

# Big Bear Watermaster

## Thirty-Third Annual Report

For Calendar Year 2009



Photo showing construction of new bridge that will cross Bear Creek just downstream of Bear Valley Dam..

Big Bear Municipal Water District vs. North Fork Water District, et al  
Case No. 165493 - County of San Bernardino



BEAR VALLEY MUTUAL WATER COMPANY



### **Watermaster Members:**

Donald E. Evenson  
Michael L. Huffstutler  
R. Robert Neufeld

### **Mailing Address:**

P.O. Box 1839  
Redlands, CA 92373  
909-793-2503

# BIG BEAR WATERMASTER

FOR

BIG BEAR MUNICIPAL WATER DISTRICT VS. NORTH FORK WATER CO. ET AL  
CASE NO. 165493--COUNTY OF SAN BERNARDINO

**WATERMASTER MEMBERS:**

**DONALD E. EVENSON**

**R. ROBERT NEUFELD**

**MICHAEL L. HUFFSTUTLER**

**MAILING ADDRESS**

**P. O. BOX 1839**

**REDLANDS, CA 92373-0581**

**(909) 793-2503**

March 25, 2010

To: Clerk of the Superior Court of San Bernardino County and All Parties

Subject: Watermaster Report for Calendar Year 2009

Gentlemen:

We have the honor of submitting the Thirty-Third Annual Report of the Big Bear Watermaster for Calendar Year 2009.

Paragraph Twenty (20) of the Judgment requires that the Watermaster Report be submitted to the Court and the Parties before April 1 of each year on all significant Watermaster activities and provide an accounting of water deliveries for the preceding calendar year as set forth in Section VI, Physical Solution, of the Judgment.

We and each of us hereby certify that this is a true and correct report of the Watermaster work performed by us and under our supervision during 2009 pursuant to the requirements of the Judgment.

Respectfully submitted,

By: Donald E. Evenson  
Donald E. Evenson

By: R. Robert Neufeld  
R. Robert Neufeld

By: Michael L. Huffstutler  
Michael L. Huffstutler

# **THIRTY-THIRD ANNUAL REPORT BIG BEAR WATERMASTER CALENDAR YEAR 2009**

## **TABLE OF CONTENTS**

	<u>Page</u>
I. INTRODUCTION	1
II. SUMMARY	2-3
III. BASIC DATA	4-34
IV. DETERMINATIONS AND ACCOUNTS	35-44
V. OTHER WATERMASTER ACTIVITIES	45-61

### **APPENDICES**

Appendix A - Minutes of Watermaster Meetings in 2009

Appendix B - Accounts for Calendar Year 2009

# **THIRTY-THIRD ANNUAL REPORT BIG BEAR WATERMASTER CALENDAR YEAR 2009**

## **LIST OF TABLES**

		<u>Page</u>
TABLE III-1	Monthly Precipitation for Two Stations in Big Bear Area	7
TABLE III-2	Thirty-Three Years of Precipitation for Two Stations in the Big Bear Area	8
TABLE III-3	Big Bear Lake Inflows	10
TABLE III-4	Estimates of Monthly Dam Leakage	16
TABLE III-5	Monthly Discharges from the Outlet Works of Bear Valley Dam	18
TABLE III-6	Comparison of Flows at Station B with Estimated Leakage, Flows from Outlet Works and Spillway Flows	19
TABLE III-7	Net Wastewater Exports	22
TABLE III-8	Summary of Diverted Flow at Mouth of Santa Ana River Canyon	24
TABLE III-9	Water Deliveries to Mutual by Big Bear Municipal Water District	30
TABLE III-10	Summary of Water Deliveries by Mutual	32
TABLE III-11	Equivalent Water Diversions by Mutual	33
TABLE IV-1	Effect of Wastewater Export Credits on Mutual's Lake Account	40

# **THIRTY-THIRD ANNUAL REPORT BIG BEAR WATERMASTER CALENDAR YEAR 2009**

## **LIST OF FIGURES**

		<u>Following Page</u>
FIGURE 1	Actual Lake Contents and Mutual's Lake Account, 1977 through 2009	2
		<u>Page</u>
FIGURE 2	Water Balance for 2009 Actual Lake Operations	36
FIGURE 3	Water Balance for 2009 Mutual's Lake Operation	37
FIGURE 4	Water Balance for 2009 Big Bear MWD's Lake Operation	41

# **I. INTRODUCTION**

The Big Bear Watermaster presents the Thirty-Third Annual Report of its activities for Calendar Year 2009. The Watermaster's activities ensure that the rights of all parties subject to the Judgment rendered in Case No. 165493 are protected. The Watermaster generally oversees watershed conditions that may affect the Judgment and attempts to improve the conditions to the benefit of all parties.

This report describes the 2009 activities of the Watermaster including the status of accounts and various tabulations as required by the Judgment.

In 2009, the Big Bear Watermaster Committee was composed of Donald E. Evenson, President, representing Big Bear Municipal Water District; Michael L. Huffstutler, representing Bear Valley Mutual Water Company; and R. Robert Neufeld, Secretary, representing San Bernardino Valley Water Conservation District.

The Watermaster Committee met three times during 2009. These meetings were held on the following dates:

January 3, 2009

May 5, 2009

August 24, 2009

Appendix A contains the minutes of these meetings. Minutes of the meetings are also on file at the office of each of the representatives.

## II. SUMMARY

### 2009 WATERMASTER ACCOUNTS

2009 was a below average hydrologic year. Annual precipitation at the two gages in the Big Bear Lake watershed averaged 21.3 inches, which is 86 percent of the 24.8 inches of average annual rainfall since 1977. Precipitation at Bear Valley Dam was 30.70 inches, which is 87 percent of the 100-year (1910-2009) average of 35.46 inches. Consequently, inflow to Big Bear Lake in 2009 was below average. The 2009 calculated lake inflow was 9,212 acre-feet, which is 57 percent of the average inflow since 1977. The average inflow for the 33 years since the Judgment was rendered is 16,204 acre-feet per year.

Actual lake levels fell 1.19 feet in 2009 and ended the year 7.49 feet below the top of the dam. Accordingly, lake contents decreased by 3,174 acre-feet during the year. On December 31, 2009, the lake contained 52,431 acre-feet of water. The lake level is 72.33 feet and the lake holds 73,320 acre-feet when it is full. **Figure 1** shows the history of the actual lake contents since the Judgment was rendered in 1977.

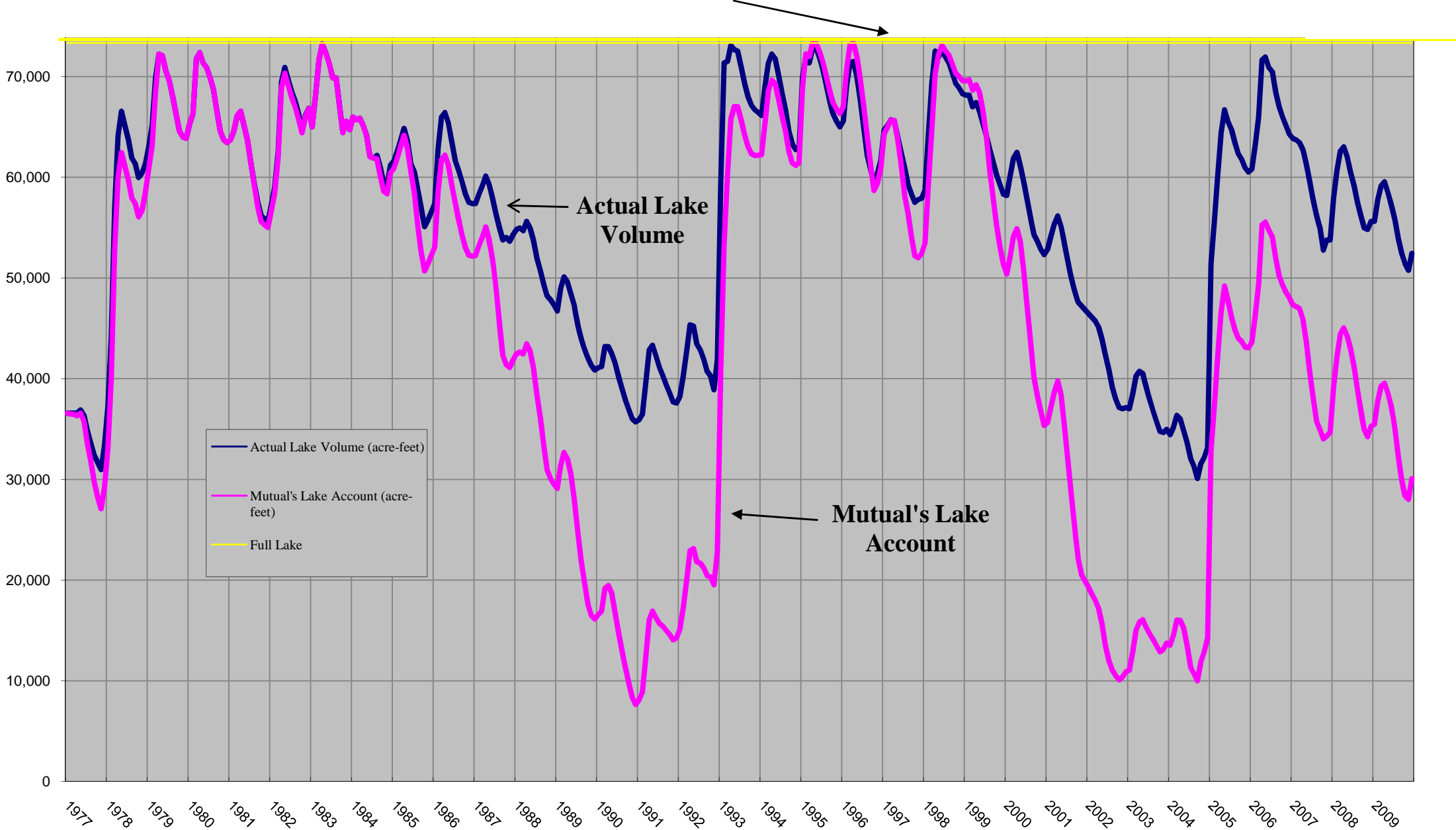
Mutual's lake account held 30,034 acre-feet at the end of 2009. Their lake account decreased by 5,217 acre-feet during the year. Figure 1 also shows the history of Mutual's lake account since 1977. Under a "Mutual Operation", lake releases would be made to meet Mutual's water demands and their lake account is credited with the net wastewater exported from the Big Bear Lake watershed. Under these conditions, the lake level would have ended the year 17.28 feet below the top of the dam or 9.79 feet lower than the actual year-end lake level. If Mutual had not been credited with the net wastewater exports, their lake account balance would have been 23,496 acre-feet and the lake would have been 20.78 feet below the top of dam, or 13.29 feet lower than it actually was.

In 2009, Mutual received 6,500 acre-feet of water from Big Bear MWD. Big Bear MWD has the option to provide in-lieu supplies or to release water from the lake. In 2009, Mutual received 5,990 acre-feet of in-lieu water. Also, Mutual was able to use 510 acre-feet of water from Big Bear Lake for fish protection purposes as required under SWRCB Order No. 95-4.

At the beginning of the year, Big Bear MWD had 20,354 acre-feet in their lake account. By the end of the year, their lake account had increased by 2,043 acre-feet to 22,397 acre-feet. Big Bear MWD's lake account is the difference between the actual lake contents and Mutual's lake account as shown on Figure 1.

Lake Full = 73,320 AF

Lake  
Content  
(acre-feet)



Actual Lake Volume (acre-feet)  
Mutual's Lake Account (acre-feet)  
Full Lake

Actual Lake  
Volume

Mutual's Lake  
Account



The Basin Compensation Account balance increased by 44 acre-feet in 2009. The Basin Compensation Account began the year with a balance of 24,157 acre-feet and ended the year with a balance of 24,201 acre-feet. The increase resulted from higher basin additions from lake releases made to meet the requirements of SWRCB Order 95-4 under a Big Bear MWD lake operation as compared to a Mutual Operation.

## **OTHER WATERMASTER ACTIVITIES**

The Watermaster has the responsibility to undertake studies and investigations, collect and maintain data and records, and monitor related activities necessary to implement the physical solution contained in the Judgment. In 2009, the Watermaster was involved in monitoring and discussing three issues. These issues are:

- Impacts of Seven Oaks Dam,
- Issues related to Wild and Scenic Rivers System.
- Protecting Big Bear Lake from Quagga Mussels

These issues are discussed in Chapter V.

### III. BASIC DATA

#### BIG BEAR LAKE

##### Summary

The Watermaster conducts a water balance of Big Bear Lake for each month. This water balance is based on measurements of lake levels, releases, leakages and air temperature, as well as calculated values of spills, evaporation and inflows. For 2009, the overall water balance for the lake was:

Initial Storage (1-01-09)	55,605 acre-feet
Inflows	9,212 acre-feet
Evaporation	11,233 acre-feet
Releases for Mutual	-0- acre-feet
Releases & Leakage for SWRCB Order 95-4	740 acre-feet
Spills & Flood Control Releases	-0- acre-feet
Net Snowmaking Withdrawal	414 acre-feet
Ending Storage (12-31-09)	52,431 acre-feet
Change-in-Storage	-3,174 acre-feet

In 2009, the volume of water in Big Bear Lake decreased by 3,174 acre-feet. The following subsections of this chapter describe each of the components in this water balance.

##### Lake Levels and Storage

Water levels in Big Bear Lake are measured continuously based on a reference mark located on the upstream side of the dam. In July 1998, Big Bear MWD completed installation of a continuous lake level recorder. The lake level recorder is a Global Water Model WL300 and is enclosed in a stilling well, which is attached to the upstream face of the dam. Lake level data is continuously transmitted by a remote telemetry unit (RTU) in the control building at the dam. From there, data are transmitted via radio to a central computer in the administrative offices of Big Bear MWD. The automatically recorded values have been used since July 1998. The recorder can only record lake levels when the lake is within 15 feet of the top of the dam (i.e. above a gage height of 57.33 feet). In 2009, the lake was within the top 15 feet for the entire year.

The lake began the year at a gage height of 66.03 feet and ended the year at a gage height of 64.84 feet. Over the year, the lake level dropped 1.19 feet. The lowest recorded lake level was 64.07 feet or 8.26 below the top of the dam, and it occurred on December 6, 2009. The highest recorded lake level was 67.53 feet, which occurred on April 24, 2009. The lake is full at a gage height reading of 72.33 feet (6,743.20 feet above msl) and is empty at a gage height of zero.

The Watermaster uses an established gage height-lake capacity table to estimate the volume of water in the lake from the measured gage heights. At the beginning of the year, the lake contained 55,605 acre-feet of water. At the end of the year, there were 52,431 acre-feet of water in the lake. The lake content decreased by 3,174 acre-feet during 2009. When full, the lake contains 73,320 acre-feet of water.

### **Lake Evaporation**

The Watermaster calculates evaporation from the lake surface using the Blaney Criddle formula to estimate monthly evaporation rates. The 1977 Annual Watermaster report describes the formula as follows:

“The Blaney Criddle empirical formula, utilizing average temperatures and daylight hours, has been used. The constant K for each month was calculated based on float pan empirical data at Long Valley Reservoir in Mono County, California, which is at elevation 6,796 feet, compared to the elevation of Big Bear Lake which is 6,743 feet.”

Monthly lake evaporation is calculated using the estimated evaporation rate and the average surface area of the lake during the month. If a negative value for lake inflow is calculated, the monthly evaporation rate is increased to achieve a zero lake inflow. A negative lake inflow was calculated for one month in 2009. This month was August. Total evaporation from the lake for 2009 was calculated to be 11,233 acre-feet. This amount is equivalent to an annual evaporation rate of 50.4 inches.

## **Precipitation**

Precipitation in the Big Bear Lake watershed varies significantly from Bear Valley Dam to Big Bear City at the east end of the watershed. **Table III-1** shows the monthly precipitation at Bear Valley Dam and the Big Bear City Community Services District for 2009. 2009 precipitation at the two stations was 30.70 and 11.88 inches, respectively. May and September were the driest months with no precipitation. February and December were the wettest months with approximately 80 percent of the annual precipitation.

**Table III-1** also compares the 2009 precipitation at the two stations with their corresponding averages for the thirty-three years since the Judgment was rendered. At the Bear Valley Dam station, precipitation was 86 percent of its thirty-three year average, while at the Big Bear Community Services District station, precipitation was 85 percent of its thirty-three year average. For both stations, 2009 precipitation averaged 86 percent of their thirty-three year combined average.

**Table III-2** shows the annual precipitation for both stations for the thirty-three years since the Judgment was rendered. As shown in Table III-2, 2009 was a below average year for precipitation. For the Bear Valley Dam station, precipitation was 86 percent of the 100-year (1910–2009) average of 35.46 inches.

In the review of this year's precipitation data, the Watermaster Committee became aware of some data collections issues at the Big Bear Lake Fire Department station. As a result, the data from this station has been deleted from the annual report. Big Bear MWD installed a precipitation gage near their office and the Watermaster Committee will review this station in 2010 to determine if it can serve as a replacement for the Big Bear Lake Fire Department station.

## **Lake Inflow**

Inflows to Big Bear Lake are not measured. Consequently, inflows naturally tributary to Big Bear Lake above Bear Valley Dam are calculated for each month using a water balance on the actual operation of the lake. This calculation, which utilizes observed basic data along with the calculated evaporation losses described previously, creates a water balance for each month to determine the amount of natural flow into the lake. The formula used is:

$$\text{Inflow} = \text{Evaporation} + \text{Releases} + \text{Spills} + \text{Leakage} + \\ \text{Net Withdrawals} - \text{Change in Storage}$$

**TABLE III-1**  
**MONTHLY PRECIPITATION FOR TWO STATIONS**  
**IN BIG BEAR AREA**

(inches)  
 Calendar Year 2009  
 Big Bear Watermaster

<b>Month</b>	<b>Bear Valley Dam</b>	<b>Big Bear Community Services District</b>
January	1.75	0.59
February	13.89	5.35
March	0.82	0.44
April	0.38	0.11
May	0.00	0.01
June	0.19	0.04
July	0.19	0.49
August	0.21	0.17
September	0.00	0.02
October	1.11	0.17
November	1.34	1.07
December	<u>10.82</u>	<u>3.42</u>
<b>2009 Totals</b>	<b>30.70</b>	<b>11.88</b>
<b>1977-2009 -33-yr average</b>	<b>35.71</b>	<b>13.90</b>
<b>2009 % of 33-yr average</b>	<b>86 %</b>	<b>85 %</b>

**Average of the 33-year average for both stations = 24.81 inches**

**Average of the 2009 totals for both stations = 21.29 inches**

**2009 average as a percentage of 33-year average = 86 %**

**TABLE III-2**  
**THIRTY-THREE YEARS OF PRECIPITATION FOR TWO STATIONS**  
**IN THE BIG BEAR AREA**

(inches)

Calendar Year 2009 – Big Bear Watermaster

<b>Year</b>	<b>Bear Valley Dam</b>	<b>Big Bear Community Services District</b>
1977	31.95	13.35
1978	68.43	26.09
1979	34.87	15.84
1980	63.00	29.86
1981	16.67	8.42
1982	49.17	26.53
1983	56.97	24.29
1984	20.19	16.66
1985	22.40	14.11
1986	35.16	15.26
1987	27.49	12.52
1988	24.18	8.15
1989	17.32	6.85
1990	22.20	11.02
1991	38.47	19.81
1992	44.03	16.64
1993	73.81	19.45
1994	31.78	12.24
1995	49.00	15.89
1996	41.04	15.47
1997	27.00	12.92
1998	50.40	12.07
1999	13.22	6.06
2000	24.82	5.21
2001	30.62	9.10
2002	15.02	3.82
2003	32.44	12.70
2004	39.50	13.51
2005	54.74	19.56
2006	37.96	9.98
2007	16.11	4.89
2008	37.87	8.58
2009	<u>30.70</u>	<u>11.88</u>
<b>33-Year Average</b>	<b>35.71</b>	<b>13.90</b>
<b>100-Year Average</b>	<b>35.46</b>	<b>N/A</b>

If the calculated monthly inflow is a negative value, it is reset to zero, and the monthly evaporation rate is recalculated to achieve a lake water balance. Negative lake inflows occurred one time in 2009, in August. Inflow in this month was set to zero.

Total annual inflow for 2009 into the lake was calculated to be 9,212 acre-feet. The largest monthly inflow was 2,471 acre-feet, and it occurred in February. The long-term (1939-88) average annual inflow is 14,492 acre-feet. The average annual lake inflow for the years since the Judgment was rendered (1977–2009) is 16,204 acre-feet. The median annual inflow for this same period is 10,569 acre-feet.

**Table III-3** lists the annual lake inflows for the period 1977–2009. This table also ranks the inflows from the lowest (1,717 acre-feet in 2002) to the highest (48,613 acre-feet in 1993). Inflow to the lake for 2009 was well below average and a little below the median inflow for the years since the judgment was rendered in 1977.

### **SWRCB Order No. 95-4**

On February 16, 1995, the State Water Resources Control Board (SWRCB) issued Order No. 95-4. This order directed the Big Bear MWD and Bear Valley Mutual Water Company to release enough water from the lake to maintain a minimum seven-day average flow of 1.2 cfs and a minimum average daily flow of 1.0 cfs in Bear Creek no more than 500 feet downstream of its confluence with West Cub Creek. This location is referred to as Station A. In 1998, Big Bear MWD completed construction of a continuous flow recording device at Station A to measure compliance with SWRCB Order No 95-4.

SWRCB Order No. 95-4 also required sufficient releases to maintain a minimum flow of 0.3 cfs at a location approximately 300 feet downstream from the toe of the dam. This location is referred to as Station B. In 1998, Big Bear MWD also completed construction of a continuous recording device at this location to measure compliance with SWRCB Order No. 95-4.

On December 29, 2004, data transmission from Station A ceased. In January of 2005, major storms hit the Bear Creek watershed with significant snowfall. Consequently, Big Bear MWD staff could not access Station A until May. On their first visit to the site, they found the data transmission facilities destroyed, the stilling basin filled with sediment and the weir plate damaged. The staff estimated the flow in Bear Creek at this time to be in the range of 10 to 15 cfs, well above the 1.20 cfs requirement.

**Table III - 3**  
**Big Bear Lake Inflows**  
**1977 - 2009**  
**(acre-feet / year)**

Year	Lake Inflows (AF/year)	Rank	Plotting Position	Year	Lake Inflow (AF/year)	
1977	7,103	1	2.9%	2002	1,717	Min.
1978	40,743	2	5.9%	2007	2,841	
1979	25,318	3	8.8%	1999	3,774	
1980	42,336	4	11.8%	1988	4,551	
1981	6,529	5	14.7%	1990	4,856	
1982	25,310	6	17.6%	1989	4,967	
1983	35,072	7	20.6%	1981	6,529	
1984	10,569	8	23.5%	2001	6,915	
1985	9,497	9	26.5%	2000	6,930	
1986	13,812	10	29.4%	1977	7,103	
1987	8,005	11	32.4%	1987	8,005	
1988	4,551	12	35.3%	2003	8,295	
1989	4,967	13	38.2%	2004	8,404	
1990	4,856	14	41.2%	1997	8,757	
1991	11,658	15	44.1%	2009	9,212	
1992	15,543	16	47.1%	1985	9,497	
1993	48,613	17	50.0%	1984	10,569	Median
1994	11,015	18	52.9%	1994	11,015	
1995	33,340	19	55.9%	1991	11,658	
1996	13,119	20	58.8%	1996	13,119	
1997	8,757	21	61.8%	1986	13,812	
1998	34,600	22	64.7%	2008	14,182	
1999	3,774	23	67.6%	1992	15,543	
2000	6,930	24	70.6%	2006	17,564	
2001	6,915	25	73.5%	1982	25,310	
2002	1,717	26	76.5%	1979	25,318	
2003	8,295	27	79.4%	1995	33,340	
2004	8,404	28	82.4%	1998	34,600	
2005	39,600	29	85.3%	1983	35,072	
2006	17,564	30	88.2%	2005	39,600	
2007	2,841	31	91.2%	1978	40,743	
2008	14,182	32	94.1%	1980	42,336	
2009	9,212	33	97.1%	1993	48,613	Max.
<b>1977 - 2009</b>		<b>33</b>				
<b>Maximum</b>	<b>48,613</b>					
<b>Average</b>	<b>16,204</b>					
<b>Median</b>	<b>10,569</b>					
<b>Minimum</b>	<b>1,717</b>					



Beginning in June, the staff visited the site every two weeks and made velocity and water depth measurements. From these measurements, they used two methods to estimate the flow at Station A. Flow estimates ranged between 11.8 cfs and 2.3 cfs. Consequently, in 2005 Station A was well in compliance with the 1.20 cfs, seven-day flow requirement.

During the summer and fall of 2005, Big Bear MWD repaired the weir plate, cleaned out the stilling basin, and installed a battery operated, pressure transducer to record flow information during the winter and early spring months. Since 2005, when weather conditions permit, Big Bear MWD retrieves the recorded information and calculates the flows at Station A.

To measure the flow at Station B, Big Bear MWD installed a permanent weir structure. The weir plate is a compound weir with a v-notch section and a rectangular section. It is attached to a reinforced concrete structure in the riverbed. The v-notch section has a flow range of 0 to 0.44 cfs and the rectangular section has a flow range of 0.44 to 5.03 cfs. A water level transmitter is located in a stilling well just upstream of the weir structure. The water level data are transmitted to a remote telemetry unit (RTU) located in the control building at the dam. From there, data are transmitted to a central computer at the administrative offices of Big Bear MWD where average daily flow rates at Station B are calculated based on the rating curve of the weir plate. In 2006, Station B was out of service or not functioning properly for two extended periods. The first period was from December 21, 2005 through January 13, 2006. The second period was from April 15 to September 20. On September 20, 2006, a new measurement probe was installed and calibrated, and flow measurements at Station B resumed.

During 2005, Big Bear MWD, working with State Water Resources Control Board (SWRCB) and the State Department of Fish and Game, developed a proposed plan to keep Station A in compliance with both the 1.0 cfs average daily flow requirement and the 1.2 cfs seven-day average flow requirement. This proposed plan involves increasing the Station B flow requirements to insure the Station A requirements are met. The new Station B requirements vary by month and hydrologic year type. The hydrologic year type is based on year-to-date precipitation at Bear Valley Dam. Water years (October 1 to September 30) are used to determine the hydrologic year type. The plan is presented in the following table. The plan was approved by the SWRCB on January 08, 2009.

**Table to Determine Minimum Average Daily Flows at Station B  
Based Upon Year-to-Date Precipitation at Bear Valley Dam**

Date	Enter Year-to-date Precipitation at Bear Valley Dam (inches)	Dry Year		Below Normal Year		Above Normal Year		Wet Year	
		If year-to-date precipitation is less than (inches)	Station B Minimum Flow is (cfs)	If year-to-date precipitation is between (inches)	Station B Minimum Flow is (cfs)	If year-to-date precipitation is between (inches)	Station B Minimum Flow is (cfs)	If year-to-date precipitation is more than (inches)	Station B Minimum Flow is (cfs)
October 1	0.00	n.a.	0.95	n.a.	0.95	n.a.	0.95	n.a.	0.95
November 1		0.03	0.90	0.03 and 0.56	0.90	0.57 and 1.93	0.70	1.93	0.70
December 1		1.59	0.85	1.59 and 3.04	0.85	3.05 and 5.60	0.80	5.60	0.60
January 1		3.73	0.90	3.73 and 8.14	0.75	8.15 and 12.84	0.75	12.84	0.30
February 1		8.94	1.00	8.94 and 13.84	0.85	13.85 and 20.79	0.50	20.79	0.30
March 1		14.42	0.80	14.42 and 20.05	0.40	20.06 and 31.47	0.40	31.47	0.30
April 1		19.29	0.75	19.29 and 25.84	0.50	25.85 and 40.30	0.40	40.30	0.30
May 1		21.61	0.95	21.61 and 28.65	0.70	28.66 and 41.16	0.55	41.16	0.30
June 1		22.18	1.15	22.18 and 30.01	0.80	30.02 and 41.86	0.75	41.86	0.30
July 1		22.42	1.20	22.42 and 30.01	0.95	30.02 and 41.86	0.95	41.86	0.30
August 1		22.93	1.25	22.93 and 30.69	1.05	30.70 and 42.48	0.95	42.48	0.30
September 1		23.30	1.00	23.30 and 30.86	0.95	30.87 and 43.69	0.95	43.69	0.30

Starting in December of 2005, Big Bear MWD has been following the proposed flow requirements for Station B. Based on the above table and the actual year-to-date precipitation at Bear Valley Dam, the minimum flow requirements at Station B in 2009 were as follows.

<b>Month 2009</b>	<b>Hydrologic Condition</b>	<b>Minimum Flow (cfs)</b>
January	Above Normal	0.75
February	Below Normal	0.85
March	Above Normal	0.40
April	Above Normal	0.40
May	Above Normal	0.55
June	Below Normal	0.80
July	Below Normal	0.95
August	Below Normal	1.05
September	Below Normal	0.95
October	Start Water Year	0.95
November	Above Normal	0.70
December	Below Normal	0.85

Flows at Station B normally consist of leakage from the dam and spillway gates, releases and leakage from the outlet works, spills from the lake, and inflows and consumptive losses between the dam and Station B.

In 2009, the recorded flows at station B were above the minimum flows shown above except for a seven day period between October 6 and October 12. During this period, the Station B recorder was out of calibration and appears to have been recording lower flows than actually occurred. The lake releases from the 6-inch Bypass line were above the minimum flow requirement on 6 of the 7 days. The only day the release from the 6-inch Bypass line (0.90 cfs) was below the requirement (0.95 cfs) was October 11.

To handle the SWRCB Order No 95-4 lake release and in-lieu delivery conditions, the Watermaster Committee, in 2002, clarified the accounting procedures. In 2003, the Watermaster made further improvements to these procedures. In 2005, they made a further change to better reflect actual lake management. This change was to include leakage with the flows from the outlet works in the accounting for flows to meet SWRCB Order 95-4. For the lake accounts, the accounting procedures are:

1. The outlet works flows and dam leakage will be deducted from both Mutual's and BBMWD's lake accounts in proportion to the amount of water in their respective lake accounts on days when Mutual is not fully utilizing all the flow in the Santa Ana River at the point of diversion to the forebay of SCE Power Plant No. 1.
2. The outlet works flows and dam leakage releases will be deducted entirely from Mutual's lake account on days when:
  - a) Mutual is fully utilizing all the flow in the Santa Ana River,
  - b) Mutual is requesting releases from the lake and BBMWD is releasing water from the lake or providing in-lieu supplies, and
  - c) Mutual is purchasing SWP.

The term "fully utilized" is defined as days when the "net amount" of water the SBVWCD diverted from the forebay of SCE Power Plant No. 3 is less than the amount of the fish release. The "net amount" of water diverted from the forebay is defined as the actual amount diverted by SBVWCD for groundwater recharge less the amount of water delivered to the forebay by the Bear Valley Pick-up on the Santa Ana River below Seven Oaks Dam.

The input data and allocation of releases under SWRCB Order No. 95-4 in Table 2.C of Appendix B reflect the above procedures.

For the Basin Compensation Account, the accounting procedures are:

1. Under a Big Bear MWD operation, the actual fish releases used by Mutual under Item 2 above will be considered a "release actually made under District Operation ( $R_d$ )" and the actual releases under Item 1 above will be treated as "spills which actually occurred under District Operation ( $S_d$ )".
2. Under a Mutual operation, the fish releases used by Mutual under Item 2 above will be considered a "release which would have been made under a Mutual Operation ( $R_m$ )", and the releases allocated to Mutual under Item 1 above will be considered a "spill which would have occurred under a Mutual Operation ( $S_m$ )."

Tables 4.A and 4.B of Appendix B reflect these accounting procedures.

The Watermaster Committee will continue to work on these accounting procedures to make sure they will be accurate for all possible river flow and diversion conditions that could occur in future years.

## **Dam and Spillway Gate Leakage**

Minor leakage through the dam and spillway gates occurs in Bay 1 and Bay 10. The structural reinforcement project completed in 2009 eliminated the leakage from cracks in the upper arches of Bays 5, 6 and 8. For 2009, the lake level was above the spillway crest (Elevation 6731.00 feet) for the entire year so some minor leakage occurred. Big Bear MWD estimates the leakage from Bays 1 and 10 by visual observations. The estimated monthly leakages are shown in **Table III-4**. The total leakage for 2009 was estimated to be only 8.2 acre-feet.

## **Outlet Works Releases and Leakage**

Water is released from the lake through an outlet works. These releases can be for flood control purposes, for Mutual, or for fishery protection in accordance with SWRCB Order No. 95-4. Releases are made either through a 36-inch outlet works or a 6-inch bypass pipeline that is connected to the 36-inch outlet works. A 36-inch butterfly valve is the primary control mechanism on the outlet works. Flows in the outlet works are measured by an in-line 36-inch flow meter that was installed on the outlet piping downstream of the butterfly valve in December 1993 to replace an older meter. The new meter is an Electromatic Flow Meter Model 655 manufactured by Sparling Instruments, Inc. Downstream of the flow meter the outlet works split into a 24-inch pipeline and a 14-inch pipeline. Flow through these two pipelines is controlled by two motorized sluice gates. The two sluice gates are 24-inch by 24-inch and 14-inch by 14-inch. The 36-inch meter was calibrated with an accuracy of  $\pm 0.5$  percent between 7.07 and 212 cfs. When the sluice gates were fully opened and the lake was full, the meter measured a flow of 256 cfs, which is the maximum that can be discharged through the outlet works. The rate of flow and totalized flow are recorded at the flow meter and also at the control building. There is usually a small amount of leakage through the two sluice gates.

There was a 2-inch relief line and valve on the 36-inch outlet pipeline. In 2009 this relief line was replaced with a 3-inch pipeline and valve. In addition, a 3-inch meter was installed to record the amount of water released through the 3-inch relief line. During the winter months this valve is usually opened to allow a small amount of flow to pass through the 36-inch pipeline and prevent the water in it from freezing.

The 3-inch line is also used to provide water for the construction of a new bridge that will be downstream of the dam (see cover of this report), and will replace the existing bridge that sets on the top of Bear Valley Dam. In 2009, Big Bear MWD provided 1.9 acre-feet of water to the bridge construction project.

**TABLE III-4**  
**ESTIMATES OF**  
**MONTHLY DAM LEAKAGE**  
 (acre-feet)  
 Calendar Year 2009  
 Big Bear Watermaster

<b>Month</b>	<b>Dam Leakage Estimates (AF)</b>
January	1.1
February	1.0
March	1.1
April	0.7
May	0.6
June	0.5
July	0.5
August	0.5
September	0.5
October	0.6
November	0.5
December	<u>0.6</u>
<b>Annual Total</b>	<b>8.2</b>

Flow through the 6-inch bypass pipeline was metered beginning April 12, 2008 when Big Bear MWD installed a flow meter on this bypass pipeline.

In 2009, Big Bear MWD did not release any water from the lake for flood control purposes or to meet Mutual's request for lake water. All releases were made to comply with SWRCB Order No. 95-4.

**Table III-5** summarizes the monthly amounts of water discharged (both leakage and releases) from the outlet works (the 6-inch bypass pipeline, the 2-inch relief line, and the two sluice gates) in 2009. The total from the outlet and leakage works in 2009 was estimated to be 735.1 acre feet. The values in Table III-5 also show the water used for construction of the new bridge downstream of Bear Valley Dam, which was 1.9 acre-feet.

## **Spills**

Spills are flows that leave the lake over the spillway of the dam. They are calculated from lake gage height readings and spillway gate settings at the dam during the time of the spill. In 2009, there were no flows over the spillway of the dam.

## **Station B Flows**

Leakage estimates and outlet works flows are confirmed by comparing the sum of dam leakage plus the amount released from the lake through the outlet works less the amount delivered to the bridge construction project with the flow measured at Station B, which is 300 feet downstream of the dam. The differences can be either gains or losses. Although small, these differences illustrate the impacts of rainfall/snowfall and plant evapotranspiration between the dam and Station B. Table III-6 shows this comparison. In 2009, the measured flow at Station B was 15.9 acre-feet less than the estimated amount leaving Big Bear Lake from releases, leakage and spills.

The measurement problems at Station B that Big Bear MWD identified in December 2008 appear to have continued into January and February 2009. The measured flows at Station B were less than the measured outflows from the Lake. Normally, there are some small gains between the dam and Station B from local runoff of rain or snowmelt. Between March and mid-July the Station B measurements look fine. In March and April, the Station B flows were a little more than the lake outflows which is a result of runoff and snowmelt. In May, June and July, the Station B flows were a little less than the lake outflows as a result of consumptive losses between the dam and station B. Beginning in mid-July, the Station B measurements began to increase without any corresponding increase in lake releases. A measurement problem was identified on

**TABLE III-5**  
**MONTHLY DISCHARGES FROM**  
**THE OUTLET WORKS OF BEAR VALLEY DAM**  
(acre-feet)  
Calendar Year 2009  
Big Bear Watermaster

<b>Month</b>	<b>Flood Control Releases (AF)</b>	<b>Mutual Releases (AF)</b>	<b>Bridge Construction (AF)</b>	<b>SWRCB Discharges (AF)</b>	<b>Total Discharges (AF)</b>
January	-0-	-0-	-0-	67.9*	67.9
February	-0-	-0-	-0-	56.0*	56.0
March	-0-	-0-	-0-	27.8*	27.8
April	-0-	-0-	-0-	29.3*	29.3
May	-0-	-0-	-0-	51.4*	51.4
June	-0-	-0-	0.4	66.4*	66.8
July	-0-	-0-	0.4	77.0*	77.4
August	-0-	-0-	0.3	80.2*	80.5
September	-0-	-0-	0.4	74.3*	74.7
October	-0-	-0-	0.3	74.1*	74.4
November	-0-	-0-	0.1	58.9*	59.0
December	<u>-0-</u>	<u>-0-</u>	-0-	<u>69.9*</u>	<u>69.9</u>
<b>Total</b>	<b>-0-</b>	<b>-0-</b>	<b>1.9</b>	<b>733.2</b>	<b>735.1</b>

\* These releases were also used to partially or wholly meet Mutual's needs for lake water.



**TABLE III-6**  
**COMPARISON OF FLOWS AT STATION B**  
**WITH ESTIMATED OUTFLOWS FROM BIG BEAR LAKE**  
 (acre-feet)  
 Calendar Year 2009  
 Big Bear Watermaster

<b>Month</b>	<b>Total Outflow From Lake (AF)</b>	<b>Station B Estimates (AF)</b>	<b>Gain or (Loss) (AF)</b>
January	69.0	59.9	(9.1)
February	57.0	56.0	(1.0)
March	28.9	38.2	9.3
April	30.1	36.6	6.5
May	52.0	49.2	(2.8)
June	66.5	64.6	(1.9)
July	77.1	77.9	0.8
August	80.4	91.0	10.6
September	74.4	69.9	(4.5)
October	74.3	62.6	(11.7)
November	59.3	50.4	(8.9)
December	<u>70.5</u>	<u>67.2</u>	<u>(3.2)</u>
<b>Annual Total</b>	<b>739.5</b>	<b>723.6</b>	<b>(15.9)</b>

August 26 and repairs to Station B were made on September 11. After the repairs were made, the measurements at Station B were less the lake outflows, which indicates that Station B measurements were probably too low. The weir at Station B was recalibrated on December 21 and the flows measurements appear to be correct for the balance of the year.

### **Lake Withdrawals for Snowmaking**

Big Bear MWD sells water from Big Bear Lake for use in snowmaking, fire protection and revegetation for ski areas within the watershed. In 2009, 790 acre-feet of water was withdrawn from the lake for these purposes. The withdrawals for snowmaking occurred in seven winter months (January, February, March, April, October, November and December). The withdrawals for fire protection and revegetation occurred in five summer and fall months (May, June, July, August and September). The Watermaster estimates that half of the monthly amount pumped from the lake for snowmaking in the winter months returns to the lake in the form of snowmelt during the same month. In the summer and fall months, 33 acre-feet of water was used and none was returned to the lake. In 2009, the withdrawal from the lake for snowmaking was 757 acre-feet and 378 acre-feet returned to the lake. The “net withdrawal” for all purposes was 412 acre-feet.

### **Net Wastewater Exports**

The Watermaster Committee calculates “net” wastewater exports as the difference between the wastewater that leaves the Big Bear Lake watershed and the water supply that is imported into the Big Bear Lake watershed from the Baldwin Lake watershed. The methodology used to make these calculations is documented in a report entitled “Development of a Methodology for Estimating Gross Sewage Export from Upper Bear Creek Watershed”, prepared by James M. Montgomery, Consulting Engineers, Inc., in September 1989 for Big Bear Municipal Water District.

Wastewater is exported from the Big Bear Lake watershed to the Baldwin Lake watershed from the following three areas:

- City of Big Bear Lake
- San Bernardino County Service Area 53B
- Airport area served by Big Bear City CSD

Wastewater flows from the first two areas are measured by the Big Bear Area Regional Wastewater Authority (BBARWA). Wastewater flows from the airport area within the Big Bear Lake watershed are estimated based upon the number of connections in the area.

Water is imported into the Big Bear Lake watershed from the Baldwin Lake watershed by the following three activities:

- City of Big Bear Lake imports groundwater from the Baldwin Lake watershed.
- Big Bear City CSD provides water to the airport area from the Baldwin Lake watershed
- Big Bear City CSD occasionally provides emergency water to the City of Big Bear Lake

The City of Big Bear Lake imported supplies and emergency supplies are both metered, while the airport area supplies are estimated based on the number of service connections.

In 2009, the "net" wastewater exported from the Big Bear Lake watershed was 1,074 acre-feet. **Table III-7** contains the 2009 monthly net exports. The 2009 net exports were a little less than the 2008 net exports. The reason for the decrease was lower estimated inflow and infiltration (I&I) into the sewer system in 2009, which reflects the lower lake levels and below average runoff in 2009.

## **SANTA ANA RIVER**

### **Bear Valley Mutual Water Company Water Needs**

Mutual meets the water needs of its shareholders primarily by diverting water from the Santa Ana River. When river flow is inadequate to meet their needs, Mutual can call upon water stored in Big Bear Lake, pump ground water from the San Bernardino ground water basin, buy State Water Project (SWP) water from San Bernardino Valley MWD, or reduce the delivery rate to its shareholders.

In 2009, Mutual reported they would need about 6,500 acre-feet of water from Big Bear MWD including the portion of the SWRCB outflows they could beneficially use. Their intent was to limit their deliveries from BBMWD to 6,500 acre-feet in 2009. Mutual met their overall 2009 water needs by in-lieu supplies from Big Bear MWD, diversions from the Santa Ana River, purchases of SWP water, and local groundwater. Mutual also got some water from lake releases and dam leakage for fish protection in Bear Creek.

### **Summary of Flows and Diversions at Mouth of the Santa Ana River Canyon**

Exhibit D, Section 1(f) of the Judgment calls for data to be included in each Watermaster annual report summarizing the river flows at the mouth of the Santa Ana River Canyon and diversions at

**TABLE III-7**  
**NET WASTEWATER EXPORTS**  
 (acre-feet)  
 Calendar Year 2009  
 Big Bear Watermaster

<b>Month</b>	<b>Net Wastewater Exports (acre-feet)</b>
January	119.9
February	147.4
March	172.1
April	97.5
May	74.5
June	63.2
July	67.2
August	64.1
September	43.8
October	51.8
November	60.2
December	<u>111.9</u>
<b>Total</b>	<b>1,073.6</b>

the mouth of the Santa Ana River Canyon. Specifically, it requests quantities of water diverted into the following facilities:

1. Bear Valley High Line
2. Redlands Canal
3. North Fork Canal
4. Edwards Canal
5. San Bernardino Valley Water Conservation District Spreading Grounds

Exhibit D also requires the annual report to estimate the amount of Santa Ana River flow not diverted for beneficial use. **Table III-8** contains this information for 2009.

### **Flow of Santa Ana River at Mouth of Canyon**

The United States Geological Survey (USGS) reports flow in the Santa Ana River at the mouth of the Santa Ana Canyon under Station No. 11051501. This station is the combination of flow records from three gages (USGS Station No. 11049500, 11051499, and 11051502). Flow in the flume between the afterbay of SCE Power House No. 1 (SCE Power House No. 2 was removed due to the construction of Seven Oaks Dam) and the forebay of SCE Power House No. 3 is estimated by USGS using the Daily Flow Report provided by the San Bernardino Valley Water Conservation District and verified by a new meter installed by SCE and reported as Station No. 11049500. Note that this derived estimate does include the overflow from the old SCE Powerhouse No. 3 forebay as reported on the Daily Flow Report. In addition, the USGS maintains two gauging stations near the mouth of the Santa Ana River Canyon below Seven Oaks Dam. Station No. 11051499 measures the flow in the main river channel while Station No. 11051502 measures river flow diverted into the afterbay of SCE Power House No. 3 through the Bear Valley River Pick-up. The records from these three sources are summarized and reported as the total flow in the Santa Ana River, USGS Station No. 11051501.

During 2009, the total river flow reported by the USGS, currently provisional, was 21,982 acre-feet. However, measurements at Station No. 11049500 include the amount of groundwater pumped by Mutual and discharged into the flume above the gage. Thus, to get the actual Santa Ana River Flow, the canyon well production must be deducted from the reported flows. In 2009, there was no canyon well production. The resulting river flow below Seven Oaks Dam was 21,982 acre-feet in 2009. However, this figure reflects storage change in the reservoir behind Seven Oaks Dam. In 2009, an estimated 634 acre-feet of river flow was stored behind the dam. Thus, the estimated flow of the Santa Ana River at the mouth of the canyon above Seven Oaks Dam was 22,616 acre-feet in 2009.

TABLE III-8

**SUMMARY OF DIVERTED FLOW AT MOUTH OF  
SANTA ANA RIVER CANYON  
(ACRE-FEET)**

Calendar Year 2009  
Big Bear Watermaster

Flow Component		Amount (AF)
<b>FLOW OF SANTA ANA RIVER AT MOUTH OF CANYON</b>		
Flow Reported for U.S.G.S. Gage 11051501-provisional		21,982
BVMWC Canyon Well No. 1 Production		-0-
Santa Ana River Flow Below Seven Oaks Dam		<u>21,982</u>
Annual Storage Change in Seven Oaks Dam		<u>634</u>
<b>Santa Ana River Flow at Mouth of Canyon</b>		<b>22,616</b>
<b>DIVERSIONS BY BEAR VALLEY MUTUAL WATER COMPANY</b>		
Diversions:	Greenspot Metering Station	-0-
	Edwards Line	-0-
	North Fork Canal	492
	Bear Valley Highline	3,067
	Redlands Aqueduct (includes Redlands Tunnel)	7,419
	SBVMWD Morton Canyon Connector Deliveries	-0-
	Redlands Sandbox Spreading (observed)	<u>45</u>
		11,022
Adjustments:	Water pumped from BVMWC Canyon Well No. 1	-0-
	Redlands Tunnel Diversion	<u>-654</u>
	<b>Total MUTUAL Diversions</b>	<b>10,368</b>
<b>DIVERSIONS BY SBVWCD</b>		
	Diversion by San Bernardino Valley Water Conservation District	8,469
	SBVMWD Morton Canyon Connector Deliveries to SBVWCD	<u>-0-</u>
	<b>Total SBVWCD Diversions</b>	<b>8,469</b>
<b>TOTAL DIVERSIONS FROM THE SANTA ANA RIVER</b>		
<b>Total Diversions by Mutual and SBVWCD</b>		<b>18,837</b>
<b>AMOUNT NOT DIVERTED</b>		
Santa Ana River Flow at Mouth of Canyon		22,616
Mutual and SBVWCD Diversions		<u>- 18,837</u>
Amount Diverted to Storage Behind Seven Oaks Dam		<u>-634</u>
Estimated Not Diverted		3,145
Estimated Flow Downstream of Diversion*		<u>8</u>
<b>Estimated Losses and Measurement Errors **</b>		<b>3,137 or 14.5 %</b>

\* This value equals the amount observed at the Cuttle Weir.

\*\* See written text for explanation

## **Diversions by Bear Valley Mutual Water Company**

Amounts diverted by Mutual and associated prior right companies are reported to the State Water Resources Control Board under Recordation Numbers 36-00021, 36-00022 and 36-00028. In 2009, Mutual's measured diversions were 11,022 acre-feet. The vast majority, 10,368 acre-feet, was water diverted from the Santa Ana River. They did not pump any groundwater from their well located in the Santa Ana Canyon above the major points of diversion, but they did produce 654 acre-feet of water from the Redlands Tunnel. Mutual's diversions were used for agricultural and domestic purposes. In 2009, domestic deliveries were made to the City of Redlands for their Horace P. Hinckley Water Treatment Plant and to East Valley Water District's water treatment plant.

## **Diversions by San Bernardino Valley Water Conservation District**

Water diverted by the San Bernardino Valley Water Conservation District for groundwater recharge is by virtue of licenses and pre-1914 rights; all diversions are reported to the State Water Resources Control Board. In 2009, they diverted 8,469 acre-feet of Santa Ana River water for ground water recharge.

## **Amount Not Diverted**

In years prior to 1996, the sum of the diversions mentioned above was subtracted from the total river flow, as reported by USGS Gage 11051501, to determine the "Amount Not Diverted". Since 1977, this difference has been reported as the "Amount Not Diverted", which is supposed to be the amount of water that flowed past the mouth of the Santa Ana River Canyon without being diverted for beneficial use.

## **Losses and Measurement Errors**

During preparation of the 1996 report, the Watermaster Committee discovered significant discrepancies between the value for "Amount Not Diverted", as calculated by the method contained in previous Watermaster Reports, and observed flows in the Santa Ana River just downstream from the last diversion point. Since 1994, San Bernardino Valley Water Conservation District staff have been estimating the amount of water flowing past the Greenspot Road Bridge at the Cuttle Weir, which is just downstream from the mouth of the Santa Ana River Canyon, on a daily basis. In past years the difference between the estimated flows at the Greenspot Road Bridge and the "Amount Not Diverted" were significantly different. The

Watermaster has conducted extensive research with regards to the discrepancy and provided the following five explanations:

1. Leakage Losses between Inflows and Outflows. The first explanation was unmeasured losses between the points where inflows and outflows are measured. These include:

1. Leakage in the tailrace from SCE Power House No. 3 afterbay,
2. Leakage in the Redlands Aqueduct between SCE Power House No. 3 afterbay and the Redlands Sandbox, and
3. Leakage around the Redlands Sandbox weir.

2. Unmeasured Diversions. The second explanation was that Mutual can divert water for spreading at the Redlands Sandbox without it being measured. San Bernardino Valley Water Conservation District staff now observes and reports this diversion on a daily basis. These estimates are based on known flows delivered to the Redlands Sandbox and are fairly accurate. This possible source of error has been corrected and the amount diverted for spreading is included in Table III-8.

3. USGS Gage Accuracy. The third possible explanation for the disparity is the accuracy of the USGS flow records. The USGS reports that this combined flow measurement of three gage stations is considered to have an accuracy rating of "fair". A "fair" rating means that 95 percent of the daily discharge measurements are within 15 percent of the true value. According to Jeffrey Agajanian of the USGS, this means the error band for the entire year should be within approximately 15 percent of the total measured flow. This value is a conservative estimate of the possible measurement errors and the flow is likely to be well within this error band, especially during the summer months when flows are generally constant and lower.

4. Water Delivery Flow Measuring Device Accuracy. A fourth reason for the difference could be inaccuracies in the diversion measuring devices, which should be less than +/- 10 percent at any given time. Most of these measurements are obtained through the use of stable, long-term weirs and parshall flumes, but small, though not insignificant, errors are possible. Some of the measurement devices provide daily readings and are equipped with totalizer equipment providing monthly data. The San Bernardino Valley Water Conservation District (SBVWCD) will continue to update totalizer equipment on any of the measurement devices that are not equipped with totalizer equipment. The SBVWCD is developing a program to maintain and verify the accuracy of the existing measuring devices. These activities will help minimize errors in diversion measurements.



5. Observed Flow at the Cuttle Weir. A fifth possible explanation was the accuracy of the flow estimates at the Cuttle Weir. These estimates are based on daily flow observations. Total flow quantities are difficult to determine because of the high degree of short-term variability in the river flows during storm events.

The construction of the Seven Oaks Dam required the reconstruction of the SCE flume between the old Power House No. 2 and No. 3. This eliminated any losses in the flume from the old Power House No. 2 and No. 3 and required the USGS to move Station No. 11049500 to the old forebay of Power House No. 3. Flow at this station is estimated by using the Daily Flow Report provided by the San Bernardino Valley Water Conservation District and is reported as Station No. 11049500. As of August 2001, SCE has installed a new meter in the forebay of Power House No. 3. In addition, improved efforts were taken to monitor diverted water at the Redlands Sand Box for ground water recharge and observed flows at the Cuttle Weir. The Watermaster has concluded that these efforts have reduced the losses and measurement inaccuracies such that the large errors that occurred in the past should no longer occur.

6. Storage Behind Seven Oaks Dam. There is, however, an additional factor that must be considered when the Watermaster Committee estimates the “amount not diverted”. This factor is the amount of water that has been stored behind Seven Oaks Dam (SOD) and not released by year-end. This stored water is Santa Ana River flow that has not yet been measured by the two USGS stream gages below the dam. In addition, water stored behind the dam from inflow in the previous year and released in the current year must also be taken into account. The amount stored behind SOD at the end of 2008 was 919 acre-feet (water surface elevation of 2,162.94 feet). The amount stored behind SOD at the end of 2009 was 1,553 acre-feet (water surface elevation of 2,178.20 feet). In other words, there has been water stored behind the dam from inflow in the current year that had not been released by the end of 2009. This amount was 634 acre-feet and was not included in the USGS provisional value of 21,982 acre-feet. Adding the amount of water stored behind SOD to the USGS provisional value increases the estimate of Santa Ana River flow to 22,616 acre-feet for 2009.

### **2009 Estimate of Amount Not Diverted**

In 2009, San Bernardino Valley Water Conservation District observed river flow past the Cuttle Weir at the Greenspot Road Bridge on only two days. Their estimate of the amount not diverted was eight acre-feet. In other words, all except eight acre-feet of the flow in the Santa Ana River was diverted in 2009. The Santa Ana River flow is estimated as the total flow reported by the USGS less the canyon well production plus Santa Ana River flow stored behind Seven Oaks Dam. In 2009, the estimated Santa Ana River flow was 22,616 acre-feet. The total diversion of

Santa Ana River flow by Mutual and San Bernardino Valley Water Conservation District was 18,837 acre-feet. In addition, 634 acre-feet was put into storage behind Seven Oaks Dam. The difference between estimated inflow and total diversions is 3,145 acre-feet.. Comparing this difference with the observed flow at Greenspot Road bridge (8 acre-feet), results in leakage losses and measurement errors of 3,137 acre-feet. These losses and errors represent 14.5 percent of the estimated Santa Ana River flow and are at the high end of the probable error range of the flow measurements.

### **Lake Releases/In-Lieu Water Deliveries**

Santa Ana River flows are often insufficient to meet Mutual's water needs; as a result, they frequently request lake releases from Big Bear MWD to meet their needs. Big Bear MWD has the choice of releasing water from the lake or providing an in-lieu supply. At their meeting on May 1, 1987, the Board of Directors of the Big Bear Municipal Water District voted unanimously to approve the following policy for providing in-lieu supplies.

*"1. Adopt the following 1987 in-lieu policy:*

- A. When the lake is in the top 4 feet, the irrigation demands from the lake will be met by releasing water from Big Bear Lake.*
- B. When the lake is between 4 feet and 6 feet down, the District intends to purchase in-lieu water between the months of May 1st and October 31st from either wells or the State Water Project; between November 1st and April 30, water required would be released from Big Bear Lake.*
- C. When the lake is between 6 and 7 feet down, the Board shall determine whether to release from the lake.*
- D. In the unlikely event that the lake is more than 7 feet down, the District intends to buy in-lieu water throughout the year.*
- E. The General Manager shall inform the Board each time water is released.*

On November 16, 2006, the Board of Directors of BBMWD modified their Lake Release Policy to eliminate items C, D and E and to use in-lieu water whenever the lake is more than 6 feet below full. The revised Lake Release Policy is:

- 1. When the Lake is within the top 4 feet, the water demands from Bear Valley Mutual will be met with Lake releases;*

2. *When the Lake is between 4 and 6 feet below full, the District intends to obtain in-lieu water between the months of May 1 and October 31. Between November 1 and April 30, water required would be released from Big Bear Lake;*
3. *When the Lake is more than 6 feet below full, the District intends to obtain in-lieu water throughout the year.*

In 2009, the lake level was below 6 feet down until February 8. It was between 6 feet and 4 feet down between February 8 and July 18. From July 19 through the end of the year, the lake level was more than 6 feet down.

Mutual received 6,500 acre-feet of water from Big Bear MWD in 2009. This year Mutual's needs were met by in-lieu deliveries of SWP water and water discharged from the lake for fishery protection under SWRCB Order No. 95-4. Mutual also purchased 1,322 acre-feet of SWP water. **Table III-9** shows Big Bear MWD monthly water deliveries to Mutual during 2009 under the assumption that the SWP in-lieu deliveries were made before Mutual purchased SWP water. In total, Big Bear MWD provided 6,500 acre-feet of water to Mutual. This amount consists of 5,990 acre-feet of in-lieu supplies and 510 acre-feet of water they were able to use from the fish outflows.

The amount of water Big Bear MWD is obligated to deliver to Mutual is limited by the Judgment. According to the Physical Solution Agreement, Article III.A.1.(b), Mutual has the right to:

*“divert water, or cause water to be diverted, at such rate as may be reasonably necessary to meet the requirements of Mutual’s stockholders, not exceeding 65,000 acre-feet in any ten (10) year period, as determined by the Board of Directors of Mutual in its sole discretion.”*

**TABLE III-9**  
**WATER DELIVERIES TO MUTUAL BY**  
**BIG BEAR MUNICIPAL WATER DISTRICT**  
 (acre-feet)  
 Calendar Year 2009  
 Big Bear Watermaster

<b>Month</b>	<b>Outflows from Big Bear Lake to Mutual</b>	<b>"In Lieu" State Water Project</b>	<b>Total Deliveries to Mutual</b>
January	-0-*	61.3	61.3
February	-0-*	38.8	38.8
March	7.9*	192.3	200.2
April	2.0*	394.7	396.7
May	36.1*	221.2	257.3
June	66.5*	420.8	487.3
July	77.1*	1,146.7	1,223.8
August	80.4*	1,331.2	1,411.6
September	74.5*	1,242.1	1,316.6
October	74.4*	941.1	1,015.5
November	59.3*	-0-	59.3
December	<u>31.8*</u>	<u>-0-</u>	<u>31.8</u>
<b>Total</b>	<b>509.8</b>	<b>5,990.2</b>	<b>6,500.0</b>

\* Also required to comply with SWRCB Order No. 95-4

**Table III-10** summarizes the deliveries to Mutual since the agreement went into effect. For the ten-year period ending with calendar year 2009, the amount of water delivered to Mutual by Big Bear MWD was 60,793 acre-feet. For the 33-year period the Judgment has been in effect, the average annual deliveries by Big Bear MWD to Mutual has been 4,307 acre-feet.

In 2010 Mutual can request up to 17,595 acre-feet of water from Big Bear MWD. This value is the amount that they are below the 65,000 limitation at the end of 2009 (which was 4,207 acre-feet), plus the deliveries made in 2000 (which was 13,388 acre-feet), which will be dropped from the ten-year period ending in 2010. The 17,595 acre-feet total includes in-lieu deliveries, lake releases and fishery outflows that Mutual is able to divert.

### **Mutual's Equivalent Water Diversions**

**Table III-11** shows the amount of water that Mutual would have diverted from the Santa Ana River if the Judgment had not been rendered. This figure is determined by adding the in-lieu water deliveries as reported in Table III-8 to the river diversions by Mutual and Mutual's groundwater production from their Canyon Wells No. 1 and 2, as shown in Table III-6. The value for river diversions includes the supply from the Redlands Tunnel. This equivalent diversion is the amount of Santa Ana River water Mutual would have diverted if their demands for water from Big Bear MWD had been met by lake releases. In 2009, Mutual's equivalent diversions were 17,012 acre-feet, which is about what it was when the Judgment was rendered in 1977.

**TABLE III-10**  
**SUMMARY OF WATER DELIVERIES TO MUTUAL**  
**1977-2009**  
(acre-feet)

Calendar Year 2009

Big Bear Watermaster

Calendar Year	Releases From Big Bear Lake	SWRCB Releases to Mutual	"In Lieu" from Wells	"In Lieu" SWP Purchases & Exchanges	"In Lieu" EVWD Exchange Water	"In Lieu" Delivery on BBMWD Owned Stock*	Total Deliveries to Mutual	Ten Year Totals
1977	868		4,412	0	0	0	5,280	N/A
1978	0		0	0	0	0	0	N/A
1979	0		0	0	0	0	0	N/A
1980	0		0	0	0	0	0	N/A
1981	2,250		0	672	0	0	2,922	N/A
1982	657		0	56	0	0	713	N/A
1983	0		0	0	0	0	0	N/A
1984	1,700		0	993	0	0	2,693	N/A
1985	2,466		842	2,994	0	0	6,302	N/A
1986	1,358		1,139	190	0	0	2,687	20,597
1987	0		3,301	4,762	0	84	8,147	23,464
1988	0		1,864	5,4	0	63	7,359	30,823
1989	0		1,593	8,555	0	0	10,148	40,971
1990	0		561	7,722	0	0	8,283	49,254
1991	79		0	0	151	0	230	46,562
1992	0		0	0	0	0	0	45,849
1993	0		0	0	0	0	0	45,849
1994	1,141		0	0	0	0	1,141	44,297
1995	88		0	0	0	0	88	38,083
1996	3,461		0	4,027	0	0	7,488	42,884
1997	364		0	6,780	0	0	7,144	41,881
1998	0		0	0	0	0	0	34,522
1999	124	147	0	10,436	0	0	10,706	35,080
2000	-0-	510	0	12,878	0	0	<b>13,388</b>	40,185
2001	46	493	48	14,212	0	0	<b>14,799</b>	54,754
2002	0	614	0	5,000	0	0	<b>5,614</b>	60,368
2003	0	484	0	0	0	0	<b>484</b>	60,853
2004	0	512	0	2,500	0	0	<b>3,012</b>	62,724
2005	0	146	0	2,218	0	0	<b>2,364</b>	65,000
2006	0	467	0	2,070	0	0	<b>2,537</b>	60,050
2007	0	486	0	6,500	0	0	<b>6,986</b>	59,892
2008	0	474	0	4,634	0	0	<b>5,108</b>	65,000
2009	0	510	0	5,990	0	0	<b>6,500</b>	60,793

N/A = Not Applicable  
\* Not Authorized After 1988

33 Year Average

4,307

**TABLE III-11**  
**EQUIVALENT WATER DIVERSIONS BY MUTUAL**  
**1977-2009**  
 (acre-feet)  
 Calendar Year 2009  
 Big Bear Watermaster

Calendar Year	Net Santa Ana River Diversion by BVMWC*	Groundwater Production From Wells No. 1 & 2	Big Bear MWD In- Lieu Deliveries	Equivalent Total Water Diversions
1977	14,420	1,546	4,412	20,378
1978	16,809	282	-	17,373
1979	19,470	114	-	19,584
1980	20,479	188	-	20,667
1981	20,449	1,130	672	22,251
1982	18,565	246	56	18,867
1983	19,209	53	-	19,262
1984	23,392	739	993	25,124
1985	19,837	872	3,836	24,545
1986	23,160	894	1,9	25,383
1987	16,373	947	8,147	25,467
1988	14,170	612	7,359	21,141
1989	11,449	672	10,148	22,269
1990	11,242	1,576	8,283	21,101
1991	13,715	368	151	14,234
1992	16,840	97	-	16,937
1993	26,591	-	-	26,591
1994	23,819	594	-	24,413
1995	30,794	60	-	30,853
1996	19,529	1,131	4,027	24,687
1997	19,490	1,559	6,780	27,829
1998	26,625	105	-	26,730
1999	21,336	484	10,436	32,256
2000	17,171	2	12,878	30,371
2001	12,355	140	14,260	26,755
2002	8,007	58	5,000	13,065
2003	13,301	114	-	13,415
2004	11,815	67	2,500	14,382
2005	13,615	-	2,218	15,833
2006	18,733	-	2,070	20,803
2007	12,445	182	6,500	19,127
2008	14,144	182	4,634	18,960
2009	11,022	-	5,990	17,012

\* Includes Redlands Tunnel Diversions

## IV. DETERMINATIONS AND ACCOUNTS

### ACCOUNTING REQUIREMENTS

In accordance with Article 29 of the Judgment, "Watermaster shall maintain three basic accounts, in accordance with Watermaster Operating Criteria, as follows:

- (a) District's Lake Water Operation. A detailed account to reflect actual operation of the Lake by District shall be maintained.*
- (b) Mutual's Lake Water Operations. In addition, a corollary account shall be maintained to simulate the effect of Mutual's operations with regard to Lake water under the In-Lieu Water operations.*
- (c) Basin Compensation Account. An account of District's annual and cumulative obligation for Basin Make-up Water shall also be maintained."*

In 1986, the Watermaster Committee developed a computer program for keeping these accounts. This program was designed to operate on an IBM (or IBM compatible) personal computer using Lotus 1-2-3. To standardize all years of operations under the Judgment, all past accounts were recalculated using the program and were included in the 1986 Annual Report.

In 1990, the Watermaster Committee decided how to account for wastewater exports from the Big Bear Lake watershed and delivery of water on Mutual stock owned by Big Bear MWD. Only the Basin Compensation Account was affected by these decisions. Consequently, the 1990 Watermaster Report contained revised tables for the Basin Compensation Accounts for calendar years 1986, 1987, 1988 and 1989, as well as the status of all the 1990 accounts.

For the 1994 report, the Watermaster Committee updated the accounting procedures to reflect 1994 Watermaster decisions and to clarify the reports.

In 1995, the Watermaster made several additional revisions to the accounting procedures. However, in preparing the 1996 accounts, the Watermaster Committee discovered some errors in the changes made in 1995. These errors were corrected and, as a result, the 1995 accounts were recomputed and were included in the 1996 Annual Watermaster Report.



## **2009 ACCOUNT BALANCES**

Appendix B contains the 2009 accounts. The first four pages of the appendix present the input data used to calculate the various accounts. The fifth page summarizes the status of the various accounts. The remaining pages of Appendix B are the detailed monthly tables of the accounts.

### **Actual Lake Account**

**Figure 2** illustrates the water balance for the actual operation of Big Bear Lake in 2009. **Table 1** of Appendix B provides additional detail. This information shows that:

- 1) the lake level dropped 1.19 feet, from a gage height of 66.03 feet to 64.84 feet; 72.33 feet is full;
- 2) lake storage decreased by 3,174 acre-feet, it began the year with 55,605 acre-feet and ended the year with 52,431 acre-feet; when the lake is full, it contains 73,320 acre-feet of water;
- 3) lake surface area varied between 2,585 and 2,746 acres;
- 4) evaporation was 11,233 acre-feet;
- 5) lake inflow was 9,212 acre-feet,
- 6) the total of spills, releases, leakage and net lake withdrawals was 1,153 acre-feet.

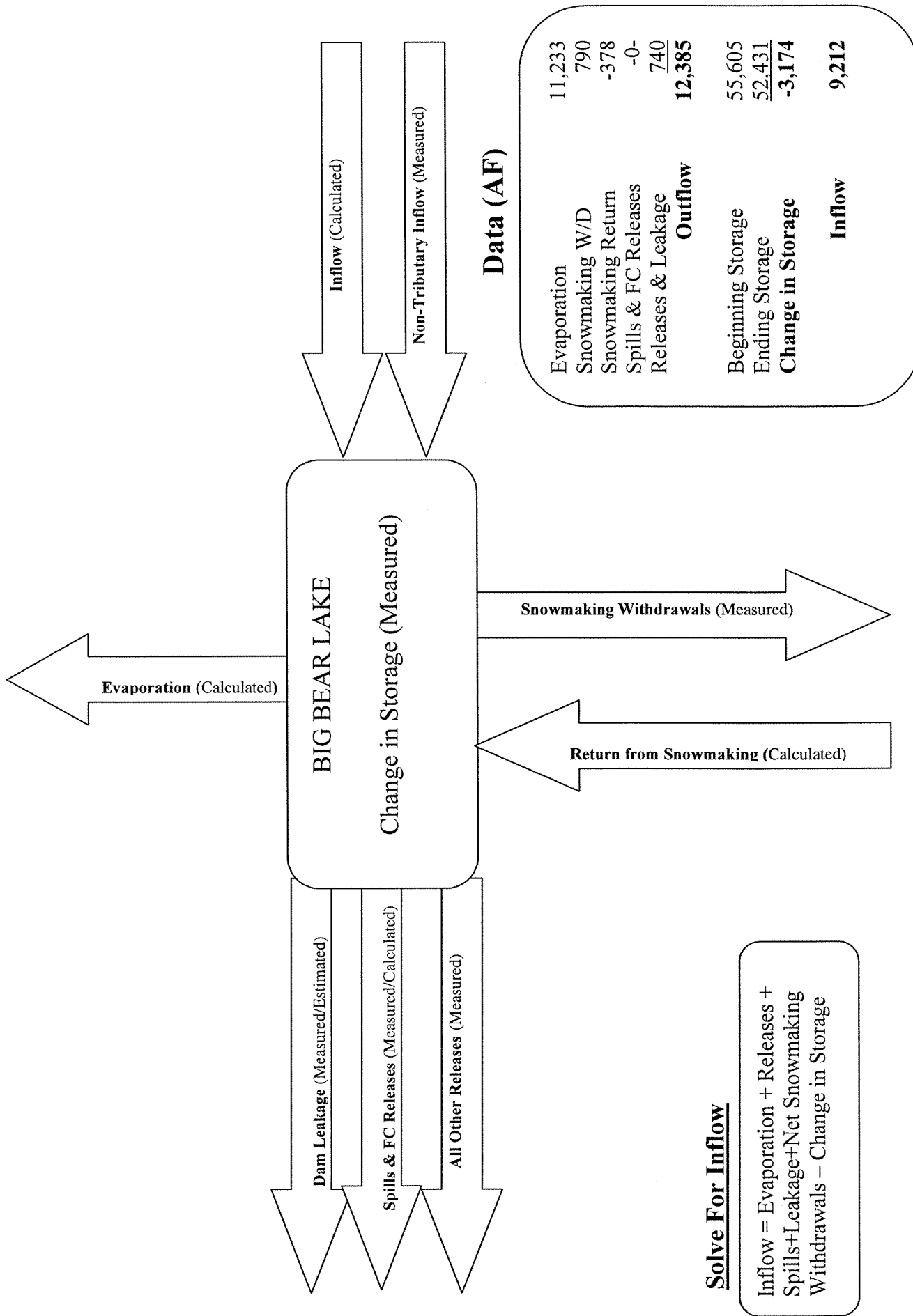
Tables 1A through 1D provide additional details to support Table 1.

### **Mutual's Lake Account**

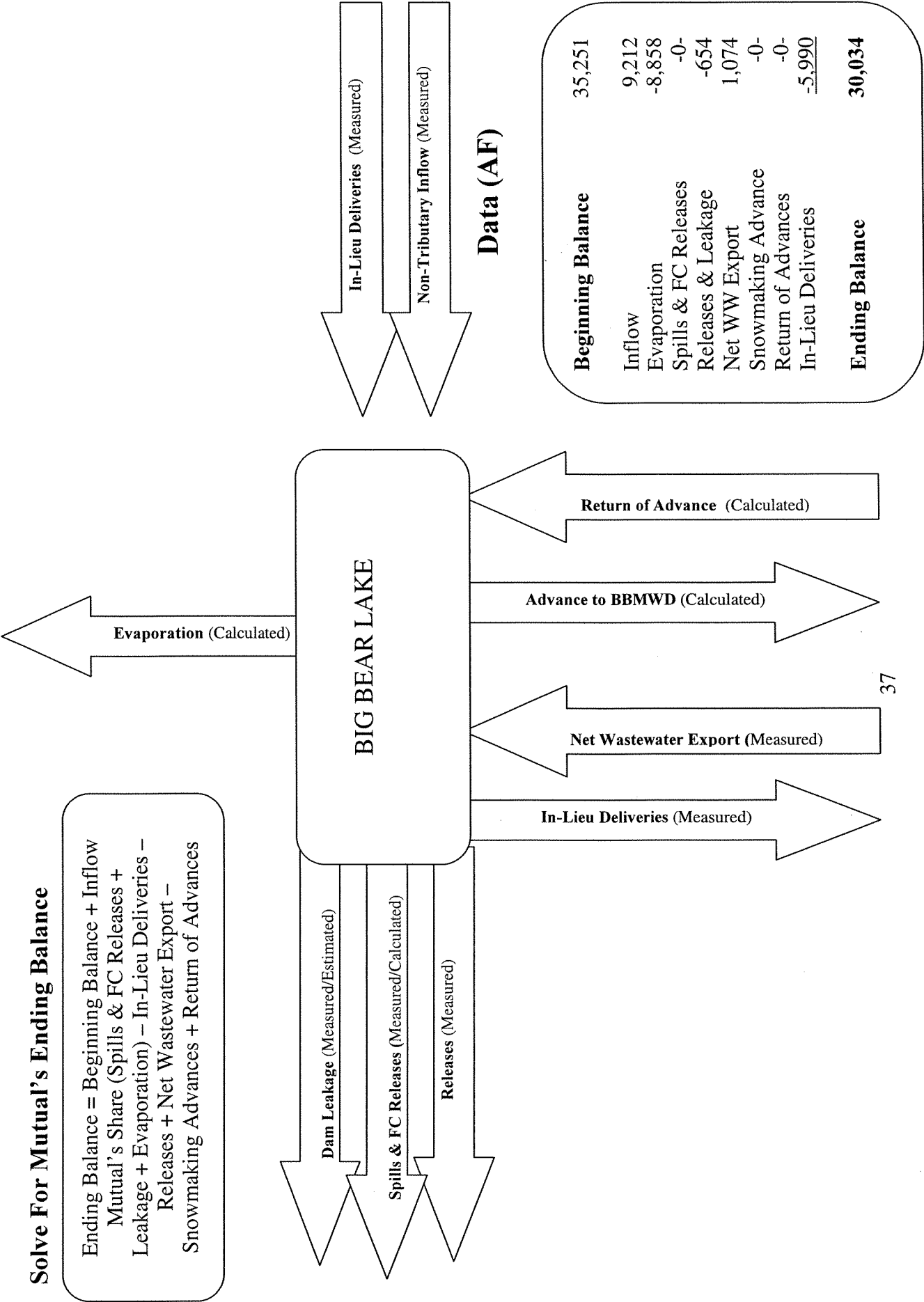
**Figure 3** illustrates the water balance for Mutual's synthesized operation of Big Bear Lake in 2009. Mutual's operation shows what would have happened if:

- 1) Mutual had owned the lake,
- 2) the in-lieu program was not in place, and
- 3) the net wastewater exported from Big Bear Lake watershed entered the lake as supplemental inflow.

**Figure 2**  
**Water Balance for 2009 Actual Lake Operations**



**Figure 3**  
**Water Balance for 2009 Mutual's Lake Operation**  
 (Synthesized Conditions)



In this synthesized case, Mutual's demands for lake water would have been met entirely from lake releases.

Figure 3 and Table 2 of Appendix B show that Mutual had 30,034 acre-feet in its lake account at the end of 2009. This account balance is 5,217 acre-feet less than was in their lake account at the end of 2008. Table 2 also shows that in 2009 Mutual's lake account was credited with all the lake inflow (9,212 acre-feet), and the total of their releases, spills, leakage and in-lieu deliveries was 654 acre-feet. Supplemental inflow added to Mutual's Lake Account for net wastewater exported from the basin was 1,074 acre-feet. In 2009, there were no advances to Big Bear MWD for snowmaking within the watershed. Evaporation that would have taken place under a Mutual operation was 8,858 acre-feet. The cumulative effect of changes in lake releases and supplemental inflows that would have taken place since 1977 under a "Mutual Operation" would be a lake level that would have been 55.05 feet at the end of 2009 or 17.28 feet below the top of the dam. This synthesized lake level is 9.79 feet lower than it actually was. This lower lake level reflects the impact of what Mutual's lake withdrawals would have been without the in-lieu program and with the credits they receive from the net wastewater exports. Tables 2A through 2C provide additional details to support Table 2.

Article 4.(b) of the Watermaster Operating Criteria (Exhibit "D" of the Judgment discusses how to handle the export of wastewater from and the import of water to the Upper Bear Creek Watershed. Specifically, it says:

*In the event gross export from Upper Bear Creek Watershed to any area not tributary to the Santa Ana River Watershed within Upper Bear Creek Watershed, calculated inflow to the Lake shall be increased each year, beginning with the calendar year 1986 by the amount by which such gross export exceeds imports. If gross import exceeds gross export, said excess shall be credited against District's Basin Make-up Water obligation.*

In 1986, the Watermaster Committee decided to handle the net wastewater exports (gross exports-gross imports) entirely in the District's Basin Make-up water obligations. This decision was contingent upon implementation of a wastewater reclamation project in the Upper Bear Creek Watershed by December 31, 1994. A reclamation project was not implemented by that date so the Watermaster Committee, in 1994, decided to add the net wastewater credits to the calculated lake inflows effective January 1990. This decision adds the net wastewater credits to Mutuals lake account. Essentially, it transfers the amount of the credit from Big Bear MWD's lake account to Mutual's lake account.

**Table IV-1** shows the impacts of crediting Mutual's lake account (and debiting Big Bear MWD's lake account) with the net wastewater exports. Since 1990, Mutual has been credited with 26,986 acre-feet of net wastewater exports. After 20 years of getting these credits, Mutual's lake account has 6,538 acre-feet more water than it would have had if it hadn't received the credits. This additional increase raised their simulated lake level by 3.50 feet. In other words, without the credits, Mutual's lake account would have been 23,496 acre-feet and their lake level would have ended the year at 51.55 or 20.78 feet down. In other words, it would have been 13.29 feet below the actual lake level. This value is 3.50 feet lower than reported in Mutual's lake account tables.

There are two primary reasons why the increase in their lake account (6,538 acre-feet) is less than the cumulative credits they have received (26,986 acre-feet). The first reason is spills. When the lake fills, Big Bear MWD's water spills first, and then Mutual's water spills. The credits they receive will spill during very wet years, like 1998. The second reason is evaporation. Mutual's lake level increases with the credits. With higher lake levels, their share of the evaporation losses increases. The end result is that at the end of 2009 Mutual's lake account had 6,538 acre-feet more and Big Bear MWD's lake account had 6,538 acre-feet less as a consequence of the net wastewater export credits.

### **Big Bear MWD's Lake Account**

Section 3(b), District's Water in Storage, of the Watermaster Operating Criteria of the Judgment describes the procedure to determine Big Bear MWD's storage account as follows:

*“Any water actually in storage in excess of Mutual's water in Storage, as calculated above, shall be for the account of District. So long as District has water in storage, all spills from the Lake shall be deemed District Water.”*

**Figure 4** illustrates the water balance for Big Bear MWD's lake account in 2009. Table 3 of Appendix B summarizes the results. This information shows the water actually in storage (from Table 1 of Appendix B), Mutual's water in storage (from Table 2 of Appendix B), and the difference between the two, which is the amount in Big Bear MWD's account. In 2009, Big Bear MWD's account balance began with 20,354 acre-feet and ended the year with 22,397 acre-feet. The increase in their account was 2,043 acre-feet. This increase was because the evaporation losses, SWRCB releases, net snowmaking withdrawals and net wastewater exports was less than the in-lieu deliveries made to Mutual during the year.

**TABLE IV-1**  
**EFFECT OF WASTEWATER EXPORT CREDITS**  
**ON MUTUAL'S LAKE ACCOUNT**

Calendar Year 2009  
Big Bear Watermaster

End Of Calendar Year	Net Wastewater Export Credit (AF)	<u>w/Wastewater Credits</u>		<u>w/o Wastewater Credits</u>		<u>Differences</u>	
		Storage Account (AF)	Lake Level (Feet)	Storage Account (AF)	Lake Level (Feet)	Storage Account (AF)	Lake Level (Feet)
1989	-	16,905	47.00	16,905	47.00	-	-
1990	857	7,627	40.30	6,864	39.50	763	
1991	940	14,226	45.75	12,772	44.65	1,454	1.10
1992	723	22,787	51.15	20,886	50.05	1,901	1.10
1993	2,223	62,165	68.40	58,271	67.00	3,894	1.40
1994	1,397	61,407	68.15	56,451	66.35	4,956	1.80
1995	2,012	66,308	69.90	65,019	69.45	1,289	0.45
1996	1,540	60,875	67.95	58,229	67.00	2,646	0.95
1997	1,427	52,407	64.80	48,663	63.35	3,744	1.45
1998	2,427	69,566	71.00	68,282	70.60	1,284	0.40
1999	1,339	51,390	64.40	48,922	63.45	2,468	0.95
2000	1,337	35,335	57.65	31,900	56.00	3,435	1.65
2001	1,317	19,898	49.45	15,732	46.75	4,166	2.70
2002	889	10,856	43.15	6,897	39.55	3,959	3.60
2003	1,044	13,718	45.35	9,695	42.20	4,023	3.15
2004	1,024	14,200	45.70	10,233	42.65	3,967	3.05
2005	1,750	43,041	61.05	37,900	58.85	5,141	2.20
2006	1,462	48,034	63.10	42,067	60.65	5,967	2.46
2007	997	34,655	57.35	28,588	54.30	6,067	3.05
2008	1,207	35,251	57.60	28,855	54.45	6,396	3.15
2009	1,074	30,034	55.05	23,496	51.55	6,538	3.50
<b>Total</b>	<b>26,986</b>						

**Figure 4**  
**Water Balance for 2009 BBMWD's Lake Operation**  
 (Synthesized Conditions)

**Solve For BBMWD's Ending Balance**

Ending Balance = Beginning Balance + In-Lieu Deliveries – BBMWD's Share (Spills & FC Releases + Leakage + Evaporation + Releases)  
 – Net Wastewater Export + Snowmaking Withdrawal + Return Flow from Snowmelt

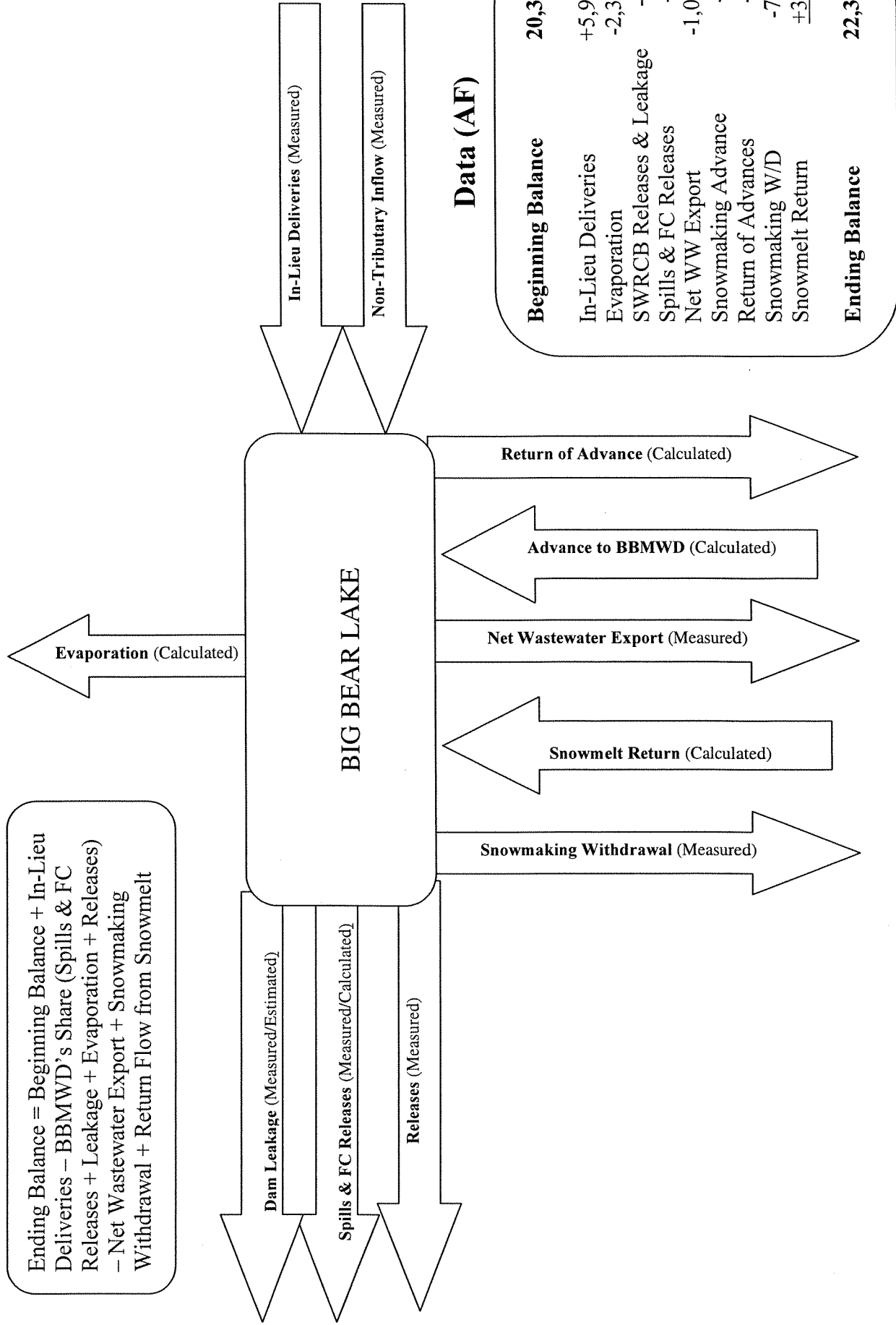


Table 3 of Appendix B also shows the status of Big Bear MWD's "Advance Account". This account represents the net amount of water Big Bear MWD has "borrowed" from Mutual for snowmaking in the Big Bear Lake watershed. In 2009, Big Bear MWD's advance account was zero throughout the year.

Tables 3.A and 3.B of Appendix B provide supporting information to Table 3.

### **Basin Compensation Account**

Exhibit D of the Judgment contains a formula to be used for determination of the amount of Basin Make-up Water, if any, that is needed to offset deficiencies in the recharge supply to the San Bernardino Groundwater Basin. Tables 4, 4A, 4B and 4C in Appendix B follow the formula presented in the Judgment for calculating the credit or deficiency in the Basin Compensation Account. The formula contained in the Judgment is:

Deficiency or Credit =

$$[(.50) (R_d) + (.51) (S_d) + (.50) (P_d)] - [(.50) (R_m) + (.51) (S_m)]$$

wherein:

$R_d$  = Releases actually made under District Operation.

$S_d$  = Spills which actually occurred under District Operation.

$P_d$  = In lieu water purchased by District from San Bernardino Valley MWD or the Management Committee of the Mill Creek Exchange and delivered under District Operation to Mutual for service area requirements.

$R_m$  = Releases which would have been made under a Mutual Operation.

$S_m$  = Spills which would have occurred under a Mutual Operation.

The first three terms in the equation represent the recharge that occurs under Big Bear MWD's lake operation. These are referred to as the "Big Bear's Basin Additions" in Table 4. Table 4.A shows the details of the calculations for these three terms.



The last two terms in the equation represent the recharge that would have occurred if Mutual had owned and operated the lake and met its supplemental water needs from lake releases. Collectively these terms are referred to as "Mutual's Basin Additions" in Table 4. Table 4.B shows the detailed calculations for these two terms.

The fish releases that Mutual used in 2009 (509.8 acre-feet) were included in both the releases made under District Operation ( $R_d$ ) and the releases made under a Mutual Operation ( $R_m$ ). The amount of fish releases that Mutual was not able to use (229.7 acre-feet) was treated as a spill under a District Operation ( $S_d$ ) and 117.2 acre-feet was credited as a Big Bear Basin Addition. The portion that was allocated to Mutual (144.4 acre-feet) was treated as a spill under a Mutual Operation ( $S_m$ ) and 73.6 acre-feet was credited as a Mutual Addition. The differences in these basin additions resulted in an increase in the Basin Compensation Account of 43.5 acre-feet.

The monthly net credit or deficiency in recharge to the San Bernardino Basin is shown in Column 5 of Table 4. These calculations are in accordance with the formula in the Judgment.

The Judgment also requires Big Bear MWD to make-up for deficiencies in recharge that would occur as a result of their lake operations. Column 7 of Table 4 shows the amount of water recharged by Big Bear MWD in the San Bernardino Basin to correct (or prevent) deficiencies in recharge. Table 4.C presents details of the sources of water used to replenish the Basin Compensation Account.

Table 4 of Appendix B presents the status of the Basin Compensation Account for 2009. The account balance began the year with a balance of 24,157 acre-feet and ended the year with 24,201 acre-feet. There was a 44 acre-feet increase in the Basin Compensation Account in 2009.

# **OTHER WATERMASTER ACTIVITIES**

## **IMPACTS OF SEVEN OAKS DAM**

### **Previous Activities**

Construction of Seven Oaks Dam by the U.S. Army Corps of Engineers (Corps) has been underway since 1990. The construction contract for the 550-foot high dam embankment was issued in 1994 and was completed in December 1998. Various clean up and other miscellaneous contracts were completed in late 1999.

The plunge pool by-pass pipeline, which routes low flows through the dam, around the plunge pool and back to the river channel was completed in 2001. The low flows will be diverted for beneficial use by either Mutual through its “River Pick-up” or by SBVWCD at its main river diversion.

Subsequent to authorizing the project and beginning construction, the U.S. Fish and Wildlife Service (Service) listed the Slender Horned Spine Flower and the San Bernardino Merriam’s kangaroo rat as endangered species. This action generated new official biological mitigation consultations with the Service, as required by Section 7 of the Federal Endangered Species Act. A biological assessment by the Corps was expected to be presented to the Service in April 2000 and a biological opinion by the Service was to be returned by the end of the year 2000.

There are two features of Seven Oaks Dam that could affect future Watermaster activities. The first is that Seven Oaks Dam will prevent natural, subsurface flow of groundwater from leaving the Santa Ana River Canyon and will cause all groundwater coming from upstream of the dam to rise to the surface. This subsurface flow will then pass through the dam outlet structure. The plunge pool by-pass line will help to overcome the loss of these subsurface flows.

The second feature is related to impounding storm flows behind the dam. The San Bernardino Valley MWD and Western Municipal Water District of Riverside County provided funding to the Corps for a water conservation study, which began in November 1993, to evaluate Seven Oaks Dam as a dual use structure for flood control and water conservation (see discussion below). The Corps issued a Draft Environmental Impact Statement (DEIS) and responded to comments; however, the Corps has yet to publish a Final EIS and Record of Decision. The Corps and Service will not initiate Section 7 consultations on mitigation requirements for the water

conservation aspect of Seven Oaks Dam until after the biological mitigation issues related to operating the dam as a flood control project are resolved. Then, the Corps will publish the Final EIS and Record of Decision.

In 1995, the San Bernardino Valley MWD and Western Municipal Water District of Riverside County filed a petition to revise the Declaration that the Santa Ana River Stream System is Fully Appropriated and an application to Appropriate Water By Permit with the State Water Resources Control Board. The petition and application is to give the two local agencies the right to impound water behind Seven Oaks Dam, subject to the operational directions of the dam for flood control.

The possible impoundment of waters of the Santa Ana River for other than flood control raises a number of water rights issues that are yet to be resolved. Several diversion points for SBVWCD, North Fork Water Company, Mutual, and Redlands Water Company (“Below the Dam Diverters”) are downstream of Seven Oaks Dam, and the operation of these historical diversion points will be altered by the dam. During 1998 and 1999, discussions between the water rights holders and the San Bernardino Valley MWD began with an attempt to understand what and how much water would be impounded at various times of the year, along with the manner in which releases of storm flows from Seven Oaks Dam would be made.

It was the intent of the “below the dam diverters” to have releases from Seven Oaks Dam approximate average annual natural flows, recognizing that flood control release flows are expected to have less silt than previous flows and may be more evenly distributed. Their request is to have the amount of water to be impounded behind Seven Oaks Dam for other than flood control determined after the combined needs have been met for (1) the water supply agencies to provide direct delivery water and (2) the integrity of the groundwater basin is stabilized by assuring groundwater levels are maintained within an appropriate operating range. These are the primary elements of discussion between the agencies. These discussions did not result in any agreement prior to the State Water Resources Control Board public hearing on the petition on December 7 and 8, 1999.

A Biological Assessment (BA) by the Corps was submitted to the Service in June 2000; however, in a November 2000 letter, the Service rejected the BA, and requested additional information, with particular emphasis on the Corps’ position related to the future water conservation element that had not been addressed by the Service. It is the apparent position of the Service that the biological mitigation requirements for operating the dam as a flood control

facility must be negotiated before any attempt to address the biological impacts of the water conservation element of Seven Oaks Dam.

On September 21, 2000, the State Water Resources Control Board (SWRCB) adopted Order WR2000-12 to allow for processing the application filed by the San Bernardino Valley MWD and Western Municipal Water District of Riverside County. SWRCB Order WR2000-12 also allowed for processing a water right application filed by Orange County Water District. The Chino Basin Water Conservation District filed a petition requesting the SWRCB to reconsider its decision, but in November 2000 the State Board denied the petition and upheld its September order. This decision meant that the applications for appropriation of the right to use water that will be impounded behind Seven Oaks Dam could be processed.

### **2001 Activities**

The U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service continued meeting during 2001, but most of their discussions were focused on flood control issues at Prado Dam. Neither the flood control nor biological issues related to Seven Oaks Dam had been resolved.

On March 21, 2001, the water rights application (AO31165) filed by San Bernardino Valley MWD and Western Municipal Water District of Riverside County was accepted for processing by the State Water Resources Control Board. On April 20, 2001, the water rights application (31174) filed by Orange County Water District was accepted.

In May and June 2001, respectively, the San Bernardino Valley MWD filed a second application, and the San Bernardino Valley Water Conservation District (SBVWCD) filed an application for the right to use Santa Ana River water that would initially be impounded behind Seven Oaks Dam, then released for downstream use. As with the prior applications, accompanying each of the new applications was a petition requesting the fully appropriated stream designation for the Santa Ana River be overturned. Combined with the petition and application received in September 2000 from the Chino Basin Watermaster, there were three additional petitions pending. The State Board indicated a preference to hold hearings on all of the water rights applications together.

## **2002 Activities**

On January 11, 2002, the SWRCB noticed the water rights applications filed by San Bernardino Valley MWD - Western Municipal Water District of Riverside County and Orange County Water District (Applications 31165 and 31174, respectively), which triggered a 60-day protest period. However, on March 4 the SWRCB extended the protest period until a hearing was conducted on additional filings for water rights and accompanying petitions to revise the fully appropriated stream designation for the Santa Ana River.

On March 19, 2002, a Pre-Hearing Conference and Public Hearing was noticed for the water rights applications filed by the Chino Basin Watermaster, San Bernardino Valley MWD - Western Municipal Water District of Riverside County (second application), San Bernardino Valley Water Conservation District, and the City of Riverside. During the Pre-Hearing Conference on April 16, 2002, all parties agreed to accept the evidence, which resulted in Order WR 2000-12 revising the fully appropriated stream designation for the Santa Ana River, as evidence that they would have presented again in their petitions. Consequently, the SWRCB adopted WR 2002-6 during its Public Hearing on July 2, 2002. Following the hearing on July 2, the protest period for Applications 31165 and 31174 was closed on July 17. Several protests were submitted and responses provided, but no further action occurred.

Also on July 2, 2002, the SWRCB staff notified all parties (all 6 applications) by letter that it was the SWRCB's intent to process all the applications in a similar time frame and requested each party to provide a schedule for completing its environmental documents for its respective application. A hearing on all the applications will be scheduled when the environmental analyses are completed.

The Corps and Service continued meeting during 2002. On December 19, 2002, a Biological Opinion outlining the mitigation requirements for Seven Oaks Dam was finalized and accepted. Various agencies in the San Bernardino Valley were given an opportunity to review the final draft and submit comments before it was finalized. With the Biological Opinion finalized, the Corps could complete any required environmental analyses for operating Seven Oaks Dam as a flood control facility. When that work is completed, the issue of a conservation pool of water

detained behind Seven Oaks Dam can be reviewed, and any needed biological consultations can be initiated. The impacts that a conservation pool may have on water rights remain unknown.

### **2003 Activities**

In 2003 the Corps and the Local Sponsors, (San Bernardino and Orange County Flood Control Districts) continued to operate the dam under the Interim Water Control Plan. When a storm event occurred, the gates were closed until the water behind the dam stabilized. at which time large volumes of water were released until the water level behind the dam reached the dead pool elevation. There were four events when large amounts of water were accumulated and released from the dam, one in February, two in March and one in April. All but 616 acre-feet of Santa Ana River water was diverted for beneficial use by Bear Valley Mutual Water Company and SBVWCD in 2003. The Corp and the Local Sponsors continued to operate the dam under the Interim Water Control Plan until December 30<sup>th</sup>, at which time they adopted the final plan and began to develop a debris pool. The dam will be operated in 2004 under the Water Control Manual for the Seven Oaks Dam & Reservoir.

The dam has been in operation for several years, and the Watermaster has identified an issue with regards to the river flow data collection. All of the USGS gages are located downstream of the dam. The dam prevents the gages from recording the actual stream flow during a storm event. The Watermaster Committee has found it important enough to investigate the location of a stream flow gage upstream of the dam. This location will allow the Watermaster to correlate precipitation data with stream flow data and to estimate inflow to the reservoir. The gages downstream of the dam will provide the amount of water released from the dam. Watermaster Committee members have conducted a field trip to locate a gage upstream of the inundation pool and have initiated discussion with the USGS and the Corps for assistance.

The review of the water rights applications proceeded in 2003. As of the end of 2003, a hearing date had not been set and no environmental documents had been distributed for review. Parties continue to negotiate to find common ground and interest.

## **2004 Activities**

2004 started with the Army Corp of Engineers (ACOE) and the Local Sponsors releasing a base flow of approximately 3 cfs. The Water Control Manual required that during the storm season (October to May) a debris pool (water surface elevation of 2,200 feet) be formed for the purposes of protecting the intake tower from sediment intrusion. As of the beginning of May, the debris pool elevation had reached 2,180 feet and contained approximately 1,700 acre-feet of water. At this time, the ACOE began releasing water from the debris pool so they could begin their maintenance activities. As raw water was released, two water treatment plants, one owned by East Valley Water District (EVWD) and the other owned by the City of Redlands (COR), began to receive water from the debris pool. It was quickly noted that the raw water discharged from Seven Oaks Dam (SOD) was of poor quality and adversely impacted the ability of EVWD and the COR to successfully treat this water at their respective plants. This poor quality water is related to releases of water from the debris pool. If the upstream flow is diverted around the debris pool, such as when the Edison Facility is operational, there are no adverse impacts at their respective plants.

Because of this difficulty to treat water from SOD, EVWD hired a consultant, Camp Dresser & McKee, to perform a study on the treatability of the SOD discharges at their Plant 134. The report looked at two periods when water was released from SOD, May and November of 2004. The report concluded that local source water quality in November of 2004 showed significant degradation when it passed through the debris pool as compared to historical water quality. The results showed turbidity increasing from 2 NTU to between 5 to 80 NTU. Similar affects were noted with an increase in color units, iron, manganese, and TOC. All of these are indicative of poorer quality water than historical Santa Ana River water quality conditions. Limited source water quality sampling by the COR confirmed some of these adverse water quality trends during a period in May 2004 when discharges were also made from the debris pool. The water agencies impacted by the degradation of the water quality of the debris pool are meeting and working closely with the ACOE and the Local Sponsors to find a solution to the problem.

At the end of November 2004, the ACOE and the Local Sponsors completed their maintenance activities and began building the debris pool for the upcoming storm season. By the end of

December 2004, the debris pool was at a water surface elevation of 2,165 and contained approximately 900 acre-feet.

## **2005 Activities**

The 2005 year began with abnormal rainfall. Late rains in 2004 had begun to fill the debris pool behind the dam. By the first of the year, the debris pool had reached elevation 2,165. Heavy rains in January and February more than filled the debris pool and by the end of March there was approximately 40,000 acre-feet of water stored behind the dam. The flood pool was at an elevation of approximately 2,390. In accord with operational guidelines, the Corps and local sponsors began to make releases at a rate of approximately 500 cfs. As happened in 2004, the water quality was unsuitable for surface diversion to the two local water treatment facilities. The NTU's were in excess of 400 and the water had the look of liquid milk chocolate. The Edison facilities were off line due to the storms. Surface water diverters were again faced with unusable water for domestic treatment purposes. The Conservation District initially diverted some of the degraded water for groundwater percolation but ultimately had to greatly reduce diversions due to the excessive turbidity and poor water quality.

A group was formed by the Upper Santa Ana River Water Resources Association to take another look at the water quality situation. East Valley Water District engaged the services of Camp Dresser & McKee (CDM) to prepare a detailed report addressing the problem as well as identifying potential solutions. Representatives from the Basin met with Congressman Jerry Lewis to describe the situation and seek Federal assistance to solve the problem. Congress has appropriated \$1,000,000 to study the issue. By the end of 2005, CDM and the working committee from the Upper Santa Ana River Basin had completed their study. The study has been distributed to the Corps, Local Sponsors and to Congressman Lewis' office.

Because of the large body of water contained behind the SOD, the Corps decided to test the operating valves for flood releases in mid-spring. During the test period when high velocity releases were taking place, a portion of the outlet tunnel failed and the tests were terminated. For the balance of the spring, summer and fall seasons the releases from the SOD were minimal and averaged between 3 and 80 cfs, until the debris pool was emptied. The repairs to the tunnel were



completed in November and it was anticipated that in early 2006, testing would again be resumed. However, mother nature has not been very cooperative and, since March of 2005, there has been no measurable rainfall in the watershed above the SOD.

Water quality remains a priority concern. While 2005 was one of the wettest years on record, local diverters, who normally rely on the flows from the Santa Ana River for their source of treatable water for domestic purposes, had to purchase State Water Project water. The saving grace for the local water users is that Edison was able to repair all their upstream facilities by early fall. Their diversions by-pass SOD and they were able to deliver good quality water to the two local water treatment facilities. However, by the end of 2004 the debris pool was non-existent and slowly beginning to rise. Water quality again became poor.

### **2006 Activities**

At their January 17, 2006 meeting, the Watermaster Committee received a copy of the “Seven Oaks Dam Water Impact Study” report prepared by Camp, Dresser & McKee, Inc. (CDM). This report identified the water quality and water supply impacts of Seven Oaks Dam on downstream water users, and recommended comprehensive alternatives to mitigate these impacts. Water quality impacts included longer durations and elevated levels of turbidity, total organic carbon, color, iron, manganese, algae, and taste and odor causing compounds. Water supply impacts included less supply in dry hydrologic years, reduced supplies in Fall through Winter as the Debris Pool behind the Dam is filled, and extended periods of time the SCE facilities are out of service after flood events. During these extended periods, the SCE facilities cannot be used to divert high quality Santa Ana River (and Bear Creek) water around Seven Oaks Dam.

The CDM report recommended long-term comprehensive alternatives and an interim solution. The long-term comprehensive alternatives included pretreatment of the water delivered from Seven Oaks Dam to achieve the water quality levels that existed before the Dam was constructed, and hardening of the SCE facilities so they would be more reliable and remain in-service for longer periods of time. The recommended interim solution is to purchase imported SWP water from San Bernardino Valley MWD to replace the water that could not be used because of water

quality problems or that was not available due to dam operations and unavailability of SCE facilities.

At the May 16, 2006 meeting, the Watermaster Committee was advised that the ACOE was going to undertake a two-year \$3.5 million study of these issues. At the October 10, 2006 meeting, the Watermaster Committee was further notified that the ACOE staff had initiated their study, and they were in the data gathering phase.

The Watermaster Committee is concerned that the current operations of Seven Oaks Dam could restrict the operations of Big Bear Dam and the in-lieu program as described in the 1977 Judgment. These restrictions could include, at a minimum, reduced releases and increased in-lieu requirements when:

- SCE facilities are out of service and the quality of water behind Seven Oaks Dam is unacceptable to Mutual.
- SCE facilities are operating at capacity and the quality of water behind Seven Oaks Dam is unacceptable to Mutual.
- SCE facilities are out of service or operating at capacity in the fall and winter months when the Debris Pool is being filled and there are no releases from Seven Oaks Dam.

In addition, any reduction in releases from the Lake would increase lake evaporation and decrease the long-term average deliveries to Mutual. These restrictions could also constrain Big Bear MWD's opportunities to beneficially use the flood control releases they would make from Big Bear Lake in the late fall and winter months.

## **2007 Activities**

2007 began with a release of approximately 3 cfs from Seven Oaks Dam. USACOE slowly raised the reservoir elevation. As of January 9, 2007 the elevation was 2,157.25 feet. The debris pool's desired elevation is 2,200.00 feet. Due to the abnormally dry weather conditions in January and February, SBVWCD began spreading State Project Water in the Santa Ana River spreading basins. By the end of February, the debris pool elevation was 2,175.20 feet and rising.

During the last two weeks in April, USACOE and local sponsors had hoped to accumulate enough water to test the Seven Oaks Dam tunnel repairs which were completed in early 2006, but never subjected to test flows. Unfortunately there was insufficient water behind the Dam and the “high flow” testing lasted only approximately six (6) hours.

Very little to no water was released from Seven Oaks Dam from summer through November 2007. Southern California Edison was offline due to repairs on their facilities and on the intake.

In Spring of 2007, the capacity of the Foothill Feeder was tested. San Bernardino Valley Municipal Water District (Valley) is building a pump station on the Foothill Pipeline at the interconnect between Valley’s and Metropolitan Water District’s (MWD) pipeline to help improve the water pressure towards the east end of the valley when making large deliveries to MWD. It would also be used by MWD until their Inland Feeder Project tunnels are completed. In the future, the pumping station will help increase the flow capacity to the east end of the valley and the San Geronio Pass Water Agency. The results of the capacity testing are unknown.

In late November and early December 2007, the Upper Santa Ana Integrated Regional Water Management Plan (IRWMP) was approved. A press release in October 2007 by San Bernardino Valley Municipal Water District (Valley) summarized the main goal of the IRWMP is to improve water supply reliability in the region. To improve water supply reliability, the region must reduce demands as much as possible and capture and store wet year supplies for use during drought periods and other emergencies. The Plan is designed to meet this objective, and it addresses the following topics: water conservation and recycling, surface water management, groundwater management, diversification of water supplies, disaster preparedness, protection of water quality, ecosystem restoration and environmental improvement, and climate change.

## **2008 Activities**

In 2008, the San Bernardino Valley Water Conservation District partnered with the San Bernardino Valley Municipal Water District in conducting a study of the capacity of the water spreading facilities downstream of the Seven Oaks Dam. The field work was conducted during March through December, 2008 and consisted of:

- Field flow testing of the diversion and conveyance facilities
- Survey of diversion works and conveyance (measurements of dimensions and slopes)

- Soil investigation consisting of:
- Excavation of 15 trenches
- Collection of 72 surface soil samples
- Drilling, sampling, and lithologic logging of 7 borings to a maximum depth of 157 feet
- Laboratory analysis of 75 samples for grain size analysis, and 16 of these samples for analysis of hydraulic conductivity
- Construction of 6 monitoring wells and installation of automated monitoring equipment
- Several types of percolation tests at existing recharge ponds
- Physical surveys of existing well locations and elevations

Major conclusions of the study are:

- The sedimentary materials underlying the recharge facilities form an unconfined aquifer consisting of permeable, coarse, sandy gravel and/or gravelly sand. No significant, laterally-continuous strata of low permeability are present that would prevent the downward percolation of recharge water.
- Some existing ponds have a thin layer of silt and/or clay derived from the introduction of turbid recharge water which limits percolation capacity.
- Faulting associated with the San Andreas Fault Zone has created a groundwater barrier which limits recharge capacity on the eastern portion of the site due to shallow groundwater that surfaces or “daylights” east (upgradient) of this barrier.
- During high runoff periods such as those that occurred in 1980, 1993, 1998 and 2005, the regional area in the vicinity of the recharge facilities may become saturated with shallow groundwater, limiting recharge in all of the facilities. However, these events have been very temporary and may occur at a different frequency depending on the operation of the Seven Oaks Dam.
- The current intake capacity of the Intake Structure without modification is approximately 150 cfs. Ultimately the desired conveyance capacity is 500 cfs for the entire conveyance system.
- Downstream of the Intake Structure and Cuttle Weir, earthen canals limit the capacity of the conveyance facilities to approximately 300 cfs.
- The recharge capacity of the existing percolation ponds at the SAR recharge facility west of the groundwater barrier is approximately 145 cfs.

The missing upstream gaging station has not been replaced yet by the USACE. This is having a negative effect on the water flow monitoring capabilities of the Seven Oaks Dam as well as the downstream watershed.

The U.S. Army Corps of Engineers (USACE) has completed its draft study of the steps taken to address the degradation of the Santa Ana River water quality resulting from the construction of Seven Oaks Dam. That study has been reviewed by CDM, a consultant engineering firm hired by Bear Valley Mutual Water Company, Lugonia Water Company, Redlands Water Company, North Fork Water Company, San Bernardino Valley Conservation District, and the San Bernardino Valley Mutual Water District, and other interested water purveyors. The USACE report verifies original methodology used in calculating the effects of placing a dam interrupting the natural flow of the Santa Ana River for purposes of flood control and water retention to maintain a predictable daily controlled water flow for downstream users. The USACE report notes through modeling techniques based on field records data, that there appears to be no negative effect on the Santa Ana River water quality. The downstream uses contend otherwise, that the very nature of the water being retained behind the dam for lengthy periods of time causes algae and bacterial growth, causes water to become stale and stagnant, and tends to plug up the pervious rock and soil layers of the downstream spreading basins. Several of the downstream water purveyors with water treatment facilities have difficulty, or cannot treat the stagnant water at all since the treatment facilities were not designed to treat water of this poor quality. The debate continues.

## **2009 Activities**

In May, the Seven Oaks Dam Orange County Flood Control district operators emptied the reservoir behind the dam. With the advent of a drought breaking rainy season that began in October, the dam is now about 30 percent full. To view a daily activities record of the SOD, as well as information about other area dams, use the web address of:

<http://www.spl.usace.army.mil/cgi-bin/cgiwrap/zinger/slProjReport.cgi?allRes.in.>

The unanswered question remaining from last year's summary of SOD activities is the issue of degraded water quality of river runoff retained for long time periods behind the dam. At Congressman Lewis's urging, the US Army Corps of Engineers (USACE) has resumed bi-monthly talks with interested downstream prior rights and permitted water users to reach a conclusion about the change in operation of the SOD to decrease the impact of dam retention on degradation of good quality stream water. A final study report is due to be issued in April 2010. Two general conclusions have been offered on how to deal with the water quality problem: (1) do

not fill the debris pool with runoff that is high in organic materials; with less organic material contained in the stored water, less contamination of the water will result, and (2) use the volume for long term water storage to form a lake, thereby reducing the impact of plant life on pooled water (weeds, bushes, other plants that have grown since the last reservoir filling) and there will be no dry land for the plants to regenerate on when the reservoir is drained each Spring. The USACE is willing to change its method of operations if the downstream users agree to accept responsibility for downstream water quality. There are still decisions to be made by the downstream users about the level of responsibility for water quality they are willing to accept if the reservoir behind the SOD becomes a perpetual lake instead of a seasonal facility for strictly storm control purposes.

Another issue of importance to Bear Valley Mutual Water Company and downstream water users, and to the water volume calculations of the Big Bear Watermaster Report is the upstream bypass of high quality water that is collected upstream of the SOD and conveyed past the dam in Southern California Edison Electric Company pipelines to the SCE Power Plant No. 3. There the water is used to power a 3 MW generator. This better quality water is then distributed to Redlands Water Company, East Valley Water District, and Bear Valley Mutual Water Company for their usage. The water is clean and easily treatable by the respective water purveyors' treatment plants. When the reservoir level surpasses the access road to the upstream valves controlling the SCE Highline, water cannot be directed to the downstream SCE Power Plant No. 3. Then the high quality upstream water flows into the SOD reservoir and the water stored behind the SOD is distributed to the above entities. Most of the time that water is not usable. The access to the upstream valves when the reservoir levels are higher than the access road is now an issue that has to be resolved. Although the debate continues, at least there is the beginning of a consensus of how the water above the SOD can best be utilized by the water users downstream of the dam.

## **WILD AND SCENIC RIVERS ISSUE**

### **2004 Activities**

In mid-2004, the Watermaster Committee became aware of the U.S. Forest Service's Draft Land Management Plan for Southern California National Forests ("Forest Plan"). The Forest Plan proposes to designate Bear Creek from below Bear Valley Dam to its confluence with the Santa Ana River and three stretches of the Santa Ana River as "eligible" for addition to the Wild & Scenic Rivers System. Comments on the Forest Plan were due on August 11, 2004.

The Watermaster responded on August 9, 2004. The response outlined the responsibilities of the Watermaster Committee and requested a 180-day extension of the comment period to obtain, review and comment on the “Forest Plan.” The Forest Plan is a large, complex document and the additional time was needed to determine what impacts the proposed action would have on the administration of the Rights and Physical Solution stipulated in the Judgment of the Superior Court.

By the end of 2004, the U.S. Forest Service had not responded to the Watermaster Committee’s request.

## **2005 Activities**

On September 20, 2005, the U.S. Forest Service issued the Revised Land and Resource Management Plans (Forest Plans) and accompanying Final Environmental Impact Statement (FEIS) and Records of Decision for the Angeles, Cleveland, Los Padres, and San Bernardino National Forests. The U.S. Forest Service selected Alternative 4a for implementation. This alternative recommends for designation a few wild and scenic rivers but none are in the San Bernardino National Forest.

The FEIS includes Appendix E, Wild and Scenic Rivers, that describes the efforts completed related to suitability for a river to be designated as a “wild and scenic river (WSR).” These efforts require determinations to be made regarding a river’s eligibility, classification and suitability.

In the Santa Ana River watershed, two rivers were found “eligible” to be classified as a WSR. They are 1) 8.9 miles of Bear Creek below Bear Valley Dam, and 2) 19.8 miles of the Santa Ana River above the confluence with Bear Creek. According to Appendix E *“Eligibility is an evaluation of whether a river is free-flowing and possesses one or more outstandingly remarkable values (ORVs) including scenery, recreation, geology, fish and wildlife, history, cultural (prehistoric), or similar values.”*

If a river is found “eligible,” it is to be placed into one or more of three classes: wild, scenic or recreational. In the case of the rivers in the Santa Ana Watershed, the classifications are as follows.

<b>River</b>	<b>Length (miles)</b>	<b>Description</b>	<b>Classification</b>
Bear Creek	8.9	Big Bear Dam to private land near Santa Ana River	Wild
Santa Ana River	2.4	South Fork Meadows to Wilderness Boundary	Wild
	13.9	Big Meadows to Filaree Flat	Recreational
	<u>3.5</u>	Filaree Flat to Confluence w/Bear Creek	Scenic
	19.8		

The final step is to determine if the “eligible” rivers are “suitable” to be recommended to be part of the National Wild and Scenic River System. This determination is made through completion of “suitability studies.” The FEIS stated that the suitability study phase for the eligible rivers will be initiated at a later date.

In summary, the U.S. Forest Service has found major portions of both Bear Creek and the Santa Ana River “eligible” to become designated as a “wild and scenic river” and a suitability study will be initiated at a future time.

### **2006 Activities**

The Watermaster Committee has not received any additional information from the U.S. Forest Service related to this issue.

### **2007 Activities**

The Watermaster Committee has not received any additional information from the U.S. Forest Service related to this issue.

### **2008 Activities**

The Watermaster Committee has not received any additional information from the U.S. Forest Service related to this issue.



## **2009 Activities**

The Watermaster Committee has not received any additional information from the U.S. Forest Service related to this issue.

### **QUAGGA MUSSEL PROTECTION PROGRAM**

The invasive Quagga Mussel became a significant threat to Big Bear Lake in 2009. Big Bear Municipal Water District launched a major program at the beginning of the boating season to prevent the mussel from getting into the lake. While once only a problem east of the 100th meridian, the mussel reached western lakes, and most significantly Lake Mead in January 2007. By the fall of 2009 the mussel was pervasive in Lake Mojave, Lake Havasu, and boaters traveling to and from the lake were transporting the microscopic larvae in bilges and out drives creating a threat to Big Bear Lake. The California mussel population expanded via the Colorado River aqueduct turnout at Parker Dam into receiving reservoirs in San Diego County. Other southern California lakes became infested when infected boats transported the microscopic mussel larvae.

The Quagga mussel is a prolific reproducer and colonizes on every solid object it encounters. Fouled boat hulls, sinking buoys, clogged water pipes and screens are just some of the problems caused by the Quagga mussel. Also, because each mature mussel can filter feed about one liter of water daily, huge mussel masses significantly reduce concentrations of plankton that are an essential food supply for fisheries.

In our situation the potential impact of an infestation is great because Big Bear Lake is at the top of the Santa Ana River watershed. Every water body and stream below the lake could become infected, and the resulting impacts to Bear Creek fisheries, the pool behind Seven Oaks Dam, the Edison generating station, and the Santa Ana River could be disastrous.

In response to the threat the District imposed new rules on launching, installed traffic control structures to prevent unauthorized launching, and strictly regulated the launch ramp hours to provide constant staffing at the start of the boating season in 2009. All boats entering the lake at public launch ramps were required to complete a questionnaire to determine if and when they might have been in an infected lake. They were also checked for standing water in bilges, lockers, bait live wells, etc. All vessels that the District inspectors were suspicious about were decontaminated at no charge to the boat owner with pressurized hot (140 degree) water. Some

limited training was also provided to commercial ramp operators who were responsible for sending suspicious vessels to a District facility for decontamination.

Both the City of Big Bear Lake and Snow Summit Resort contributed funds to help defray the costs associated with unexpected burden on the financial resources of the District. Nearly \$100,000 was spent during the summer of 2009 for educational materials, signs, additional summer staffing and capital improvements to fund the Quagga Prevention Program.

Sampling at the end of the 2009 boating season revealed that Big Bear Lake was free of visible mussels. Beginning in 2009 sampling for the microscopic mussel larvae will begin as soon as the lake warms to 45 degrees, the minimum temperature at which the mussels can reproduce.

In 2009 a Quagga Prevention Program surcharge will be added to boat permits to defray the costs associated with the program. The surcharge will remain in place as long as a threat exists. With the number of Quagga Mussel infested lakes in southern California increasing, and the proximity of recreational boating opportunities at the Colorado River, the threat of infestation becomes greater. New, more stringent protective measures will be instituted at the start of the 2009 boating season. These will include training the entire public and private marina work force operating on the lake, requirements for commercial marinas to staff launch ramps with certified Quagga mussel inspectors, significant limitations on the use of private launch ramps and an expanded program of boat decontamination with pressurized hot water at both public launch ramps and the District office.

## **2009 Activities**

Several new initiatives were launched in 2009 intended to keep Big Bear Lake Quagga Mussel free. Before the start of the boating season the BBMWD hosted a Level 1 Quagga Inspection training for all District and private marina workers. The 8 hour course was completed by nearly 50 workers who were then authorized by the District to perform boat inspections at all boat launching sites. The District also began collecting a boat permit surcharge of five dollars to help defray the costs associated with the Quagga Prevention Program. In an attempt to gain control of risks posed by privately owned launch ramps on single family properties, the District adopted strict standards for their use. District regulation required each of these individual ramps to be secured from unauthorized use with a chain and lock attached to steel posts set in concrete footings. The owners were also required to meet personally with District personnel to educate them regarding Quagga mussel risks and transport mechanisms. At the two public launch ramps District ramp personnel used hot water to decontaminate more than 1,200 boats and sealed more

than 10,000 boats to their trailers as they left the lake. Sealing boats to trailers allows the boater to return to the launch ramp at a later date without having to be inspected.

Static sample media suspended in the lake at each marina and the launch ramps were free of Quagga Mussels in November for the second full year of monitoring. Also lake water sampling conducted during the entire boating season did not find any Quagga larvae. Big Bear Lake continues to be Quagga Mussel free.

## **APPENDIX A**

### **MINUTES OF WATERMASTER MEETINGS**

#### **Dates**

**January 3, 2009**

**May 5, 2009**

**August 24, 2009**

**APPENDIX B**

**TABLE OF**

**ACCOUNTS OF OPERATION OF BIG BEAR LAKE**

**ACCOUNTS FOR**

**CALENDAR YEAR 2009**

INPUT DATA	B-1 thru B-4
SUMMARY OF RESULTS	B-5
1. ACTUAL OPERATION OF BIG BEAR LAKE	B-6
1.A Summary Details	B-7
1.B Release Details	B-8
1.C Lake Withdrawal Details	B-9
1.D Evaporation Details	B-10
2. SYNTHESIZED MUTUAL OPERATION OF BIG BEAR LAKE	B-11
2.A Lake Outflow Details	B-12
2.B Synthesized Evaporation Calculation	B-13
2.C Mutual's Leakage and Adjusted Spills	B-14
3. DETERMINATION OF BIG BEAR'S LAKE ACCOUNT STATUS	B-15
3.A Lake Inflow Details	B-16
3.B Lake Outflow Details	B-17
4. BASIN COMPENSATION ACCOUNT	B-18
4.A Big Bear's Basin Additions	B-19
4.B Mutual's Basin Additions	B-20
4.C Basin Replenishments	B-21

**BIG BEAR WATERMASTER**  
**DRAFT MINUTES OF THE MEETING OF JANUARY 13, 2009**

**PLACE:** Redlands Country Club  
1749 Garden Street  
Redlands, CA 92373

**PRESENT:** Watermaster Committee  
Don Evenson  
Michael L. Huffstutler  
R. Robert Neufeld

Representing  
Big Bear MWD, Chair  
Bear Valley Mutual Water Company  
SBV Water Conservation District

Others

Scott Heule  
Vince Smith  
Todd Murphy  
Monty Dill  
Shanae Smith

Big Bear MWD  
Big Bear MWD  
Big Bear MWD  
Bear Valley Mutual Water Company  
SBV Water Conservation District

**1. WELCOME AND CALL TO ORDER**

The Big Bear Watermaster meeting was called to order by Don Evenson at 1:30 p.m.

**2. APPROVAL OF MINUTES**

The draft minutes of the October 21, 2008 meeting were distributed for review by committee members.

**3. LAKE AND BEAR CREEK STATUS**

Scott Heule reported that the lake level was 66.00 feet, which is 6.33 feet below full.

He said that 42 inches of snow had fallen, and 11.9 inches of precipitation has been recorded since October 2008. He said that the fishery releases were based on an above normal year for the month of January, and that 480 gallons per minute were being released from the 6 inch valve. He said that 0.95 cfs was being measured at Station B during the morning and evening hours, meeting the .75 cfs flow requirement.

Mr. Heule stated that the State Water Resources Control Board (SWRCB) conducted a scoping meeting for a CEQA process for Mercury TMDL in the lake, and the comment period would end the end of January. They would begin the environmental document in February. He explained that Mercury levels found in bass exceeded the the state requirement for fish tissue. Mercury levels in the lake are below the State drinking water standard. The SWRCB may place bass

in Big Bear Lake on the Federal 303 list as exceeding the Mercury levels. A discussion ensued regarding a decision from a litigation regarding planting trout in high elevations, as Big Bear Lake was removed from the prohibition list.

Mr. Heule also reported that monuments had been placed on either side of the cracks in the dam to measure the distance of the cracks over time. He explained that one significant crack at Bay 9 measured 1.5 inches wide and was 13 feet from the base of the dam. He said that MWH engineers ruled out any negative impacts to the integrity of the dam, and that at Bay 1, an additional crack at the joint where the concrete had fallen had been repaired.

Mr. Heule said that MWH also conducted an investigation of the boulders on the downstream side of the dam, as the Department of the Safety Dams was concerned that boulders would topple over in the event of an overflow. He said that the investigation showed no significant adverse affects to the integrity of the dam.

Mr. Heule concluded his report by explaining that the District was drafting a plan to be submitted to Caltrans for costs associated with negotiating a replacement of a maintenance walkway for foot traffic across the dam once the highway has been removed.

#### **4. SANTA ANA RIVER STATUS**

Robert Neufeld reported that both he and Robert Martin, the General Manager for the East Valley Water District (EVWD), were scheduled to meet with the newly appointed chief staff personnel for the US Army Corp of Engineers (ACOE) in the Los Angeles office on January 20 to resume discussions regarding water quality issues behind the dam. Scott Heule stated that BBMWD also had a meeting scheduled with planning personnel of the ACOE at the end of January.

Mr. Neufeld reported that limitations had been set by the Basin Technical Advisory Committee (BTAC) on the Conservation District's spreading targets within the Bunker Hill basin, based on the 2009 Regional Water Management Plan for the Integrated Regional Water Management Plan (IRWMP). He stated that those limitations would have significant impacts on the Conservation District's spreading capabilities in the Santa Ana River. Mr. Neufeld said that Mill Creek spreading targets had yet to be indentified in the IRWMP, nor had the responsible spreading entity been identified.

Mr. Neufeld stated that an application was filed by Muni with the SWRCB to renew the Temporary Urgency Permit (No. 31732) to the previously granted permit (No. 21212) for 25,000 acre-feet of additional water on November 7, 2008 which was granted.

#### **5. MUTUAL'S PROJECTION OF NEEDS.**

Mr. Huffstutler reported that Mutual's needs would be up to 6,500 acre-feet of water, which would be met by Santa Ana River water. He stated that due to sufficient river flow in December 2008, State Water Project (SWP) water was not in use. A discussion ensued.

## **6. GROUNDWATER PRODUCTION AND DEVELOPMENT IN BIG BEAR VALLEY.**

No new report.

## **7. OTHER TOPICS**

### **a. Seven Oaks Dam Operations.**

Mr. Huffstutler reported that 3 cfs was the minimum release requirement from the dam and the 3 cfs is being diverted at the BV river pick-up and ultimately delivered to the City of Redlands or North Fork WC. A discussion ensued.

### **b. Seven Oaks Dam Water Quality.**

Robert Neufeld said that a joint effort on the part of the Conservation District, EVWD and the ACOE was currently being undertaken. Mike Huffstutler reported that water quality behind the dam was good and usable; however, EVWD had been utilizing SWP water, as it deemed the water behind the dam unusable.

### **c. Status of SAR Stream Gauge.**

No new report.

### **d. LAFCO Consolidation Application Process.**

Mr. Neufeld reported that the review and consideration of the Certification of the Final Environmental Impact Report (EIR) for LAFCO 3076 - Consolidation of the Conservation District and Muni was scheduled January 21, at the LAFCO office. He said that a subsequent vote of the LAFCO Commissioners could be as early as April 2009.

Mr. Neufeld reported that the Conservation District was awaiting a decision from the Ventura County Appellate Court regarding the jurisdictional law suit against LAFCO at a hearing that took place December 9, 2008, preceded by a 60 – 90 review period. A discussion ensued.

### **e. 2008 Annual Report.**

Don Evenson provided a copy of the report assignments to each committee member, which outlined the schedule in detail and that all data requests should be received no later than March 6, allowing adequate




time to review the draft report for submission to the courts on the April 1, 2009 deadline.

**8. DATE FOR NEXT MEETING**

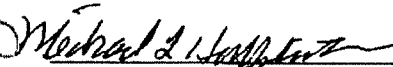
The next meeting will be on Tuesday, March 17, 2009, at 1:30 p.m., at the San Bernardino Valley Conservation District, Redlands, CA.

**9. ADJOURN**

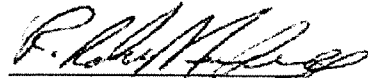
There being no further business, the meeting was adjourned at 2:38 p.m.



Donald E. Evenson



Michael L. Huffstutler



R. Robert Neufeld

**BIG BEAR WATERMASTER**  
**MINUTES OF THE MEETING OF May 5, 2009**

**PLACE:** San Bernardino Valley Water Conservation District  
1630 W. Redlands Blvd., Suite A  
Redlands, CA 92373

<b>PRESENT:</b>	<u>Watermaster Committee</u>	<u>Representing</u>
	Don Evenson	Big Bear MWD, Chair
	Michael L. Huffstutler	Bear Valley Mutual Water Company
	R. Robert Neufeld	SBV Water Conservation District
	<u>Others</u>	
	Scott Heule	Big Bear MWD
	Skip Suhay	Big Bear MWD
	Paula Fashempour	Big Bear MWD
	Claud Seal	SBV Water Conservation District
	Shanae Smith	SBV Water Conservation District

**1. WELCOME AND CALL TO ORDER**

The Big Bear Watermaster meeting was called to order by Don Evenson at 1:35 p.m.

**2. APPROVAL OF MINUTES**

The minutes from the January 13, 2009 meeting were reviewed. A change was made to read, "Monte Dill, Bear Valley Mutual Water Company." It was moved by Robert Neufeld and seconded by Michael Huffstutler to accept the minutes as amended.

**3. LAKE AND BEAR CREEK STATUS**

Scott Heule reported that the lake level was 67.44 feet, 4.89 feet below full. At this time last year, the level was 68.70 feet, 3.63 below full. He reported that precipitation since October 1, 2008 was 28.03 inches; a below normal year for May (April was above normal). Mr. Heule added that the fishery releases were measuring at 325 gallons per minute or 0.73 cfs, and 0.76 cfs at Station B.

Mr. Heule explained that after speaking with Mike Huffstutler, Big Bear MWD made an agreement with Flat Iron Construction Corp. that would allow the use of up to 4 acre-feet of lake water over a three-year period while the new bridge is constructed, in exchange for the purchase and installation of metering, and monitoring equipment on the 2-inch discharge pipe at the base of the dam. He added that Flat Iron Construction Corp. was scheduled to install equipment within

one to two weeks, and would provide the Big Bear MWD with an accounting of total water used, in addition to the frequency of use.

Mr. Heule also reported that the new footings for the tower crane and the west side trestle bridge have been poured, and blasting for the large road cut on the east side below the Dam Keeper's house would begin in May.

Mr. Heule said that the Big Bear MWD has continued to work with Caltrans to secure a funding agreement to replace the old highway bridge on the dam with a maintenance/pedestrian bridge. He explained that the cost would be approximately \$1 million, and that the community of Big Bear would be encouraged to assist with the selection of the final aesthetic design for railing and lighting.

#### **4. SANTA ANA RIVER STATUS**

Robert Neufeld reported that the Orange County Flood Control District began its annual releases, and that a total of up to 48 cfs per day was being released from the debris pool.

Mr. Neufeld also reported that the Santa Ana River Groundwater Recharge Optimization Study (Optimization Study) was in the final stage of completion. He explained that the purpose of the study was to evaluate existing spreading facilities and determine their maximum estimated capacity and to recover use of spreading facilities lost to construction of Seven Oaks Dam. Mr. Neufeld explained that the easterly 2/3 of the borrow pit was not conducive for additional spreading facilities due to the discovery of a fault line and compacted silty floor covering. He added that the Conservation District Board of Directors had approved the conceptual design of a wetlands project in the pit to help address water quality issues behind the dam.

Mr. Neufeld report that he would be coordinating meetings with the United States Army Corp of Engineers (USACE) chief personnel to discuss the committee's request for the installation of a stream gauge for the dam. A discussion ensued.

#### **MUTUAL'S PROJECTION OF NEEDS.**

Mr. Huffstutler said that Mutual's needs for water from BBMWD would be up to 6,500 acre-feet of water, but so far this year he has not needed any in-lieu deliveries. He said that State Water Project (SWP) water was being delivered and paid for by East Valley Water District (EVWD). He said that Mutual would continue to utilize Santa Ana River water.

Mr. Huffstutler reported that state water contractors would receive an allocation of up to 30% for the 2009 - 2010 water year, as Don Evenson made an inquiry about Muni's ability to provide SWP water. Mr. Neufeld added that the San Bernardino Valley Municipal Water District (Muni) reported to the Basin Technical

Advisory Commission (BTAC) that an additional 13% of water would be available to local producers this year.

## **5. GROUNDWATER PRODUCTION AND DEVELOPMENT IN BIG BEAR VALLEY.**

Scott Heule said that there was nothing new to report on this item. He reported that the Big Bear Department of Water and Power drilled a new well to replace existing wells no longer in use that were too high with contaminants on heavy demand days. He said that the new well had no detectible contaminants and that the water demands will be satisfied by the new well.

## **6. OTHER TOPICS**

### **a. Seven Oaks Dam Operations.**

This item was previously covered.

### **b. Seven Oaks Dam Water Quality.**

Mike Huffstutler reported that the water was viable for spreading.

### **c. Status of SAR Stream Gauge.**

This item was previously covered.

### **d. LAFCO Consolidation Application Process.**

Mr. Neufeld reported that the LAFCO staff was in the process of conducting an independent financial analysis of the cost savings for the consolidation of the Conservation District and Muni. He explained that the initial amount of \$700,000 projected in Muni's 2006 Plan for Service was suspect, as the Conservation District's mining revenues have since decreased by 90%, significantly impacting the estimated cost savings to taxpayers in the event of a consolidation.

Mr. Neufeld added that should the LAFCO commissioners vote yes for consolidation of the two Districts at the July 15 hearing, the Conservation District would cease to exist as an agency. Subsequently, Muni would be named the successor agency after an approximate 6 month transition period. Mr. Huffstutler noted that Muni would absorb all Conservation District staff as indicated in their Plan for Service.

### **e. 2008 Annual Report.**

Don Evenson distributed lake accounting worksheets and led a discussion regarding various issues with the flow measurements at Station B that impacted the lake accounting for the 2008 report. Mr. Evenson stated that all comments should be received within ten days for a timely submission to the court by June 1, 2009.

### **f. Fish Release Lake Account Discussion.**

Mr. Evenson explained while preparing the report, both he and Conservation District Engineer discovered inconsistencies in past procedures and methodology used for calculating previous Watermaster reports. He stated that revised procedures will be implemented to clarify the annual calculation process.

**8. DATE FOR NEXT MEETING**

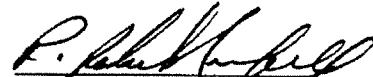
The next meeting will be on Tuesday, August 4, 2009 (this date was later changed to August 24, 2009), at 11:30 a.m., at the B's Backyard Bar-B-Que, Big Bear, CA.

**9. ADJOURN**

There being no further business, the meeting was adjourned at 2:40 p.m.

  
Donald E. Evenson

  
Michael L. Huffstutler

  
R. Robert Neufeld

**BIG BEAR WATERMASTER**  
**MINUTES OF THE MEETING OF AUGUST 24, 2009**

**PLACE:** B's Backyard Bar-B-Q  
350 Alden Road  
Big Bear Lake, CA 92315

<b>PRESENT:</b>	<u>Watermaster Committee</u> Don Evenson R. Robert Neufeld	<u>Representing</u> Big Bear MWD, Chair SBV Water Conservation District
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<b>ABSENT:</b>	Michael L. Huffstutler	Bear Valley Mutual Water Company
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<u>Others</u> Scott Heule Skip Suhay James Weber Claud Seal Shanae Smith	Big Bear MWD Big Bear MWD Big Bear MWD SBV Water Conservation District SBV Water Conservation District
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**1. WELCOME AND CALL TO ORDER**

The Big Bear Watermaster meeting was called to order by Don Evenson at 11:35 a.m.

**2. APPROVAL OF MINUTES**

Approvals of the minutes from the May 5, 2009 committee meeting were tabled until the next meeting for further review.

**3. LAKE AND BEAR CREEK STATUS**

Scott Heule reported the lake level is at elevation 6736.5 feet, which is 6.72 feet below full as of Friday August 21, 2009. He said the State Water Resources Control Board's (SWRCB) Order is to maintain flows during August at Station B at 1.05 cfs, with leakage from through the gates and releases by the controls at the base of the dam. He said the measurement at Station B is 1.61 cfs as of the AM. James Weber said release is 0.95 cfs through the six inch valve at the dam. A discussion ensued regarding the 300 gallon discrepancy in the measurement at Station A.

Mr. Heule reported that suspension of Proposition 1A by the state will result in the loss of approximately \$250,000 in tax revenue for Big Bear MWD, totaling 67% of income generated annually. Discussion ensued.

Mr. Heule also reported construction of the new bridge is on schedule and should be completed by the contractor in 2010. He said damage to the south side spillway training wall from a boulder was the only issue to date, and blasting has been within the Department of Water Resources Division of Safety of Dams' (DSOD) established safety parameters. He also reported working with Caltrans to secure an agreement for replacement of the old bridge with the maintenance/pedestrian bridge after the new bridge is completed.

Mr. Heule presented a three dimensional model of Big Bear Lake. He said eventually the model will be able to show effects of different management strategies; lake weeds, chemistry and dredges. He said the model illustrated how the agreements between the Big Bear Municipal Water District (BVMWD) and the San Bernardino Valley Municipal Water District (SBVMWD) help keep water in the lake. A discussion ensued.

#### **4. SANTA ANA RIVER STATUS**

Robert Neufeld indicated that accurate accounts of water had not been made in the past and that Conservation District staff was in the process of revising the Daily Flow Report (DFR) to provide a more accurate account of flows and general understanding of the report. He said that BVMWD's involvement is essential in order for Conservation District staff to work through water quality issues that have impacted East Valley Water District (EVWD) regarding flows that are not being captured. He said the system should be sealed allowing the District the ability to spread the water not being used by EVWD. Claud Seal reported that Conservation District staff proposed to BVWD to install an additional pipeline to stop the leakage, as roughly 4 cfs of water is continuously being lost daily. He said that the water should be put in the Conservation District's system for banking. A discussion ensued regarding the leakage of water into the main channel and potential options to resolve the leakage issue.

#### **MUTUAL'S PROJECTION OF NEEDS.**

Mr. Evenson said he assumed Mutual's needs were all in-lieu deliveries due to the lake being more than six feet down. Mr. Neufeld said that during a Basin Technical Advisory Committee (BTAC) meeting, the SBVMWD reported an increase in allocations from the Department of Water Resources (DWR) of an additional 13,000 to 17,000 acre-feet of State Water Project (SWP) water will be available this year for purchase by local producers. A discussion ensued regarding deliveries of SWP water purchased from the SBVMWD to the Conservation District's facilities and SBVMWD's ability to provide in-lieu deliveries to Mutual.

#### **5. GROUNDWATER PRODUCTION AND DEVELOPMENT IN BIG BEAR VALLEY.**

There was nothing new to report on this item.

## 6. OTHER TOPICS

- a. **Seven Oaks Dam Operations.** This item was not covered due to Mr. Huffstutler's absence.
- b. **Seven Oaks Dam Water Quality.** This item was not covered due to Mr. Huffstutler's absence.
- c. **Status of SAR Stream Gauge.** Mr. Neufeld reported that meetings were being coordinated among Bob Martin, the General Manager of EVWD and the United States Army Corp of Engineers (USACE), scheduled for September 2009.
- d. **LAFCO Consolidation Application Process.** Mr. Evenson congratulated Mr. Neufeld on the Conservation District's victory regarding the consolidation of the Conservation District and the SBVMWD. Mr. Neufeld reported that Conservation District staff and Board of Directors were pleased with the outcome of the LAFCO vote. A discussion ensued regarding the Conservation District's plans to implement a new strategic plan for the agency.
- e. **Big Bear Dam Visit.** Mr. Weber said the tour would be an overview of the progress of the new bridge. He said the committee members would be able to view the 36-inch pipe and concrete kicker, in addition to the 14-inch and 24-inch valve, the control building and gates. Mr. Evenson said in the past, before meters were installed, the main problem with the annual report was trying to balance the outflows from the dam. A discussion ensued.

At 12:20 p.m. the meeting adjourned to the Big Bear Dam visit.

## 8. DATE FOR NEXT MEETING

The next meeting will be on Tuesday, October 23, 2009 at 10:00 a.m., at the San Bernardino Valley Water Conservation District, CA.

## 9. ADJOURN

There being no further business, the tour was adjourned at 3:45 p.m.

  
Donald E. Evenson

  
Michael L. Huffstutler

  
R. Robert Neufeld



**INPUT DATA**  
**BIG BEAR WATERMASTER REPORT**  
**CALENDAR YEAR**  
**2009**

Calendar Year	2009		
Mutual's Lake Account Balance on Jan. 1	35,251	acre-feet	
Basin Compensation Account Balance on Jan. 1	24,157	acre-feet	
Account Balance for Mutual's Advances to BBMWWD	-	acre-feet	
Repayment Premium for Mutual's Advances to BBMWWD	0%		
Recharge Factor for Lake Deliveries to Mutual	0.500		
Recharge Factor for Imported Water Deliveries to Mutual	0.500		
Recharge Factor for Lake Spills	0.510		
Snowmelt Return Factor	0.500		Jan, Feb, Mar, Apr, Oct, Nov, Dec
Snowmelt Return Factor	0.000		May, June, July, Aug, Sept
<u>Monthly Evaporation Rate Calculation Factors</u>			
	<u>C1</u>	<u>C2</u>	<u>C3</u>
January	7.09	0.42	1,200
February	6.90	0.50	1,200
March	8.36	0.74	1,200
April	8.82	0.87	1,200
May	9.73	1.02	1,200
June	9.72	1.10	1,200
July	9.90	1.13	1,200
August	9.34	1.22	1,200
September	8.36	1.25	1,200
October	7.89	1.22	1,200
November	7.01	1.07	1,200
December	6.91	0.50	1,200
Evaporation rate (feet/month)	=	Average air temperature x C1 x C2 / C3	

**INPUT DATA**  
**BIG BEAR WATERMASTER REPORT**  
**CALENDAR YEAR**  
**2009**  
**(continued)**

Month	Gage* Height 1st of Month (feet)	Actual Mutual Shareholder Releases (acre-feet)	Mutual Other Releases (acre-feet)	Actual Flood Control Releases (acre-feet)	Actual Flood Spills (acre-feet)	Big Bear's Spreading Releases (acre-feet)	Big Bear's Other Releases (acre-feet)	Leakage (Not used, included in Fish Releases) (acre-feet)
January	66.03	-	-	-	-	-	-	-
February	66.07	-	-	-	-	-	-	-
March	66.85	-	-	-	-	-	-	-
April	67.35	-	-	-	-	-	-	-
May	67.48	-	-	-	-	-	-	-
June	67.11	-	-	-	-	-	-	-
July	66.65	-	-	-	-	-	-	-
August	66.08	-	-	-	-	-	-	-
September	65.41	-	-	-	-	-	-	-
October	64.86	-	-	-	-	-	-	-
November	64.43	-	-	-	-	-	-	-
December	64.21	-	-	-	-	-	-	-
	64.84	-	-	-	-	-	-	-

\* Gage at Bear Valley Dam

INPUT DATA  
BIG BEAR WATERMASTER REPORT  
CALENDAR YEAR  
2009  
(continued)

Month	Big Bear's Withdrawals for Snowmaking (acre-feet)	Summer Withdrawals Used for Snowmaking (acre-feet) (not used)	Big Bear's Withdrawals for Flatiron (acre-feet) New in 2009	Mutual Spills of Wastewater Exports (acre-feet)	In-Lieu Imported Supplies (SBVMWD) (acre-feet)	In Lieu Supplies from SBVMWD's Wells (acre-feet)	In Lieu Supplies from Mutual's Wells (acre-feet)	Other In Lieu Supplies (acre-feet)
January	145.47	-	-	-	61.30	-	-	-
February	9.43	-	-	-	38.80	-	-	-
March	45.64	-	-	-	192.30	-	-	-
April	3.14	-	-	-	394.70	-	-	-
May	2.15	-	-	-	221.20	-	-	-
June	1.35	-	0.37	-	420.80	-	-	-
July	10.91	-	0.39	-	1,146.70	-	-	-
August	9.47	-	0.35	-	1,331.20	-	-	-
September	9.29	-	0.37	-	1,242.10	-	-	-
October	80.19	-	0.27	-	941.08	-	-	-
November	151.93	-	0.15	-	-	-	-	-
December	321.13	-	-	-	-	-	-	-
					5,990.18			

**INPUT DATA**  
**BIG BEAR WATERMASTER REPORT**  
**CALENDAR YEAR**  
**2009**  
 (continued)

Month	SWRCB Order 95-4 Releases & Leakage (acre-feet)	Mutual's Direct Use of Order 95-4 Releases (acre-feet)	Basin Replenishment from SBVMWD (acre-feet)	Basin Replenishment from Others (acre-feet)	2009 Net Wastewater Exports (acre-feet)	Average Air Temperature (degrees F)
January	68.98	-	-	-	119.92	36.3
February	57.03	-	-	-	147.42	32.3
March	28.89	7.90	-	-	172.05	38.8
April	30.08	1.96	-	-	97.53	45.7
May	52.00	36.11	-	-	74.52	58.5
June	66.50	66.50	-	-	63.24	54.6
July	77.12	77.12	-	-	67.20	67.7
August	80.36	80.36	-	-	64.11	63.8
September	74.46	74.46	-	-	43.78	60.9
October	74.37	74.37	-	-	51.75	45.7
November	59.26	59.26	-	-	60.17	42.4
December	70.49	31.78	-	-	111.93	32.6
	739.54	509.82			1,073.62	

**SUMMARY RESULTS  
CALENDAR YEAR  
2009**

<b>LAKE ACCOUNTS (acre-feet)</b>	<b>Big Bear</b>	<b>Mutual</b>	<b>Actual</b>
<b>Initial Storage</b>	<b>20,354</b>	<b>35,251</b>	<b>55,605</b>
Lake Inflows	0	9,212	9,212
In-Lieu Supplies to Mutual	5,990	(5,990)	0
Lake Releases (Mutual & BBMWWD)	0	0	0
Releases & Leakage (SWRCB 95-4)	(85)	(654)	(740)
Net Snowmaking Withdrawals from Lake (includes Flatiron deliveries)	(414)	0	(414)
Lake Spills & Flood Control Releases	0	0	0
Leakage from Dam	0	0	0
Evaporation from Lake	(2,375)	(8,858)	(11,233)
Net Wastewater Exports	(1,074)	1,074	0
Advances & Repayment of Advances	0	0	0
<b>Ending Storage</b>	<b>22,397</b>	<b>30,034</b>	<b>52,431</b>
<b>BASIN MAKE UP ACCOUNT (acre-feet)</b>			
<b>Beginning Balance</b>	n.a.	n.a.	<b>24,157</b>
Recharge From Deliveries of Lake Water	255	3,250	(2,995)
Recharge From Deliveries of Imported Water	2,995	n.a.	2,995
Recharge from Spills & Releases	117	74	44
<b>Account Credit (Debit)</b>	<b>3,367</b>	<b>3,324</b>	<b>44</b>
Amount Replenished	0	n.a.	0
<b>Ending Balance</b>			<b>24,201</b>

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 1  
ACTUAL OPERATION OF BIG BEAR LAKE

Month	1 Gage Height 1st of Month (Input Data) (feet)	2 Volume in Storage (ac-ft)	3 Change in Storage (ac-ft)	4 Lake Surface Area (acres)	5 Spills Releases Leakage Withdrawals (see Table 1.A) (feet) (see Table 1.D)	6 Estimated Lake Evaporation (ac-ft)	7 Calc. Total Inflow (ac-ft)	8 Adjusted Lake Inflow * (ac-ft)	9 Adjusted Lake Evap * (ac-ft)	10 Adjusted Evap Rate * (feet/month)
January	66.03	55,605	0	2,676	142	241	383	383	241	0.090
February	66.07	55,605	2,159	2,676	62	250	2,471	2,471	250	0.093
March	66.85	57,764	1,366	2,715	52	545	1,963	1,963	545	0.200
April	67.35	59,130	412	2,739	32	801	1,245	1,245	801	0.292
May	67.48	59,542	(1,098)	2,746	54	1,324	280	280	1,324	0.484
June	67.11	58,444	(1,220)	2,727	68	1,321	170	170	1,321	0.486
July	66.65	57,224	(1,484)	2,705	88	1,699	303	303	1,699	0.631
August	66.08	55,740	(1,859)	2,679	90	1,612	(156)	0	1,769	0.665
September	65.41	53,881	(1,450)	2,644	84	1,395	29	29	1,395	0.530
October	64.86	52,431	(1,040)	2,617	115	956	31	31	956	0.367
November	64.43	51,391	(650)	2,598	135	687	172	172	687	0.265
December	64.21	50,741	1,690	2,585	231	244	2,165	2,165	244	0.094
TOTALS	64.84	52,431	(3,174)	2,617	1,153	11,077	9,056	9,212	11,233	4.197

\* NOTE: Evaporation adjusted to eliminate negative inflow

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 1.A  
ACTUAL OPERATION OF BIG BEAR LAKE  
Summary Details

1 Month	2 Actual Lake Spills (Input Data) (ac-ft)	3 Actual Flood Control Releases (Input Data) (ac-ft)	4 Actual Lake Releases (see Table 1.B) (ac-ft)	5 Actual Estimated Leakage (Input Data) (ac-ft)	6 Estimated Net Lake Withdrawal (see Table 1.C) (ac-ft)	7	8	9 Total Spills Releases Leakage Withdrawals (ac-ft)
January	-	-	69.0	-	72.7			141.7
February	-	-	57.0	-	4.7			61.7
March	-	-	28.9	-	22.8			51.7
April	-	-	30.1	-	1.6			31.7
May	-	-	52.0	-	2.2			54.2
June	-	-	66.5	-	1.7			68.2
July	-	-	77.1	-	11.3			88.4
August	-	-	80.4	-	9.8			90.2
September	-	-	74.5	-	9.7			84.1
October	-	-	74.4	-	40.4			114.7
November	-	-	59.3	-	76.1			135.4
December	-	-	70.5	-	160.6			231.1
<b>TOTALS</b>	-	-	<b>739.5</b>	-	<b>413.5</b>			<b>1,153.1</b>

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 1.B  
ACTUAL OPERATION OF BIG BEAR LAKE  
Release Details

Month	1 Mutual's Shareholder Releases (Input Data) (ac-ft)	2 Mutual's Other Releases (Input Data) (ac-ft)	3 Mutual's Total Releases (Col. 1 + Col. 2) (ac-ft)	4	5 Big Bear's Spreading Releases (Input Data) (ac-ft)	6 Big Bear's Other Releases (Input Data) (ac-ft)	7 Big Bear's Total Releases (Col. 5 + Col. 6) (ac-ft)	8 SWRCB Order NO. 95-4 Releases (Input Data) (ac-ft)	9 Total Actual Releases (Cols. 5+ 7+ 8) (ac-ft)
January	-	-	-		-	-	-	69.0	69.0
February	-	-	-		-	-	-	57.0	57.0
March	-	-	-		-	-	-	28.9	28.9
April	-	-	-		-	-	-	30.1	30.1
May	-	-	-		-	-	-	52.0	52.0
June	-	-	-		-	-	-	66.5	66.5
July	-	-	-		-	-	-	77.1	77.1
August	-	-	-		-	-	-	80.4	80.4
September	-	-	-		-	-	-	74.5	74.5
October	-	-	-		-	-	-	74.4	74.4
November	-	-	-		-	-	-	59.3	59.3
December	-	-	-		-	-	-	70.5	70.5
<b>TOTALS</b>	<b>•</b>	<b>•</b>	<b>•</b>		<b>•</b>	<b>•</b>	<b>•</b>	<b>739.5</b>	<b>739.5</b>



CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 1.C  
ACTUAL OPERATION OF BIG BEAR LAKE  
Lake Withdrawal Details

1 Month	2 Snowmaking Withdrawals (Input Data) (ac-ft)	3 Flatiron Withdrawals (Input Data) (ac-ft)	4	5 Total Lake Withdrawals (ac-ft)	6	7 Return from Snow melt @ 50.0% (ac-ft)	8	9 Estimated Net Lake Withdrawals (ac-ft)
January	145.47	-		145.47		72.74		72.73
February	9.43	-		9.43		4.72		4.71
March	45.64	-		45.64		22.82		22.82
April	3.14	-		3.14		1.57		1.57
May	2.15	-		2.15		-		2.15
June	1.35	0.37		1.72		-		1.72
July	10.91	0.39		11.30		-		11.30
August	9.47	0.35		9.82		-		9.82
September	9.29	0.37		9.66		-		9.66
October	80.19	0.27		80.46		40.10		40.36
November	151.93	0.15		152.08		75.97		76.11
December	321.13	-		321.13		160.57		160.56
<b>TOTALS</b>	<b>790.10</b>	<b>1.90</b>		<b>792.00</b>		<b>378.49</b>		<b>413.51</b>

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 1.D  
ACTUAL OPERATION OF BIG BEAR LAKE  
Evaporation Details

1 Month	2	3 Lake Surface Area (acres)	4 Average Lake Area (acres)	5 Average Air Temperature (Input Data) (deg F)	6 Calculated Evaporation Rate (feet/month)	7	8	9 Estimated Lake Evaporation (ac-ft)
January		2,676	2,676	36.30	0.090			241.0
February		2,676	2,696	32.30	0.093			250.3
March		2,715	2,727	38.80	0.200			545.5
April		2,739	2,743	45.70	0.292			801.4
May		2,746	2,737	58.50	0.484			1,324.0
June		2,727	2,716	54.60	0.486			1,321.3
July		2,705	2,692	67.70	0.631			1,699.0
August		2,679	2,662	63.80	0.606			1,612.4
September		2,644	2,631	60.90	0.530			1,395.1
October		2,617	2,608	45.70	0.367			955.9
November		2,598	2,592	42.40	0.265			686.8
December		2,585	2,601	32.60	0.094			244.1
<b>TOTALS</b>					<b>4.138</b>			<b>11,076.8</b>

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 2  
SYNTHESIZED MUTUAL OPERATION OF BIG BEAR LAKE

Month	1 Gauge Height 1st of Month (feet)	2 Mutual's Lake Account (ac-ft)	3 Change in Storage (*) (ac-ft)	4 Lake Surface Area (acres)	5 Mutual's Lake Inflow (see Table 1) (feet) (see Table 2.A)	6 Mutual's Net Wastewater Export Credit (ac-ft) (see Table 2.B)	7 Mutual's Lake Evap. (ac-ft) (see Table 3)	8 Mutual's Snowmaking Advances to Big Bear (ac-ft) (see Table 3)	9 Mutual's Credit for Return of Advances (ac-ft) (see Table 3)	10 Mutual's Releases Leakage Spills & In-lieu Del. (see Table 2.A) (ac-ft)
January	57.60	35,251	205	2,129	382.8	119.9	192.2	-	-	105.0
February	57.70	35,456	2,341	2,138	2,471.1	147.4	202.4	-	-	75.2
March	58.80	37,797	1,472	2,222	1,963.2	172.1	449.4	-	-	213.9
April	59.45	39,269	262	2,271	1,245.1	97.5	664.8	-	-	415.3
May	59.55	39,532	(1,007)	2,279	280.1	74.5	1,094.2	-	-	267.9
June	59.10	38,524	(1,336)	2,244	169.5	63.2	1,081.0	-	-	487.3
July	58.50	37,189	(2,216)	2,200	303.4	67.2	1,362.6	-	-	1,223.8
August	57.50	34,973	(2,722)	2,122	-	64.1	1,374.1	-	-	1,411.6
September	56.15	32,251	(2,293)	2,013	29.2	43.8	1,049.8	-	-	1,316.6
October	55.00	29,958	(1,638)	1,946	30.6	51.8	704.9	-	-	1,015.5
November	54.15	28,320	(330)	1,900	172.2	60.2	502.6	-	-	59.3
December	54.00	27,991	2,044	1,893	2,165.2	111.9	180.3	-	-	53.1
TOTALS	55.05	30,034	(5,217)	1,949	9,212.3	1,073.6	8,858.3	-	-	6,644.4

(\*) Col. 3 = Col. 5 + Col. 6 - Col. 7 - Col. 8 + Col. 9 - Col. 10

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 2.A  
SYNTHESIZED MUTUAL OPERATION OF BIG BEAR LAKE  
Lake Outflow Details

Month	1 Mutual's Spills & FC Releases from Table 2.C (ac-ft)	2 Mutual's Lake Releases from Table 1.B (ac-ft)	3 Mutual's Leakage from Table 2.C (ac-ft)	4 Mutual's Order No. 95-4 Releases from Table 2.C (ac-ft)	5 Big Bear's In-lieu Supply Deliveries (see Table 3.B) (ac-ft)	6 Mutual's Releases Leakage Spills & In-lieu Del. (to Table 2) (ac-ft)	7	8 Net Credit for Wastewater Exports (Input Data) (ac-ft)	9 Spilled from Mutual's Lake Acct. (Input Data) (ac-ft)	10 Net Wastewater Export Credit (to Table 2) (ac-ft)
January	-	-	-	43.7	61.3	105.0		119.9	-	119.9
February	-	-	-	36.4	38.8	75.2		147.4	-	147.4
March	-	-	-	21.6	192.3	213.9		172.1	-	172.1
April	-	-	-	20.6	394.7	415.3		97.5	-	97.5
May	-	-	-	46.7	221.2	267.9		74.5	-	74.5
June	-	-	-	66.5	420.8	487.3		63.2	-	63.2
July	-	-	-	77.1	1,146.7	1,223.8		67.2	-	67.2
August	-	-	-	80.4	1,331.2	1,411.6		64.1	-	64.1
September	-	-	-	74.5	1,242.1	1,316.6		43.8	-	43.8
October	-	-	-	74.4	941.1	1,015.5		51.8	-	51.8
November	-	-	-	59.3	-	59.3		60.2	-	60.2
December	-	-	-	53.1	-	53.1		111.9	-	111.9
<b>TOTALS</b>	-	-	-	<b>654.2</b>	<b>5,990.18</b>	<b>6,644.4</b>		<b>1,073.6</b>	-	<b>1,073.6</b>

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 2.B  
SYNTHESIZED MUTUAL OPERATION OF BIG BEAR LAKE  
Synthesized Evaporation Calculation

Month	1 Starting Volume (ac-ft)	2 Starting Area (acres)	3 Assumed Evap (ac-ft)	4 Estimated Ending Volume (ac-ft)	5 Estimated Ending Area (acres)	6 Average Area (acres)	7 Mutuals Lake Evap. (to Table 2) (ac-ft)	8 Big Bear's Lake Evap. (to Table 3.A) (ac-ft)	9 Revised Ending Volume Estimate (ac-ft)	10
January	35,251.0	2,129.0	191.8	35,456.9	2,138.0	2,133.5	192.2	48.8	35,456.4	
February	35,456.4	2,138.0	198.5	37,801.2	2,222.0	2,180.0	202.4	47.9	37,797.4	
March	37,797.4	2,222.0	444.5	39,274.2	2,271.0	2,246.5	449.4	96.1	39,269.3	
April	39,269.3	2,271.0	663.7	39,532.9	2,279.0	2,275.0	664.8	136.6	39,531.7	
May	39,531.7	2,279.0	1,102.6	38,515.9	2,244.0	2,261.5	1,094.2	229.8	38,524.3	
June	38,524.3	2,244.0	1,091.7	37,178.1	2,200.0	2,222.0	1,081.0	240.3	37,188.8	
July	37,188.8	2,200.0	1,388.5	34,947.1	2,118.0	2,159.0	1,362.6	336.4	34,973.0	
August	34,973.0	2,122.0	1,410.3	32,215.3	2,013.0	2,067.5	1,374.1	394.7	32,251.4	
September	32,251.4	2,013.0	1,067.6	29,940.3	1,946.0	1,979.5	1,049.8	345.3	29,958.0	
October	29,958.0	1,946.0	713.4	28,311.6	1,900.0	1,923.0	704.9	251.0	28,320.0	
November	28,320.0	1,900.0	503.5	27,989.6	1,893.0	1,896.5	502.6	184.2	27,990.5	
December	27,990.5	1,893.0	177.7	30,036.8	1,949.0	1,921.0	180.3	63.8	30,034.2	
<b>TOTALS</b>							<b>8,858.3</b>	<b>2,374.9</b>		

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 2.C  
SYNTHESIZED MUTUAL OPERATION OF BIG BEAR LAKE  
Mutual's Leakage, Spills & FC Releases, and SWRCB Releases

Month	1 Total Leakage from Input Data (ac-ft)	2 Mutual's Leakage to Table 2.A (ac-ft)	3 Big Bear's Leakage to Table 3.B (ac-ft)	4 Actual Spills & FC Releases from Input Data (ac-ft)	5 Big Bear's Spills & FC Releases to Table 3.B (ac-ft)	6 Mutual's Spills & FC Releases to Table 2.A (ac-ft)	7 SWRCB Order 95-4 Releases from Input Data (ac-ft)	8 Mutual's Order 95-4 Releases from Input Data (ac-ft)	9 Mutual's Order 95-4 Releases to Table 2.A (ac-ft)	10 Big Bear's Order 95-4 Releases to Table 3.B (ac-ft)
January	-	-	-	-	-	-	69.0	0.00	43.7	25.2
February	-	-	-	-	-	-	57.0	0.00	36.4	20.7
March	-	-	-	-	-	-	28.9	7.90	21.6	7.3
April	-	-	-	-	-	-	30.1	1.96	20.6	9.4
May	-	-	-	-	-	-	52.0	36.11	46.7	5.3
June	-	-	-	-	-	-	66.5	66.50	66.5	-
July	-	-	-	-	-	-	77.1	77.12	77.1	-
August	-	-	-	-	-	-	80.4	80.36	80.4	-
September	-	-	-	-	-	-	74.5	74.46	74.5	-
October	-	-	-	-	-	-	74.4	74.37	74.4	-
November	-	-	-	-	-	-	59.3	59.26	59.3	-
December	-	-	-	-	-	-	70.5	31.78	53.1	17.4
<b>TOTALS</b>	-	-	-	-	-	-	<b>739.54</b>	<b>509.82</b>	<b>654.2</b>	<b>85.3</b>

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 3  
DETERMINATION OF BIG BEAR'S LAKE ACCOUNT STATUS  
Lake Account and Advance Account

Month	1 Actual Lake Account (see Table 1) (ac-ft)	2 Mutual's Lake Account (see Table 2) (ac-ft)	3 Big Bear's Lake Account (calc.) (ac-ft)	4 Change in Big Bear's Lake Account (calc.) (ac-ft)	5	6 Big Bear's Advances From Mutual (calc.) (ac-ft)	7 Big Bear's Payments Against Advances (calc.) (ac-ft)	8 Big Bear's Advance Account Balance (calc.) (ac-ft)	9 Big Bear's 0% Repayment Premium (calc.) (ac-ft)	10 Mutual's Credit for Return of Advances (to Table 2) (ac-ft)
January	55,605	35,251	20,354	(205.4)						
February	55,605	35,456	20,149	(181.9)						
March	57,764	37,797	19,967	(105.9)						
April	59,130	39,269	19,861	149.5						
May	59,542	39,532	20,010	(90.6)						
June	58,444	38,524	19,920	115.5						
July	57,224	37,189	20,035	731.8						
August	55,740	34,973	20,767	862.5						
September	53,881	32,251	21,630	843.4						
October	52,431	29,958	22,473	598.0						
November	51,391	28,320	23,071	(320.5)						
December	50,741	27,991	22,750	(353.7)						
	52,431	30,034	22,397							
TOTALS				2,042.8						

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 3.A  
DETERMINATION OF BIG BEAR'S LAKE ACCOUNT STATUS  
Lake Inflow Details

Month	1 In-lieu Water from SBVMWD (Input Data) (ac-ft)	2 In-lieu Water from Other's Wells (Input Data) (ac-ft)	3 In-lieu Supplies from Mutual's Wells (Input Data) (ac-ft)	4	5 Other Sources of In-lieu Supplies (Input Data) (ac-ft)	6 Big Bear's In-lieu Deliveries to Mutual (calc.) (ac-ft)	7	8 Big Bear's Advances From Mutual (from Table 3) (ac-ft)	9	10 Big Bear's Total Lake Inflows (calc.) (ac-ft)
January	61.3	-	-	-	-	61.3	-	-	-	61.3
February	38.8	-	-	-	-	38.8	-	-	-	38.8
March	192.3	-	-	-	-	192.3	-	-	-	192.3
April	394.7	-	-	-	-	394.7	-	-	-	394.7
May	221.2	-	-	-	-	221.2	-	-	-	221.2
June	420.8	-	-	-	-	420.8	-	-	-	420.8
July	1,146.7	-	-	-	-	1,146.7	-	-	-	1,146.7
August	1,331.2	-	-	-	-	1,331.2	-	-	-	1,331.2
September	1,242.1	-	-	-	-	1,242.1	-	-	-	1,242.1
October	941.1	-	-	-	-	941.1	-	-	-	941.1
November	-	-	-	-	-	-	-	-	-	-
December	-	-	-	-	-	-	-	-	-	-
<b>TOTALS</b>	<b>5,990.2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>5,990.2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>5,990.2</b>



CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 3.B  
DETERMINATION OF BIG BEAR'S LAKE ACCOUNT STATUS  
Lake Outflow Details

Month	1 Big Bear's Snowmaking Withdrawals (Input Data) (ac-ft)	2 Big Bear's Flatiron Withdrawals (Input Data) (ac-ft)	3 Return Flow from Snowmelt 50.0% (Table 1.C) (ac-ft)	4 Big Bear's Net Lake Withdrawal (calc.) (ac-ft)	5 Big Bear's Payments Against Advances (see Table 3) (ac-ft)	6 Big Bear's Spills & FC Releases from Table 2.C (ac-ft)	7 Big Bear's Leakage + SWRCB Rel. from Table 2.C (ac-ft)	8 Big Bear's Lake Evaporation from Table 2.B (ac-ft)	9 Net Wastewater Export Credit (from Table 2.A) (ac-ft)	10 Big Bear's Total Lake Outflows (calc.) (ac-ft)
January	145.5	-	72.7	72.7	-	-	25.2	48.8	119.9	266.7
February	9.4	-	4.7	4.7	-	-	20.7	47.9	147.4	220.7
March	45.6	-	22.8	22.8	-	-	7.3	96.1	172.1	298.2
April	3.1	-	1.6	1.6	-	-	9.4	136.6	97.5	245.2
May	2.2	-	-	2.2	-	-	5.3	229.8	74.5	311.8
June	1.4	0.4	-	1.7	-	-	-	240.3	63.2	305.3
July	10.9	0.4	-	11.3	-	-	-	336.4	67.2	414.9
August	9.5	0.4	-	9.8	-	-	-	394.7	64.1	468.7
September	9.3	0.4	-	9.7	-	-	-	345.3	43.8	398.7
October	80.2	0.3	40.1	40.4	-	-	-	251.0	51.8	343.1
November	151.9	0.2	76.0	76.1	-	-	-	184.2	60.2	320.5
December	321.1	-	160.6	160.6	-	-	17.4	63.8	111.9	353.7
<b>TOTALS</b>	<b>790.1</b>	<b>1.9</b>	<b>378.5</b>	<b>413.5</b>	<b>-</b>	<b>-</b>	<b>85.3</b>	<b>2,374.9</b>	<b>1,073.6</b>	<b>3,947.4</b>

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 4  
BASIN COMPENSATION ACCOUNT

Month	1 Big Bear's Basin Additions (see Table 4.A) (ac-ft)	2	3 Mutual's Basin Additions (see Table 4.B) (ac-ft)	4	5 Net Credit (Debit) (ac-ft)	6	7 Total Basin Replenishment (see Table 4.C) (ac-ft)	8	9 Basin Comp. Account Balance (ac-ft)
January	65.8		53.0		12.9		-		24,157
February	48.5		37.9		10.5		-		24,170
March	110.8		107.1		3.7		-		24,180
April	212.7		207.9		4.8		-		24,184
May	136.8		134.0		2.7		-		24,189
June	243.7		243.7		-		-		24,192
July	611.9		611.9		-		-		24,192
August	705.8		705.8		-		-		24,192
September	658.3		658.3		-		-		24,192
October	507.7		507.7		-		-		24,192
November	29.6		29.6		-		-		24,192
December	35.6		26.8		8.9		-		24,192
TOTALS	3,367.2		3,323.6		43.5		0.0		24,201

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 4.A  
BIG BEAR'S BASIN ADDITIONS

Month	SPILLS		LAKE RELEASES				IN LIEU SUPPLIES		
	1 Actual Spills & FC Releases (ac-ft)	2 Actual SWRCB 95-4 Releases (ac-ft)	3 Basin Addition @ 51.0% (ac-ft)	4 Lake Release for Mutual (ac-ft)	5 SWRCB 95-4 Releases for Mutual (ac-ft)	6 Basin Addition @ 50.0% (ac-ft)	7 Imported In Lieu Deliveries (ac-ft)	8 Basin Addition @ 50.0% (ac-ft)	9 Big Bear's Basin Additions (ac-ft)
January	-	69.0	35.2	-	-	-	61.3	30.7	65.8
February	-	57.0	29.1	-	-	-	38.8	19.4	48.5
March	-	21.0	10.7	-	7.9	4.0	192.3	96.2	110.8
April	-	28.1	14.3	-	2.0	1.0	394.7	197.4	212.7
May	-	15.9	8.1	-	36.1	18.1	221.2	110.6	136.8
June	-	-	-	-	66.5	33.3	420.8	210.4	243.7
July	-	-	-	-	77.1	38.6	1,146.7	573.4	611.9
August	-	-	-	-	80.4	40.2	1,331.2	665.6	705.8
September	-	-	-	-	74.5	37.2	1,242.1	621.1	658.3
October	-	-	-	-	74.4	37.2	941.1	470.5	507.7
November	-	-	-	-	59.3	29.6	-	-	29.6
December	-	38.7	19.7	-	31.8	15.9	-	-	35.6
TOTALS	0.0	229.7	117.2	0.0	509.8	254.9	5,990.2	2,995.1	3,367.2

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 4.B  
MUTUAL'S BASIN ADDITIONS

Month	SPILLS & FISH RELEASES			LAKE RELEASES			7 Total Basin Additions (ac-ft)
	1 Mutual's Spills (ac-ft)	2 Mutual's SWRCB 95-4 Releases (ac-ft)	3 Basin Addition @ 51.0% (ac-ft)	4 Mutual's Lake Demands (ac-ft)	5 SWRCB 95-4 Releases for Mutual (ac-ft)	6 Basin Addition @ 50.0% (ac-ft)	
January	-	43.7	22.3	61.3	0.0	30.7	53.0
February	-	36.4	18.5	38.8	0.0	19.4	37.9
March	-	13.7	7.0	192.3	7.9	100.1	107.1
April	-	18.7	9.5	394.7	2.0	198.3	207.9
May	-	10.5	5.4	221.2	36.1	128.7	134.0
June	-	-	-	420.8	66.5	243.7	243.7
July	-	-	-	1,146.7	77.1	611.9	611.9
August	-	-	-	1,331.2	80.4	705.8	705.8
September	-	-	-	1,242.1	74.5	658.3	658.3
October	-	-	-	941.1	74.4	507.7	507.7
November	-	-	-	-	59.3	29.6	29.6
December	-	21.4	10.9	-	31.8	15.9	26.8
<b>TOTALS</b>	<b>0.0</b>	<b>144.4</b>	<b>73.6</b>	<b>5,990.2</b>	<b>509.8</b>	<b>3,250.0</b>	<b>3,323.6</b>

CALENDAR YEAR  
2009  
BIG BEAR WATERMASTER

TABLE 4.C  
BASIN REPLENISHMENTS

1 Month	2 Amount Replenished From SBV/MWD (ac-ft)	3	4	5 Amount Replenished From Releases (ac-ft)	6 Amount Replenished From Others (ac-ft)	7	8 Total Amount Replenished (ac-ft)	9
January	-			-	-		-	
February	-			-	-		-	
March	-			-	-		-	
April	-			-	-		-	
May	-			-	-		-	
June	-			-	-		-	
July	-			-	-		-	
August	-			-	-		-	
September	-			-	-		-	
October	-			-	-		-	
November	-			-	-		-	
December	-			-	-		-	
	<u>0.0</u>			<u>0.0</u>	<u>0.0</u>		<u>0.0</u>	