided: (1) that Camp Pendleton's rights to such groundwater in storage shall not exceed 5000 acre-feet at any one time; and provided further: (2) that the District's obligation to deliver stored groundwater shall not exceed 2200 acre-feet per year over any required makeup obligation which the District may have, and in no event at a rate in excess of 11.5 cfs. Any such groundwater held in the basin for the account of Camp Pendleton shall be subject to a proportionate share of losses. All governmental approvals required to discharge either Metropolitan Water District water or stored groundwater into the river, pursuant to this Section, shall be the responsibility of Camp Pendleton.

18. Use of River Channel. With respect to the flow requirements under Section 5 and the emergency surplus delivered to the Gorge under Section 17, it is the Parties' express intent that the natural channel of the Santa Margarita River serve as a conduit for delivery of those flows to Camp Pendleton.

19. Federal and Indian Water Rights. This Agreement is entered into by the United States solely on behalf of Camp Pendleton and not on behalf of any other federal agency or in any other capacity, including, but not limited to, its capacity as trustee for any Indian tribe, band or community. Nothing in this Agreement may affect the water quality, water rights or the water rights claims of any Indian tribe, band or community or federal agency located within the Santa Margarita River watershed, or of the United States acting on their behalf.

20. Representations and Warranties. The parties to this Agreement represent and warrant as follows:

(a) The parties affirm that the representatives executing the Agreement are empowered to do so and thereby bind the respective parties, and that there is no other condition to be satisfied or approval to be secured from any governmental or quasi-governmental agency or body in order to execute this Agreement;

(b) Each party affirms its present competence to enter into the settlement provided for in this Agreement, with respect to the advisability of executing this Agreement, and with respect to its meaning;

(c) Each party affirms that, as of the effective date of this Agreement, each has not previously assigned or transferred in any manner, or purported to have assigned or transferred in any manner, any of the claims set forth in this Agreement;

(d) No party is relying upon any statement, representation or promise of any other party or any officer, director, agent, partner, employee, consultant, representative or attorney of or for any other party in executing this Agreement or in making the settlement provided for, except as expressly stated in this Agreement and admissible to interpret the Agreement.

21. Successors-in-Interest and Assigns. Subject to any restriction on transferability contained in this Agreement, this Agreement shall be binding upon and shall inure to the benefit of the successors-in-interest and assigns of each party to this Agreement. Nothing in this Section shall create any rights enforceable by any person not a party to this Agreement, except for the rights of the successors-in-interest and assigns of each party to this Agreement, unless such rights are expressly granted in this Agreement to other specifically identified persons.

22. Integration. This Agreement is an integrated agreement and constitutes the entire Agreement between the parties and supersedes all prior and contemporaneous oral and written agreements and discussions.

23. Modification in Writing. This Agreement may be modified only by a writing executed by the parties to this Agreement against whom enforcement of such modification is sought.

24. Drafting Ambiguities. Each party to this Agreement and its counsel have reviewed and revised this Agreement. The rule of construction that any ambiguities are to be resolved against the drafting party shall not be employed in the interpretation of this Agreement or of any amendments or exhibits to this Agreement.

25. Partial Invalidity. Each provision of this Agreement shall be valid and enforceable to the fullest extent permitted by law. If any provision of this Agreement or the application of such provision to any person or circumstance shall, to any extent, be invalid or unenforceable, the remainder of this Agreement or the application of such provision to persons or circumstances other than those as to which it is held invalid or unenforceable, shall not be affected by such invalidity or unenforceability, unless such provision or such application of such provision is essential to this Agreement.

26. Waiver. Any waiver of a default under this Agreement must be in writing and shall not be a waiver of any other default concerning the same or any other provision of this Agreement. No delay or omission in he exercise of any right or remedy shall impair such right or remedy or be construed as a waiver. A consent to or approval of any act shall not be deemed to waive or render unnecessary consent to or approval of any other or subsequent act.

27. Further Assurances. Each party to this Agreement shall execute all instruments and documents and take all actions as may be reasonably required to effectuate this Agreement.

28. Time of Essence. Time and strict punctual performance are of the essence with respect to each provision of this Agreement.

29. Headings. The headings of the Sections of this Agreement have been included only for convenience, and shall not be deemed in any manner to modify or limit any of the provisions of this Agreement, or be used in any manner in the interpretation of this Agreement.

30. Effectiveness. This Agreement shall become effective when it has been executed by all of the parties, and approved by the Court as provided in Section 3.

31. Anti-Deficiency Act. The parties to this Agreement recognize and acknowledge that any payment obligations of the United States on behalf of Camp Pendleton in satisfaction of this Agreement can only be paid from appropriated funds legally available for such purpose. Nothing in this agreement shall be interpreted as a commitment or requirement that the United States obligate funds or pay costs in contravention of Anti-Deficiency Act, 31 USC §§ 1301, 1341, or any other applicable provision of law.

32. Notice. All notices or other communications required or permitted to be given to a party to this Agreement shall be in writing and shall be personally delivered,

sent by registered or certified mail, postage pre-paid, return receipt requested, or sent by an overnight express courier service that provides written confirmation of delivery to such party at the following respective addresses:

UNITED STATES:	Assistant Attorney General United States Department of Justice Environmental and Natural Resources Division Washington, DC
WITH A COPY TO:	Director, Office of Water Resources Box 555013, MCB Camp Pendleton, CA 92055-5013
DISTRICT:	General Manager Rancho California Water District P.O. Box 9017 Temecula, CA 92589-90017
WITH A COPY TO:	General Counsel Rancho California Water District P.O. Box 9017 Temecula, CA 92589-9017

UNITED STATES OF AMERICA

Date: 3/26/02

By: _____

Andrew F. Walch, Senior Counsel
United States Department of Justice
Environment and Natural
Resources Division
General Litigation Section
999 18th Street, Suite 945
Denver, CO 80202

Date: 3/26/02

By: _____

_____

_____

United States Marine Corps
Camp Pendleton, California

RANCHO CALIFORNIA WATER DISTRICT

Date: 3-26-02

By: Lysa D. Herman
President

ATTEST:

Linda M. Fugro
Secretary

APPROVED AS TO FORM

BEST BEST & KRIEGER LLP

Arthur L. Littleworth

C. Michael Cowett

EXHIBIT A

DEFINITIONS AND MAP

EXHIBIT A

DEFINITIONS

Basin	The groundwater basin consists of the Temecula, Pauba, and Younger Alluvial aquifers. The younger alluvial aquifer is located along the river bottoms and is generally considered the most permeable. The Pauba and Temecula aquifers underlie the Younger Alluvium and are generally less permeable.
Direct Recharge Facilities	Direct recharge facilities presently include the Valle De Caballos located in the upper part of the Pauba Valley. Natural run-off from Temecula Creek is released from Vail Lake and imported waters are diverted to the VDC to recharge the aquifers used for groundwater production from the groundwater system.
Gorge	The Gorge is located at the head of the Santa Margarita River at the confluence of Murrieta and Temecula Creeks. The USGS presently operates streamflow gage 11044000 at the Gorge with a period of record beginning in 1923.
Groundwater Model	The groundwater model simulates surface and groundwater movement in the Younger Alluvium, Pauba, and Temecula aquifers. The groundwater model uses the USGS's finite difference code MODFLOW and consists of 102 rows, 127 columns, and three layers. The transient calibration period extends from 1935 to 1999 using quarterly stress periods. The groundwater model was developed from 1995 to 1999 by the District with continuous involvement by all members of the TAC.
Groundwater Supply	Groundwater supply includes the natural supply and that portion of imported water, reclaimed water, and other waters that directly or indirectly recharge the three aquifers.
Groundwater System	The Groundwater system is described by the groundwater model and consists of all aquifers located above the Gorge. Furthermore, recharge from direct precipitation, recharge from surface water, discharge to surface water, subsurface recharge, and movement of water between aquifers also pertain to the groundwater system.

HSPF Surface Water Model	The Hydrologic Simulation Program Fortran (HSPF) surface water model was developed to simulate natural flow at the Gorge. The model was calibrated using the period water year 1931 through 1936 as natural flow conditions in the upper basin. The model was developed in 1999 by Camp Pendleton and reviewed by the TAC.
Imported Water	Water the source of which is outside the Santa Margarita River watershed.
Natural Supply	The natural supply of water in the upper basin is defined by the amount of water that is recharged to the groundwater system from direct precipitation, surface flow, releases from Vail Lake, subsurface inflow, and return flow from imported or reclaimed water.
TAC	The Technical Advisory Committee (TAC) consists of representatives from the Rancho California Water District, Camp Pendleton, the United States Geological Survey, and the Watermaster.
VDC	The Valle De Caballos (VDC) is a direct recharge facility located in the upper portion of Pauba Valley. Both natural run-off and imported water are applied at these facilities in order to recharge the groundwater system.
Year	Unless otherwise indicated, year refers to the water year running from October 1st through September 30th of the following year.

EXHIBIT B

DESCRIPTION OF THE GROUNDWATER MODEL AND HSPF SURFACE WATER MODEL, AND APPLICATION TO FLOW REQUIREMENTS

DESCRIPTION OF THE GROUNDWATER MODEL AND HSPF SURFACE WATER MODEL, AND APPLICATION TO FLOW REQUIREMENTS

The purpose of this Exhibit is to memorialize and explain the method used to develop the flows guaranteed in the Agreement. To the extent there may be any inconsistencies, the language of the Agreement, and not this Exhibit, establishes the District's flow guarantees.

MODFLOW GROUNDWATER MODEL

The RCWD/CAMP PENDLETON surface and groundwater model (Groundwater Model) was developed to investigate the effects of groundwater pumping on streamflow within the Murrieta-Temecula area of Riverside County in southern California. The Groundwater Model was developed by GEOSCIENCE Support Services, Inc. (GEOSCIENCE) in cooperation with the United States Geologic Survey (USGS). Rancho California Water District (RCWD), the United States Marine Corps - Camp Pendleton Base (Camp Pendleton), Stetson Engineers, Inc. (Stetson), and the Santa Margarita River Watershed Watermaster (SMR Watermaster).

The Groundwater Model was developed for streams and the unconsolidated and poorly consolidated sediments of the Murrieta-Temecula Basin. The Groundwater Model consists of three distinct model layers: Layer 1 - Younger Alluvium; Layer 2 - Pauba Formation; and Layer 3 - Temecula Arkose. The streams crossing the model area in the aquifers (i.e., Younger Alluvium, Pauba Formation and Temecula Arkose) can be both influent (losing water to the aquifer) and effluent (gaining water from the aquifer). The streamflow inflow components are the surface runoff generated from rain events and water gained from aquifers. The streamflow outflow components are leakage into the aquifers and flow out of the model area through the Gorge. The primary sources of recharge to the aquifers include subsurface recharge, underflow recharge, areal recharge, artificial recharge, return flow and streamflow leakage. The primary discharge terms are groundwater pumping, evapotranspiration, underflow discharge and leakage out of the aquifer.

MODFLOW was the computer code used in the Murrieta-Temecula Basin model. MODFLOW is a block-centered, three-dimensional, finite-difference groundwater flow model developed by the USGS (McDonald and Harbaugh, 1988) for the purpose of modeling groundwater flow model to account for the interaction between surface streams and groundwater.

The model covers approximately 288 square miles with a three layer variable-grid network consisting of 102 nodes in the north-to-south direction (i-direction), 127 nodes in the west-to-east direction (j-direction), for a total of 38,862 nodes. Most nodes represent an area 600 ft (north-south) by 600 ft (east-west). Nodes near the edges of the model are of variable size, ranging up to 5,000 ft on a side.

The period selected for the model calibration was 1935 to 1994. This period covers various wet and dry hydrologic cycles, and pre-development and development conditions. A quarterly stress period was used for model calibration. After the model was calibrated, a verification run (Run 89) was simulated by adding the period 1995-1998 to the final model calibration run (Run 88B).

Model simulation (Run 93) of the condition of actual precipitation without any pumping or any effect of Vail Dam was conducted to calculate the natural streamflow at the Gorge. This was done using the same model input data from Model Run 89 (final calibration and verification) except for the Streamflow-Routing Package and Well Package. Quarterly flux for Vail Releases and Vail Spill of the Streamflow Routing Package was based on the net Vail Dam inflow. The net Vail Dam inflow calculation involve estimating the calculated Vail inflow by balancing the Vail Dam releases, Vail Dam spill, evaporation, precipitation and change in storage on a monthly basis. The net Vail Dam inflow then can be calculated by subtracting the evapotranspiration of the phreatophytes under no Vail Dam conditions, from the calculated Vail Dam inflow. The well package was recompiled to include only subsurface recharge, underflow recharge, and underflow discharge. RCWD pumping, private pumping, artificial recharge, and return flow were excluded. The results of this model run are presented in the report Surface and Groundwater Model of the Murrieta-Temecula Basin, California (GEOSCIENCE, 2000).

HSPF Surface Water Model

Monthly base flows at the Gorge are defined by hydrologic conditions based on rainfall at the Wildomar precipitation station and streamflow at the Aguanga streamflow gage (see Exhibit C). The current hydrologic condition and the monthly base flows are used in Section 5 of the Agreement to provide a basis for supplementing streamflow at the Gorge to meet the flow guarantees of the Agreement.

Natural streamflow at the Gorge was simulated using daily precipitation input values to the HSPF model. The calibration period chosen was from October 1930 to September 1936 and the transient period extended from 1936 to 1996. HSPF is able to account for antecedent conditions in the watershed using daily rainfall data from the Wildomar rain gage. Figure B-1 shows a comparison of simulated versus actual streamflow during the calibration period. Frequency distribution tables and plots were constructed to show the distribution of daily natural flow on a monthly basis. The results of this analysis is presented in Technical Memorandum 3.0 (Stetson Engineers, March 1, 2000)

COMPARISON OF HSPF AND RCWD/CAMP PENDLETON GROUNDWATER MODELS

The Environmental Protection Agency's Hydrologic Simulation Program Fortran (HSPF) was used to simulate daily streamflow based on daily precipitation data from the Wildomar station. The correlation between rainfall and runoff provides the ability to determine the conditions of the basin based on daily rainfall data. The RCWD/Camp Pendleton Groundwater Model simulates streamflow at the Gorge based on quarterly values of tributary inflow, subsurface inflow, aerial recharge and other recharge mechanisms.

TABLE B-1

COMPARISON OF HSPF AND GROUNDWATER MODEL NATURAL FLOW QUARTERLY STREAMFLOW VALUES AT THE GORGE (1935 TO 1996)

QUARTERLY PERIOD	MEDIAN HSPF (CFS)	MEDIAN G-W MODEL (CFS)	DIFFERENCE (%)
October - December	8.8	10.0	14
January - March	19.0	17.1	-10
April - June	11.7	10.1	-13
July - September	7.9	7.7	-2
Annual Mean	11.8	11.2	-5

Comparison of quarterly values of both the HSPF and Groundwater Model indicates a high degree of correlation. Statistically, the annual mean of quarterly median streamflow of both the HSPF and Groundwater Models is 11.82 cfs and 11.24 cfs, respectively. Quarterly medians are also similar between the two models, differing by no more than 1.9 cfs (10%) during the winter quarter (Table B-1). The natural flow analysis presented in this exhibit is based on the HSPF model since it compares well with the Groundwater Model, is based on daily precipitation, and can be calculated on either a daily, monthly, or annual basis.

NATURAL FLOW OF THE SANTA MARGARITA RIVER NEAR TEMECULA

The frequency distribution table and graphs allow the hydrologist to estimate the statistical occurrence and probabilities of specific flows. This method is extremely useful in southern California streams with flows that vary order of magnitudes during any given year. The 50% probability on the frequency distribution graph represents the median daily flow for the stream system. In general, flows calculated based on means will be greater than flows based on the median. For example, the mean daily natural flow during the month of October is calculated to be 10.6 cfs, while the median flow is simulated to be only 7.9. During high flow months such as February, mean daily natural flow is estimated to be 211 cfs, while median daily flow during the same month is 17.4 cfs. Frequency distribution allows hydrologists to estimate the variability and distribution of flows based on seasonal and hydrological changes.

Streamflow values during dry, normal, and wet hydrologic conditions may be estimated using the variability of the historical natural flow during dry, normal, and wet hydrologic conditions. In order to estimate median flows during dry and wet cycles, two separate period of records were chosen to represent these different hydrologic conditions. Water years 1957 to 1966 were selected to represent dry natural flow conditions, while water years 1937 to 1946 were chosen to represent a wet hydrologic cycle. In order to estimate median flows during these periods, frequency distribution analysis and plots were developed for each cycle.

The mean median annual natural flow during dry hydrologic conditions is 5.3 cfs, less than half of the annual natural flow for the entire period of record of 12.0 cfs. The mean median annual natural flow during wet hydrologic conditions is 23.4 cfs, almost twice the annual natural flow. The median daily flow during the wet period ranged from 13.8 cfs in August to 49.4 cfs in March.

DETERMINING FLOW REQUIREMENTS AT THE GORGE

Flow requirements at the Gorge are based on two-thirds the median natural flow during wet, normal, and dry conditions. Flow requirements for critically dry and very wet conditions are based on the 50% median flows for the period 1957 to 1966 and 1937 to 1946, respectively. Above normal flows are based on the mean of the 50% median wet flows and the 50% median all years. Similarly, below normal flows are based on the mean of the 50% median dry flows and the 50% median all years. Table B-2 shows the results of this determination and is the basis for the flow guarantees established in Section 5 of the Agreement.

TABLE B-2

DAILY FLOWS AT THE GORGE BASED ON TWO-THIRDS OF THE MEDIAN NATURAL FLOW AS DETERMINED BY THE HSPF MODEL

MONTH	CRITICALLY DRY FLOW (CFS)	BELOW NORMAL FLOW (CFS)	ABOVE NORMAL FLOW (CFS)	VERY WET FLOW (CFS)
October	3.0	3.9	7.7	10.1
November	3.0	4.5	8.8	11.5
December	3.3	5.3	10.4	13.5
January	3.3	6.9	13.6	16.8
February	4.6	8.1	17.5	23.4
March	4.9	8.7	22.7	32.9
April	5.0	8.2	17.2	23.1
May	3.8	5.7	11.7	15.7
June	3.3	4.9	9.4	12.2
July	3.0	4.3	7.8	9.7
August	3.0	4.4	7.6	9.2
September	3.0	4.1	7.4	9.4
Total	3.6	5.8	11.8	15.6

Note: Flow is based on 2/3 natural flow or 3 cfs, whichever is greater.

DETERMINATION OF HYDROLOGIC CONDITIONS

The methodology used to estimate the required monthly base flows at the Gorge is based on flows occurring during different hydrologic conditions. The median flow during the wet hydrologic cycle defines the break between above normal and very wet conditions when compared to the entire period of record. Similarly, the median flow during the dry hydrologic cycle defines the break between critically dry and below normal conditions. In order to determine the frequency at which these different hydrologic cycles occur, the median from the dry and wet cycles are compared to the monthly flow values for the entire period of record. Table B-3 below shows the results for each month when the dry and wet cycle median natural flow is plotted on the entire period of record for each month. For example, the December median dry cycle (WY 1957-1966) natural flow value of 4.9 cfs was plotted on the frequency distribution graph for the entire period of record (WY 1931-1996). The result indicated that the 4.9 cfs flow would be met or exceeded 87.4% of the time (Table B-3). The table shows the variation between the months for both dry and wet cycles. In order to remain consistent while determining different hydrologic cycles, the median values for the twelve months were used.

TABLE B-3

WET AND DRY TIME EXCEEDANCE VALUES FOR EACH MONTH USING THE ENTIRE PERIOD OF RECORD

MONTH	DRY FLOW (%)	WET FLOW (%)
October	84.5	22.1
November	84.7	22.8
December	87.4	24.2
January	90.1	28.1
February	87.1	26.8
March	86.9	26.5
April	83.3	24.6
May	84.7	25.1
June	85.0	21.4
July	83.8	24.2
August	82.7	27.8
September	80.4	19.8
Median	84.7	24.4

Exhibit C describes the development of a hydrologic index for the Santa Margarita River Basin which is based on the median values of the monthly wet and dry time exceedance. The hydrologic break between extremely dry and below normal occurs at the 84.7% exceedance value while the break between above normal and very wet hydrologic conditions occurs at 24.4%. The hydrologic break between above normal and below normal occurs at the 50% exceedance interval.

Simulated versus Historical Streamflow at the Gorge (WY 1931-1936)

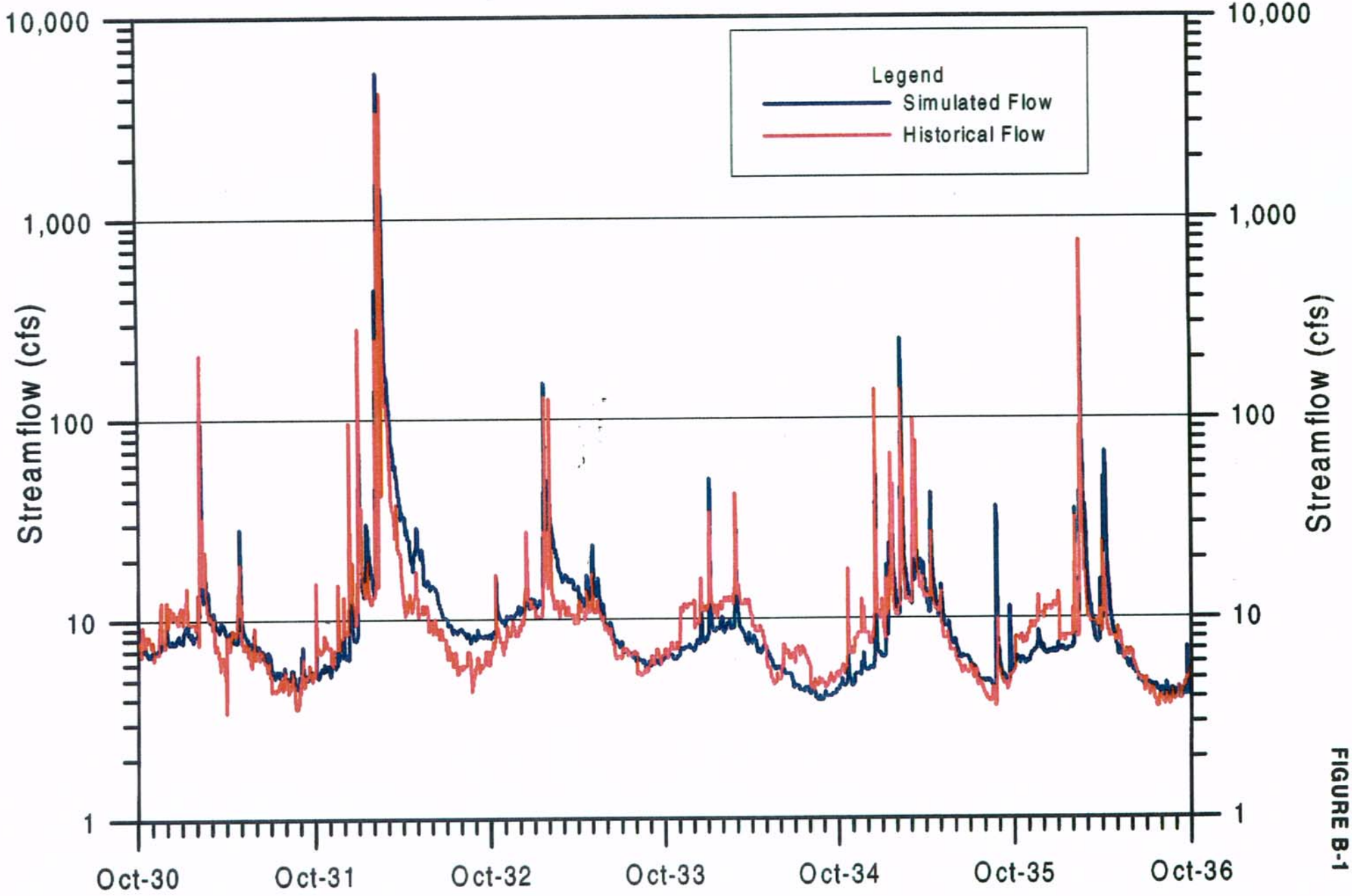


FIGURE B-1

Frequency Distribution of Natural Flow at the Gorge During The Month of October (WY 1931-1996)

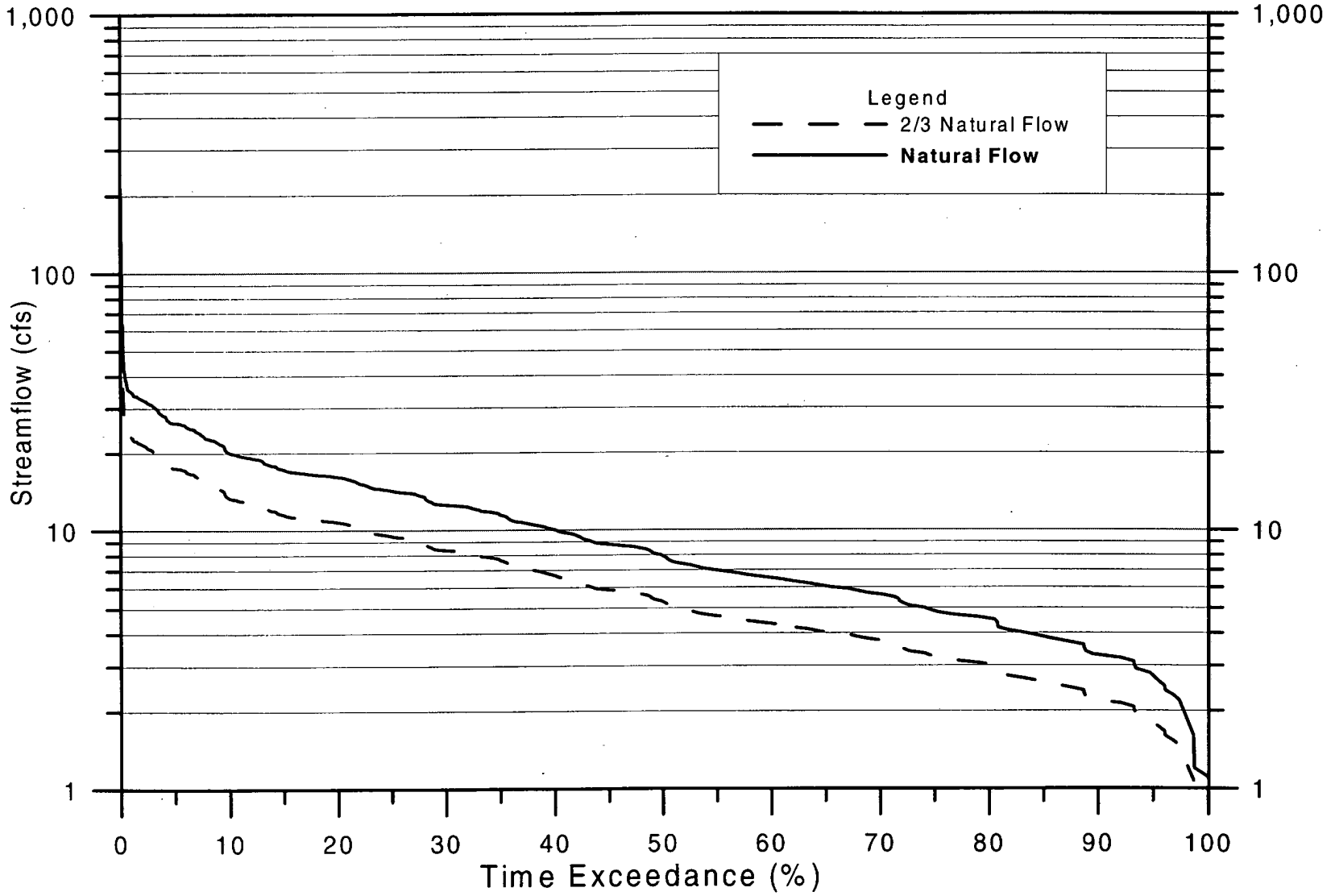


FIGURE B-2

EXHIBIT C

DETERMINATION OF HYDROLOGIC CONDITIONS IN THE SANTA MARGARITA RIVER BASIN

EXHIBIT C

DETERMINATION OF HYDROLOGIC CONDITIONS IN THE SANTA MARGARITA RIVER BASIN

The purpose of this Exhibit is to memorialize and explain the method used to develop the flows guaranteed in the Agreement. To the extent there may be any inconsistencies, the language of the Agreement, and not this Exhibit, establishes the District's flow guarantees.

This Exhibit describes the streamflow and precipitation data available in the upper basin and the hydrologic index used to describe the hydrologic condition of the Santa Margarita River Basin above the Gorge. The hydrologic index is calculated using the historical precipitation record at the Wildomar precipitation gage, streamflow at the Aguanga streamflow gage, and calculated natural streamflow at the Gorge and Murrieta gages. The methodology accounts for antecedent conditions that existed prior to the year being determined, allowing for a previous wet year or dry year to influence the current year's hydrologic condition. The methodology provides a means to determine the flow requirements at the Gorge for twelve months, in conjunction with other provisions of the Agreement.

Based on the October through April's natural streamflow totals at Murrieta and Vail Lake, the May through December monthly streamflow requirement at the Gorge is categorized as either Critically Dry, Below Normal, Above Normal, or Very Wet hydrologic conditions. The January through April streamflow requirement is predetermined to be 11.5 cubic feet per second (cfs), calculated from the average of January through April's median natural flow requirement at the Gorge. The median natural flow requirement is two-thirds the simulated natural flow at the Gorge based on the period of record 1931 through 1996.

ESTABLISHMENT OF A HYDROLOGIC INDEX

The hydrologic index combines October through April natural streamflow at Murrieta, natural streamflow at Vail Lake, and natural streamflow from Pauba and Wolf Valleys. Natural flow at Murrieta is calculated using the rainfall/run-off relationship between rainfall at Wildomar and the HSPF natural flow at Murrieta, developed in Technical Memorandum 1.0 (January 20, 2000). Natural flow at Vail Lake is calculated using the run-off correlation between Aguanga streamflow and Inflow to Vail Lake during the period water years 1958 to 1996, also developed in Technical Memorandum 1.0 (January 20, 2000). The natural flow contribution from Pauba and Wolf Valleys is calculated to be 50% of the natural run-off into Vail Lake.

Natural streamflow at Murrieta is calculated by the rainfall/runoff relationship developed between monthly rainfall at Wildomar and monthly natural streamflow determined from the HSPF model. Equation 1 provides the polynomial equation that describes this relationship, where X is the monthly rainfall in inches and Y is the monthly natural streamflow at Murrieta in cubic feet per second (cfs):

$$Y = 9.068 - 34.798 * X + 11.339 * X^2. \quad (X \geq 2.79) \quad (1)$$
$$Y = 0 \quad (X < 2.79)$$

Runoff at Vail Lake is calculated by the runoff/runoff relationship developed between runoff at Aguanga and inflow to Vail Lake. Equation 2 provides the linear equation that describes this relationship, where X is October through April natural streamflow at Aguanga (Acre-Feet) and Y is October through April natural streamflow at Vail Lake (Acre-Feet):

$$Y = 1.380 * X \quad \text{(Acre-Feet)}. \quad (2)$$

Contribution from the Pauba and Wolf valleys was estimated to be 50% of the natural inflow to Vail Lake. Run-off relationships between Aguanga, Murrieta, Pechanga Creek, and the Gorge, as well as sensitivity analysis during development of the Hydrologic Index, were used to determine the proportion of contribution from these two valleys..

Figure C-1 provides the frequency distribution curves of the combined total October through April natural streamflow at Murrieta, natural streamflow at Vail Lake, and natural streamflow contribution from Pauba and Wolf Valleys. The frequency distribution curve was divided into four parts established by the 24th, 50th, and 85th percentile breaks (Exhibit B and Technical Memorandum 3.0, February 25, 2000). Using these breakpoints, the division between Critically Dry, Below Normal, Above Normal, and Very Wet hydrologic conditions was established. The corresponding breaks between hydrologic conditions are 3,230 acre-feet, 14,510 acre-feet, and 47,810 acre-feet, respectively. Review of 66 years of historical data indicates that ten years would have been classified as Critically Dry, 23 years as Below Normal, 17 years as Above Normal, and 16 years as Very Wet.

The hydrologic index was compared to actual water years for the 66 year period from 1931 to 1996. Of the 66 years that were compared, the hydrologic index mismatched nineteen years; overestimating nine years while underestimating the hydrologic conditions during the other ten years (Table C-1, Attached). The antecedent conditions prior to the Below Normal and Above Normal "misses" were reviewed in order to correct errors. If the hydrologic condition was determined to be Below Normal and the prior year was determined to be Above Normal or Very Wet, 2,200 AF was added to the hydrologic condition. Similarly, if the hydrologic condition was determined to be Above Normal and the previous year was classified as Critically Dry, 10,000 AF was subtracted from the hydrologic condition. These adjustment values were developed from an iterative process of refining the Hydrologic Index by minimizing the number of mismatches. The algorithm used to adjust for antecedent conditions prior to Above Normal

and Below Normal years was applied to all values in column (7). Hydrologic conditions that were incorrectly classified as Very Wet or Critically dry were not adjusted.

The results of adjusting for antecedent conditions during Above Normal and Below Normal years decreases the number of misses to thirteen. Of these thirteen years, seven years are overestimated while six years are underestimated. Closer inspection of the data shows that the hydrologic index tends to overestimate hydrologic conditions during the first half of the data set and underestimate hydrologic conditions during the later half of the record. For example, five of the seven years that are overestimated occur when calculated inflow to Vail Lake or streamflow at Butterfield Canyon were used to estimate natural flow at Vail Lake. The data set used in the regression analysis used to convert streamflow at Aguanga to natural flow at Vail Lake began in 1958.

IMPLEMENTATION OF THE HYDROLOGIC INDEX

The hydrologic index used to estimate the required streamflow at the gorge is based on natural streamflow at Murrieta and Vail Lake. On May 1st of each year the rainfall at Wildomar is used to estimate natural flow at Murrieta and the streamflow at Aguanga is used to estimate natural flow at Vail Lake. A simple spreadsheet, that would adjust for antecedent conditions, may be used to calculate the hydrologic index based on these input parameters. Once the hydrologic condition is determined, the table in Section 5 of the Agreement is used to determine the required flows at the Gorge.

Figure C-2 provides a schematic diagram of the steps to be followed to determine the hydrologic condition that would prescribe the current year's summer time flows and the following year's winter flow requirement. The following outline provides the steps necessary to implement the Agreement. **[Both Figure C-2 and the following outline do not address credits for groundwater banking to Camp Pendleton]**

First Year of Agreement:

F-1. Provide 11.5 cfs at the Gorge from January 1 to April 30
F-2. Determine Hydrologic Condition on May 1
   a. Convert monthly precipitation at Wildomar to monthly natural flow at Murrieta using equation (1) above.
   b. Sum October through April natural flow at Murrieta.
   c. Sum October through April streamflow at Aguanga.
   d. Convert streamflow at Aguanga to natural flow at Vail lake using equation (2) above.
   e. Add 50% of Natural Flow at Vail Lake for Pauba and Wolf Valleys' contribution.
   f. Add (b) + (d) + (e) and calculate hydrologic condition Using Figure C-1.

g. Correct for antecedent condition:
    i. If hydrologic condition is classified as Above Normal and previous year was Critically Dry, subtract 10,000 from (f).
    ii. If hydrologic condition is classified as Below Normal and previous year was Above Normal or Very Wet, add 2,200 to (f).

h. Redetermine Hydrologic Condition Using corrected value and Figure C-1.

F-3. Determine Flow Requirements

a. Based on the Hydrologic Condition determined in F-2(h), specify May through December required flows at the Gorge using the table in Section 5 of the Agreement.

b. If Hydrologic Condition is "Below Normal" or "Critically Dry", determine the District's Carry-Over Credit to be applied the during the following winter.

c. If Hydrologic Condition is "Above Normal" or "Very Wet", no Carry-Over Credit is to be applied during the following winter.

Subsequent Years of the Agreement:

S-1. Provide 11.5 cfs less Carry-Over Credit, if available, from January 1 to April 30

S-2. Determine Hydrologic Condition on May 1

a. Follow F-2(a) through (h).

S-3. Determine Flow Requirements

a. Based on the Hydrologic Condition determined in S-2(a), specify May through December required flows at the Gorge using the table in Section 5 of the Agreement.

b. If Hydrologic Condition is "Below Normal" or "Critically Dry", determine the District's Carry-Over Credit to be applied during the following winter. Add to existing Carry-Over Credit that has not been applied.

c. If Hydrologic Condition is "Above Normal" or "Very Wet", apply any unused Carry-Over Credit to the following Winter.

In order to illustrate the procedure for determining and meeting flow requirements at the Gorge, actual rainfall and streamflow data from 1992 and 1993 were chosen. The example below would represent the implementation of the hydrologic determination and flow requirements during the first and second years of the Agreement. Although not shown below, if the Agreement were in place in 1991, the Carry-Over Credit to 1992 would have been 227 AF, reducing the winter flow requirement from 11.5 cfs to 10.5 cfs.

F-1. Provide 11.5 cfs at the Gorge from January 1, 1992 to April 30, 1992

F-2. Determine Hydrologic Condition on May 1

a. October 1991 through April 1992 rainfall at Wildomar:
   10/91 precip = 0.18 inches ≡ 0 AF streamflow
   11/91 precip = 0.04 inches ≡ 0 AF streamflow
   12/91 precip = 1.79 inches ≡ 0 AF streamflow
   01/92 precip = 2.71 inches ≡ 0 AF streamflow
   02/92 precip = 7.06 inches ≡ 20,204 AF streamflow
   03/92 precip = 4.34 inches ≡ 4,404 AF streamflow
   04/92 precip = 0.26 inches ≡ 0 AF streamflow

b. October 1991 through April 1992 natural streamflow at Murrieta = 24,608 AF.

c. October 1991 through April 1992 streamflow at Aguanga = 2,886 AF.

d. Natural flow at Vail Lake = 3,982 AF.

e. Add an additional 1,991 AF for contribution from Pauba and Wolf Valleys.

f. Hydrologic Condition is "Above Normal" based on 30,580 AF of Natural Flow (Figure C-1) at approximately 30% Exceedance.

g. Previous year classified as "Very Wet" so,
   i. No correction necessary

h. Hydrologic Condition remains "Above Normal".

F-3. Determine Flow Requirements

a. Non-Winter Flow Requirements:

May =	11.5 cfs
June =	9.4 cfs
July =	7.8 cfs
August =	7.6 cfs
September =	7.4 cfs
October =	7.7 cfs
November =	8.8 cfs
December =	10.4 cfs

b./c. 0 AF Carry-Over Credit since Hydrologic Condition was "Above Normal".

S-1. Provide 11.5 cfs - 0 Carry-Over Credit from January 1, 1993 to April 30, 1993.

S-2. Determine Hydrologic Condition on May 1

a. October 1992 through April 1993 rainfall at Wildomar:
10/92 precip = 0.66 inches ≡ 0 AF streamflow
11/92 precip = 0.00 inches ≡ 0 AF streamflow
12/92 precip = 4.46 inches ≡ 4,884 AF streamflow
01/93 precip = 15.39 inches ≡ 132,767 AF streamflow
02/93 precip = 9.41 inches ≡ 42,161 AF streamflow
03/93 precip = 1.20 inches ≡ 0 AF streamflow
04/93 precip = 0.00 inches ≡ 0 AF streamflow

b. October 1992 through April 1993 natural streamflow at Murrieta = 179,812 AF.

c. October 1992 through April 1993 streamflow at Aguanga = 37,668 AF.

d. Natural flow at Vail Lake = 51,968 AF.

e. Add an additional 25,984 AF for contribution from Pauba and Wolf Valleys.

f. Hydrologic Condition is "Very Wet" based on 257,764 AF of Natural Flow (Figure C-1) at approximately 1% Exceedance.

g. Previous year classified as "Above Normal" and existing year classified as "Very Wet", so,
i. No correction necessary

h. Hydrologic Condition remains "Very Wet".

S-3. Determine Flow Requirements

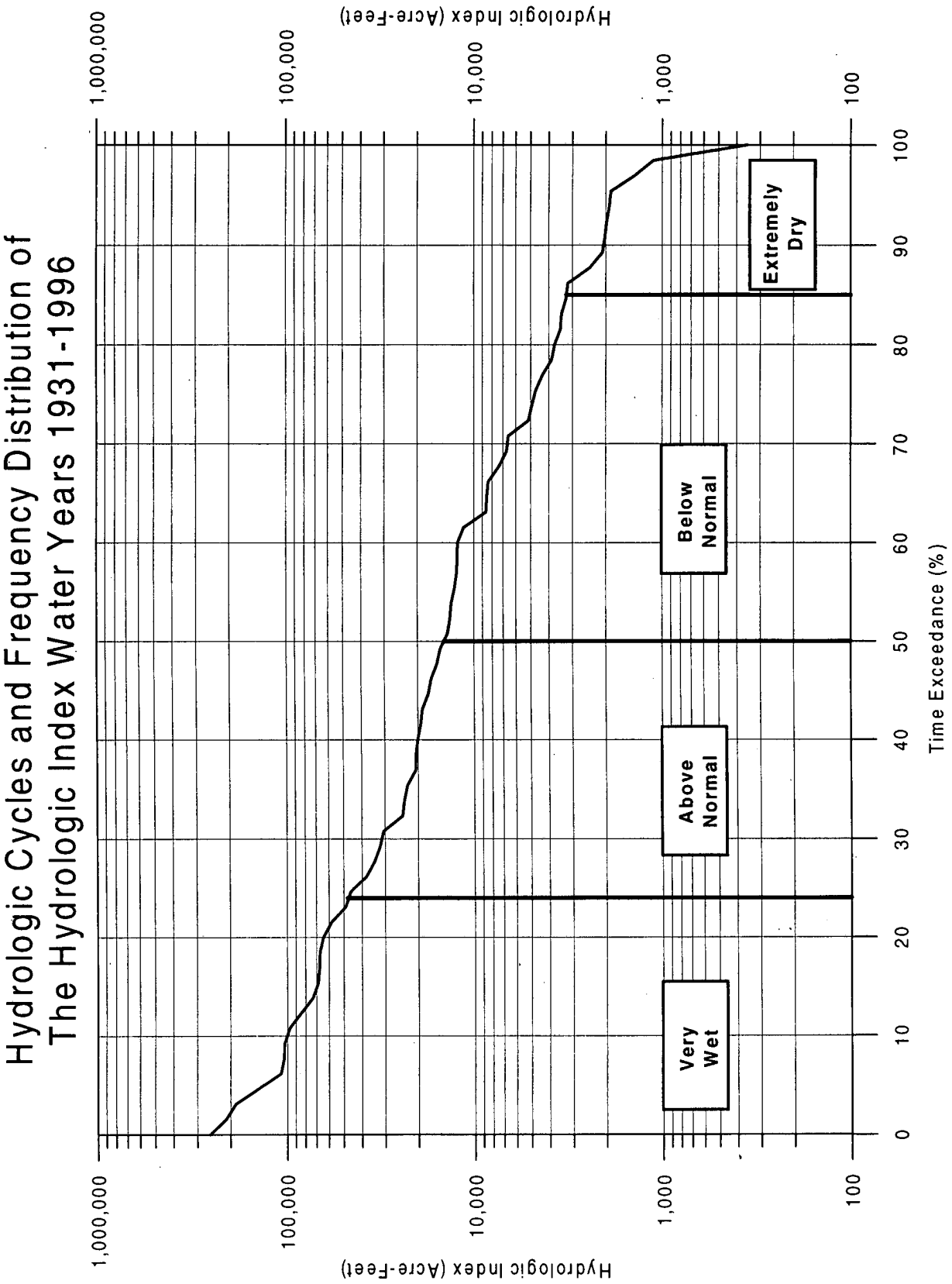
a. Non-Winter Flow Requirements:

May = 11.5 cfs
June = 11.5 cfs
July = 9.7 cfs
August = 9.2 cfs
September = 9.4 cfs
October = 10.1 cfs
November = 11.5 cfs
December = 11.5 cfs.

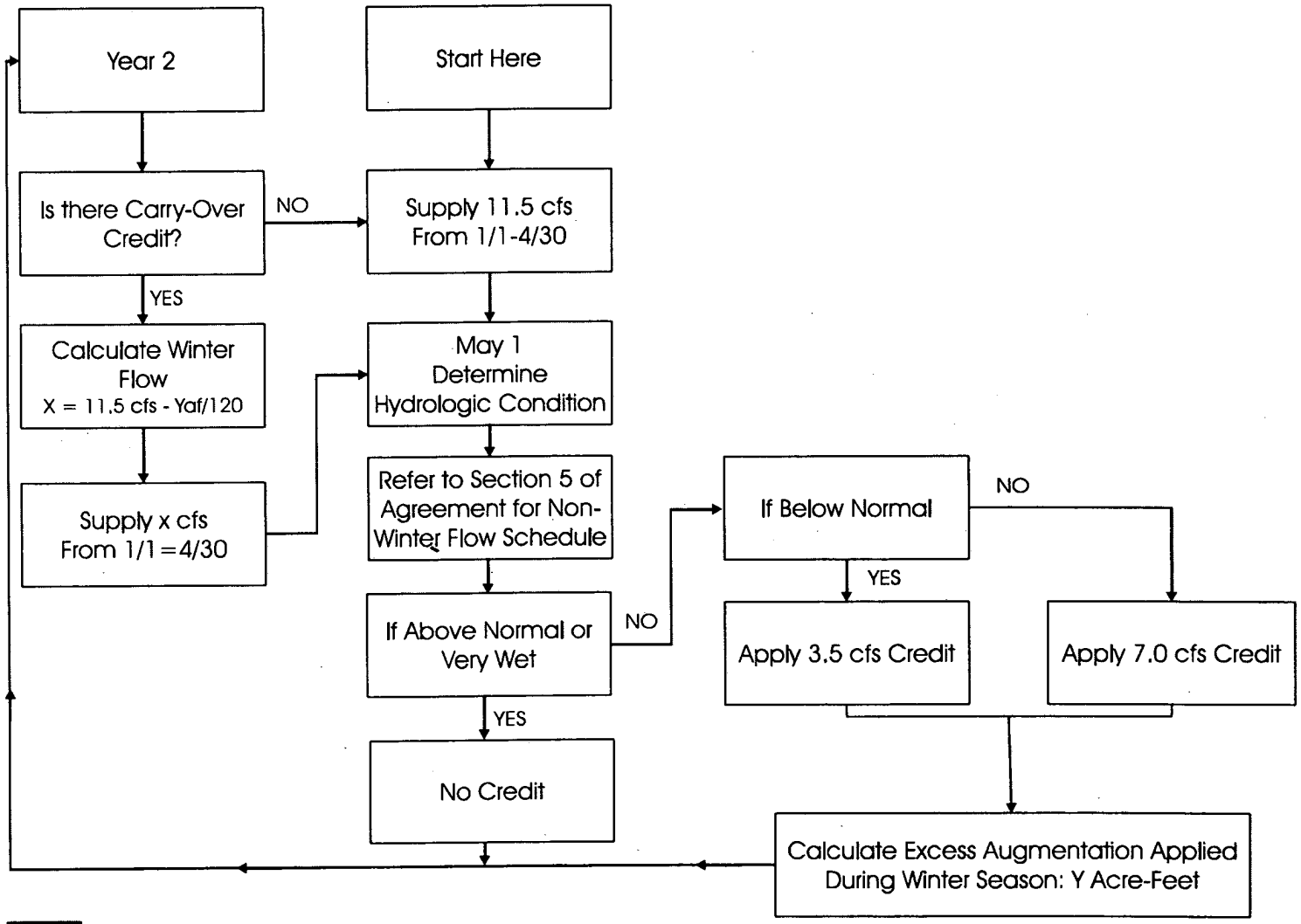
b./c. 0 AF Carry-Over Credit since Hydrologic Condition was "Very Wet".

As mentioned above, if the Agreement had been in place in 1991 there would have been 227 AF of Carry-Over Credit from 1991 to 1992, reducing the flow requirement at the Gorge from 11.5 to 10.5. Since 1992 was an "Above Normal" year, only 161 AF of the 227 AF would have been applied as credit, leaving 66 AF to be applied in 1993. The 66 AF applied to 1993 would reduce the winter time flow requirement 0.3 cfs from 11.5 cfs to 11.2 cfs. **[The credit to Camp Pendleton for foregoing higher minimum flows during "Above Normal" and "Very Wet" years is not addressed in this example.]**

Figure C-1


Hydrologic Cycles and Frequency Distribution of
The Hydrologic Index Water Years 1931-1996
Hydrologic Index (Acre-Feet)
1,000,000
100,000
10,000
1,000
100
Time Exceedance (%)
0
10
20
30
40
50
60
70
80
90
100
Very Wet
Above Normal
Below Normal
Extremely Dry

Flow Diagram of Settlement Agreement Minimum Flows



STETSON ENGINEERS INC.

Figure C-2

TABLE C-1

CALCULATION OF THE HYDROLOGIC INDEX
SANTA MARGARITA RIVER BASIN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)
	Classification	Aguanga	Calculated	Wildomar	Calculated			Water Year		
	based on	Streamflow	Vail Inflow	Precipitation	Murrieta Flow	Hydrologic	Water Year	Classification		Over/Under-
Water	Majority	Oct-Apr Sum	Oct-Apr Sum	Oct-Apr Sum	Oct-Apr Sum	Index	Classification	Corrected for		Estimate
Year	WY Class	(AF)	(AF)	(in)	(AF)	(AF)		Anteceedent	Flag	
1931	Below Normal		1,512	9.87	2,066	4,334	Below Normal	Below Normal	0	
1932	Above Normal		14,778	18.30	44,975	67,143	Very Wet	Very Wet	1	Overestimate
1933	Below Normal		3,311	9.43	7,290	12,256	Below Normal	Below Normal	0	
1934	Extremely Dry		1,391	7.52	1,395	3,482	Below Normal	Below Normal	1	Overestimate
1935	Below Normal		3,365	16.38	2,325	7,372	Below Normal	Below Normal	0	
1936	Below Normal		3,445	10.64	15,354	20,522	Above Normal	Above Normal	1	Overestimate
1937	Very Wet		34,392	25.21	52,065	103,653	Very Wet	Very Wet	0	
1938	Very Wet		29,210	20.19	60,418	104,233	Very Wet	Very Wet	0	
1939	Above Normal		6,713	14.53	35,925	45,994	Above Normal	Above Normal	0	
1940	Above Normal		5,577	11.28	5,495	13,860	Below Normal	Above Normal	0	
1941	Very Wet		20,888	27.07	66,156	97,489	Very Wet	Very Wet	0	
1942	Above Normal		8,485	9.86	0	12,728	Below Normal	Above Normal	0	
1943	Very Wet		12,412	19.26	66,013	84,632	Very Wet	Very Wet	0	
1944	Above Normal		6,588	13.52	24,425	34,308	Above Normal	Above Normal	0	
1945	Above Normal		5,882	12.91	14,864	23,687	Above Normal	Above Normal	0	
1946	Above Normal		4,004	9.92	6,377	12,382	Below Normal	Above Normal	0	
1947	Below Normal		2,432	8.13	8,594	12,242	Below Normal	Below Normal	0	
1948	Below Normal		1,721	7.71	850	3,432	Below Normal	Below Normal	0	
1949	Below Normal		2,443	8.02	1,475	5,138	Below Normal	Below Normal	0	
1950	Extremely Dry		1,256	6.34	0	1,884	Extremely Dry	Extremely Dry	0	
1951	Extremely Dry		942	4.27	0	1,414	Extremely Dry	Extremely Dry	0	
1952	Very Wet		11,007	19.52	32,419	48,929	Very Wet	Very Wet	0	
1953	Below Normal		1,407	8.84	1,772	3,882	Below Normal	Below Normal	0	
1954	Above Normal		4,580	12.12	13,196	20,065	Above Normal	Above Normal	0	
1955	Below Normal		1,064	9.22	3,328	4,924	Below Normal	Below Normal	0	
1956	Extremely Dry		1,074	6.79	2,126	3,738	Below Normal	Below Normal	1	Overestimate
1957	Extremely Dry		740	9.61	16,526	17,635	Above Normal	Above Normal	1	Overestimate

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)
	Classification	Aguanga	Calculated	Wildomar	Calculated			Water Year		
	based on	Streamflow	Vail Inflow	Precipitation	Murrieta Flow	Hydrologic	Water Year	Classification		Over/Under-
Water	Majority	Oct-Apr Sum	Oct-Apr Sum	Oct-Apr Sum	Oct-Apr Sum	Index	Classification	Corrected for		Estimate
Year	WY Class	(AF)	(AF)	(in)	(AF)	(AF)		Anteceedent	Flag	
1958	Very Wet	8,669	11,961	26.00	49,581	67,522	Very Wet	Very Wet	0	
1959	Below Normal	716	987	5.24	1,693	3,174	Extremely Dry	Extremely Dry	1	Underestimate
1960	Extremely Dry	809	1,116	9.84	414	2,087	Extremely Dry	Extremely Dry	0	
1961	Extremely Dry	171	235	5.09	0	353	Extremely Dry	Extremely Dry	0	
1962	Below Normal	1,438	1,983	15.59	19,873	22,848	Above Normal	Below Normal	0	
1963	Below Normal	181	249	8.37	4,326	4,700	Below Normal	Below Normal	0	
1964	Extremely Dry	541	746	8.13	0	1,119	Extremely Dry	Extremely Dry	0	
1965	Below Normal	1,058	1,460	12.35	22,013	24,203	Above Normal	Below Normal	0	
1966	Above Normal	4,673	6,447	19.19	63,527	73,197	Very Wet	Very Wet	1	Overestimate
1967	Above Normal	7,082	9,770	15.55	17,364	32,020	Above Normal	Above Normal	0	
1968	Below Normal	1,018	1,404	11.79	4,602	6,708	Below Normal	Below Normal	0	
1969	Very Wet	17,107	23,601	29.40	176,676	212,077	Very Wet	Very Wet	0	
1970	Above Normal	1,183	1,632	11.42	16,878	19,325	Above Normal	Above Normal	0	
1971	Below Normal	896	1,236	7.67	580	2,435	Extremely Dry	Extremely Dry	1	Underestimate
1972	Below Normal	853	1,177	6.19	4,802	6,568	Below Normal	Below Normal	0	
1973	Above Normal	3,107	4,287	15.37	9,426	15,856	Above Normal	Above Normal	0	
1974	Below Normal	1,234	1,702	11.21	18,028	20,582	Above Normal	Above Normal	1	Overestimate
1975	Below Normal	935	1,290	12.84	6,482	8,417	Below Normal	Below Normal	0	
1976	Below Normal	964	1,330	10.39	11,484	13,478	Below Normal	Below Normal	0	
1977	Extremely Dry	510	704	7.00	968	2,024	Extremely Dry	Extremely Dry	0	
1978	Very Wet	11,723	16,174	31.24	118,004	142,264	Very Wet	Very Wet	0	
1979	Very Wet	8,404	11,594	21.46	51,097	68,488	Very Wet	Very Wet	0	
1980	Very Wet	26,114	36,027	27.82	134,267	188,308	Very Wet	Very Wet	0	
1981	Above Normal	4,198	5,791	7.32	2,655	11,342	Below Normal	Below Normal	1	Underestimate
1982	Above Normal	6,313	8,709	14.83	24,945	38,009	Above Normal	Above Normal	0	
1983	Very Wet	11,271	15,549	24.20	34,932	58,256	Very Wet	Very Wet	0	
1984	Above Normal	4,173	5,757	8.17	0	8,636	Below Normal	Below Normal	1	Underestimate

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)
	Classification	Aguanga	Calculated	Wildomar	Calculated			Water Year		
	based on	Streamflow	Vail Inflow	Precipitation	Murrieta Flow	Hydrologic	Water Year	Classification		Over/Under-
Water	Majority	Oct-Apr Sum	Oct-Apr Sum	Oct-Apr Sum	Oct-Apr Sum	Index	Classification	Corrected for		Estimate
Year	WY Class	(AF)	(AF)	(in)	(AF)	(AF)		Anteceedent	Flag	
1985	Above Normal	3,590	4,953	9.54	11,543	18,972	Above Normal	Above Normal	0	
1986	Above Normal	5,174	7,139	11.64	2,547	13,255	Below Normal	Above Normal	0	
1987	Below Normal	1,567	2,162	7.75	0	3,243	Below Normal	Below Normal	0	
1988	Below Normal	1,831	2,526	17.33	4,756	8,545	Below Normal	Below Normal	0	
1989	Below Normal	934	1,289	6.65	51	1,984	Extremely Dry	Extremely Dry	1	Underestimate
1990	Below Normal	927	1,279	5.45	0	1,918	Extremely Dry	Extremely Dry	1	Underestimate
1991	Very Wet	8,775	12,106	14.39	46,117	64,277	Very Wet	Very Wet	0	
1992	Above Normal	2,886	3,982	16.38	24,608	30,580	Above Normal	Above Normal	0	
1993	Very Wet	37,668	51,968	31.12	179,812	257,763	Very Wet	Very Wet	0	
1994	Above Normal	4,574	6,310	10.97	7,533	16,999	Above Normal	Above Normal	0	
1995	Very Wet	14,874	20,521	22.55	77,346	108,127	Very Wet	Very Wet	0	
1996	Above Normal	3,424	4,724	8.73	8,081	15,167	Above Normal	Above Normal	0	
									13	

1) Water year based on October 1 to September 30.

2) Water Year classification based on majority of HSPF, Run 93, and natural flow at Vail Lake.

3) Total October through April streamflow at Aguanga

4) Calculated Vail Inflow based on streamflow at Aguanga

5) Total October through April Precipiation at Wildomar

6) Calculated Streamflow at Murrieta based on Wildomar Precipitation

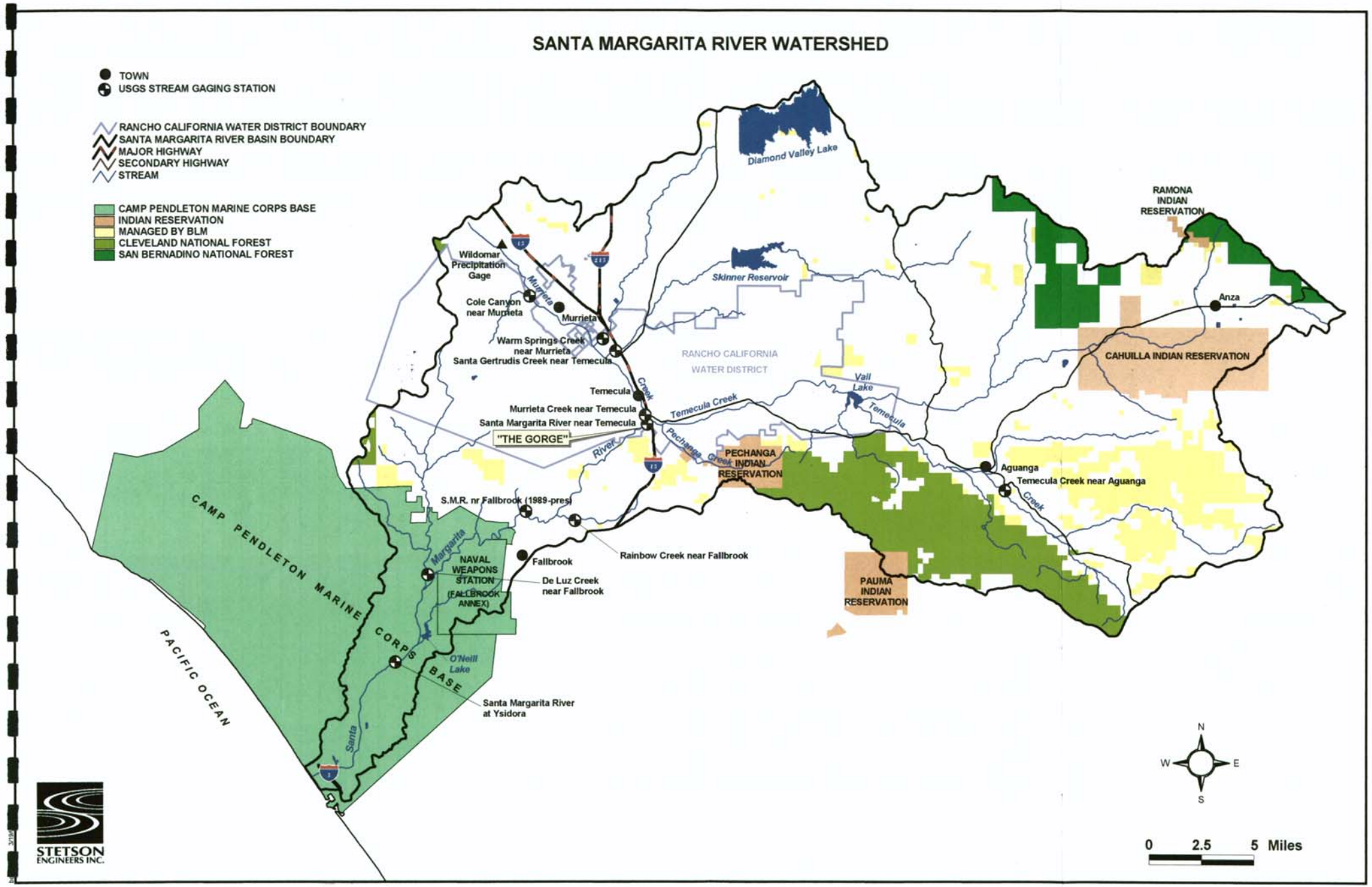
7) Hydrologic Index - 150% Total Calculated Vail Inflow and Calculated Murrieta Flow (4) + (6) +.5*(4)

8) Water Year Classification based on 85%, 50% and 24% of column (7)

9) Water Year Classification corrected for Antecedent Conditions

10) Overestimate/Underestimate of required streamflow at the Gorge

Overestimate	7
Underestimate	6


SANTA MARGARITA RIVER WATERSHED
TOWN
USGS STREAM GAGING STATION
RANCHO CALIFORNIA WATER DISTRICT BOUNDARY
SANTA MARGARITA RIVER BASIN BOUNDARY
MAJOR HIGHWAY
SECONDARY HIGHWAY
STREAM
CAMP PENDLETON MARINE CORPS BASE
INDIAN RESERVATION
MANAGED BY BLM
CLEVELAND NATIONAL FOREST
SAN BERNADINO NATIONAL FOREST
Diamond Valley Lake
Skinner Reservoir
RAMONA INDIAN RESERVATION
Anza
CAHUILLA INDIAN RESERVATION
Wildomar Precipitation Gage
Cole Canyon near Murrieta
Murrieta
Warm Springs Creek near Murrieta
Santa Gertrudis Creek near Temecula
RANCHO CALIFORNIA WATER DISTRICT
Vail Lake
Temecula
Murrieta Creek near Temecula
Santa Margarita River near Temecula
"THE GORGE"
Temecula Creek
PECHANGA INDIAN RESERVATION
Aguanga
Temecula Creek near Aguanga
S.M.R. nr Fallbrook (1989-pres)
Rainbow Creek near Fallbrook
Fallbrook
De Luz Creek near Fallbrook
NAVAL WEAPONS STATION (FALLBROOK ANNEX)
PAUMA INDIAN RESERVATION
CAMP PENDLETON MARINE CORPS BASE
PACIFIC OCEAN
O'Neill Lake
Santa Margarita River at Ysidora
N
W
E
S
0 2.5 5 Miles
STETSON ENGINEERS INC.