

Big Bear Watermaster

Thirty-Fourth Annual Report

For Calendar Year 2010



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:

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BIG BEAR WATERMASTER

FOR

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

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March 24, 2011

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

Subject: Watermaster Report for Calendar Year 2010

Gentlemen:

We have the honor of submitting the Thirty-Fourth Annual Report of the Big Bear Watermaster for Calendar Year 2010.

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 2010 pursuant to the requirements of the Judgment.

Respectfully submitted,

By: Donald E. Evenson
Donald E. Evenson

By: Daniel B. Cozad
Daniel B. Cozad

By: Michael L. Huffstutler
Michael L. Huffstutler

THIRTY-FOURTH ANNUAL REPORT BIG BEAR WATERMASTER CALENDAR YEAR 2010

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I. INTRODUCTION

The Big Bear Watermaster presents the Thirty-Fourth Annual Report of its activities for Calendar Year 2010. 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 2010 activities of the Watermaster including the status of accounts and various tabulations as required by the Judgment.

In 2010, 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 Court approved Daniel B. Cozad as the Conservation District's representative on January 4, 2011. Appendix C contains a copy of the Court's Order.

The Watermaster Committee met four times during 2010. These meetings were held on the following dates:

January 3, 2010

March 11, 2010

May 11, 2010

June 22, 2010

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

2010 WATERMASTER ACCOUNTS

2010 was an above average hydrologic year. Annual precipitation at the two gages in the Big Bear Lake watershed averaged 48.69 inches, which is 191 percent of the 25.51 inches of average annual rainfall since 1977. Precipitation at Bear Valley Dam was 64.14 inches, which is 175 percent of the 101-year (1910-2010) average of 35.74 inches. Consequently, inflow to Big Bear Lake in 2010 was above average. The 2010 calculated lake inflow was 32,959 acre-feet, which is 197 percent of the average inflow since 1977. The average inflow for the 34 years since the Judgment was rendered is 16,697 acre-feet per year.

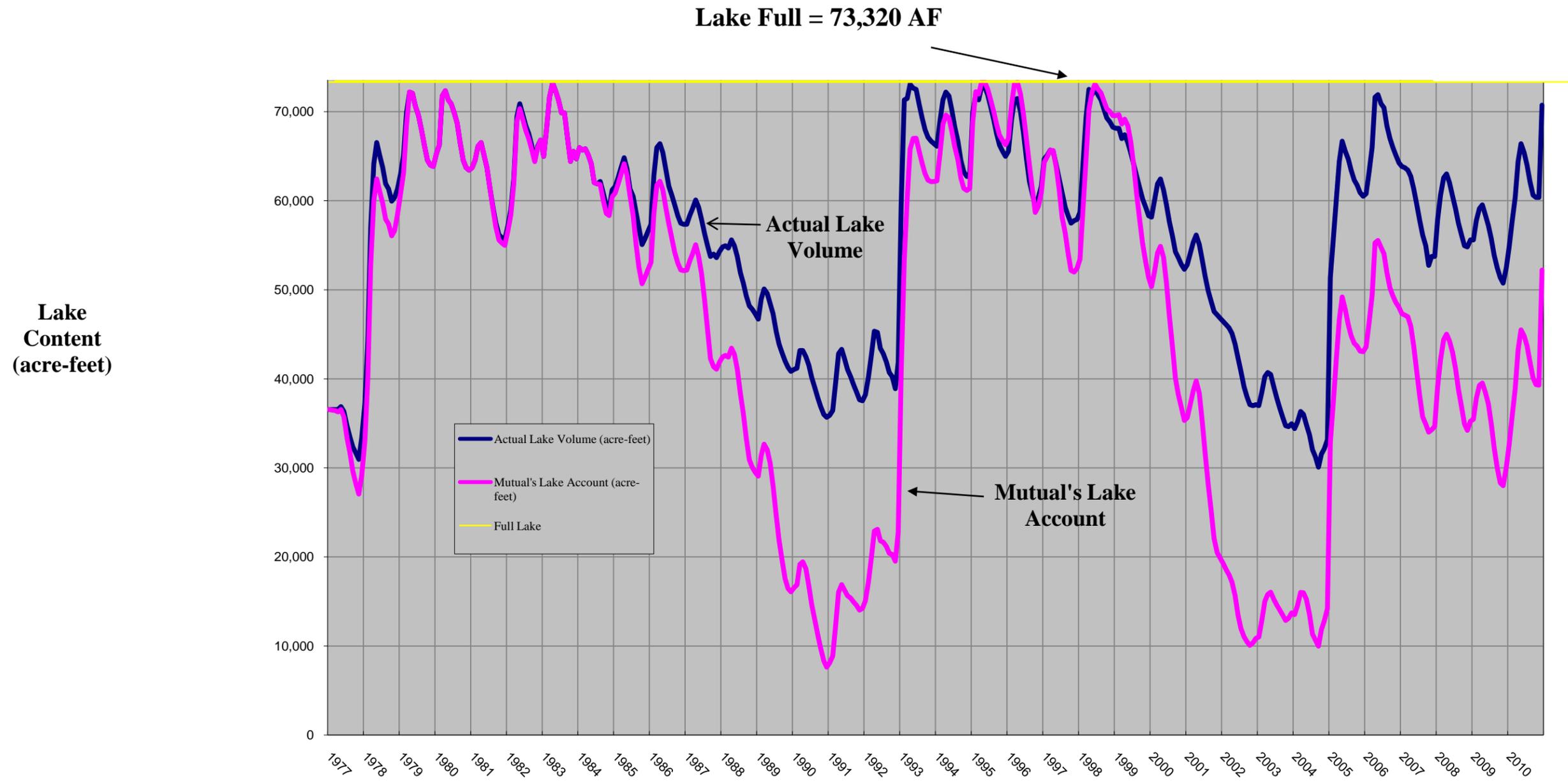
Actual lake levels rose 6.62 feet in 2010 and ended the year 0.87 feet below the top of the dam. Accordingly, lake contents increased by 18,315 acre-feet during the year. On December 31, 2010, the lake contained 70,746 acre-feet of water. The lake level is 72.33 feet and the lake holds 73,320 acre-feet 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 52,208 acre-feet at the end of 2010. Their lake account increased by 22,174 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 7.58 feet below the top of the dam or 6.71 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 44,898 acre-feet and the lake would have been 10.48 feet below the top of dam, or 9.61 feet lower than it actually was.

In 2010, Mutual received 2,878 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 2010, Mutual received 2,479 acre-feet of in-lieu water and released 123 acre-feet of water from Big Bear Lake. Also, Mutual was able to use 276 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 22,397 acre-feet in their lake account. By the end of the year, their lake account had decreased by 3,859 acre-feet to 18,538 acre-feet. Big Bear

FIGURE 1
Actual Lake Contents and Mutual's Lake Account 1977 - 2010



MWD's lake account is the difference between the actual lake contents and Mutual's lake account as shown on Figure 1.

The Basin Compensation Account balance increased by 1,256 acre-feet in 2010. The Basin Compensation Account began the year with a balance of 24,201 acre-feet and ended the year with a balance of 25,457 acre-feet. The increase resulted primarily from the flood control releases under a Big Bear MWD lake operation; there was also a small increase 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 2010, the Watermaster was involved in monitoring and discussing three issues. These issues are:

- Impacts of Seven Oaks Dam,
- 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 2010, the overall water balance for the lake was:

Initial Storage (1-01-10)	52,431 acre-feet
Inflows	32,959 acre-feet
Evaporation	11,374 acre-feet
Releases for Mutual	123 acre-feet
Releases & Leakage for SWRCB	445 acre-feet
Order 95-4	
Spills & Flood Control Releases	2,401 acre-feet
Net Snowmaking Withdrawal	300 acre-feet
Ending Storage (12-31-10)	70,746 acre-feet
Change-in-Storage	18,315 acre-feet

In 2010, the volume of water in Big Bear Lake increased by 18,315 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 2010, the lake was within the top 15 feet for the entire year.

The lake began the year at a gage height of 64.84 feet and ended the year at a gage height of 71.46 feet. Over the year, the lake level rose 6.62 feet. The lowest recorded lake level was 64.79 feet or 7.54 below the top of the dam, and it occurred on January 16, 2010. The highest recorded lake level was 71.57 feet, which occurred on December 31, 2010. 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 52,431 acre-feet of water. At the end of the year, there were 70,746 acre-feet of water in the lake. The lake content increased by 18,315 acre-feet during 2010. 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 two months in 2010. These months were August and September. Total evaporation from the lake for 2010 was calculated to be 11,374 acre-feet. This amount is equivalent to an annual evaporation rate of 48.8 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 2010. 2010 precipitation at the two stations was 64.14 and 33.23 inches, respectively. June was the driest month with no precipitation. January and December were the wettest months with approximately 64 percent of the annual precipitation.

Table III-1 also compares the 2010 precipitation at the two stations with their corresponding averages for the thirty-four years since the Judgment was rendered. At the Bear Valley Dam station, precipitation was 175 percent of its thirty-four year average, while at the Big Bear Community Services District station, precipitation was 230 percent of its thirty-four year average. For both stations, 2010 precipitation averaged 191 percent of their thirty-four year combined average.

Table III-2 shows the annual precipitation for both stations for the thirty-four years since the Judgment was rendered. As shown in Table III-2, 2010 was an above average year for precipitation. For the Bear Valley Dam station, precipitation was 179 percent of the 101-year (1910–2010) average of 35.74 inches.

In the review of last 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 is reviewing this station 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 2010
Big Bear Watermaster

Month	Bear Valley Dam	Big Bear Community Services District
January	13.56	9.63
February	9.65	3.70
March	1.64	0.56
April	4.37	1.54
May	0.99	0.31
June	0.00	0.00
July	0.25	0.10
August	0.00	1.30
September	0.00	0.15
October	1.54	2.24
November	4.67	1.76
December	<u>27.47</u>	<u>11.94</u>
2010 Totals	64.14	33.23
1977-2010 -34-yr average	36.55	14.47
2010 % of 34-yr average	175%	230%

Average of the 34-year average for both stations = 25.51 inches
Average of the 2010 totals for both stations = 48.69 inches
2010 average as a percentage of 34-year average = 191%

TABLE III-2
THIRTY-FOUR YEARS OF PRECIPITATION FOR TWO STATIONS
IN THE BIG BEAR AREA
(inches)

Calendar Year 2010 – Big Bear Watermaster

Year	Bear Valley Dam	Big Bear Community Services District
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	30.70	11.88
2010	<u>64.14</u>	<u>33.23</u>
34-Year Average	36.55	14.47
101-Year Average	35.74	N/A

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 two times in 2010, in August and September. Inflow in these months were set to zero.

Total annual inflow for 2010 into the lake was calculated to be 32,959 acre-feet. The largest monthly inflow was 13,217 acre-feet, and it occurred in December. 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 (1977–2010) is 16,697 acre-feet. The median annual inflow for this same period is 10,792 acre-feet.

Table III-3 lists the annual lake inflows for the period 1977–2010. 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 2010 was well above average for the thirty-four 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 - 2010
(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	5.7%	2007	2,841	
1979	25,318		3	8.6%	1999	3,774	
1980	42,336		4	11.4%	1988	4,551	
1981	6,529		5	14.3%	1990	4,856	
1982	25,310		6	17.1%	1989	4,967	
1983	35,072		7	20.0%	1981	6,529	
1984	10,569		8	22.9%	2001	6,915	
1985	9,497		9	25.7%	2000	6,930	
1986	13,812		10	28.6%	1977	7,103	
1987	8,005		11	31.4%	1987	8,005	
1988	4,551		12	34.3%	2003	8,295	
1989	4,967		13	37.1%	2004	8,404	
1990	4,856		14	40.0%	1997	8,757	
1991	11,658		15	42.9%	2009	9,212	
1992	15,543		16	45.7%	1985	9,497	
1993	48,613	Max.	17	48.6%	1984	10,569	Median
1994	11,015		18	51.4%	1994	11,015	Median
1995	33,340		19	54.3%	1991	11,658	
1996	13,119		20	57.1%	1996	13,119	
1997	8,757		21	60.0%	1986	13,812	
1998	34,600		22	62.9%	2008	14,182	
1999	3,774		23	65.7%	1992	15,543	
2000	6,930		24	68.6%	2006	17,564	
2001	6,915		25	71.4%	1982	25,310	
2002	1,717	Min.	26	74.3%	1979	25,318	
2003	8,295		27	77.1%	2010	32,959	
2004	8,404		28	80.0%	1995	33,340	
2005	39,600		29	82.9%	1998	34,600	
2006	17,564		30	85.7%	1983	35,072	
2007	2,841		31	88.6%	2005	39,600	
2008	14,182		32	91.4%	1978	40,743	
2009	9,212		33	94.3%	1980	42,336	
2010	32,959		34	97.1%	1993	48,613	Max.
1977 - 2010			34				
Maximum	48,613						
Average	16,697						
Median	10,792						
Minimum	1,717						

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.

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
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 daily average flow requirements at Station B in 2010 were as follows.

Month 2010	Hydrologic Condition	Minimum Daily Average Flow (cfs)
January	Wet Year	0.30
February	Wet Year	0.30
March	Wet Year	0.30
April	Above Normal	0.40
May	Wet Year	0.30
June	Wet Year	0.30
July	Wet Year	0.30
August	Wet Year	0.30
September	Wet Year	0.30
October	Start Water Year	0.95
November	Above Normal	0.70
December	Wet Year	0.60

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 2010, the daily average flows at Station B were above the minimum flows shown throughout the year. There were five periods when the flow recorder at Station B did not function. During two of those periods, the flows exceeded the weir capacity. These periods were 1) August 18–21, when Big Bear MWD was releasing water for delivery to Mutual, and 2) December 22–31, when Big Bear MWD made flood control releases to prevent the lake level from getting within one foot from the top of the dam. The other three times when the recorder did not function properly there were computer problems and the measurements were not saved. These periods were October 2–7, October 15–18, and December 9–13. The Watermaster Committee estimated the flows during these five periods based on releases from the Lake and estimates of leakage.

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 2010 eliminated the leakage from cracks in the upper arches of Bays 5, 6 and 8. For 2010, 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 estimated leakage from Bays 1 and 10 for 2010 was estimated to be 10.8 acre-feet.

In late November 2009 during excavation of foundations for the new highway bridge below the dam, workers noticed water entering the excavation and seeping to the surface below. During meetings with Caltrans engineers and the Districts' engineer in January, Caltrans indicated they were convinced the new seepage was not related to their blasting efforts but the result of the removal of overburden and bedrock resulting in the opening of new pathways for seepage water to move through the abutment rock. Caltrans promised to prepare a remedial grouting plan and submit it to the District for engineering review and approval. In spite of several conversations since that time, and requirements that the Division of Safety of Dams must review the grouting plan before implementation, Caltrans has not yet performed on their obligation to prepare a remedial grouting plan.

The leakage could not be directly measured but was estimated from flow measurements at Station B that were in excess of the measured releases from the lake. **Table III-4** shows the estimated additional leakage through the foundation. For 2010, this additional leakage was estimated to be 138.9 acre-feet.

The total estimated dam leakage in 2010 was 149.7 acre-feet. Of this total, 10.2 acre-feet was delivered to Mutual in the period August 22 – September 10, and the balance of 139.5 acre-feet was included in the outflows from the Lake to meet the requirements of SWRCB Order 95-4.

Outlet Works Releases

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.

TABLE III-4
ESTIMATES OF
MONTHLY DAM LEAKAGE
 (acre-feet)
 Calendar Year 2010
 Big Bear Watermaster

Month	Bay 1 and Bay 10 Leakage Estimates (AF)	Additional Foundation Leakage (AF)	Total Estimated Leakage (AF)
January	0.5	9.3	9.8
February	0.5	8.4	8.9
March	0.7	12.3	13.0
April	0.5	11.9	12.4
May	0.7	12.2	12.9
June	0.7	11.8	12.5
July	0.7	12.3	13.0
August	0.7	12.3	13.0
September	3.1	11.9	15.0
October	0.9	12.3	13.2
November	0.8	11.9	12.7
December	<u>1.0</u>	12.3	<u>13.3</u>
Annual Total	10.8	138.9	149.7

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 splits into a 24-inch pipeline and a 14-inch pipeline. Flows through these two pipelines are 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 ± 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. When the lake is full and only the 14-inch sluice gate is open, the flow from the outlet works is estimated to be 68 cfs. When only the 24-inch sluice gate is open, the maximum discharge from the Outlet Works is estimated to be 195 cfs. 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 is also a 3-inch relief line, meter and valve on the 36-inch outlet pipeline. 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 2010, Big Bear MWD released 28.7 acre-feet of water through this relief line and 3.7 acre-feet of this water was delivered to the bridge construction project. The balance of the water, 25.0 acre-feet, flowed down Bear Creek and was measured as part of the flow at Station 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 2010, Big Bear MWD released water from the lake through the Outlet Works for flood control purposes, to meet Mutual's request for lake water, and to comply with SWRCB Order No. 95-4. These releases were made through the 6-inch bypass pipeline, the 3-inch relief line, and both the 14-inch and 24-inch sluice gates.

Table III-5 summarizes the monthly amounts of water discharged from the outlet works in 2010. The total from the Outlet Works and leakage in 2010 was estimated to be 2,194.4 acre feet.

TABLE III-5
MONTHLY DISCHARGES FROM
THE OUTLET WORKS OF BEAR VALLEY DAM
(acre-feet)
Calendar Year 2010
Big Bear Watermaster

Month	Flood Control Releases (AF)	Mutual Releases (AF)	Bridge Construction (AF)	SWRCB Discharges (AF)	Total Discharges (AF)
January	-0-	-0-	-0-	27.5*	27.5
February	-0-	-0-	0.1	19.0*	19.1
March	-0-	-0-	0.3	20.4*	20.7
April	-0-	-0-	0.3	22.3*	22.6
May	-0-	-0-	0.3	20.1*	20.4
June	-0-	-0-	0.5	14.0*	14.5
July	-0-	-0-	0.5	15.1*	15.6
August	-0-	103.4	0.4	6.0*	110.6
September	-0-	19.6	0.4	13.8*	33.8
October	-0-	-0-	0.5	58.6*	59.1
November	-0-	-0-	0.3	45.5*	45.8
December	<u>1772.4</u>	<u>-0-</u>	0.1	<u>32.2*</u>	<u>1,804.7</u>
Total	1772.4	123.1	3.7	295.2	2,194.4

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

Mutual Releases

In late August 2010, San Bernardino Valley MWD requested that Big Bear MWD release water from the lake for Mutual rather than provide Mutual with in-lieu deliveries. The Lake level was less than four feet from the top of the dam so Big Bear MWD increased the releases from the lake until the lake level fell below four feet from the top of the dam. The total amount released for Mutual was 123.1 acre-feet. Of the total, 112.9 acre-feet was released through the Outlet Works and 10.2 acre-feet was from leakage through the dam.

Flood Control Releases

In December 2010, a series of major rain storms occurred in the Big Bear Lake Watershed and the rapid runoff resulted in rapidly rising lake levels. Big Bear MWD's Flood Control Policy calls for keeping the lake level below one foot from the top of the dam between December 1 and March 31. Beginning December 22, Big Bear MWD began releasing water from both the outlet works and the spillway gates. In total, an estimated 2,401.4 acre-feet of water was released in December for flood control purposes. 1,772.4 acre-feet was released through the outlet works by opening the 14-inch and 24-inch sluice gates. An additional 629.0 acre-feet was released by opening Spillway Gates No. 1 and No. 2.

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 2010, during a major storm and when the Lake was nearly full, Big Bear MWD opened Spillway Gates 1 and 2 on December 22 to prevent the Lake from getting within one foot of the top of the dam. Big Bear MWD closed the spillway gates on December 23. In total, an estimated 629 acre-feet was released through the spillway gates in 2010 for flood control purposes.

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 2010, the measured and estimated flow at

**Table III-6
Comparison of Flows at Station B with
Estimated Leakage and Flows from Outlet Works**

Month	Flows from Outlet Works (AF)	Dam Leakage (AF)	Spillway Gate Release (AF)	Total Flows From Dam (AF)	Flow at Station B (AF)	Gains/ (Losses) (AF)
January	27.5	9.8	-	37.3	42.8	5.51
February	19.1	8.9	-	28.0	38.2	10.19
March	20.7	13.0	-	33.7	42.3	8.57
April	22.6	12.4	-	35.0	42.3	7.23
May	20.4	13.0	-	33.3	34.3	0.99
June	14.5	12.6	-	27.0	24.6	(2.46)
July	15.6	13.0	-	28.6	27.8	(0.78)
August	110.6	13.0	-	123.6	135.1	11.46
September	33.8	15.0	-	48.8	59.4	10.51
October	59.1	13.2	-	72.3	81.0	8.70
November	45.8	12.7	-	58.5	67.3	8.83
December	1,804.7	13.3	629.0	2,447.0	2,570.7	123.71
Total	2,194.4	149.7	629.0	2,973.1	3,165.6	192.45

Station B was 192.4 acre-feet more than the estimated amount leaving Big Bear Lake from releases, leakage and spills. Most of the gains were the result of local runoff and snowmelt from the area between the Dam and Station B.

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 2010, 544 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, 49 acre-feet of water was used and none was returned to the lake. In 2010, the withdrawal from the lake for snowmaking was 495 acre-feet and 247 acre-feet returned to the lake. The “net withdrawal” for all purposes was 297 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 2010, the "net" wastewater exported from the Big Bear Lake watershed was 1,715 acre-feet. **Table III-7** contains the 2010 monthly net exports. The 2010 net exports were more than the 2009 net exports. The reason for the increase was higher estimated inflow and infiltration (I&I) into the sewer system in 2010, which reflects the higher lake levels and above average runoff in 2010.

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 2010, Mutual reported they would need about 6,500 acre-feet of water from Big Bear MWD including the portion of the SWRCB 95-4 outflows they could beneficially use. Their intent was to limit their deliveries from BBMWD to 6,500 acre-feet in 2010. Mutual met their overall 2010 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 2010
 Big Bear Watermaster

Month	Net Wastewater Exports (acre-feet)
January	127.0
February	239.6
March	322.5
April	217.3
May	130.1
June	93.4
July	87.6
August	77.7
September	59.3
October	64.7
November	74.1
December	<u>221.9</u>
Total	1,715.1

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 2010.

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 2010, the total river flow reported by the USGS, currently provisional, was 45,733 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 2010, there was no canyon well production. Thus, the resulting estimated River flow was 45,733 acre-feet in 2010. However, this figure reflects storage change in the reservoir behind Seven Oaks Dam. In 2010, an estimated 11,624 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 57,357 acre-feet in 2010.

TABLE III-8

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

Calendar Year 2010
Big Bear Watermaster

Flow Component	Amount (AF)
FLOW OF SANTA ANA RIVER AT MOUTH OF CANYON	
Flow Reported for U.S.G.S. Gage 11051501-provisional	45,733
less BVMWC Canyon Well No. 1 Production	<u>-0-</u>
Estimated Santa Ana River Flow Below Seven Oaks Dam	45,733
plus Annual Storage Change in Seven Oaks Reservoir	<u>11,624</u>
Estimated Santa Ana River Flow at Mouth of Canyon	57,357
DIVERSIONS BY BEAR VALLEY MUTUAL WATER COMPANY	
Diversions: Greenspot Metering Station	-0-
Edwards Line	309
North Fork Canal	2,312
Bear Valley Highline	3,122
Redlands Aqueduct (includes Redlands Tunnel)	12,064
SBVMWD Morton Canyon Connector Deliveries	-0-
Redlands Sandbox Spreading (observed)	<u>346</u>
	18,153
Adjustments: Water pumped from BVMWC Canyon Well No. 1	-0-
Redlands Tunnel Diversion	<u>-629</u>
Total MUTUAL Diversions	17,524
DIVERSIONS BY SBVWCD	
Diversions by San Bernardino Valley Water Conservation District	21,266
SBVMWD Morton Canyon Connector Deliveries to SBVWCD	<u>-0-</u>
Total SBVWCD Diversions	21,266
TOTAL DIVERSIONS FROM THE SANTA ANA RIVER	
Total Diversions by Mutual and SBVWCD	38,790
AMOUNT NOT DIVERTED	
Santa Ana River Flow at Mouth of Canyon	57,357
Mutual and SBVWCD Diversions	- 38,790
Amount Diverted to Storage Behind Seven Oaks Dam	<u>-11,624</u>
Estimated Not Diverted	6,943
Estimated Flow Downstream of Diversion*	5,010
Estimated Losses and Measurement Errors **	1,933 or 3.4%

* 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 2010, Mutual's measured diversions were 18,153 acre-feet. The vast majority, 17,524 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 629 acre-feet of water from the Redlands Tunnel. Mutual's diversions were used for agricultural and domestic purposes. In 2010, 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 2010, they diverted 21,266 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 2009 was 1,553 acre-feet (water surface elevation of 2,178.20 feet). The amount stored behind SOD at the end of 2010 was 13,177 acre-feet (water surface elevation of 2,279.01 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 2010. This amount was 11,624 acre-feet and was not included in the USGS provisional value of 45,733 acre-feet. Adding the amount of water stored behind SOD to the USGS provisional value increases the estimate of Santa Ana River flow to 57,357 acre-feet for 2010.

2010 Estimate of Amount Not Diverted

In 2010, San Bernardino Valley Water Conservation District observed river flow past the Cuttle Weir at the Greenspot Road Bridge. Their estimate of the amount not diverted was 5,010 acre-feet. In other words, all except 5,010 acre-feet of the flow in the Santa Ana River was diverted in 2010. 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 2010, the estimated Santa Ana River flow was 57,357 acre-feet. The total diversion of Santa Ana River

flow by Mutual and San Bernardino Valley Water Conservation District was 38,790 acre-feet. In addition, 11,624 acre-feet was put into storage behind Seven Oaks Dam. The difference between estimated inflow and total diversions is 6,943 acre-feet. Comparing this difference with the observed flow at Greenspot Road bridge (5,010 acre-feet), results in leakage losses and measurement errors of 1,933 acre-feet. These losses and errors represent 3.4 percent of the estimated Santa Ana River flow and are at the low 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 2010, the lake level was below 6 feet down until February 14. It was between 6 feet and 4 feet down between February 14 and April 15. From April 15 through the September 6, the lake level was less than 4 feet down. From September 6 through December 19, the lake level was between 4 feet and 6 feet down. Beginning on December 19, the lake level rose rapidly due to several major storms and it ended the year 0.87 feet down.

Mutual received 2,878 acre-feet of water from Big Bear MWD in 2010. This year Mutual's needs were met by releases from the lake, in-lieu deliveries of SWP water and water discharged from the lake for fishery protection under SWRCB Order No. 95-4. Mutual did not purchase any SWP water in 2010. **Table III-9** shows Big Bear MWD monthly water deliveries to Mutual during 2010. In total, Big Bear MWD provided 2,878 acre-feet of water to Mutual. This amount consisted of 123 acre-feet of lake releases, 2,479 acre-feet of in-lieu supplies and 276 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 2010
 Big Bear Watermaster

Month	Releases from Big Bear Lake for Mutual	Mutual's Use of Fish Releases*	"In Lieu" State Water Project	Total Deliveries to Mutual
January	-0-	15.0*	-0-	15.0
February	-0-	14.1*	1.4	15.5
March	-0-	6.9*	44.7	51.6
April	-0-	6.1*	17.1	23.2
May	-0-	1.0*	68.3	69.3
June	-0-	1.7*	16.1	17.8
July	-0-	27.2*	71.9	99.1
August	103.4	20.1*	307.8	431.3
September	19.7	28.8*	593.6	642.1
October	-0-	71.8*	765.7	837.5
November	-0-	58.1*	384.6	442.7
December	-0-	<u>25.4*</u>	<u>207.5</u>	<u>232.9</u>
Total	123.1	276.2	2,478.7	2,878.0

* 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 2010, the amount of water delivered to Mutual by Big Bear MWD was 50,283 acre-feet. For the 34-year period the Judgment has been in effect, the average annual deliveries by Big Bear MWD to Mutual has been 4,265 acre-feet.

In 2010 Mutual can request up to 29,516 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 2010 (which was 14,717 acre-feet), plus the deliveries made in 2001 (which was 14,799 acre-feet), which will be dropped from the ten-year period ending in 2011. The 29,516 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 2010, Mutual's equivalent diversions were 20,632 acre-feet, which is about what it was when the Judgment was rendered in 1977.

TABLE III-10
SUMMARY OF WATER DELIVERIES TO MUTUAL
1977–2010
(acre-feet)

Calendar Year 2010 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	13,388	40,185
2001	46	493	48	14,212	0	0	14,799	54,754
2002	0	614	0	5,000	0	0	5,614	60,368
2003	0	484	0	0	0	0	484	60,853
2004	0	512	0	2,500	0	0	3,012	62,724
2005	0	146	0	2,218	0	0	2,364	65,000
2006	0	467	0	2,070	0	0	2,537	60,050
2007	0	486	0	6,500	0	0	6,986	59,892
2008	0	474	0	4,634	0	0	5,108	65,000
2009	0	510	0	5,990	0	0	6,500	60,793
2010	123	276	0	2,479	0	0	2,878	50,283

N/A = Not Applicable
* Not Authorized After 1988

34 Year Average

4,265

TABLE III-11
EQUIVALENT WATER DIVERSIONS BY MUTUAL
1977–2010
(acre-feet)
Calendar Year 2010
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
2010	18,153.	-	2,479	20,632.

* 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 re-calculated 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.

2010 ACCOUNT BALANCES

Appendix B contains the 2010 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 2010. **Table 1** of Appendix B provides additional detail. This information shows that:

- 1) the lake level rose 6.62 feet, from a gage height of 64.84 feet to 71.46 feet; 72.33 feet is full;
- 2) lake storage increased by 18,315 acre-feet, it began the year with 52,431 acre-feet and ended the year with 70,746 acre-feet; when the lake is full, it contains 73,320 acre-feet of water;
- 3) lake surface area varied between 2,617 and 2,929 acres;
- 4) evaporation was 11,374 acre-feet;
- 5) lake inflow was 32,959 acre-feet,
- 6) the total of spills, releases, leakage and net lake withdrawals was 3,270 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 2010. 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 2010 Actual Lake Operations

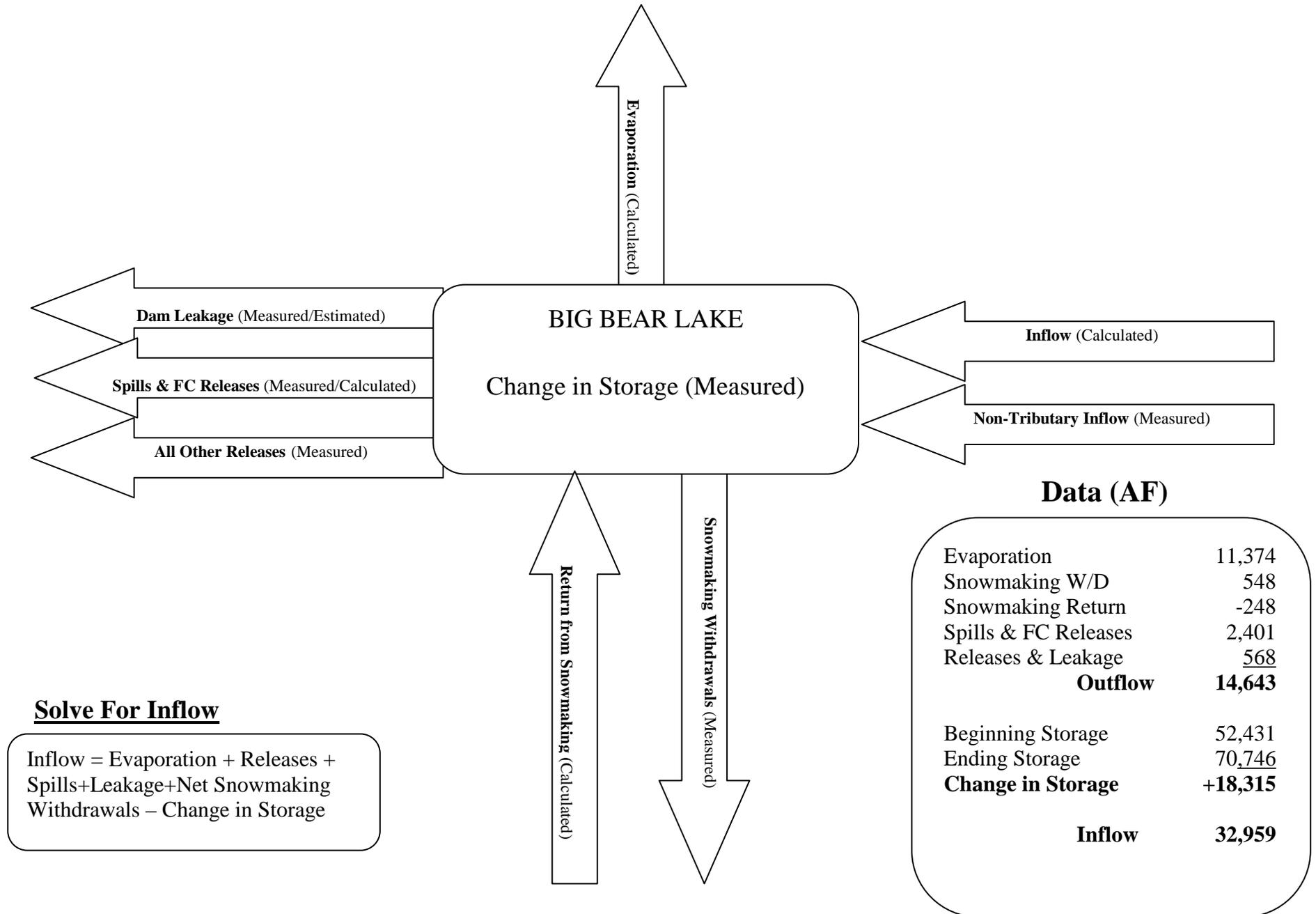
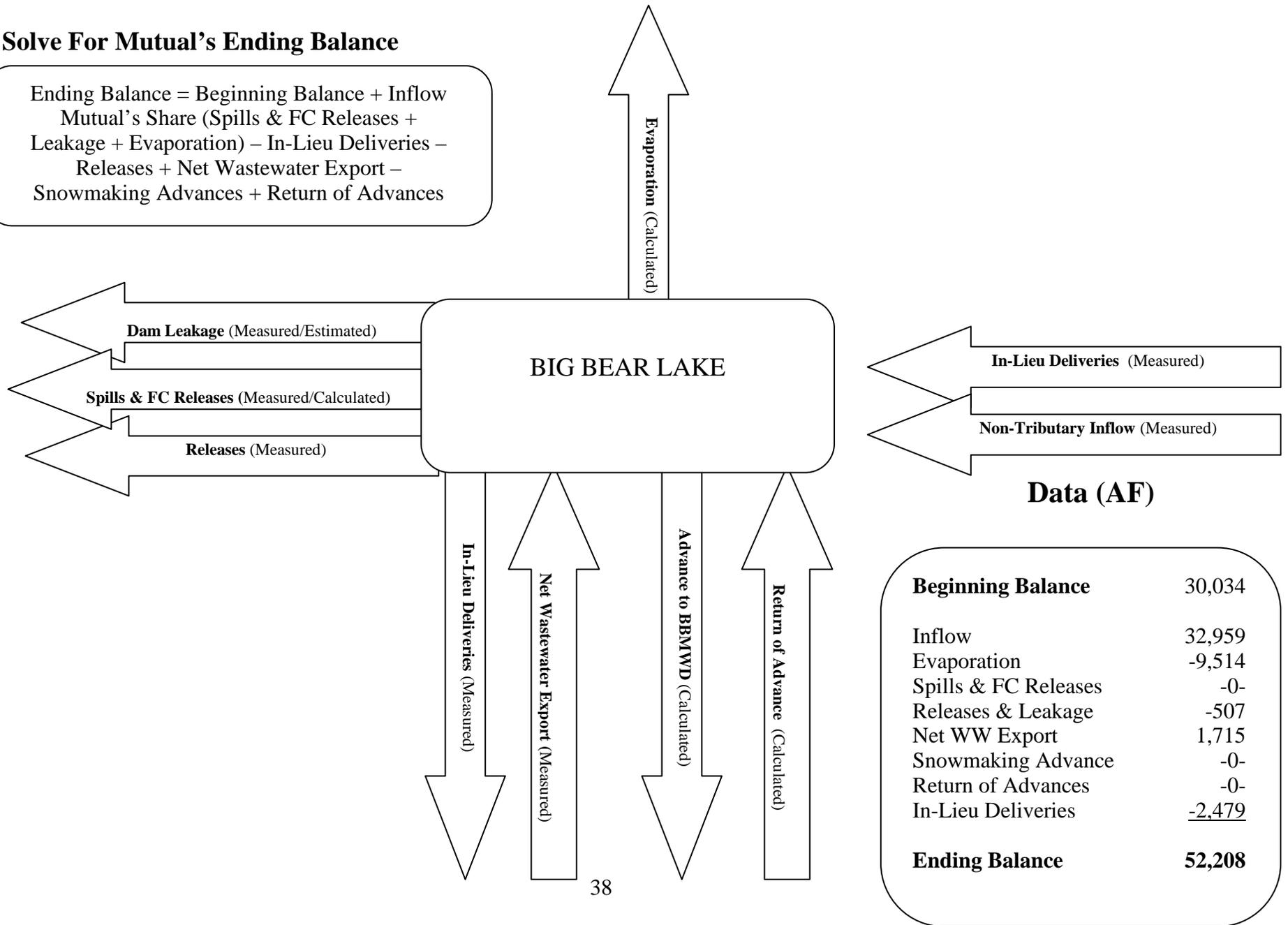


Figure 3
Water Balance for 2010 Mutual's Lake Operation
 (Synthesized Conditions)

Solve For Mutual's Ending Balance

$$\begin{aligned} \text{Ending Balance} = & \text{Beginning Balance} + \text{Inflow} \\ & \text{Mutual's Share (Spills \& FC Releases +} \\ & \text{Leakage + Evaporation)} - \text{In-Lieu Deliveries} - \\ & \text{Releases + Net Wastewater Export} - \\ & \text{Snowmaking Advances + Return of Advances} \end{aligned}$$



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 52,208 acre-feet in its lake account at the end of 2010. This account balance is 22,174 acre-feet more than was in their lake account at the end of 2009. Table 2 also shows that in 2010 Mutual's lake account was credited with all the lake inflow (32,959 acre-feet), the total of their releases, spills, leakage was 507 acre-feet and their in-lieu deliveries were 2,479 acre-feet. Supplemental inflow added to Mutual's Lake Account for net wastewater exported from the basin was 1,715 acre-feet. In 2010, there were no advances to Big Bear MWD for snowmaking within the watershed. Evaporation that would have taken place under a Mutual operation was 9,514 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 64.75 feet at the end of 2010 or 7.58 feet below the top of the dam. This synthesized lake level is 6.71 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 28,701 acre-feet of net wastewater exports. After 21 years of getting these credits, Mutual’s lake account has 7,310 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 2.90 feet. In other words, without the credits, Mutual’s lake account would have been 44,898 acre-feet and their lake level would have ended the year at 61.85 or 10.48 feet down. In other words, it would have been 9.61 feet below the actual lake level. This value is 2.90 feet lower than reported in Mutual’s lake account tables.

There are two primary reasons why the increase in their lake account (7,316 acre-feet) is less than the cumulative credits they have received (28,701 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 2010 Mutual’s lake account had 7,310 acre-feet more and Big Bear MWD’s lake account had 7,310 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 2010. 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 2010, Big Bear MWD’s account balance began with 22,397 acre-feet and ended the year with 18,538 acre-feet. The decrease in their account was 3,859 acre-feet. This decrease was because the flood control release, evaporation losses, SWRCB releases, net snowmaking withdrawals and net wastewater exports were more than the in-lieu deliveries made to Mutual during the year.

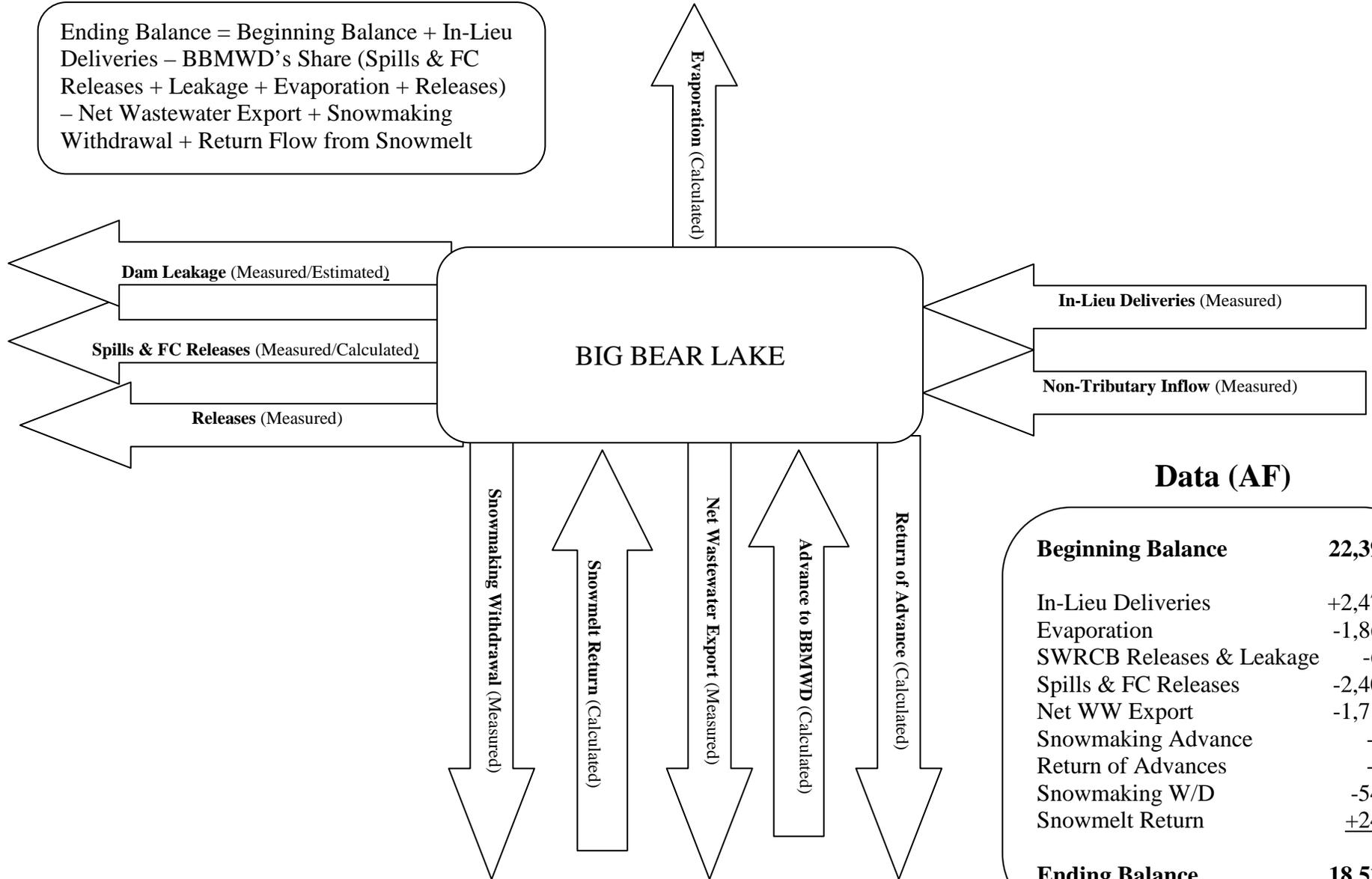
TABLE IV-1
EFFECT OF WASTEWATER EXPORT CREDITS
ON MUTUAL'S LAKE ACCOUNT
 Calendar Year 2010
 Big Bear Watermaster

End Of Calendar Year	Net Wastewater Export Credit (AF)	w/Wastewater Credits		w/o Wastewater Credits		Differences	
		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
2010	1,715	52,208	64.75	44,898	61.85	7,310	2.90
Total	28,701						

Figure 4
Water Balance for 2010 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



Data (AF)

Beginning Balance	22,397
In-Lieu Deliveries	+2,479
Evaporation	-1,860
SWRCB Releases & Leakage	-61
Spills & FC Releases	-2,401
Net WW Export	-1,715
Snowmaking Advance	-0-
Return of Advances	-0-
Snowmaking W/D	-548
Snowmelt Return	<u>+248</u>
Ending Balance	18,538

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 2010, 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 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 2010. The account balance began the year with a balance of 24,201 acre-feet and ended the year with 25,457 acre-feet. There was a 1,256 acre-foot increase in the Basin Compensation Account in 2010. The main reason for the increase was the flood control releases (2,401.4 acre-feet) under the District Operation, which resulted in a credit (51%) of 1,224.7 acre-feet. There would have been no spills under a Mutual Operation. There was also a small credit (51%) for the additional fish releases (61.0 acre-feet) under an assumed District Operation.

V. 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 30th, 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 Gorgonio 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.

2010 Activities

For most of 2010 Seven Oaks Dam's reservoir was operated for flood control by the operators on behalf of Orange Flood Control District. The calendar year began with levels below the Debris pool level of 2200 based on telemetry data. Inflow was stored until high flow testing in April. This test flow and subsequent flows were discharged from the dam. A minimum flow of 3 CFS was discharged when significant rainfall and the reservoir level rose to approximately elevation 2,279 feet with 13,177 acre-feet in storage (based on telemetry) with 3 CFS outflow.

USACOE Reservoir Regulation branch maintains the referenced website as a public record or reservoir status:

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

The quality of the water impounded behind the dam was degraded but generally better quality when compared to 2005 conditions. The USACOE is still studying the quality of the water and changes that may make better quality water available in the future. This study will likely be combined with the reoperation of the reservoir for water conservation. The general result of the latter will be the discharge of 250-500 CFS average when water is impounded and there is room available in Prado Reservoir.

QUAGGA MUSSEL PROTECTION PROGRAM

The invasive Quagga Mussel became a significant threat to Big Bear Lake in 2008. 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 2008 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 2008. 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 2008 for educational materials, signs, additional summer staffing and capital improvements to fund the Quagga Prevention Program.

Sampling at the end of the 2008 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.

2010 Activities

Lake water samples as well as inspection of static sample media suspended in the Lake at the conclusion of the 2010 boating season indicate Big Bear Lake remains Quagga Mussel free. The Big Bear Municipal Water District in conjunction with District trained private marina owners, continued to enforce pre-launch inspection of all registered vessels entering the Lake. Permits sold to non-registered vessels capable of being hand launched obligated the owners to assure the District that their vessels, mostly kayaks and canoes, were clean, drained and absolutely dry before entering the Lake. District personnel control the two public launch ramps and only fully inspected and/or decontaminated vessels are permitted to launch.

Over the course of the 2010 summer, 6,504 vessel inspections were performed and 1,251 were decontaminated with hot water. Roughly another 10,000 boats were sealed to their trailers after recovery allowing them to launch without inspection at a later date.

APPENDIX A

MINUTES OF WATERMASTER MEETINGS

Dates

January 12, 2010

March 11, 2010

May 11, 2010

June 22, 2010

BIG BEAR WATERMASTER
MINUTES OF THE MEETING OF JANUARY 12, 2010

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

PRESENT: <u>Watermaster Committee</u>	<u>Representing</u>
Don Evenson	Big Bear MWD, Chair
R. Robert Neufeld	SBV Water Conservation District
Michael L. Huffstutler	Bear Valley Mutual Water Company
<u>Others</u>	
Scott Heule	Big Bear MWD
John Eminger	Big Bear MWD
Skip Suhay	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 1:30 p.m.

2. APPROVAL OF MINUTES

It was moved by Robert Neufeld and seconded by Michael Huffstutler to approve the minutes from the May 5, 2009 and August 24, 2009 Big Bear Watermaster meetings. The motion carried unanimously.

3. LAKE AND BEAR CREEK STATUS

Scott Heule reported that the 6 inch valve releases are 104.8 gallons a minute or 0.23 cfs. The flow at Station B is 0.64 cfs. Mr. Heule said that as of January 1, 2010, there has been 13.27 inches of precipitation at Bear Valley Dam and flow at Station B is required to be 0.30 cfs during January. Mr. Heule also reported on the ongoing construction of the highway bridge downstream from the dam. Mr. Heule stated that Mike Rogers of MWH Americas, Inc., is working with Caltrans to evaluate a grouting program with respect to the seepage at the dam. As construction on the new bridge progresses, there has been a small increase in seepage through the abutment of the dam compared to what has been occurring historically. The Committee will be notified if impacts to the annual Watermaster report calculations are affected. A discussion ensued.

Mr. Heule also reported that Caltrans will build a replacement vehicular access across the dam as a change order to the original contract once the old bridge is

removed. Vehicle access will be available to service the dam and it is likely that pedestrian access will also be added. A discussion ensued regarding the new highway bridge sidewalk for pedestrians.

4. SANTA ANA RIVER STATUS

Claud Seal distributed the Daily Flow Report (DFR). Mr. Seal reported that the DFR has been revised to identify the main diversions of the District's key measuring points, including definitions of the formulas in each cell. Mr. Seal stated that the District's field operators will be taking over the responsibility of preparing and distributing the DFR, as Shanae Smith is no longer working on the project. Robert Neufeld said staff is concerned that in the past, numbers were not accurately reported relative to the amounts of water being delivered. Mr. Neufeld said he appreciates staff's efforts, as we can now trace every drop of water coming into the system, as well as the amount going out. He said that staff has received positive feedback from basin producers. Mr. Seal also reported that upgrades have been made to the Cuttle Weir, including concrete added to the depressed area and steel plates have also replaced the wood slats at the opening of the Cuttle Weir. Mr. Seal reported the purchase of a John D Excavator to assist staff with the removal of the steel plates when there is an accumulation of debris. Mr. Seal stated that the District was getting into the rock business due to the economic downturn and lack of mining income. Mr. Seal stated that District staff is developing new methods of revenue sources. Mr. Seal also reported that Phase II and III of the Optimization Study to improve the borrow pit had begun, to get 300 cfs of water moving through the system. A discussion ensued.

5. MUTUAL'S PROJECTION OF NEEDS

Michael Huffstutler stated that Mutual's needs are projected to be up to 6,500 acre feet of in-lieu water, depending on the availability of State Water Project (SWP) water, which is currently at 5% of water allocated to state contractors. A discussion ensued regarding the impacts to the groundwater delivery system and the San Bernardino Valley Municipal Water District's ability to meet Mutual's needs.

6. GROUNDWATER PRODUCTION AND DEVELOPMENT IN BIG BEAR VALLEY.

There was nothing new to report on this item.

7. OTHER TOPICS

a. Seven Oaks Dam Operations

Mr. Neufeld reported attending bi-weekly meetings with the U.S. Army Corps of Engineers (USACE) and receiving information regarding funding. Mr. Neufeld said he spoke with Congressman Lewis' office regarding possibly transferring funding sources between the water quality and water conservation studies, through the Water Resources Development Act (WRDA) funds, as \$7 million has been allocated. Mr. Neufeld stated he anticipates receiving information from the USACE regarding where the money had been spent. The USACE claims a draft copy of the studies will soon be available for public review and comment. Mr. Neufeld also reported that he requested additional funding from Dr. Axt with regard to the stream gauge and that he is encouraged by the communications.

b. Seven Oaks Dam Water Quality

This item was covered previously in the meeting.

c. Status of SAR Stream Gauge

There was nothing new to report on this agenda item.

d. 2009 Annual Report

Don Evenson reviewed the 2009 Annual Report Schedule and Assignments sheet and requested that assignments be submitted no later than February 5, 2010 for his review. Mr. Evenson summarized the report procedure process from the previous year. Mr. Neufeld reported receiving comments from the Conservation District Board of Directors regarding costs relative to the printed reports. Mr. Evenson stated that 90% of the costs associated with the report are for professional consulting services charges relative to preparation, assembly and dissemination of the annual report. A discussion ensued.

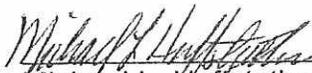
8. DATE FOR NEXT MEETING

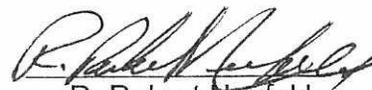
The next meeting will be on Tuesday, March 11, 2010 at 1:30 a.m., at the San Bernardino Valley Water Conservation District, CA.

9. ADJOURN

There being no further business, the meeting was adjourned at 2:15 p.m.


Donald E. Evenson


Michael L. Huffstutler


R. Robert Neufeld

BIG BEAR WATERMASTER
MINUTES OF THE MEETING OF MARCH 11, 2010

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

PRESENT: <u>Watermaster Committee</u>	<u>Representing</u>
Don Evenson	Big Bear MWD, Chair
R. Robert Neufeld	SBV Water Conservation District
Michael L. Huffstutler	Bear Valley Mutual Water Company
<u>Others</u>	
Scott Heule	Big Bear MWD
Skip Suhay	Big Bear MWD
John Eminger	Big Bear MWD
Claud Seal	SBV Water Conservation District
Samantha Brown	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. LAKE AND BEAR CREEK STATUS

Scott Heule reported the lake level is at 5.28 feet below the spill way and 69.67 feet at the staff gauge. Precipitation at Bear Valley Dam for the water year to-date is at 37.97 inches, which means the required flow at Station B is 0.30 cfs. Actual flow at Station B is currently 0.76 cfs.

Discussion ensued regarding the lake.

3. SANTA ANA RIVER STATUS

Claud Seal reported that rain fall last year was the average of 22.4 inches and finished this year with 23.5 inches. There have been periodic releases from the dam to meet their requirements of 3 cfs, on occasions they have released more than that. There is a concern with Southern California Edison (SCE) being able to supply water through their bypass pipeline since the access road is under water behind the dam and SCE cannot access their pipeline valves. The District will participate in a phone conference call with the United States Corp of Engineers (USACE) to discuss this. USACE should be finalizing a report next month with disposition of managing the dam. In the past several years they have released 25-40 cfs water from the dam in May, now they are going to keep the water in the dam reservoir to use as a conservation facility over the summer to help users in

the valley with water supply throughout the year. The San Bernardino Valley Municipal Water District (SBVMWD) has received permitting for couple hundred thousand acre feet of Santa Ana River water that would include the San Bernardino Valley Water Conservation District's (Conservation District) cooperation for water downstream. They are also going to be paying to build a pipeline connecting to, and parallel from the Conservation District's system, the "sandbox". Lastly, the Conservation District is looking to develop Wetlands in the Borrow Pit and looking at having a clarification facility from the Seven Oaks Dam to clean up the water from SOD and possibly the future housing development to the east.

Robert Neufeld explained the issues of the Santa Ana Sucker Habitat beginning with the US Fish and Wildlife Services. They are looking to create a Critical Habitat in the San Gabriel River as well.

Discussion ensued regarding the Santa Ana Sucker.

Mr. Evenson asked how the flows are holding up. Mr. Neufeld stated that yesterday there were 40 cfs at the Santa Ana River.

4. MUTUAL'S PROJECTION OF NEEDS

Mr. Huffstutler reported plans for 2010 to be up to 6,500. There is no irrigation going on right now.

5. GROUNDWATER PRODUCTION AND DEVELOPMENT IN BIG BEAR VALLEY.

None to report at this time.

6. REVIEW PRELIMINARY ANNUAL BIG BEAR WATERMASTER REPORT

Don Evenson handed out the Preliminary Annual Report, to discuss some accounting issues. He summarized 2009 being a below average year and explained why.

Mr. Heule explained the Big Bear Lake Fire Department increase has had problems recording rainfall. When the fire department is not busy they are able to keep more accurate record. Mr. Heule and Mr. Evenson discussed establishing a station to keep a more accurate record. Mr. Evenson suggested that this year we delete all references to the Big Bear Lake Fire Department data and then next year if the new station is up and running, use the data from the new station. All Committee members agreed.

Mr. Evenson continued his explanation of the problems that occurred at Station B throughout the year, resulting from Station B reporting inaccurately for 6 months

out of the year. Mr. Evenson suggested the Committee have a discussion regarding lake accounting issues regarding when fish flows are being released. Therefore, it needs to be determined when Mutual is diverting the fish releases or not diverting them. Mr. Evenson suggested that the Watermaster Committee establish that when SCE is down then Mutual is not diverting, so the numbers in the tables used to calculate Mutual's diversions of fish releases would be changed to zero when SCE is down. This logic would be used in the future.

Mr. Seal proposed adding whether SCE is shut down on the Daily Flow Report. All parties agreed.

Mr. Evenson continued summarization of the Annual Report. Mr. Evenson reported needing everyone's comments on the report by March 19th, therefore it could be at the printer and to the courts by March 31st.

Mr. Seal distributed an updated Table 8 and explained the changes. Mr. Evenson asked if the Bear Valley Highline shut down all year and if any water was delivered to Edwards. Mr. Neufeld stated he will look into those numbers.

Discussion ensued regarding finalizing the report.

Mr. Seal presented the photos from the facilities tour in August 2009. Discussion ensued regarding the upgrades since the photos were taken.

7. OTHER TOPICS

a. Seven Oaks Dam Operations.

Mr. Seal reported when Seven Oaks Dam tried to open gates when testing they could not close, therefore there will be new locks installed.

b. Seven Oaks Dam Water Quality.

Mr. Neufeld reported that the water quality is part of the ongoing work with USACE. The water quality they believe is going to be solved with the re-operation of the Dam.

c. Status of SAR Stream Gauge.

Mr. Neufeld reported that the good news is the USACE told him that they have started communications with USGS. USGS said they feel there is no need for the replacement of the gauge and that it was taken out by a storm event. USGS is concerned that if the gauge was to be replaced then it may be damaged once again by a storm. The District has begun obtaining daily evaluation logs from flood control.

d. 2009 Annual Report

This item was covered previously in the meeting.

8. OPEN DISCUSSION

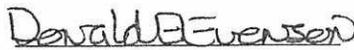
Mr. Neufeld reported that the Annual Engineering Investigation presentation has begun and the public hearing will be at the end of the month. He reported that staff is recommending that there be no increase in the Groundwater charge. He passed out the sample letter sent out to all producers.

9. DATE FOR NEXT MEETING

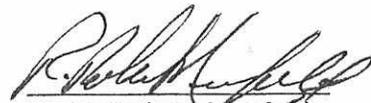
The next meeting will be on Tuesday, May 11, 2010 at 1:30 a.m., at the San Bernardino Valley Water Conservation District, CA.

10. ADJOURN

There being no further business, the meeting was adjourned at 2:48 p.m.


Donald E. Evenson


Michael L. Huffstutler


R. Robert Neufeld

BIG BEAR WATERMASTER
MINUTES OF THE MEETING OF MAY 11, 2010

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

PRESENT: <u>Watermaster Committee</u>	<u>Representing</u>
Don Evenson	Big Bear MWD, Chair
R. Robert Neufeld	SBV Water Conservation District
Michael L. Huffstutler	Bear Valley Mutual Water Company
<u>Others</u>	
Scott Heule	Big Bear MWD
Skip Suhay	Big Bear MWD
John Eminger	Big Bear MWD
Monty Dill	BV Mutual Water Company
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 1:30 p.m.

2. ADDITIONS/DELETIONS TO THE AGENDA

Don Evenson added, "*How Mutual's Needs Will Be Met,*" to the agenda as Item 4a.

3. LAKE AND BEAR CREEK STATUS

Scott Heule reported the following:

1. The current lake level is 69.67, which is 2.66 feet from the full pool level. Year-to-date precipitation at Bear Valley dam is 42.49 inches, which makes this a wet year requiring only 0.30 cfs fish release as measure at Station B. Even if we get more precipitation, we can remain at a required 0.30 cfs release through August.
2. The District is releasing 0.33 cfs from the 6 inch valve on the dam and actual measurement at Station B is 0.69 cfs.
3. Last month, the District hired divers to inspect a monument across a crack in the dam that was found in the spring of 2008. No movement of significance was observed. The divers also inspected the submerged old dam in an attempt to discern the condition of the outlet works at the base of the dam. Too much debris and mud is at the base to know if the outlet works are open, or their condition.

4. The Contractor hopes to have the work on the new highway bridge nearly completed by the end of this year and is several months ahead of schedule.
5. Information has been provided to Mike Huffstutler regarding two water demand development projects in Big Bear: The Big Bear Lake, Department of Water and Power (BBLDWP) well replacement project at pond 10, and the Moon Camp Development project, which will be covered later in the meeting.

4. SANTA ANA RIVER STATUS

Claud Seal reported attending a meeting at the San Bernardino County Flood Control District (SBCFCD) regarding conducting major high flow releases at the Seven Oaks Dam (SOD), testing the rebuilt gates and to let the rest of the water out from behind the dam to the debris level. Mr. Seal said the testing will last up to four weeks, working up from 250 cfs to 2,000 cfs. Mr. Seal said the Conservation District would like to safely control and spread from 250 cfs to 280 cfs, it is marginal at 300 cfs, since it starts to over top the Greenspot Road culvert road surface and become unstable after that. Mr. Seal stated the Conservation District is using as much water as possible and once the existing basins are filled, the water will be directed into an old channel west into the closest of the old aggregate mining pits owned by CEMEX. Mr. Seal reported that there will be no immediate structure modifications due to being short staffed and limited in our field operations. Robert Neufeld reported that SBCFCD is looking to release a total of 13,259 acre feet of water from behind the dam to reach the debris pool level. Mr. Neufeld stated that after the initial first four days, including the high flow test, originally 500 cfs of water will be diverted around the clock starting May 24 through June 4, 2010. He said we can only capture up to 300 cfs of water. A discussion ensued regarding the water quality behind the dam.

5. MUTUAL'S PROJECTION OF NEEDS

Michael Huffstutler said Mutual's projection of needs is up to 6,500 acre feet of water. Don Evenson asked what Mutual's peak demands were. Mr. Huffstutler stated approximately 45 cfs.

a. How Mutual's Needs Will Be Met

Don Evenson stated that Mr. Heule requested that he begin coordinating the needs of Mutual's deliveries and to take a look at anticipating releases, and meeting the needs for Mutual this year. Mr. Evenson reviewed graphs distributed to the Committee relative to the existing Mutual Release Policy for Mutual's needs. Mr. Evenson also summarized the graph indicating, "2010 Lake Levels." He stated that, as of the end of April, the lake was less than 3 feet down and Under

the current Lake Release Policy, Big Bear would release water to meet Mutual's needs and there would be no in-lieu water deliveries from the San Bernardino Valley Municipal Water District (SBVMWD). Mr. Evenson recapped three requirements set by the State Water Resources Control Board's (SWRCB) Order No. 95-4. He stated the third requirement limited the amount that flows that can be increased or decreased at Station B to no more than 0.2 cfs per day, in order to avoid flushing fish down the river and stranding them when flows are reduced.

Mr. Neufeld asked whether there is a means to establish a savings account for Mutual and local basin users, allowing the water to be stored until future use. Mr. Neufeld said there is plenty of capacity for storing water in the basin and the District is working closely with the SBVMWD to establish a collaborative agreement that will entail taking the labels off the water. A discussion ensued regarding modifying the operational parameters of the lake release policy to meet Mutual's needs, and options and ideas developed by the Committee to determine a resolution to the problem before July to meet Mutual's needs.

6. GROUNDWATER PRODUCTION AND DEVELOPMENT IN BIG BEAR VALLEY.

Mr. Huffstutler expanded on Mr. Heule's report regarding two development projects in Big Bear. Mr. Huffstutler said a draft EIR has been disseminated regarding the Moon Camp Development project and that the Committee should respond, as the inflow of the lake belongs to BVMWC. He stated that anything that impedes the inflow, which did not exist prior to the 1977 Judgment, should be challenged by the Committee. Mr. Huffstutler said that one of the two projects consists of rehabbing an existing well, which is not a problem, as it is grandfathered in. He said the problem is increasing the well's capacity. Mr. Huffstutler said he is not familiar with the groundwater basins in Big Bear, however, any development project or well that mines the lake, or existing stream is an issue for the BVMWC, as it is a reduction to the flow in the lake. Mr. Heule said the well is a replacement of a shallow well that was drilled in 1948 and is 48 feet and grandfathered in. Mr. Heule said that 71 acre feet of water is the long term average of production on the well and the BBLDWP has obtained grants to replace it. A discussion ensued regarding the Moon Camp subdivision east of the lake and the anticipated production of 14-15 acre feet of water per year. After discussion, the Committee agreed to submit a standard response letter relative to the terms of the 1977 Judgment for any future EIR that could possibly impact lake inflows.

7. OTHER TOPICS

a. **Seven Oaks Dam Operations.**

This item was covered previously in the meeting.

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

Mr. Neufeld said the US Army Corps of Engineers (USACE) has promised the results of the water quality and water conservation studies. Mr. Seal said Conservation District staff is waiting to hear back from the SBVMWD to determine when water can be diverted and to discuss the silt. Mr. Neufeld said the primary issue with the USACE is the re-operation of the dam, as their discussions include lowering the elevation of the debris pool to hold more water and improve the water quality. Mr. Neufeld stated that Congressman Lewis will not be setting aside earmarks through the Water Reclamation Redevelopment Act (WRDA) as he had in the past. A discussion ensued.

c. **Status of SAR Stream Gauge**

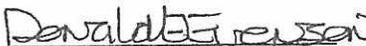
Mr. Neufeld stated he was unable to attend recent meetings with the USACE; however, the request for the installation of the stream gauge was made three months ago. Mr. Evenson suggested the Committee request the USACE or Orange County Flood Control District (OCFCD) look at the operational data, and back-end the daily inflow back into the reservoir based on changes in water elevation. Mr. Seal said the USACE currently has a website that has information available calculating the average flows over a 24 hour period. Mr. Neufeld requested that Mr. Seal forward the link to Committee members for review.

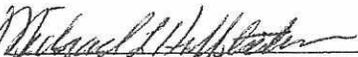
8. DATE FOR NEXT MEETING

The next meeting will be on Tuesday, June 22, 2010 at 1:30 a.m., (later changed to 10:00 a.m.) at the San Bernardino Valley Water Conservation District. The Committee will tour the facilities, including the Seven Oaks Dam and Bear Creek diversion. Doug Headrick of the SBVMWD will also be invited to attend the meeting and subsequent tour.

9. ADJOURN

There being no further business, the meeting was adjourned at 2:55 p.m.


Donald E. Evenson


Michael L. Huffstutler


R. Robert Neufeld

**BIG BEAR WATERMASTER
MINUTES OF THE MEETING OF JUNE 22, 2010**

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

PRESENT: <u>Watermaster Committee</u>	<u>Representing</u>
Don Evenson	Big Bear MWD, Chair
Robert Neufeld	SBV Water Conservation District
Michael L. Huffstutler	Bear Valley Mutual Water Company
<u>Others</u>	
Scott Heule	Big Bear MWD
Skip Suhay	Big Bear MWD
John Eminger	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 10:00 a.m.

2. APPROVAL OF MINUTES

Minutes of January 12, 2010 Meeting –Approved
Minutes of March 11, 2010 Meeting – Approved
Minutes of May 11, 2010 Meeting - Approved

3. LAKE AND BEAR CREEK STATUS

Scott Heule reported the lake level is 2.58 feet below full. The lake level is a little below the highest level so far this year, which was 2.37 feet below full on May 29, 2010. Currently, Big Bear Mutual Water District (Big Bear MWD) is releasing 0.30 cfs through the 6-inch Release Line. The SWRCB requirement for Station B is 0.30 cfs, and the flow at Station B is currently 0.43 cfs.

4. SANTA ANA RIVER STATUS

Mr. Neufeld distributed the Daily Flow Report for June 22, 2010. The Report showed Total Santa Ana River deliveries of 52.3 cfs. SCE was diverting 47.1 cfs from the River and 5.2 cfs was being released from Seven Oaks Dam. Mutual was taking delivery of 44.6 cfs and SBVWCD was spreading 7.7 cfs.

5. MUTUAL'S PROJECTION OF NEEDS

a. Mutual's Needs

Mr. Huffstutler indicated that Bear Valley Mutual Water Company (BVMWC) may need up to 6,500 acre feet from Big Bear MWD and the need could begin sometime in August.

b. Alternative Delivery Options

Mr. Evenson briefed the Committee on some alternatives that Big Bear MWD and SBVMWD are discussing to modify the existing In-Lieu Agreement between the two agencies. No decisions have been made and discussions are expected to continue in the future.

6. GROUNDWATER PRODUCTION AND DEVELOPMENT IN BIG BEAR VALLEY.

No further information on this topic.

7. OTHER TOPICS

a. **Seven Oaks Dam Operations.**

Mr. Huffstutler reported some water is being released from the Dam (5.2 cfs).

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

As shown in the Daily Flow Report, both BVMWC (0.9 cfs) and SBVWCD (4.3 cfs) are using the water released from the Dam.

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

Mr. Neufeld reported that there is no additional information on this topic.

8. DATE FOR NEXT MEETING

No date was set for the next meeting.

9. FACILITY TOUR

The Committee adjourned for a tour of the Santa Ana River diversion facilities and Seven Oaks Dam.

• **ADJOURN**

There being no further business, the meeting was adjourned at 11:30 a.m.

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

APPENDIX B

TABLE OF ACCOUNTS OF OPERATION OF BIG BEAR LAKE

ACCOUNTS FOR CALENDAR YEAR 2010

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

INPUT DATA
BIG BEAR WATERMASTER REPORT
CALENDAR YEAR
2010

Calendar Year	2010		
Mutual's Lake Account Balance on Jan.1	30,034	acre-feet	
Basin Compensation Account Balance on Jan. 1	24,201	acre-feet	
Account Balance for Mutual's Advances to BBMWD	-	acre-feet	
Repayment Premium for Mutual's Advances to BBMWD	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>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
2010
(continued)

Month	Gage* Height 1st of Month (feet)	Actual Mutual Shareholder Releases (acre-feet)	Mutual Other Releases (acre-feet)	Actual Spillway Flood Control Releases (acre-feet)	Actual Outlet Works Flood Control Releases (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	64.84	-	-	-	-	-	-	-
February	65.77	-	-	-	-	-	-	-
March	66.82	-	-	-	-	-	-	-
April	67.82	-	-	-	-	-	-	-
May	69.23	-	-	-	-	-	-	-
June	69.95	-	-	-	-	-	-	-
July	69.61	-	-	-	-	-	-	-
August	69.10	103.43	-	-	-	-	-	-
September	68.43	19.64	-	-	-	-	-	-
October	67.90	-	-	-	-	-	-	-
November	67.78	-	-	-	-	-	-	-
December	67.80	-	-	628.98	1,772.43	-	-	-
	71.46	-	-					

* Gage at Bear Valley Dam

INPUT DATA
 BIG BEAR WATERMASTER REPORT
 CALENDAR YEAR
 2010
 (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)	2010 Net Wastewater Exports (acre-feet)	Average Air Temperature (degrees F)
January	37.27	14.95	-	-	127.00	32.6
February	27.91	14.08	-	-	239.61	30.5
March	33.42	6.92	-	-	322.49	33.9
April	34.75	6.12	-	-	217.32	41.1
May	33.03	0.96	-	-	130.08	47.3
June	26.53	1.74	-	-	93.38	59.6
July	28.05	27.17	-	-	87.57	67.5
August	20.08	20.08	-	-	77.66	62.6
September	28.84	28.84	-	-	59.35	58.6
October	71.81	71.81	-	-	64.69	50.1
November	58.13	58.13	-	-	74.11	42.0
December	45.49	25.39	-	-	221.87	38.8
	445.31	276.19			1,715.13	

SUMMARY RESULTS
CALENDAR YEAR
2010

LAKE ACCOUNTS (acre-feet)	Big Bear	Mutual	Actual
Initial Storage	22,397	30,034	52,431
Lake Inflows	0	32,959	32,959
In-Lieu Supplies to Mutual	2,479	(2,479)	0
Lake Releases (Mutual & BBMWD)	0	(123)	(123)
Releases & Leakage (SWRCB 95-4)	(61)	(384)	(445)
Net Snowmaking Withdrawals from Lake (includes Flatiron deliveries)	(300)	0	(300)
Lake Spills & Flood Control Releases	(2,401)	0	(2,401)
Leakage from Dam	0	0	0
Evaporation from Lake	(1,860)	(9,515)	(11,374)
Net Wastewater Exports	(1,715)	1,715	0
Advances & Repayment of Advances	0	0	0
Ending Storage	18,538	52,208	70,746
BASIN MAKE UP ACCOUNT (acre-feet)			
Beginning Balance	n.a.	n.a.	24,201
Recharge From Deliveries of Lake Water	200	1,439	(1,239)
Recharge From Deliveries of Imported Water	1,239	n.a.	1,239
Recharge from Spills & Releases	1,311	55	1,256
Account Credit (Debit)	2,750	1,494	1,256
Amount Replenished	0	n.a.	0
Ending Balance			25,457

CALENDAR YEAR
2010
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)	6 Estimated Lake Evaporation (see Table 1.D) (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	64.84	52,431	2,377	2,617	56	214	2,647	2,647	214	0.081
February	65.77	54,808	2,821	2,662	39	236	3,096	3,096	236	0.088
March	66.82	57,629	2,736	2,712	36	478	3,250	3,250	478	0.175
April	67.82	60,365	4,051	2,760	36	734	4,821	4,821	734	0.263
May	69.23	64,416	1,986	2,826	41	1,112	3,138	3,138	1,112	0.391
June	69.95	66,402	(993)	2,857	37	1,513	557	557	1,513	0.531
July	69.61	65,409	(1,418)	2,842	37	1,781	400	400	1,781	0.629
August	69.10	63,991	(1,820)	2,819	137	1,667	(16)	0	1,683	0.600
September	68.43	62,171	(1,531)	2,790	60	1,417	(54)	0	1,471	0.530
October	67.90	60,640	(275)	2,765	91	1,110	927	927	1,110	0.402
November	67.78	60,365	0	2,760	183	725	908	908	725	0.263
December	67.80	60,365	10,381	2,760	2,518	318	13,217	13,217	318	0.112
TOTALS	71.46	70,746	18,315	2,929	3,270	11,304	32,889	32,959	11,374	4.064

* NOTE: Evaporation adjusted to eliminate negative inflow

CALENDAR YEAR
2010
BIG BEAR WATERMASTER

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

Month	1 2 Actual Spillway Control Releases (Input Data) (ac-ft)	3 Actual Outlet Works 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	-	-	37.3	-	19.1			56.4
February	-	-	27.9	-	11.0			39.0
March	-	-	33.4	-	2.1			35.5
April	-	-	34.8	-	0.8			35.5
May	-	-	33.0	-	7.6			40.7
June	-	-	26.5	-	10.2			36.7
July	-	-	28.1	-	9.0			37.1
August	-	-	123.5	-	13.1			136.6
September	-	-	48.5	-	11.3			59.7
October	-	-	71.8	-	19.5			91.3
November	-	-	58.1	-	125.2			183.3
December	629.0	1,772.4	45.5	-	71.3			2,518.2
TOTALS	629.0	1,772.4	568.4	-	300.2			3,270.0

CALENDAR YEAR
2010
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	-	-	-		-	-	-	37.3	37.3
February	-	-	-		-	-	-	27.9	27.9
March	-	-	-		-	-	-	33.4	33.4
April	-	-	-		-	-	-	34.8	34.8
May	-	-	-		-	-	-	33.0	33.0
June	-	-	-		-	-	-	26.5	26.5
July	-	-	-		-	-	-	28.1	28.1
August	103.4	-	103.4		-	-	-	20.1	123.5
September	19.6	-	19.6		-	-	-	28.8	48.5
October	-	-	-		-	-	-	71.8	71.8
November	-	-	-		-	-	-	58.1	58.1
December	-	-	-		-	-	-	45.5	45.5
TOTALS	123.1	-	123.1		-	-	-	445.3	568.4

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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	38.26	-		38.26		19.13		19.13
February	21.90	0.09		21.99		10.95		11.04
March	3.62	0.29		3.91		1.81		2.10
April	1.00	0.28		1.28		0.50		0.78
May	7.32	0.31		7.63		-		7.63
June	9.65	0.52		10.17		-		10.17
July	8.51	0.52		9.03		-		9.03
August	12.68	0.38		13.06		-		13.06
September	10.83	0.42		11.25		-		11.25
October	38.12	0.45		38.57		19.06		19.51
November	249.70	0.34		250.04		124.85		125.19
December	142.46	0.06		142.52		71.23		71.29
TOTALS	544.05	3.66		547.71		247.53		300.18

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

1 Month	2 Lake Surface Area (acres)	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	2,617	2,640	32.60	0.081				213.5
February	2,662	2,687	30.50	0.088				235.6
March	2,712	2,736	33.90	0.175				478.2
April	2,760	2,793	41.10	0.263				734.0
May	2,826	2,842	47.30	0.391				1,111.6
June	2,857	2,850	59.60	0.531				1,513.2
July	2,842	2,831	67.50	0.629				1,781.1
August	2,819	2,805	62.60	0.594				1,667.1
September	2,790	2,778	58.60	0.510				1,417.4
October	2,765	2,763	50.10	0.402				1,110.2
November	2,760	2,760	42.00	0.263				724.6
December	2,760	2,845	38.80	0.112				317.8
TOTALS	2,929				4.039			11,304.2

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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)	6 Mutual's Net Wastewater Export Credit (see Table 2.A) (ac-ft)	7 Mutual's Lake Evap. (see Table 2.B) (ac-ft)	8 Mutual's Snowmaking Advances to Big Bear (see Table 3) (ac-ft)	9 Mutual's Credit for Return of Advances (see Table 3) (ac-ft)	10 Mutual's Releases Leakage Spills & In-lieu Del. (see Table 2.A) (ac-ft)
January	55.05	30,034	2,585	1,949	2,646.9	127.0	160.9	-	-	27.7
February	56.35	32,619	3,128	2,028	3,095.6	239.6	183.2	-	-	23.8
March	57.85	35,748	3,119	2,150	3,249.7	322.5	385.0	-	-	68.1
April	59.25	38,867	4,387	2,256	4,820.6	217.3	608.8	-	-	41.7
May	61.15	43,254	2,237	2,377	3,138.2	130.1	940.8	-	-	90.8
June	62.10	45,491	(672)	2,433	556.9	93.4	1,287.0	-	-	34.8
July	61.80	44,819	(1,123)	2,414	400.2	87.6	1,511.2	-	-	99.7
August	61.35	43,696	(1,775)	2,389	-	77.7	1,421.1	-	-	431.3
September	60.60	41,921	(1,812)	2,346	-	59.4	1,229.7	-	-	642.1
October	59.80	40,109	(764)	2,297	926.5	64.7	917.9	-	-	837.5
November	59.45	39,345	(57)	2,271	907.9	74.1	596.2	-	-	442.7
December	59.45	39,288	12,920	2,271	13,217.0	221.9	272.7	-	-	246.0
TOTALS	64.75	52,208	22,174	2,612	32,959.4	1,715.1	9,514.5	-	-	2,986.1

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

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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	-	-	-	27.7	-	27.7		127.0	-	127.0
February	-	-	-	22.3	1.5	23.8		239.6	-	239.6
March	-	-	-	23.4	44.7	68.1		322.5	-	322.5
April	-	-	-	24.6	17.1	41.7		217.3	-	217.3
May	-	-	-	22.5	68.3	90.8		130.1	-	130.1
June	-	-	-	18.7	16.1	34.8		93.4	-	93.4
July	-	-	-	27.8	71.9	99.7		87.6	-	87.6
August	-	103.4	-	20.1	307.8	431.3		77.7	-	77.7
September	-	19.6	-	28.8	593.6	642.1		59.4	-	59.4
October	-	-	-	71.8	765.7	837.5		64.7	-	64.7
November	-	-	-	58.1	384.6	442.7		74.1	-	74.1
December	-	-	-	38.5	207.5	246.0		221.9	-	221.9
TOTALS	-	123.1	-	384.3	2,478.75	2,986.1		1,715.1	-	1,715.1

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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	30,034.0	1,949.0	157.7	32,622.5	2,028.0	1,988.5	160.9	52.6	32,619.3	
February	32,619.3	2,028.0	177.8	35,752.9	2,150.0	2,089.0	183.2	52.4	35,747.5	
March	35,747.5	2,150.0	375.7	38,875.9	2,256.0	2,203.0	385.0	93.2	38,866.6	
April	38,866.6	2,256.0	592.9	43,269.9	2,377.0	2,316.5	608.8	125.2	43,254.1	
May	43,254.1	2,377.0	929.9	45,501.7	2,433.0	2,405.0	940.8	170.8	45,490.8	
June	45,490.8	2,433.0	1,292.0	44,814.2	2,414.0	2,423.5	1,287.0	226.2	44,819.2	
July	44,819.2	2,414.0	1,519.1	43,688.3	2,389.0	2,401.5	1,511.2	269.9	43,696.1	
August	43,696.1	2,389.0	1,434.0	41,908.5	2,346.0	2,367.5	1,421.1	262.3	41,921.4	
September	41,921.4	2,346.0	1,242.7	40,096.0	2,297.0	2,321.5	1,229.7	241.6	40,109.0	
October	40,109.0	2,297.0	923.1	39,339.5	2,271.0	2,284.0	917.9	192.3	39,344.8	
November	39,344.8	2,271.0	596.2	39,287.8	2,271.0	2,271.0	596.2	128.4	39,287.8	
December	39,287.8	2,271.0	253.7	52,227.0	2,612.0	2,441.5	272.7	45.1	52,208.0	
TOTALS							9,514.5	1,860.0		

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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	-	-	-	-	-	-	37.3	14.95	27.7	9.5
February	-	-	-	-	-	-	27.9	14.08	22.3	5.6
March	-	-	-	-	-	-	33.4	6.92	23.4	10.1
April	-	-	-	-	-	-	34.8	6.12	24.6	10.2
May	-	-	-	-	-	-	33.0	0.96	22.5	10.5
June	-	-	-	-	-	-	26.5	1.74	18.7	7.8
July	-	-	-	-	-	-	28.1	27.17	27.8	0.3
August	-	-	-	-	-	-	20.1	20.08	20.1	-
September	-	-	-	-	-	-	28.8	28.84	28.8	-
October	-	-	-	-	-	-	71.8	71.81	71.8	-
November	-	-	-	-	-	-	58.1	58.13	58.1	-
December	-	-	-	2,401.4	2,401.4	-	45.5	25.39	38.5	7.0
TOTALS	-	-	-	2,401.4	2,401.4	-	445.31	276.19	384.3	61.0

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2010
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	52,431	30,034	22,397	(208.3)						
February	54,808	32,619	22,189	(307.2)						
March	57,629	35,748	21,881	(383.1)						
April	60,365	38,867	21,498	(336.4)						
May	64,416	43,254	21,162	(250.7)						
June	66,402	45,491	20,911	(321.4)						
July	65,409	44,819	20,590	(294.9)						
August	63,991	43,696	20,295	(45.3)						
September	62,171	41,921	20,250	281.4						
October	60,640	40,109	20,531	489.2						
November	60,365	39,345	21,020	56.9						
December	60,365	39,288	21,077	(2,539.2)						
TOTALS	70,746	52,208	18,538	(3,859.0)						

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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	-	-	-	-	-	-	-	-	-	-
February	1.5	-	-	-	-	1.5	-	-	-	1.5
March	44.7	-	-	-	-	44.7	-	-	-	44.7
April	17.1	-	-	-	-	17.1	-	-	-	17.1
May	68.3	-	-	-	-	68.3	-	-	-	68.3
June	16.1	-	-	-	-	16.1	-	-	-	16.1
July	71.9	-	-	-	-	71.9	-	-	-	71.9
August	307.8	-	-	-	-	307.8	-	-	-	307.8
September	593.6	-	-	-	-	593.6	-	-	-	593.6
October	765.7	-	-	-	-	765.7	-	-	-	765.7
November	384.6	-	-	-	-	384.6	-	-	-	384.6
December	207.5	-	-	-	-	207.5	-	-	-	207.5
TOTALS	2,478.8	-	-	-	-	2,478.8	-	-	-	2,478.8

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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	38.3	-	19.1	19.1	-	-	9.5	52.6	127.0	208.3
February	21.9	0.1	11.0	11.0	-	-	5.6	52.4	239.6	308.7
March	3.6	0.3	1.8	2.1	-	-	10.1	93.2	322.5	427.8
April	1.0	0.3	0.5	0.8	-	-	10.2	125.2	217.3	353.5
May	7.3	0.3	-	7.6	-	-	10.5	170.8	130.1	319.0
June	9.7	0.5	-	10.2	-	-	7.8	226.2	93.4	337.5
July	8.5	0.5	-	9.0	-	-	0.3	269.9	87.6	366.8
August	12.7	0.4	-	13.1	-	-	-	262.3	77.7	353.1
September	10.8	0.4	-	11.3	-	-	-	241.6	59.4	312.2
October	38.1	0.5	19.1	19.5	-	-	-	192.3	64.7	276.5
November	249.7	0.3	124.9	125.2	-	-	-	128.4	74.1	327.7
December	142.5	0.1	71.2	71.3	-	2,401.4	7.0	45.1	221.9	2,746.7
TOTALS	544.1	3.7	247.5	300.2	-	2,401.4	61.0	1,860.0	1,715.1	6,337.7

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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	18.9		14.0		4.9		-		24,201
February	14.8		12.0		2.9		-		24,206
March	39.3		34.2		5.1		-		24,209
April	26.2		21.0		5.2		-		24,214
May	51.0		45.6		5.4		-		24,219
June	21.6		17.6		4.0		-		24,224
July	50.0		49.8		0.1		-		24,228
August	215.7		215.7		-		-		24,229
September	321.0		321.0		-		-		24,229
October	418.8		418.8		-		-		24,229
November	221.4		221.4		-		-		24,229
December	1,351.4		123.1		1,228.3		-		24,229
TOTALS	2,750.0		1,494.1		1,255.8		0.0		25,457

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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	-	22.3	11.4	-	15.0	7.5	-	-	18.9	
February	-	13.8	7.1	-	14.1	7.0	1.5	0.7	14.8	
March	-	26.5	13.5	-	6.9	3.5	44.7	22.4	39.3	
April	-	28.6	14.6	-	6.1	3.1	17.1	8.6	26.2	
May	-	32.1	16.4	-	1.0	0.5	68.3	34.2	51.0	
June	-	24.8	12.6	-	1.7	0.9	16.1	8.1	21.6	
July	-	0.9	0.4	-	27.2	13.6	71.9	36.0	50.0	
August	-	-	-	103.4	20.1	61.8	307.8	153.9	215.7	
September	-	-	-	19.6	28.8	24.2	593.6	296.8	321.0	
October	-	-	-	-	71.8	35.9	765.7	382.9	418.8	
November	-	-	-	-	58.1	29.1	384.6	192.3	221.4	
December	2,401.4	20.1	1,235.0	-	25.4	12.7	207.5	103.8	1,351.4	
TOTALS	2,401.4	169.1	1,311.0	123.1	276.2	199.6	2,478.8	1,239.4	2,750.0	

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BIG BEAR WATERMASTER

TABLE 4.8
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)	7 Total Basin Additions (ac-ft)	
January	-	12.8	6.5	-	15.0	7.5	14.0	
February	-	8.2	4.2	1.5	14.1	7.8	12.0	
March	-	16.4	8.4	44.7	6.9	25.8	34.2	
April	-	18.4	9.4	17.1	6.1	11.6	21.0	
May	-	21.5	11.0	68.3	1.0	34.6	45.6	
June	-	17.0	8.7	16.1	1.7	8.9	17.6	
July	-	0.6	0.3	71.9	27.2	49.5	49.8	
August	-	-	-	411.2	20.1	215.7	215.7	
September	-	-	-	613.2	28.8	321.0	321.0	
October	-	-	-	765.7	71.8	418.8	418.8	
November	-	-	-	384.6	58.1	221.4	221.4	
December	-	13.1	6.7	207.5	25.4	116.4	123.1	
TOTALS	0.0	108.1	55.1	2,601.8	276.2	1,439.0	1,494.1	

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BIG BEAR WATERMASTER

TABLE 4.C
BASIN REPLENISHMENTS

1 Month	2 Amount Replenished From SBVMWD (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	-			-	-		-	
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APPENDIX C

**SUPERIOR COURT ORDER
APPOINTING DANIEL B. COZAD
TO WATERMASTER COMMITTEE**

1 RUTAN & TUCKER, LLP
David B. Cosgrove (State Bar No. 115564)
2 611 Anton Boulevard, Fourteenth Floor
Costa Mesa, California 92626-1931
3 Telephone: 714-641-5100
Facsimile: 714-546-9035

4 Attorneys for Defendant
5 SAN BERNARDINO VALLEY WATER
CONSERVATION DISTRICT

FILED
SUPERIOR COURT OF CALIFORNIA
COUNTY OF SAN BERNARDINO
SAN BERNARDINO CIVIL DIVISION

JAN 04 2011

Norman L. Perry
Deputy

8 SUPERIOR COURT OF THE STATE OF CALIFORNIA
9 FOR THE COUNTY OF SAN BERNARDINO

11 BIG BEAR MUNICIPAL WATER DISTRICT,
12 Plaintiff,
13 vs.
14 NORTH FORK WATER COMPANY, ET AL.,
15 Defendants.

Case No. SCV SS 165493

Judge Frank Gafkowsky, Jr.
Department S-37

Submitted on the Pleadings – No Appearance

[PROPOSED] ORDER RE RULING ON
DEFENDANT'S MOTION FOR
APPOINTMENT OF WATERMASTER
REPRESENTATIVE

Date: January 4, 2011
Time: 8:30 a.m.
Dept: S-37

Date Action Filed:
Trial Date: None

21 TO ALL PARTIES AND TO THEIR ATTORNEYS OF RECORD:

22 PLEASE TAKE NOTICE that on January 4, 2011, at 8:30 a.m., in Department S-37 of the
23 above-entitled Court, located at 303 W. Third Street, San Bernardino, California, SAN
24 BERNARDINO VALLEY WATER CONSERVATION DISTRICT's Motion for Appointment of
25 Watermaster was heard before the Hon. Frank Gafkowsky, Jr. The Motion was submitted on the
26 papers and no appearances were made.

27 Upon review of the moving papers, the Court ruled as follows:
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1. Defendant's Motion is granted, and it is hereby ORDERED Mr. Daniel B. Cozad is named as the Conservation District's representative to the Big Bear Watermaster, pursuant to the Judgment entered in this case in 1977.

2. The Court furthers order that moving party give notice of this ruling.

DATED: JAN 04 2011

FRANK GAFKOWSKI, JR.
HON. FRANK GAFKOWSKI, JR.
Judge of the Superior Court

1 San Bernardino Valley Municipal Water District
Attn: Randy Van Gelder
2 P. O. Box 5906
San Bernardino. CA 92412-5906

3
4 Lugonia Water Company
101 E. Olive Avenue
Redlands, CA 92373

5
6 Daniel Cozad
San Bernardino Valley Water Conservation District
1630 W. Redlands Blvd., Ste. A
7 Redlands, CA 92373-8032

8 Donald E. Evenson
Watermaster Member
9 Montgomery Watson
2121 N. California Boulevard, Suite 600
10 Walnut Creek, CA 94596

11 City of Redlands
Attn: Dan McHugh, City Attorney
12 P. O. Box 3005
Redlands, CA 92373

13
14 North Fork Water Company
P. O. Box 3427
San Bernardino, CA 92413

15
16 (BY MAIL) I caused such envelope(s) with postage thereon fully prepared to be placed in the United States
mail at Costa Mesa, California.

17
18 (BY PERSONAL SERVICE) I caused such envelope(s) to be delivered by hand this date to the offices of
the addressee(s).

19 (BY OVERNIGHT DELIVERY) I caused such envelope(s) to be delivered to an overnight delivery carrier
with delivery fees provided for, addressed to the person(s) on whom it is served.

20
21 (BY FACSIMILE) I served the parties listed on the service list by facsimile on the fax numbers listed below
each of the parties.

22 (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true
and correct.

23 Executed on November 30, 2010, at Costa Mesa, California.

24
25 I declare under penalty of perjury under the laws of the State of California that the foregoing is true and
correct.

26 _____
Dinah Ormsby
(Type or print name)

27 _____
Dinah Ormsby
(Signature)