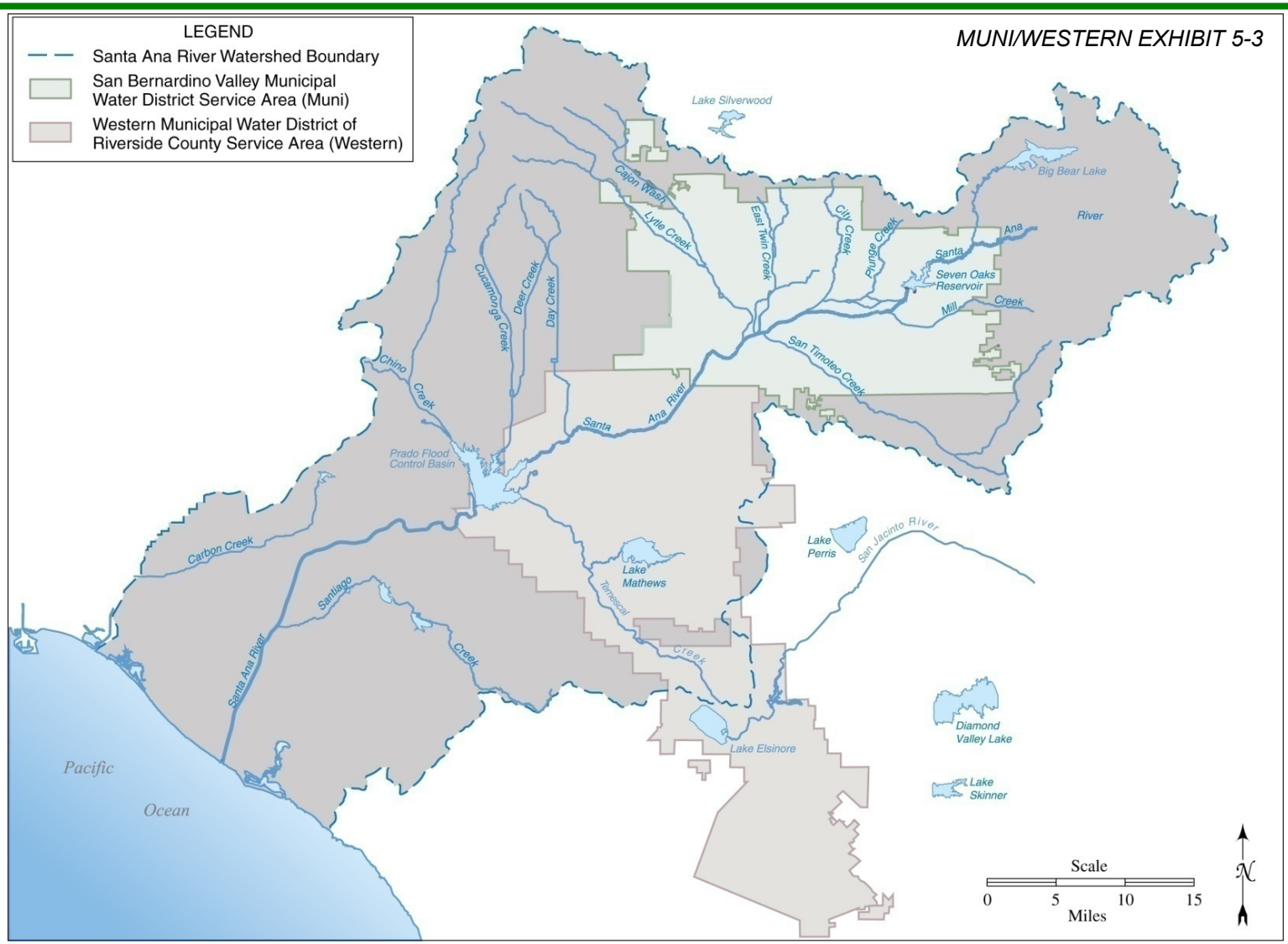
Santa Ana River Water Right Applications for Supplemental Water Supply

Presentation to California State Water Resources Control Board

May 2-4, 2007

The Project Location and Stream Gages



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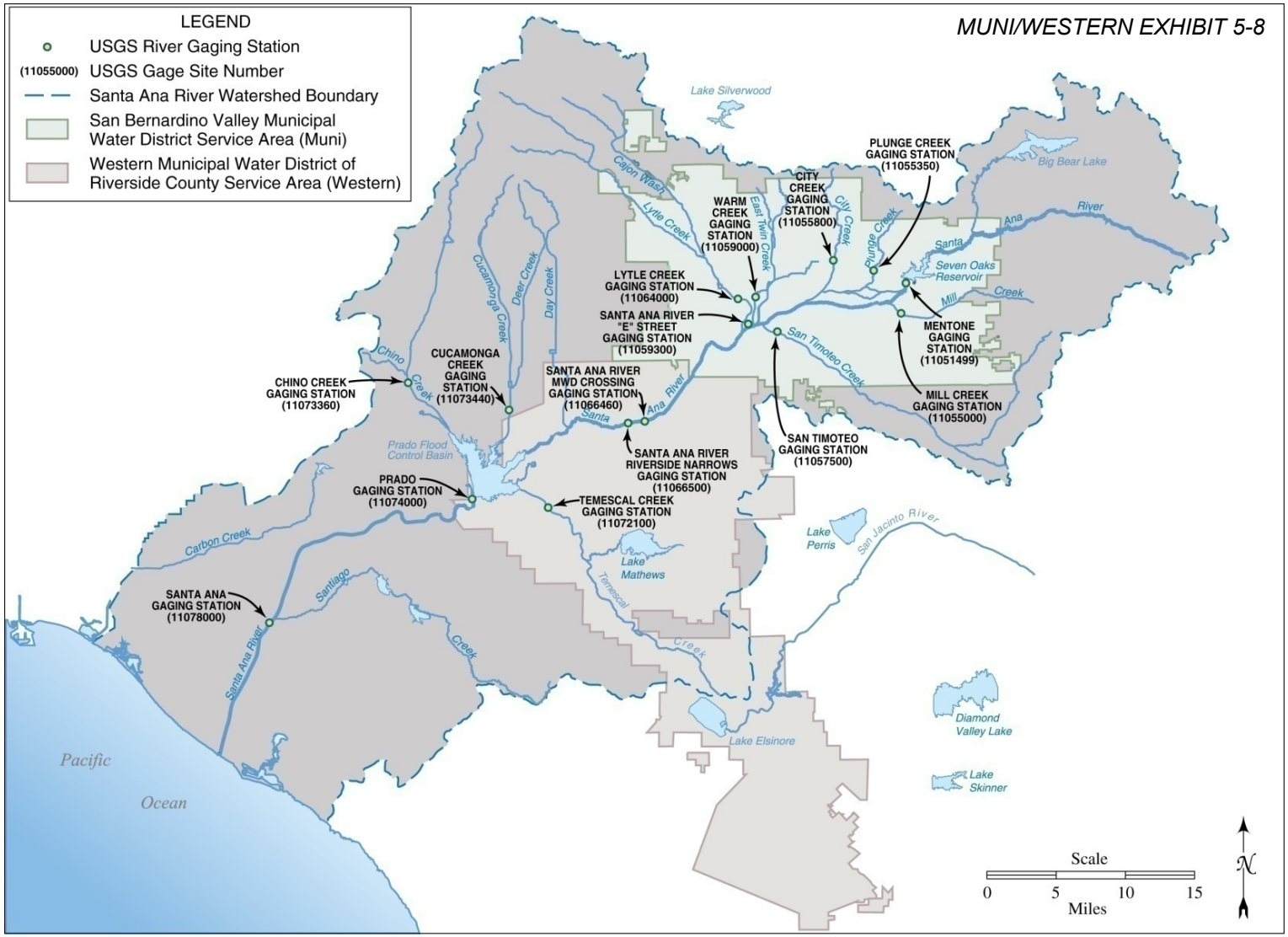
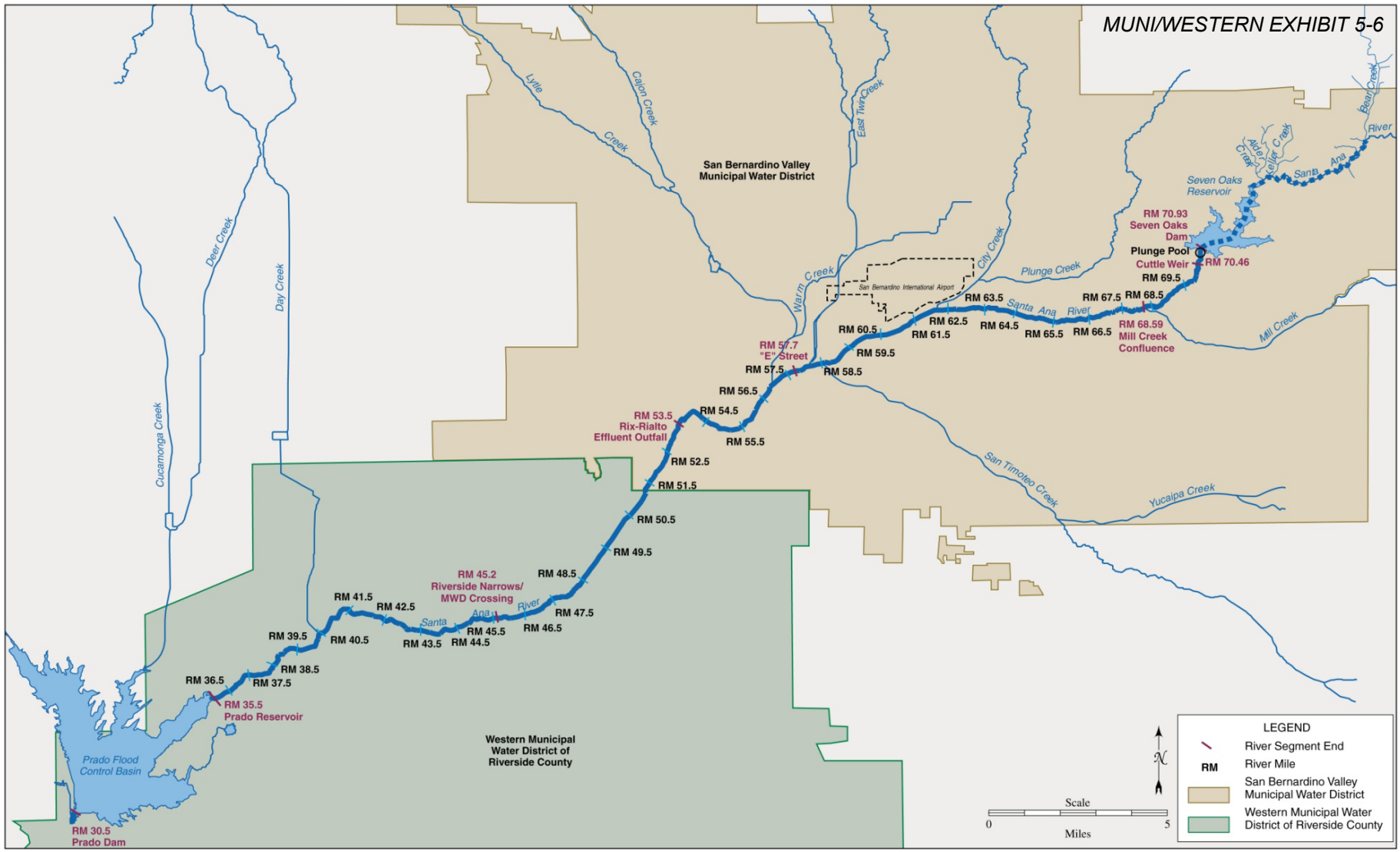


Santa Ana River Segments



Summary of Beeby Testimony

1. Since 1997 I have been providing consulting services to Muni/Western relative to their water rights application to appropriate water from the Santa Ana River.
2. I testified before this Board in 1999 that not only was there 100,000 acre-feet of unappropriated water in the Upper SAR, but that there was an additional 100,000 acre-feet available in infrequent but high flow years.
3. These findings led Muni/Western to file a second application for 100,000 acre-feet maximum annual diversion. The total of the two applications is 200,000 acre-feet.
4. The extensive studies leading to this hearing validated my earlier investigation and demonstrate the with a repetition of a wet year like 1968-69, 198,300 acre-feet of unappropriated water can be put to beneficial use.
5. The capture and beneficial use of this water can be accomplished without negatively impacting the rights of other water users.

Summary of Beeby Testimony (continued)

6. The cumulative capture of water by Muni/Western over the 39-year base period of analysis is nearly 1.1 million acre-feet.
7. Nearly 600,000 acre-feet or 54 percent of the cumulative capture is accomplished in only the four wettest years of the base period, emphasizing the importance receiving a permit that will allow this wet year capture.
8. With a repetition of the third wettest year of record on the SAR System (1992-93), under No Project conditions, there would be an inflow at Seven Oaks Dam of roughly 165,000 acre-feet and an outflow to the ocean of nearly three times that amount (443,000 acre-feet).
9. Under Muni/Western Scenario A for that same year, the Project would divert about 117,000 acre feet, diversions by downstream applicants, principally OCWD would take place, but there would still be roughly 220,000 acre-feet flowing to the ocean.

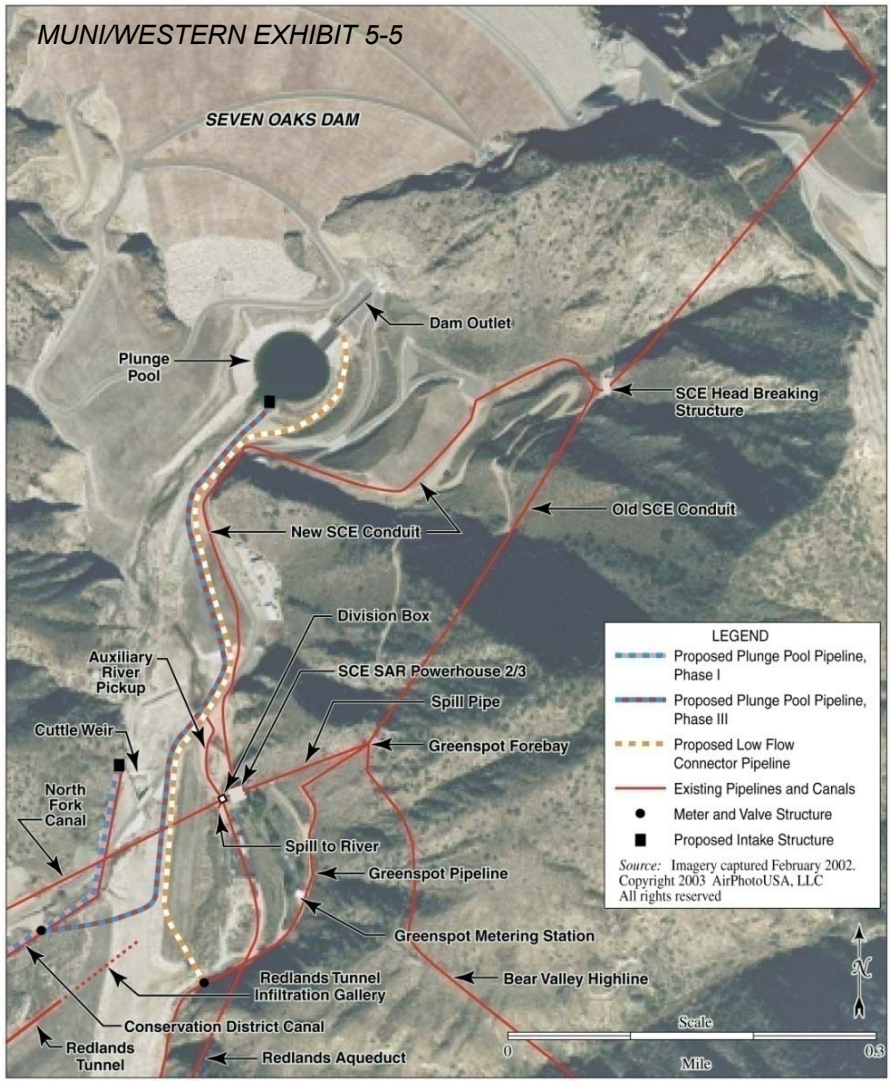
SAIC Role in Hydrologic Analyses

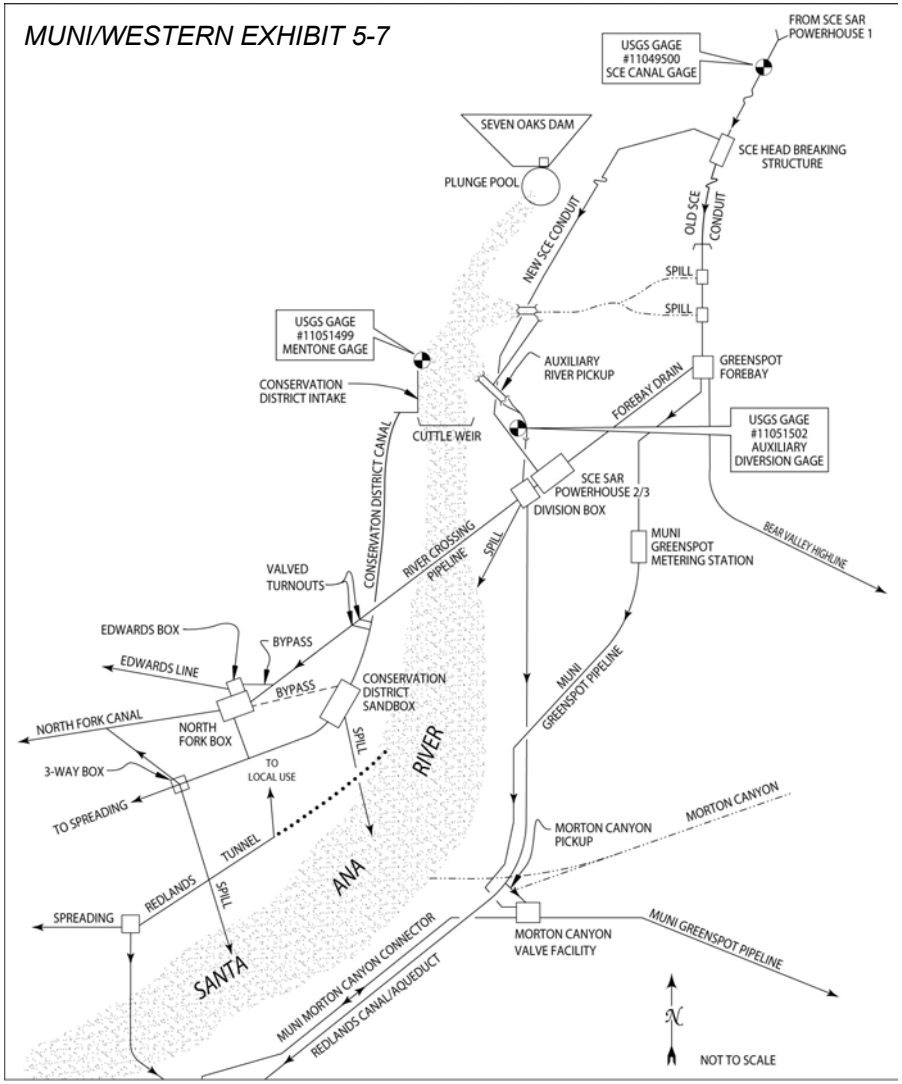
1. SAIC collected and compiled data from the U. S. Geological Survey (USGS) and other sources regarding flow and diversions within the watershed of the SAR.
2. These annual, monthly and daily data were evaluated and analyzed to gain an understanding of the surface water hydrology and use of water in the Upper Santa Ana River area (generally upstream from Prado Dam).
    a. Data evaluation relates to reliability of the data.
    b. Data analyses has to do with the meaning of the data
3. SAIC developed spreadsheet computer models to use as tools to gain an understanding of the surface water hydrology and water supplies of the Upper Santa Ana River area.
4. These computer modeling tools were also used to analyze alternative Project scenarios developed by the Muni/Western team and proposals by affected water users to protect their prior rights.

Santa Ana River System – Main Features

1. Bear Valley Dam and Reservoir.
2. Southern California Edison (SCE) Diversion Facilities upstream from Seven Oaks Dam.
3. Seven Oaks Dam.
4. Senior Water Right Claimant Facilities in the vicinity of Seven Oaks Dam.
5. Francis Cuttle Weir (Cuttle Weir).
6. San Bernardino Valley Water Conservation District Facilities.
7. Wastewater Treatment Facilities (WWTP).
8. Groundwater Recharge Facilities.

Santa Ana River System – Main Features





Santa Ana River System – Seven Segments

1. Segment A – Upstream of Seven Oaks Dam
2. Segment B – Seven Oaks Dam to Cuttle Weir
3. Segment C – Cuttle Weir to Mill Creek Confluence
4. Segment D – Mill Creek Confluence to “E” Street
5. Segment E – “E” Street to RIX and Rialto Effluent Outfall
6. Segment F – RIX and Rialto Effluent Outfall to Riverside Narrows
7. Segment G – Riverside Narrows to Prado Dam

The importance, from the viewpoint of hydrology, is:

- To provide information relating to changes in flow characteristics to the environmental scientists.
- To provide a basis for evaluating possible mitigation methods.

Gages and Measurements

1. Locations (Muni/Western Exhibit 5-8)
2. The key gages in terms of identifying potential capture amounts are:
    a. SCE Canal Gage (USGS Gage 110495000)
    b. The Auxiliary Gage (USGS Gage 11051502)
    c. The Mentone Gage (USGS Gage 11051499)
3. These three gages constitute the “Combined Flow” Mentone Gage (USGS Gage 11051501)
4. The USGS rates the accuracy of their stations using the terms Excellent, Good, Fair and Poor. Factors affecting accuracy are: (1) channel stability; (2) upstream and downstream slope; and (3) roughness coefficient including effects of vegetation in the channel.
5. The USGS gaging stations in the portion of the SAR affected by the Project are rated “Fair”.
6. When a station is rated as “Fair”, the accuracy is defined by the USGS as plus or minus 15 percent.

Institutional Considerations

The use of water in the SAR is subject to two court judgments, SWRCB Orders and agreements with local entities. The two judgments are:

1. The *Orange County* Judgment
2. The *Western* Judgment

These judgments affect the management of the SAR System and the water accounting procedures employed by the Watermasters are incorporated in the computer modeling for the Muni/Western Project.

Specific factors are shown on the next slide.

Institutional Considerations (continued)

Factors considered in Muni/Western Modeling

- The safe yield of the San Bernardino Basin Area (SBBA);
- Extractions from the SBBA by plaintiff parties equal to 27.95 percent of safe yield;
- Muni to provide replenishment for any extractions from the SBBA by non-plaintiffs in aggregate in excess of 72.05 percent of safe yield;
- Western to replenish the Colton and Riverside basins if extractions for use in Riverside County in aggregate exceed certain specific amounts; and
- Muni to replenish the Colton and Riverside basins if water levels are lower than certain specific water level elevations in specified wells.

Procedures used by the Watermaster to determine the Replenishment Obligation are used in the computer models

Institutional Considerations (continued)

Muni Contract with DWR for SWP Water Supply

1.Total Table A Allocation of 102,600 acre-feet

2.Reliability varies with demand but on the order of 70-75 percent, but Mr. Macaulay will provide details in his testimony.

3.SAIC computer modeling was based on no deficiencies in supply because a shortfall in one year could be made up in subsequent years.

Senior Water Right Claimants

Seven Oaks Accord

Santa Ana River-Mill Creek Cooperative Water Project Agreement

Big Bear Lake Operations

San Bernardino Valley Water Conservation District

Santa Ana River – Surface Water Hydrology

USGS gage records in the vicinity of Seven Oaks Dam form the cornerstone for estimates of the amount of water at that point in the SAR that would be subject to capture by the Muni/Western Project.

a. Used to select appropriate Base Period

b. Adjusted to reflect reoperation of Big Bear Lake

What is a “Base Period”?

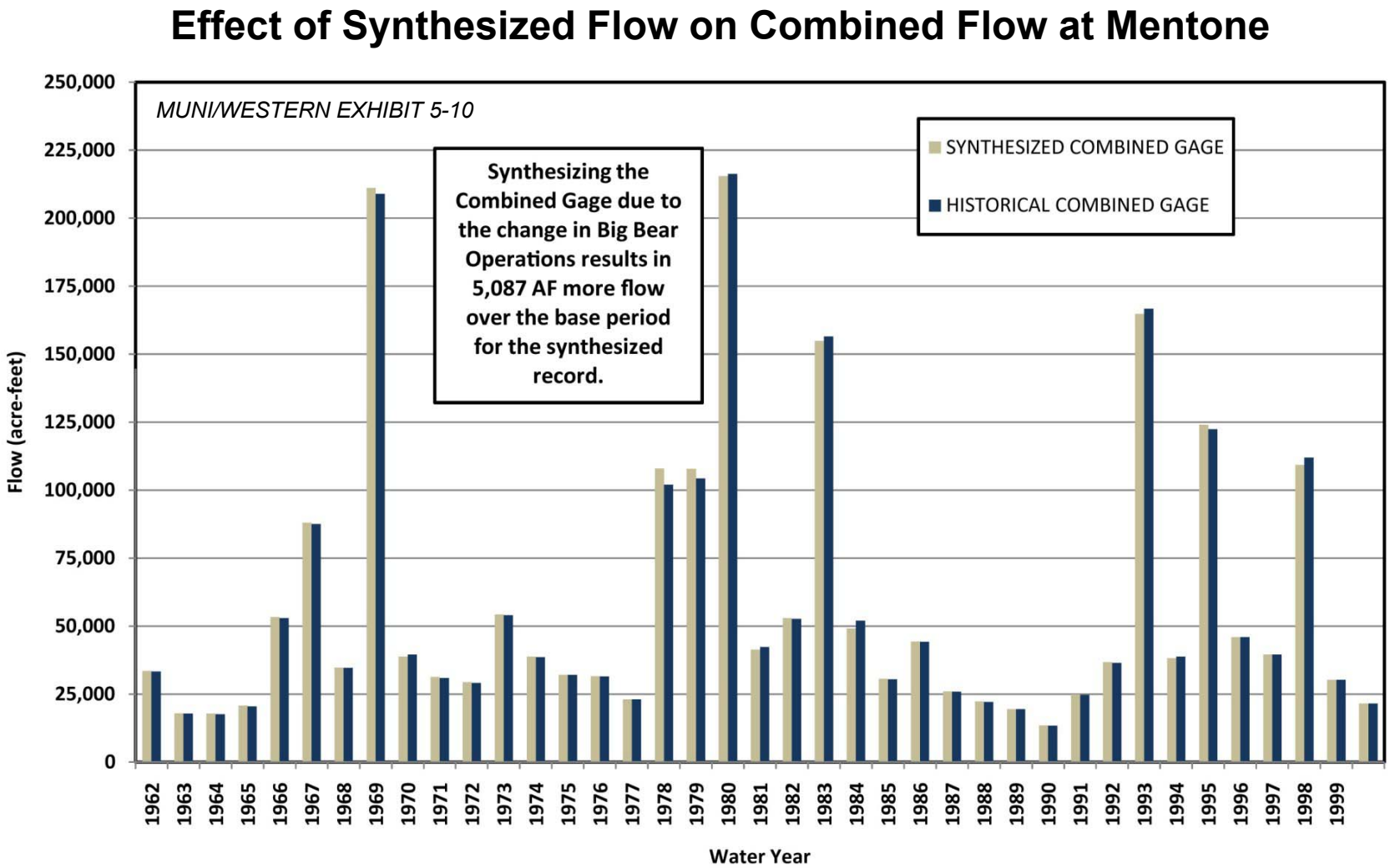
a. Reflects long-term average rainfall and runoff.

b. Includes wet, dry and average conditions.

c. Typically 20 to 30 years in length with end year close to present.

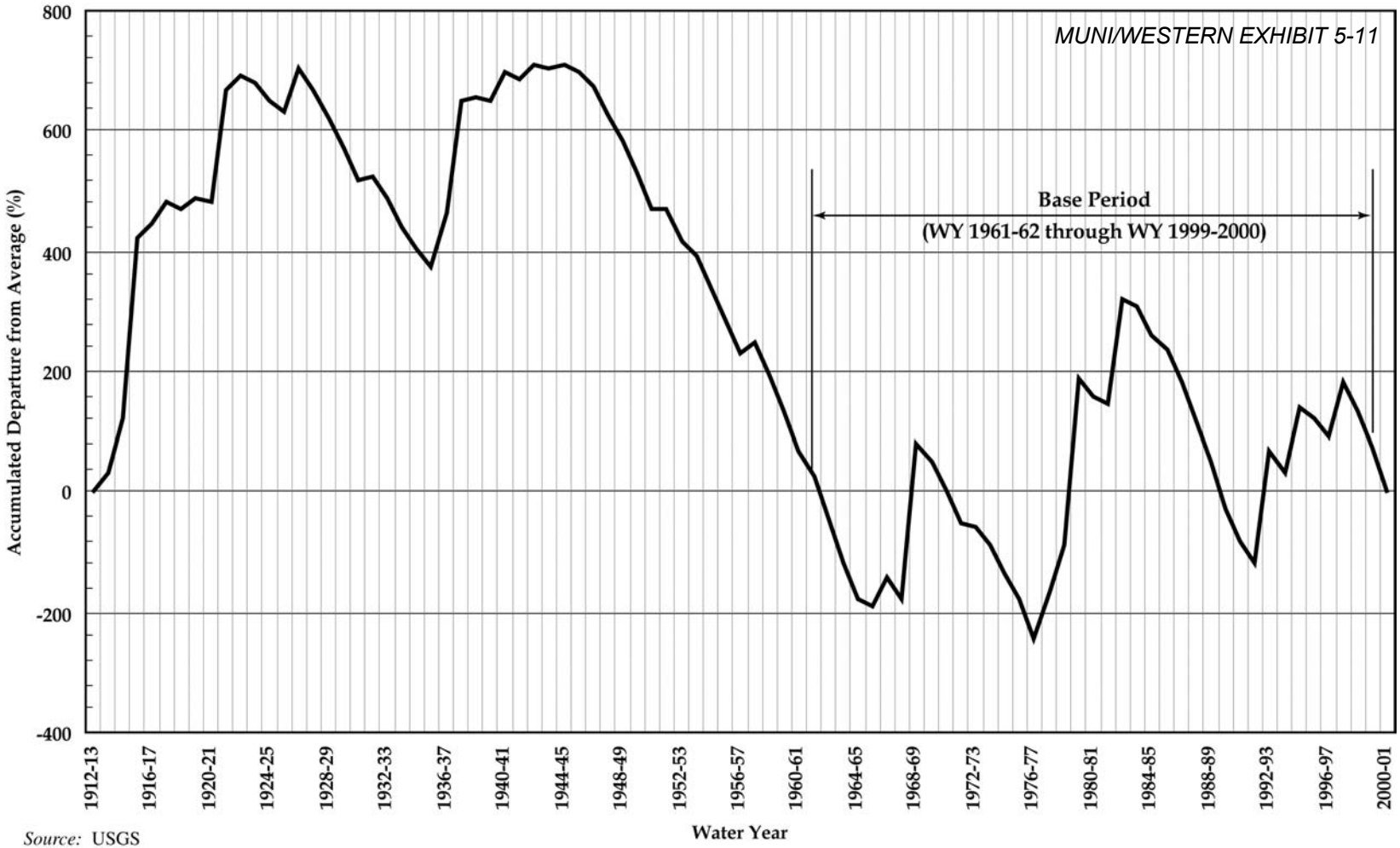
d. Contains similar hydrologic trends at beginning and end.

Santa Ana River – Surface Water Hydrology

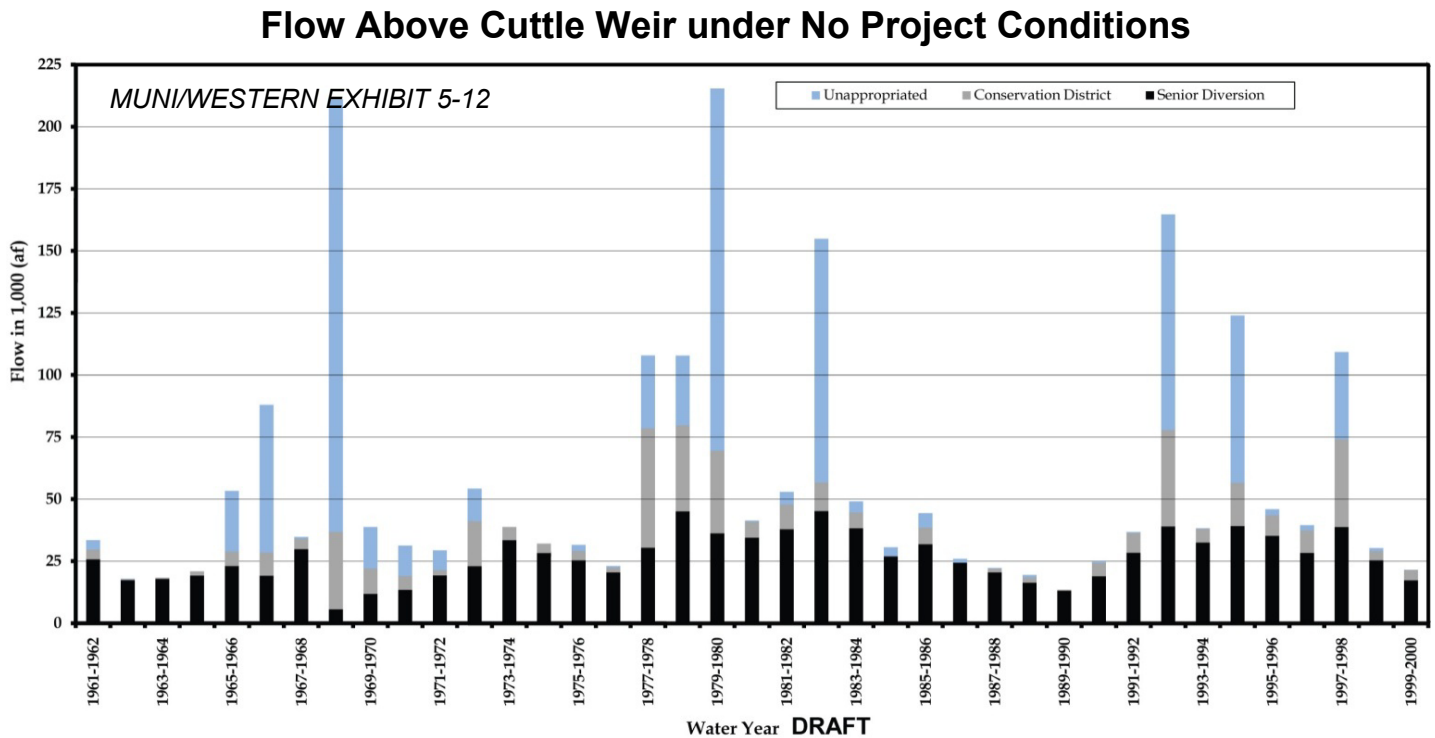


Santa Ana River – Surface Water Hydrology

Combined Flow at Mentone - Cumulative Departure from Mean



Current SAR No Project Hydrology



- The First priority diversion is for the Senior Water Right Claimants
- The Second priority diversion is for the Conservation District
- The Third priority is for habitat releases
- The remainder is unappropriated and subject to capture by Muni/Western with implementation of their Project

Current SAR No Project Hydrology

Seven Oaks Dam is not part of Muni/Western Project but has a major impact on the flow conditions of the SAR which are affected by the operational criteria developed for the Dam:

1. Subsurface flow at the site of the dam was stopped.
2. From June to November the Dam operates in a “Pass Through” mode (inflow = outflow)
3. Debris Pool filling and emptying
4. Conjunction with Prado during flood flows

The effects of Seven Oaks Dam on flood flows is illustrated in the following slide.

Current SAR No Project Hydrology

Location	Pre and Post-Seven Oaks Dam	Drainage Area Size (sq. mi.)	Flood Condition/Frequency of Peak Discharge (cfs)						
			200-Year	100-Year	50-Year	25-Year	10-Year	5-Year	2-Year
Outflow from Seven Oaks Dam	Pre	177	88,000	58,000	34,000	20,500	8,800	4,300	1,100
	Post		6,400	5,000	3,800	2,900	500	500	400
Downstream of Mill Creek	Pre	242	120,000	75,000	45,000	26,000	11,700	5,600	1,400
	Post		37,000	25,000	15,500	9,300	4,300	2,050	760
Downstream of City Creek	Pre	290	125,000	80,000	48,000	28,000	12,500	5,800	1,400
	Post		49,000	32,000	20,000	12,000	5,400	2,600	800
At "E" Street	Pre	500	165,000	105,000	60,000	33,000	13,500	6,000	1,400
	Post		100,000	67,000	39,000	22,000	9,000	4,000	920
At Riverside Narrows	Pre	824	265,000	175,000	102,000	57,000	23,000	9,500	1,600
	Post		205,000	130,000	80,000	45,000	18,000	7,600	1,400
Inflow to Prado Dam	Pre	2,255	360,000	230,000	132,000	72,000	28,000	11,500	2,800
	Post		300,000	195,000	110,000	60,000	23,000	9,500	2,300

Source: USACE 1988.

Table 3.1-5 of the Draft EIR. Santa Ana River Mainstem Discharge-Frequency Values under Pre- and Post-Seven Oaks Dam Conditions

MUNI/WESTERN EXHIBIT 5-13

Table 3.1-6 of the Draft EIR. Discharge, Depth and Velocity for Pre- and Post-Seven Oaks Dam Conditions, 50- and 100-Year Flood Events

	50-Year Flood		100-Year Flood	
	Pre – Seven Oaks Dam	Post – Seven Oaks Dam	Pre – Seven Oaks Dam	Post – Seven Oaks Dam
SAR Channel below Mill Creek Confluence				
Discharge	45,000 cfs	15,500 cfs	75,00 cfs	25,000 cfs
Velocity (up to)	12 ft/s	10 ft/s	13 ft/s	11 ft/s
Average flow depth (up to)	9 ft	8 ft	11 ft	9 ft
Overbank[a]				
Overbank Flood Area Acreage	1,379 acres	1,031 acres	1,653 acres	1,202 acres
Discharge	4,200 cfs	80 cfs	17,300 cfs	600 cfs
Velocity	2.5-4.5 ft/s	1.0-2.0 ft/s	3.5-7.0 ft/s	2.0-3.0 ft/s
Average flood depth	2.0-3.5 ft	0.5-1.0 ft	2.5-5.0 ft	1.0-2.5 ft

Source: USACE 2000.

a. Overbank flooding is generally limited to three areas between the SAR confluence with Mill Creek downstream to RM 59.17 where the river is in an alluvial floodplain. Downstream of RM 59.17, the river is channelized and overbank flooding is unlikely.

MUNI/WESTERN EXHIBIT 5-14

Current SAR No Project Hydrology

Presented below is a table showing the effects of tributary inflow downstream from Seven Oaks Dam.

Table 3.1-2 of the Draft EIR. Tributary Flow Contribution to the Santa Ana River (100-year flood event discharge in cfs)

Tributary	*Inflow*	*River Mile*
Mill Creek	19,500	68.67
City Creek & Plunge Creek (Combined)	5,000	62.87
Mission Zanja Creek	3,500	59.08
San Timoteo Creek	15,500	58.44
East Twin Creek	18,000	58.14
Lytle Creek & Warm Creek (Combined)	70,000	56.74
Source: USACE 2000.		

MUNI/WESTERN EXHIBIT 5-15

If we look back at (Muni/Western Exhibit 5-13), we will see the outflow from Seven Oaks Dam is 5,000 cfs, which is relatively small compared to the sum of the tributary inflows.

Diversions by Muni/Western will not affect the tributary inflow.

Current SAR No Project Hydrology

In addition to the tributary inflows discussed above, Wastewater Treatment Plants contribute to SAR flow downstream from Seven Oaks Dam.

Table 3.1-3 of the Draft EIR. Treated Wastewater Discharged Directly to the Santa Ana River above Riverside Narrows

Facility	*Current Discharge (afy)*	*Potential Future Discharge [a] (afy)*
RIX	49,407 [b]	44,900
Rialto	8,346 [b]	14,200
Total Discharges Directly to the SAR in the Project Area	57,753	59,000

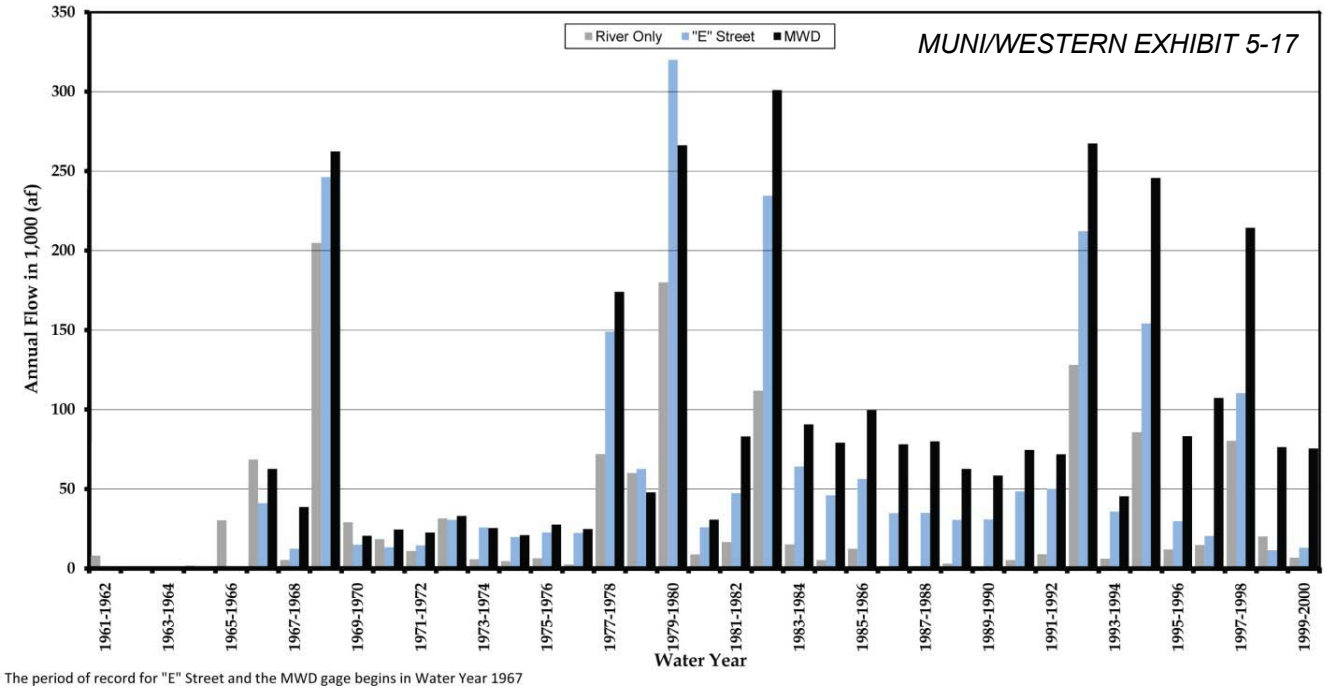
Notes:
a. Potential future discharge based on design flow of the WWTPs.
b. Based on 2000-01 water year data reported in the Thirty-Second Annual Report of the Santa Ana River Watermaster (Santa Ana River Watermaster 2003).

MUNI/WESTERN EXHIBIT 5-16

Current SAR No Project Hydrology

Under the No Project condition, annual flow in the SAR increases in a downstream direction.

This characteristic is demonstrated on Muni/Western Exhibit 5-17, which shows that except for one year during our Base Period, annual flow at the MWD Crossing Gage is greater than the River Only Gage located just downstream of the Seven Oaks Dam.



The period of record for "E" Street and the MWD gage begins in Water Year 1967

Current SAR No Project Hydrology

Seven Oaks Dam has substantially altered the natural hydrology of the Santa Ana River

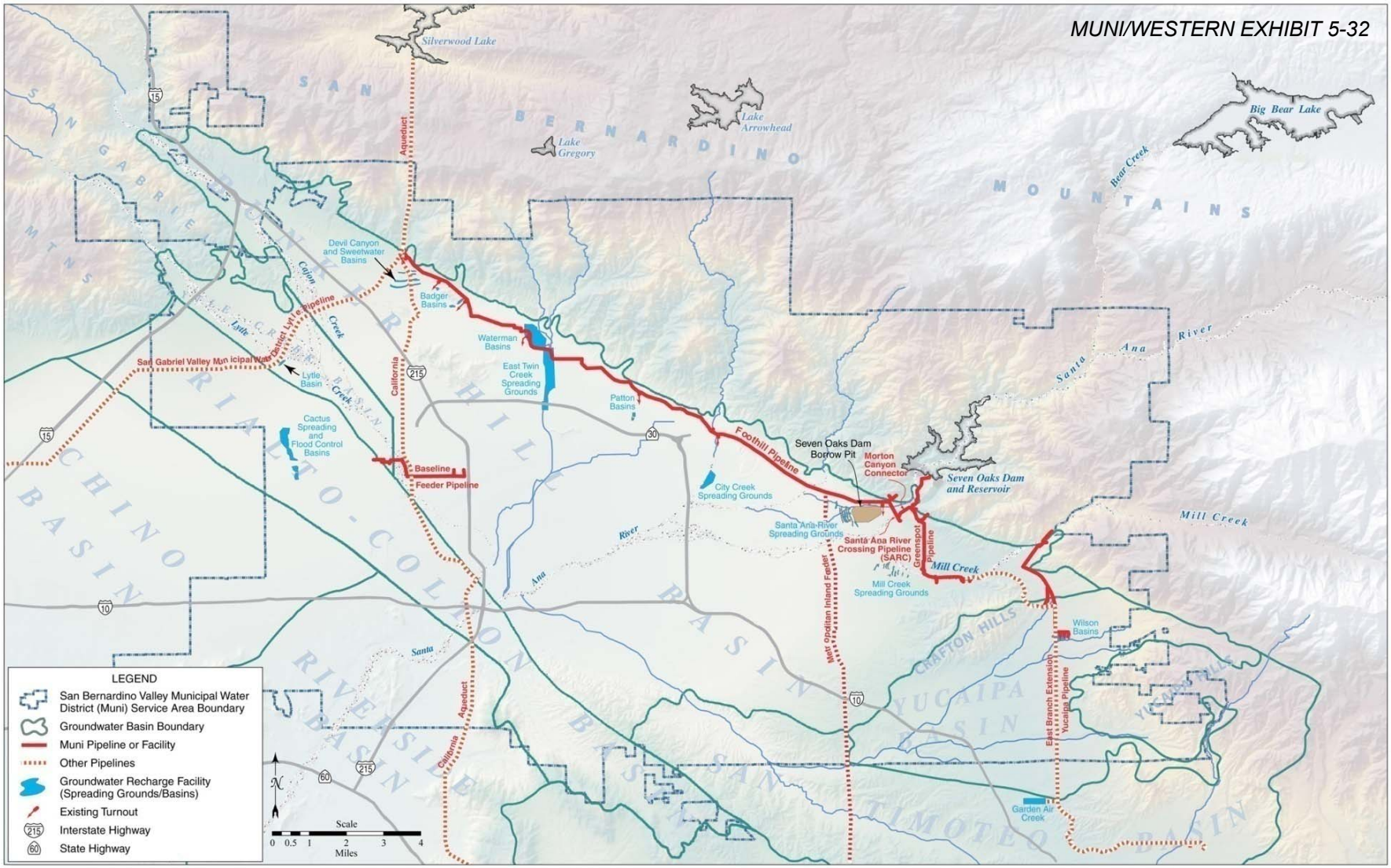
- Particularly after high stream flows
- Has affected discharge depth and velocity and extent of overbank areas
- Has affected daily discharge

Project Description and Facilities

Mr. Thomson described the various construction areas shown on Muni/Western Exhibit 5-30 and Muni/Western Exhibit 5-31 of my testimony so I will describe the conveyance and recharge facilities that will be utilized to implement the Muni/Western Project. The principal facilities are shown on Muni/Western Exhibit 5-32 and the key features are tabulated below, along with their capacities:

Conveyance Facility	*Capacity (cfs)*	*Comments*
Foothill Pipeline (Reverse Flow)	200	The capacity of the Foothill Pipeline (Reverse Flow) is 300 cfs from the Santa Ana River crossing Pipeline westward to the inter-tie with the Inland Feeder
Foothill Pipeline (Normal Flow)	288	
Santa Ana Low Turnout	288	
Greenspot Pipeline	70	
Inland Feeder (South)	1,000	
Inland Feeder (North)	300	Estimated completion date of 2010
Lytle Pipeline	55	
Santa Ana River Crossing Pipeline	70	
Morton Canyon Connector Pipeline	70	
Lytle Pipeline	120	Muni currently contracts for 55 cfs of capacity, but under certain conditions the entire 120 cfs conveyance capacity is available to Muni

Project Description and Facilities



Project Description and Facilities

The conveyance facilities just discussed will deliver unappropriated water captured by Muni/Western to several beneficial uses that I will be discussing later. New facilities in the vicinity of the Seven Oaks Dam, specifically the Plunge Pool Pipeline will be constructed in Phases.

1.Phase I – consists of a 15-foot diameter eastward extension of the existing Foothill Pipeline to a point in the Santa Ana River channel just west of the existing Cuttle Weir. The extension would initially convey up to 500 cfs.

2.Phase II – would be the construction and extension of the 15-foot diameter pipe constructed in Phase I westward to the intertie with the Foothill Pipeline and Inland Feeder Pipeline near Cone Camp Road.
The completion of Phase II would enable Muni/Western to convey up to 1,500 cfs from the Santa Ana River.

3.Phase III – would be to connect those portions of the pipeline developed in Phases I and II to the plunge pool of Seven Oaks Dam.

Project Description and Facilities

New Conveyance facilities to be constructed as part of the Project will deliver unappropriated water captured by Muni/Western to several beneficial uses that I will be discussing later. One of those beneficial uses is groundwater recharge and the proposed facilities are shown on Muni/Western Exhibit 5-33 along with factors affecting absorptive capacities.

Project Description and Facilities

Table 3.2-3 of the Draft EIR. Groundwater Recharge Facilities

Facility Name	Owner or Operator	Conveyance Used to Serve Facility: Turnout Name & Capacity (cfs)	Recharge Facility Characteristics [a]: Active Recharge Facility Area [b] (acres)	Percolation Rate [c] (ft/day)	Monthly Capacity (af)	Absorptive Capacity used in Allocation Analysis [d] (cfs)	Groundwater Basin (and sub-basin) Recharged [e]
Santa Ana River Spreading Grounds	Conservation District	Foothill Pipeline Santa Ana Low Flow (288)	60 [g]	1.5	3,060	50 [h]	SBBA (Bunker Hill)
Devil Canyon and Sweetwater Basins	SBCFCD [f]	Foothill Pipeline Sweetwater (37)	30	1.5	1,350	23	SBBA (Bunker Hill)
Lytle Basins	Lytle Creek Water Conservation Association	Fontana Power Plant Constructed drainage channel	Variable	1.5	Variable	30 [i]	SBBA (Lytle Creek)
City Creek Spreading Grounds	SBCFCD	Foothill Pipeline City Creek (60)	75	1.5	3,375	57	SBBA (Bunker Hill)
Patton Basin	SBCFCD	Foothill Pipeline Patton (12)	3	0.3	27	1	SBBA (Bunker Hill)
Waterman Basins	SBCFCD	Foothill Pipeline Waterman (135)	120	0.5	810	30 [j]	SBBA (Bunker Hill)
East Twin Creek Spreading Grounds	SBCFCD	Foothill Pipeline Waterman (135)	32	1.5	225	24 [k]	SBBA (Bunker Hill)
Badger Basins	SBCFCD	Foothill Pipeline Sweetwater (22)	15	0.5	225	4	SBBA (Bunker Hill)
Mill Creek Spreading Grounds	SBVWCD	Greenspot Pipeline Mill Creek Spreading (50)	26	1.5	1,170	20	SBBA (Bunker Hill)

Table 3.2-3 of the Draft EIR. Groundwater Recharge Facilities (continued)

Facility Name	Owner or Operator	Conveyance Used to Serve Facility: Turnout Name & Capacity (cfs)	Recharge Facility Characteristics [a]: Active Recharge Facility Area [b] (acres)	Percolation Rate [c] (ft/day)	Monthly Capacity (af)	Absorptive Capacity used in Allocation Analysis [d] (cfs)	Groundwater Basin (and sub-basin) Recharged [e]
Cactus Spreading and Flood Control Basins	SBCFCD	San Gabriel Valley Municipal Water District Lytle Pipeline Lower Lytle Creek (55)	46	1.5	2,070	35	Rialto-Colton
Wilson Basins	SBCFCD	East Branch Extension Wilson Basins (30)	12	1	360	6	Yucaipa Basin
Garden Air Creek	Muni	East Branch Extension Garden Air Creek (16)	n/a	n/a	n/a	16	San Timoteo Basin

Notes:

a. Values are from tabulation on map contained in Water Right Application by Muni and Western to appropriate water from the SAR or by engineering evaluation of spreading grounds.

b. Recharge facility area is the geographical extent of each basin that can be inundated for recharge.

c. Estimated percolation rate. This is the estimated rate at which water can percolate into the ground through the basin, expressed in feet per day. The values used have generally been computed from the annual recharge capacity tabulated on the application map. These rates are typically about one-half of the percolation rates presented by the United States Geological Survey (USGS 1972). The use of the smaller percolation rates is reasonable in that this Project would involve longer-term percolation rates that are typically smaller than short-term rates.

d. The estimated absorptive capacity for each site is computed by multiplying the basin area by the estimated percolation rate. Results are expressed in cubic feet per second (cfs) and used in the Allocation Model in acre-feet per month.

e. Note that there may be flow out of the sub-basin or basin identified. For example, a report by Geoscience Support Services, Inc. (1992) estimated that only 36 percent of the water recharged in the upper Lytle Creek area remains in the Lytle Creek sub-basin, while most of it flows to the Rialto–Colton Basin.

f. San Bernardino County Flood Control District.

g. Recharge facility area of 60 acres used, based on analysis of 1995 aerial photographs. However, the application map shows an area of 448 acres, which includes the borrow pit area for Seven Oaks Dam, possibly usable for recharge.

h Santa Ana River Spreading Grounds were assigned 50 cfs because of shared use of this facility.

i. Available absorptive capacity of Lytle Basins is assigned 30 cfs per month for use in the Allocation Model because of groundwater recharge targets; however, it has a higher estimated absorptive capacity of 97 cfs.

j. Available absorptive capacity for the Waterman Spreading Ground was assigned 30 cfs per month in the Allocation Model based on historical recharge rates. This would require use of 54 acres of the total site of 165 acres.

k. Available absorptive capacity for the East Twin Creek Spreading Grounds was assigned 24 cfs per month in the Allocation Model based on historical recharge rates. This would require use of 32 acres of the total site of 144 acres.

MUNI/WESTERN EXHIBIT 5-33

Project Scenarios

One of the fundamental concepts in the development of the Muni/Western Project is that unappropriated water would be captured only after higher priority uses were recognized. Four critical uses were identified and used to establish the amount of unappropriated water available for capture by Muni/Western. They are:

1. Diversions by the Senior Water Right Claimants
2. Diversions by the Conservation District
3. Releases from Seven Oaks Dam to accomplish habitat restoration necessitated by construction of the Dam
4. Releases from the Dam for flood control with and without seasonal storage.

These four parameters, discussed in paragraphs 88 through 91 in my testimony (Muni/Western Exhibit 5-1),were used to create 16 scenarios summarized in Muni/Western Exhibit 5-34

Project Scenarios

Using the four parameters, 16 scenarios were developed and four were selected to " bookend" the range of capture amounts. In addition to the four "bookend" scenarios, a No Project scenario was selected. I call your attention to Muni/Western Exhibit 5-34.

Table 3.0-2. Project Simulations and Project Scenarios

Parameter	*Parameter Value*																*MUNI/WESTERN EXHIBIT 5-34*
1. Senior Water Rights Claimants	User-Specified Diversion Rate of up to 88 cfs								Historical Diversions								
2. Conservation District	Historical Diversions				Licensed Right Diversions (up to 10,400 afy)				Historical Diversions				Licensed Right Diversions (up to 10,400 afy)				
3. Environmental Habitat Releases	1,000 cfs for 2 days		Other Habitat Treatment		1,000 cfs for 2 days		Other Habitat Treatment		1,000 cfs for 2 days		Other Habitat Treatment		1,000 cfs for 2 days		Other Habitat Treatment		
4. Seasonal Water Conservation Storage within Seven Oaks Reservoir	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
Simulation Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Project Scenario		C or D													A or B		

The "high" bookend is Simulation15 for 500 cfs and 1,500 cfs based on Phase.

The "low" bookend is Simulation 2 for two flow rates based on Phase.

The No Project is Simulation 10.

Computer Modeling

To evaluate the accomplishments and effects of the various scenarios computer models were developed by SAIC and GEOSCIENCE.

SAIC developed the computer models to address surface water issues

GEOSCIENCE developed the computer models to address groundwater issues.

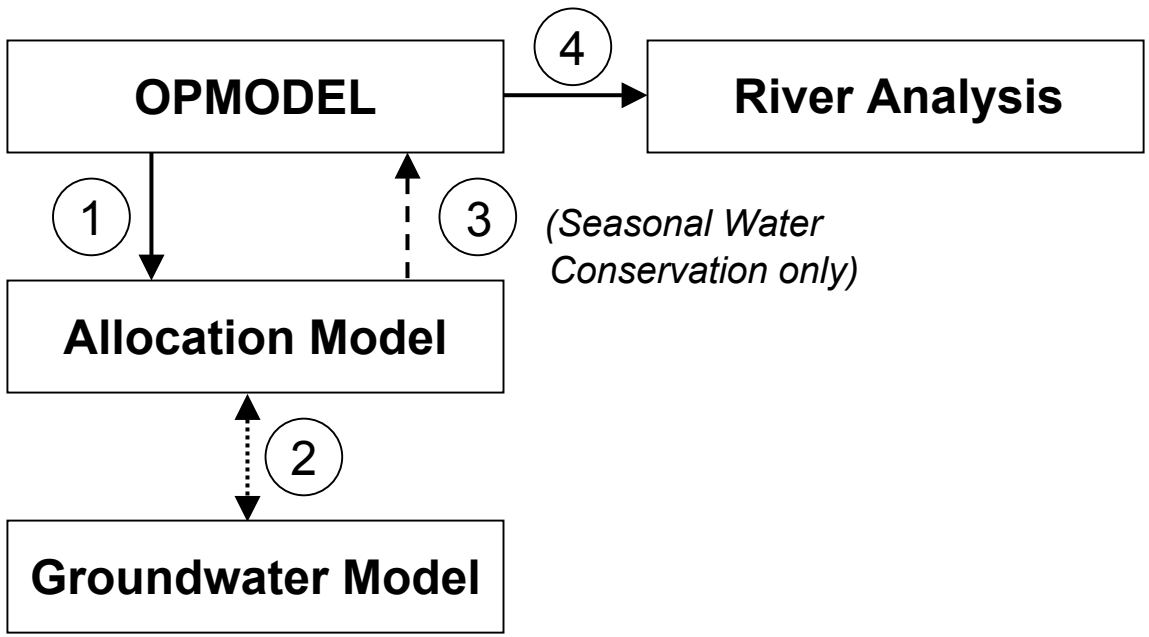
The computer models developed by both firms were used to:

1. Develop estimates of the capture potential of each scenario.
2. Evaluate the effects of that capture on environmental resources
3. Evaluate settlement alternatives proposed by other parties

Computer Modeling - Description

Modeling Structure

- OPMODEL
- Allocation Model
- Groundwater Model
- River Analysis



Computer Modeling – Priorities for Allocation

Distribution Priorities for Santa Ana River Water

Direct Delivery
- City Creek WTP
- Hinkley WTP
- Tate WTP
- West Valley Water District WTP
- Yucaipa WTP
- Other WTPs

Groundwater Recharge San Bernardino Basin Area
- Badger Basins
- City Creek Spreading Grounds
- Devil Canyon & Sweetwater Basins
- East Twin Creek Spreading Grounds
- Lytle Basins
- Mill Creek Basins
- Patton Basins
- Waterman Basins
- Other Spreading Grounds

Source: AirPhotoUSA, LLC, Copyright 2003

Groundwater Recharge Muni/Western Service Area
- Wilson Spreading Grounds
- Cactus Spreading and Flood Control Basins
- Other Spreading Grounds

Source: AirPhotoUSA, LLC, Copyright 2003

Water Exchange
- The Metropolitan Water District of Southern California
- San Gabriel Valley Municipal Water District
- San Gorgonio Pass Water Agency
- Other Agencies

Diverted Santa Ana River water will be distributed to beneficial uses according to a priority system.

Priority 1: Direct delivery within the Muni/Western service area
Priority 2: Groundwater recharge within the San Bernardino Basin Area
Priority 3: Groundwater recharge at other locations within the Muni/Western service area
Priority 4: Water exchanges with other regional water agencies

Computer Modeling – Priorities for Allocation

Characteristics of Facilities Utilized to Accomplish Beneficial Uses

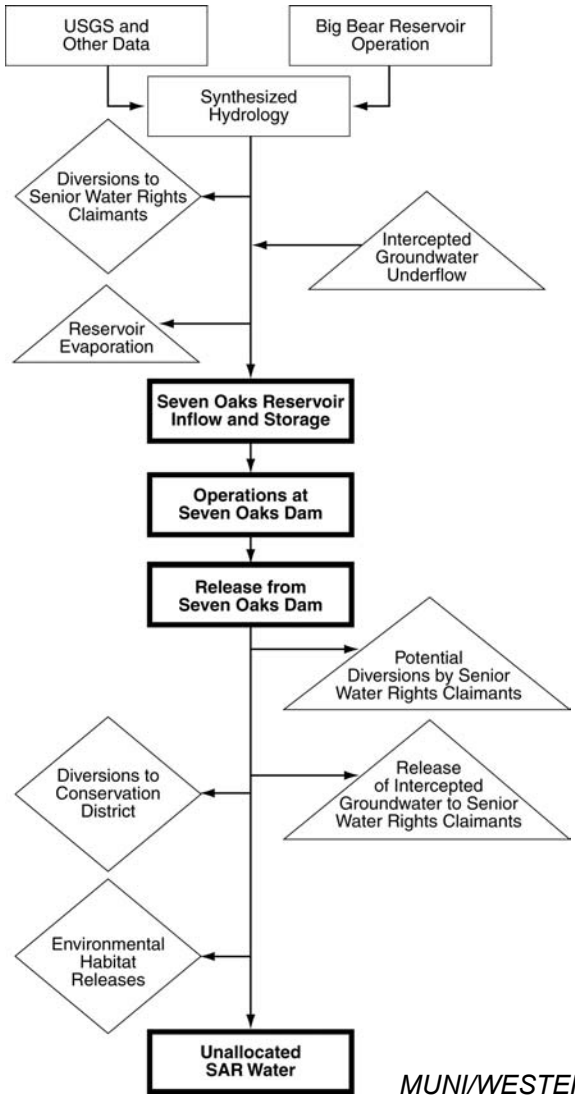
Table 5.3-1. Characteristics of Deliveries to Beneficial Uses

Delivery Point for Beneficial Use	*Available Absorptive Capacity Assigned in Allocation Model (cfs)*	*Conveyance Routes Used*	*Within SBBA*	*Potential Delivery Season*
Priority 1: Direct Uses				
Yucaipa WTP	54	Santa Ana Low and Greenspot Route	No	Year-round
Yucaipa Irrigation	5	Santa Ana Low and Greenspot Route	No	Year-round
West Valley WTP	13	Foothill Reverse Flow & Lytle Creek Routes	Yes	June through August
City Creek WTP	12	Foothill Reverse Flow Route	Yes	June through August
Hinckley WTP	40	Santa Ana Low and Greenspot Route	Yes	June through August
Tate WTP	31	Santa Ana Low and Greenspot Route	Yes	June through August
Priority 2: Groundwater Recharge in San Bernardino Basin Area				
Santa Ana River SG	50	Santa Ana Low Route	Yes	Year-round
Sweetwater SG	23	Foothill Reverse Flow Route	Yes	Year-round
Lytle Basins SG	30	Foothill Reverse Flow Route and Lytle Creek Route	Yes	Year-round
City Creek SG	57	Foothill Reverse Flow Route	Yes	March through August
Patton SG	1	Foothill Reverse Flow Route	Yes	March through August
Waterman SG	30	Foothill Reverse Flow Route	Yes	March through August
East Twin Creek SG	24	Foothill Reverse Flow Route	Yes	March through August
Badger SG	4	Foothill Reverse Flow Route	Yes	March through August
Mill Creek SG	20	Santa Ana Low and Greenspot Route	Yes	March through August
PRIORITY 3: OTHER GROUNDWATER RECHARGE IN MUNI SERVICE AREA				
Cactus SG	35	Foothill Reverse Flow & Lytle Creek Routes	No	Year-round
Wilson SG	6	Santa Ana Low and Greenspot Route	No	Year-round
Garden Air Creek	16	Santa Ana Low and Greenspot Route	No	Year-round
PRIORITY 4: EXCHANGE				
Metropolitan Exchange	1,000	Inland Feeder South Route	No	Year-round
SGVMWD Exchange	55	Foothill Reverse Flow & Lytle Creek Routes	No	Year-round
SGPWA Exchange	16	Santa Ana Low and Greenspot Route	No	Year-round
DWR	300	Inland Feeder North Route	No	Year-round

Available Absorptive Capacity – assigned in the Allocation Model; based on consideration of turnout capacity, historical use, shared facility use, and design capacities.
DWR – California Department of Water Resources
SG – Spreading Grounds
SGPWA – San Gorgonio Pass Water Agency
SGVMWD – San Gabriel Valley Municipal Water District
WTP – Water Treatment Plant

MUNI/WESTERN EXHIBIT 5-35

Computer Modeling - OPMODEL



MUNI/WESTERN EXHIBIT 5-37

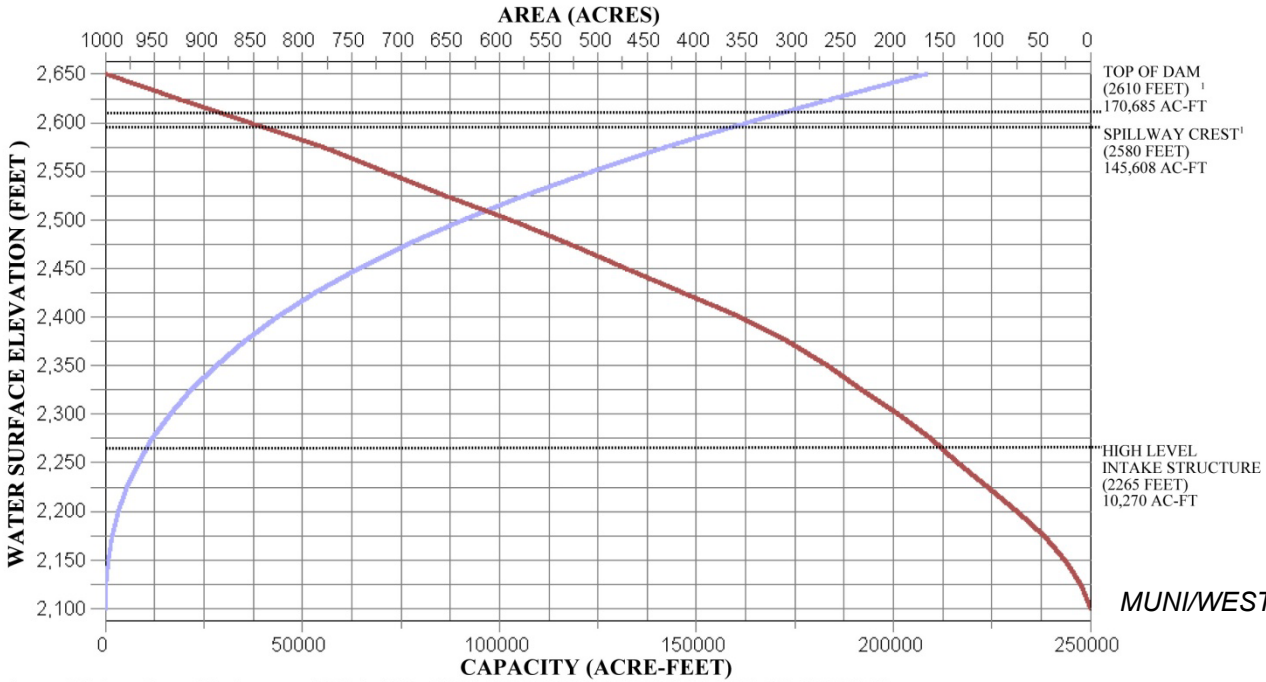
Computer Modeling - OPMODEL

Table 4.2-1. Water Uses in OPMODEL

Parameter	*Parameter Type*	*Value in Model*
Diversions by senior water rights claimants	Variable	Range between historical diversions and up to 88 cfs
Interception and Release of Groundwater Underflow at Seven Oaks Dam (credited to senior water rights claimants)	Constant	3 cfs
Reservoir Evaporation	Variable	Average reservoir surface area multiplied by an evaporation rate for a given month (see Table 4.2-2)
Seasonal Storage within Seven Oaks Reservoir	Variable	Dam operated for flood control *or* Dam operated for flood control and seasonal storage
Conservation District Diversion (assuming a maximum diversion rate of 300 cfs)	Variable	Historical *or* Licensed right
Environmental Habitat Releases	Variable	1,000 cfs for 2 days at 6-month minimum interval when water is available *or* Other Habitat Treatment
Muni/Western Diversion		
Maximum Annual Diversion	Constant	200,000 af
Diversion Capacity	Variable	500 cfs to 1,500 cfs
Monthly Demand for Short-Term Beneficial Use	Variable	Iterative, derived from output of Allocation Model for Seasonal Storage

MUNI/WESTERN EXHIBIT 5-38

Computer Modeling - OPMODEL



Source: US Army Corps of Engineers AREA AND CAPACITY FIGURES BASED ON 1989 SURVEY

MUNI/WESTERN EXHIBIT 5-39

Table 4.2-3. Seven Oaks Dam End-of-Month Target Storage (in af)

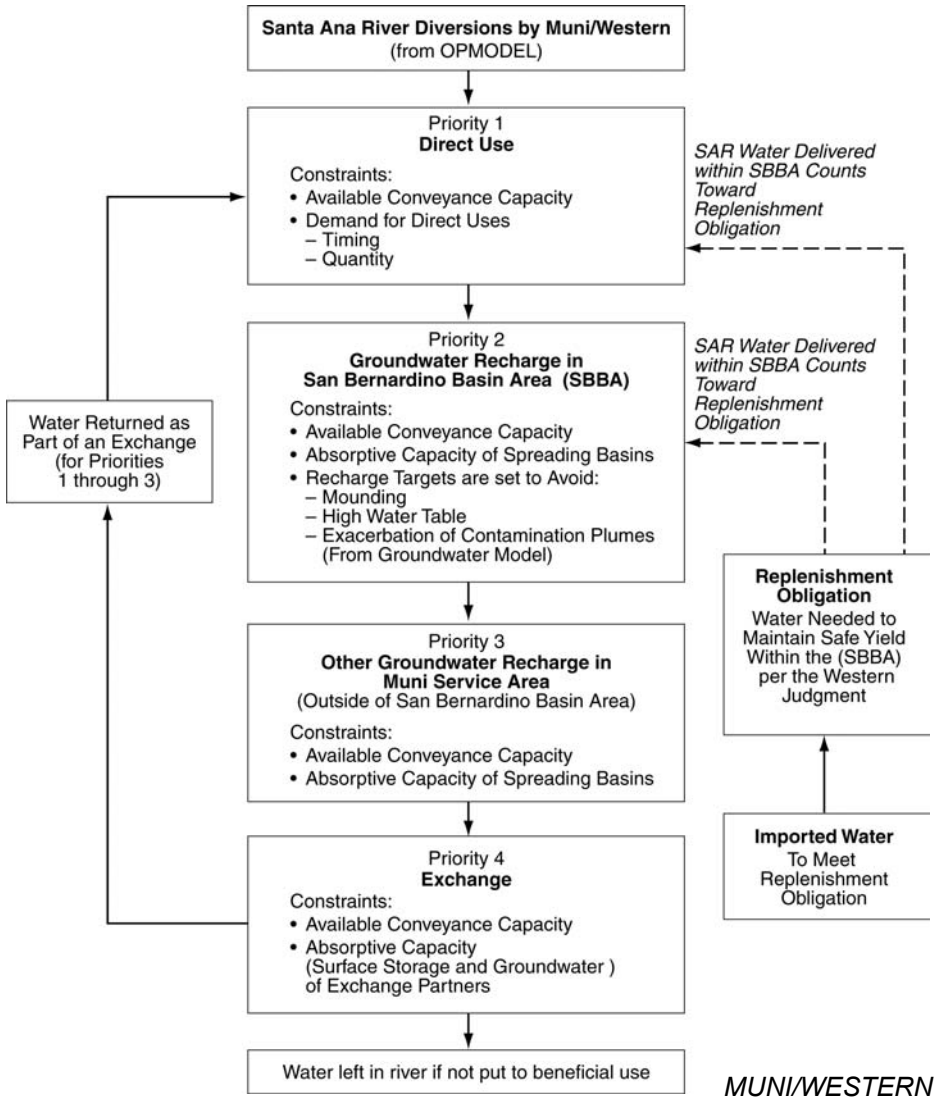
OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
WITHOUT SEASONAL STORAGE											
73	2,966	2,966	2,966	2,966	2,966	2,966	2,966	2,966	1,166	73	73
WITH SEASONAL STORAGE											
73	2,966	2,966	2,966	2,966	50,000	50,000	50,000	37,500	25,000	12,500	73

MUNI/WESTERN EXHIBIT 5-40

Computer Modeling – Allocation Model

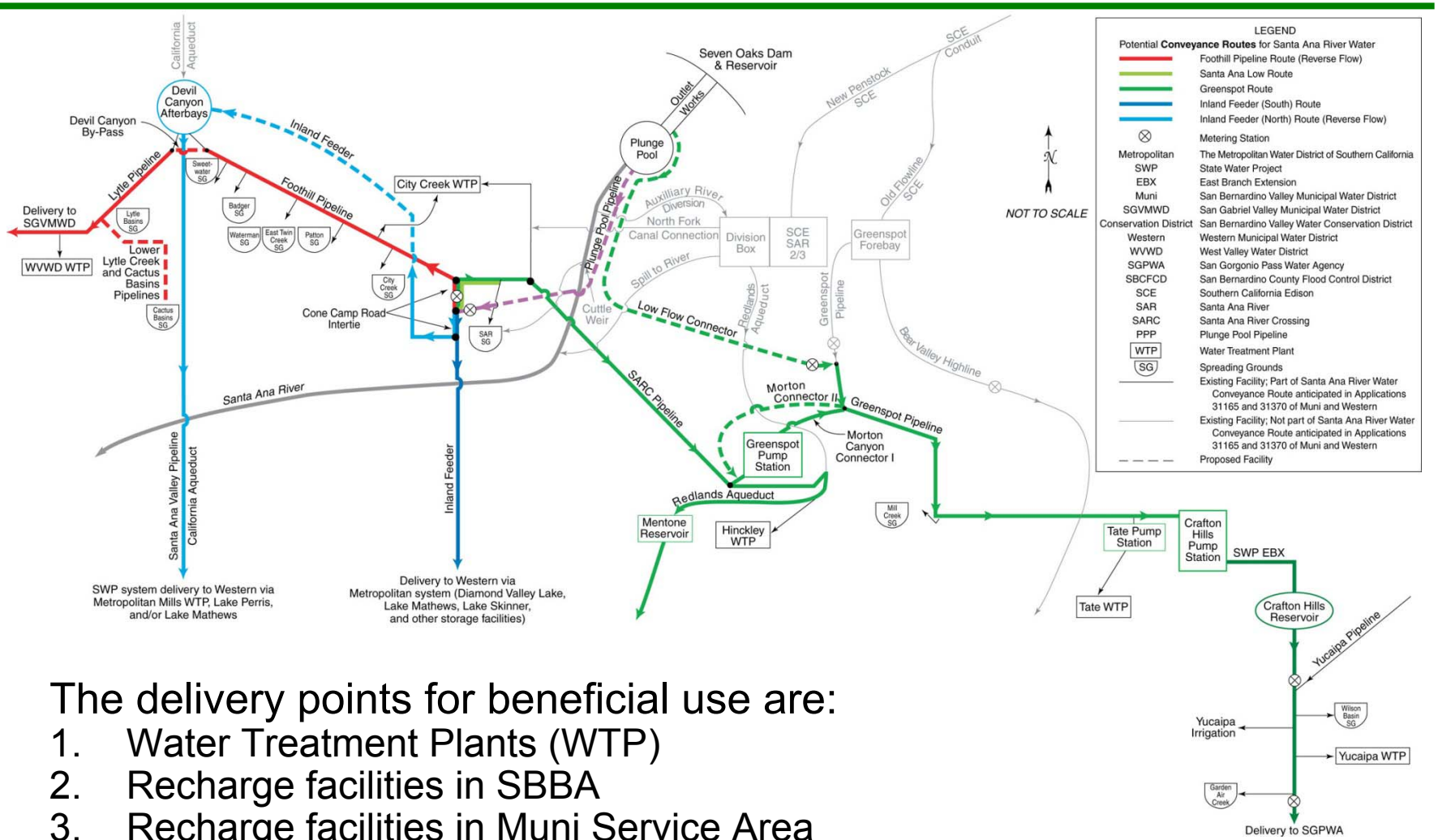
- Recognizes the four priorities and allocates accordingly
- Recognizes the need to meet Replenishment Obligations determined by the Western Watermaster
- SWP supplies used to meet Replenishment Obligations
- Recognizes physical limitations in delivery of Muni/Western capture water

Computer Modeling – Allocation Model



MUNI/WESTERN EXHIBIT 5-41

Computer Modeling – Allocation Model



The delivery points for beneficial use are:

1. Water Treatment Plants (WTP)
2. Recharge facilities in SBBA
3. Recharge facilities in Muni Service Area
4. Exchange (or Western)

MUNI/WESTERN EXHIBIT 5-42

Computer Modeling – Allocation Model

Existing and Future Water Demands in Muni Service Area

Table 5.3-2. Existing and Future Water Demands and Water Supplies for Purveyors in the Muni Service Area

Purveyors	Annual Water to meet Demand[1] in 2000 (af)	Sources to Meet Demands in 2000	Annual Water to meet Demand[1] in 2020 (af)	Sources to Meet Demands in 2020	Percent Change in Demands (2000 to 2020)
City of Riverside[3] including Gage Canal (Exporter)	57,703	Groundwater, Bunker Hill	57,703	Groundwater, Bunker Hill	0%
Fontana Union / W.C. (Exporter)	20,522	Groundwater, Bunker Hill Surface Water, Lytle Creek	20,522	Groundwater, Bunker Hill Surface Water, Lytle Creek	0%
Riverside-Highland W.C.(Exporter)	4,075	Groundwater, Bunker Hill Groundwater, Lytle Basin Groundwater, North Riverside	4,075	Groundwater, Bunker Hill Groundwater, Lytle Basin Groundwater, North Riverside	0%
City of San Bernardino	51,772	Groundwater, Bunker Hill	70,000	Groundwater, Bunker Hill	35%
City of Redlands	30,130	Groundwater, Bunker Hill Surface Water, Mill Creek Surface Water, Santa Ana River	65,100	Groundwater, Bunker Hill Surface Water, Mill Creek Surface Water, Santa Ana River	116%
West Valley W.D.	20,500	Groundwater, Bunker Hill Groundwater, Rialto Groundwater, North Riverside Groundwater, Lytle Basin Surface Water, Lytle Creek Imported Water, SWP	31,100	Groundwater, Bunker Hill Groundwater, Rialto Groundwater, North Riverside Groundwater, Lytle Basin Surface Water, Lytle Creek Imported Water, SWP	52%
East Valley W.D.	22,019	Groundwater, Bunker Hill Surface Water, Santa Ana River Import Water, SWP	24,375	Groundwater, Bunker Hill Surface Water, Santa Ana River Import Water, SWP	11%
City of Rialto	16,300	Groundwater, Bunker Hill Groundwater, Lytle Basin Groundwater, Rialto Surface Water, Lytle Creek	19,200	Groundwater, Bunker Hill Groundwater, Lytle Basin Groundwater, Rialto Surface Water, Lytle Creek	18%
City of Colton	14,350	Groundwater, Bunker Hill Groundwater, Rialto	18,260	Groundwater, Bunker Hill Groundwater, Rialto	27%
Yucaipa Valley W.D. including Western Heights W.C.	13,850	Imported Water, SWP Groundwater, Yucaipa	27,880	Imported Water, SWP Groundwater, Yucaipa	101%
City of Loma Linda	5,040	Groundwater, Bunker Hill	6,370	Groundwater, Bunker Hill	26%
Former Norton Air Force Base	2,755	Groundwater, Bunker Hill	2,755	Groundwater, Bunker Hill	0%
Muscoy Mutual W.C.	2,368	Groundwater, Bunker Hill	2,370	Groundwater, Bunker Hill	0%

Table 5.3-2. Existing and Future Water Demands and Water Supplies for Purveyors in Muni Service Area (continued)

Purveyors	Annual Water to meet Demand[1] in 2000 (af)	Sources to meet Demands in 2000	Annual Water to meet Demand[1] in 2020 (af)	Sources to meet Demands in 2020	Percent Change in Demands (2000 to 2020)
Marygold Mutual W.C.	1,780	Groundwater, Bunker Hill Groundwater, Lytle Basin	2,400	Groundwater, Bunker Hill Groundwater, Lytle Basin	35%
Terrace W. C.	944	Groundwater, Bunker Hill	944	Groundwater, Bunker Hill	0%
Regents of the Univ. of CA	536	Groundwater, Bunker Hill	536	Groundwater, Bunker Hill	0%
Municipal Subtotal	*264,644*		*353,590*		34%
Other/Agricultural/Private[3]	*44,784*		*23,378*		-48%
Total Demand (Rounded to nearest 1,000 af)	**309,000**		**377,000**		22%

Notes:
1 Deliveries to meet annual and ultimate Water Demands from Table 7-1 of the Regional Water Facilities Master Plan, prepared by Albert A Webb Associates, 2000 for Muni and presented in Appendix A and B of SAWPA's Integrated Watershed Management Plan, June 2002. Some values were updated based on purveyor's YR2000 Urban Water Management Plans.
2 Assigned demand as part of Muni service area since it is extracted from Bunker Hill Basin.
3 Agriculture demands come from Bear Valley Mutual W. C., Crafton W. C., Marigold Farms Company, Meeks and Daley W. C., Riverside-Highland W. C., and Other/Private
SWP – State Water Project
W.C. – Water Company
W.D. – Water District
n.a. – Not Applicable

MUNI/WESTERN EXHIBIT 5-43

Allocation Model interacts with Groundwater Model

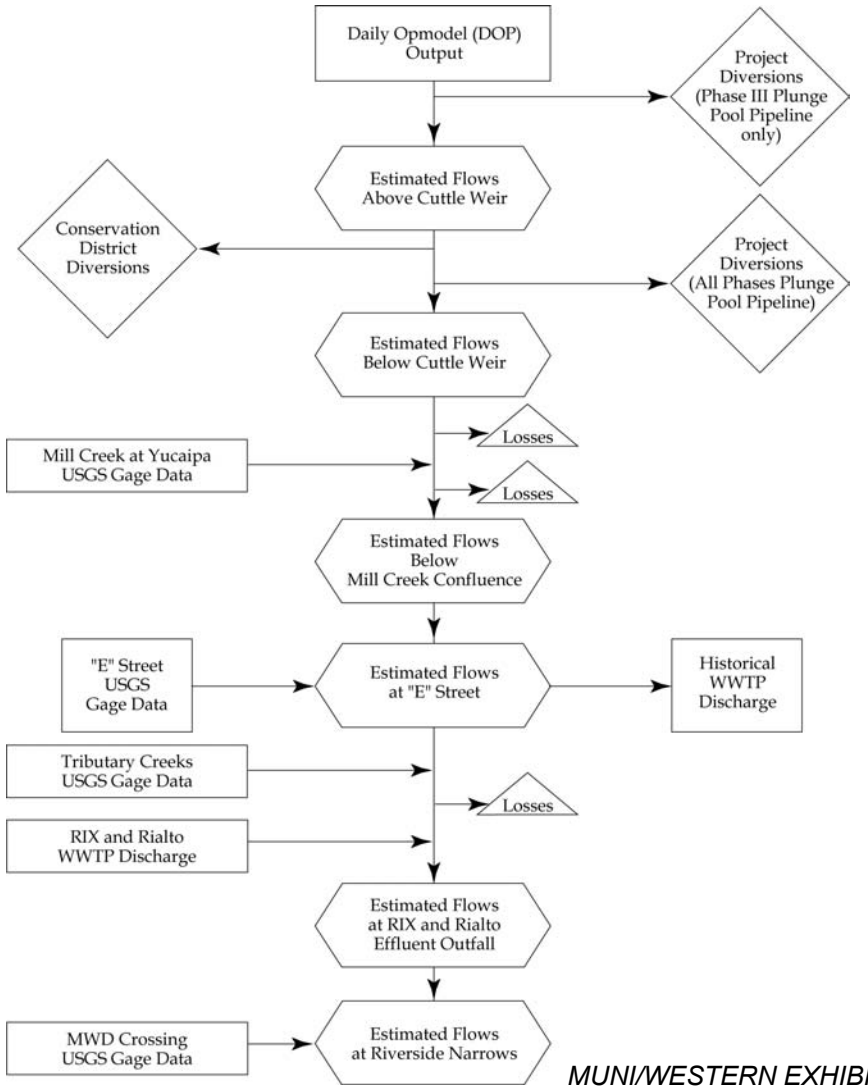
Computer Modeling – River Analysis Model

The River Analysis Model was developed to evaluate the effects on flow depths and velocities for non-storm days as defined by the Watermaster.

1.Daily Operations Model (DOP) – OPMODEL was modified to reflect daily flowrates, habitat releases, reservoir evaporation, etc., which was used as the input to DRAM.

2.Daily River Analysis Model (DRAM) – Based on utilizing a computer program called HEC-RAS and USACE data, modified with EIP cross-sectional areas. Output from DOP was combined with tributary inflow, WWTP discharges and channel losses to evaluate effects of Project on the SAR Segments.

Computer Modeling – River Analysis Model



MUNI/WESTERN EXHIBIT 5-44

Computer Modeling – River Analysis Model

The Project effects, using a diversion rate of 1,500 cfs are shown below on Muni/Western Exhibit 5-45

Table 6.1-3. Effects of Muni/Western Diversion of up to 1,500 cfs in Sub-Area 2

	Peak Flow Below Cuttle Weir (cfs)	*Peak Flow near Mill Creek Confluence (cfs)*	*Sub-Area 2 Main Channel Velocity [a] (ft/s)*	*Sub-Area 2 Main Channel Depth [b] (ft)*	*Upper Reach Overbank Velocity [c, g] (ft/s)*	*Upper Reach Overbank Hydraulic Flood Depth [d] (ft)*	*Middle Reach Overbank Velocity [c, g] (ft/s)*	*Middle Reach Overbank Hydraulic Flood Depth [d, g] (ft)*	*Sub-Area 2 Area of Inundation Santa Ana River only [e] (acres)*
5-YEAR FLOOD									
No Project	500	2,000	3.6	5.2	0.0	0.0	1.6	0.8	361
Project [f]	0	1,500	3.1	4.8	0.0	0.0	1.3	0.5	296
Effect of Project [h, i, j]	-500	-500	-0.5	-0.4	0.0	0.0	-0.3	-0.3	-65
Percent Change	-100.0%	-25.0%							-18.1%
10-YEAR FLOOD									
No Project	500	4,200	4.1	6.3	0.0	0.0	2.3	1.1	496
Project [f]	0	3,700	3.6	6.1	0.0	0.0	2.3	1.0	461
Effect of Project [h, i, j]	-500	-500	-0.5	-0.2	0.0	0.0	0	-0.1	-35
Percent Change	-100.0%	-11.9%							-6.9%
20-YEAR FLOOD									
No Project	2,500	8,000	4.8	7.7	0.0	0.0	2.7	2.0	623
Project [f]	1,000	6,500	4.5	7.1	0.0	0.0	2.5	1.6	579
Effect of Project [h, i, j]	-1,500	-1,500	-0.3	-0.6	0.0	0.0	-0.2	-0.4	-44
Percent Change	-60.0%	-18.8%							-7.1%
50-YEAR FLOOD									
No Project	3,800	15,500	5.8	9.0	0.0	0.0	1.0	0.4	764
Project [f]	2,300	14,000	5.5	8.8	0.0	0.0	0.5	0.2	735
Effect of Project [h, i, j]	-1,500	-1,500	-0.3	-0.2	0.0	0.0	-0.5	-0.2	-29
Percent Change	-39.5%	-9.7%							-3.8%
100-YEAR FLOOD									
No Project	5,000	25,000	6.5	10.3	0.0	0.0	1.3	0.5	862
Project [f]	3,500	23,500	6.3	10.1	0.0	0.0	1.3	0.5	841
Effect of Project [h, i, j]	-1,500	-1,500	-0.2	-0.2	0.0	0.0	0.0	0.0	-21
Percent Change	-30.0%	-6.0%							-2.4%

Notes:

[a] Main channel velocity is median value of cross section average velocities.
[b] Main channel depth is median value of the maximum depths of the cross section.
[c] Overbank velocity is average velocity of the cross section velocities.
[d] Overbank hydraulic flood depth is the median value of the hydraulic flood depths for each cross section. The hydraulic flood depth is the cross section area of the flow divided by the top width of the flow.
[e] Inundation Area is only approximate and includes only the Santa Ana River. Mill Creek, City Creek and Plunge Creek inundation areas would be unaffected.
[f] Project is diversion of up to 1,500 cfs by Muni/Western.
[g] Average for main overbank area (right side as one looks downstream) in the vicinity of the Wooly Star Preserve.
[h] Small positive effects of Project due to calculation methods (including tolerance levels) and do not reflect significant differences.
[i] Effects of Project may not appear to be the difference between baseline and Project because of displayed rounding.
[j] Under 5- and 10-year floods, water available for Muni/Western diversion is estimated to be no more than 500 cfs.

MUNI/WESTERN EXHIBIT 5-45

Computer Modeling – River Analysis Model

The Project effects, on Non-storm days for SAR Segments B through G are presented in my testimony and shown in Muni/Western Exhibit 5-46 thorough Muni/Western Exhibit 5-51

Muni/Western Exhibit 5-44 through Muni/Western Exhibit 5-69 are presented in my written testimony and demonstrate the effects of Muni/Western diversions

Capture by Muni/Western

The extensive computer modeling tools have two basic purposes:

1. To provide the basis for estimating the amount of unappropriated water that could be captured by the Project.

2. To provide the basis for estimating the effects on the environment if Muni/Western is granted the permit by the SWRCB and implements their Project.

Muni/Western Exhibit 5-70 and Muni/Western Exhibit 5-71 have been prepared to illustrate the potential capture amounts for the 16 scenarios

Capture by Muni/Western

Scenario B and D are highlighted on Muni/Western Exhibit 5-70 for a Muni/Western diversion rate of 500 cfs

Scenario 10 represents the No Project condition

Table 3.0-4. Estimates of Unappropriated SAR Water Available for Capture by Muni/Western for Base Period WY 1961-62 through WY 1999-2000
Project Diversion Capacity of 500 cfs
(Values in Acre-Feet)

		Project Scenario D													Project Scenario B	
Scenario	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
Senior Claimant Diversions	User-Specified Rate of up to 88 cfs								Historical Diversions							
Conservation District Diversion	Historical Diversions				Licensed Right (up to 10,400 afy)				Historical Diversions				Licensed Right (up to 10,400 afy)			
Environmental Habitat Release	1,000 cfs / 2 days		Other Habitat Treatment		1,000 cfs / 2 days		Other Habitat Treatment		1,000 cfs / 2 days		Other Habitat Treatment		1,000 cfs / 2 days		Other Habitat Treatment	
Seasonal Storage	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Cumulative Total	(39-Year Base Period)															
Senior Claimant Diversions	1,416,606	1,416,607	1,416,607	1,416,608	1,416,605	1,416,608	1,416,610	1,416,610	1,038,137	1,038,139	1,038,139	1,038,138	1,038,128	1,038,132	1,038,131	1,038,134
Reservoir Evaporation	3,218	3,196	3,234	3,196	3,328	3,196	3,380	3,196	5,734	5,608	5,783	5,608	6,029	5,608	6,081	5,608
Conservation District Diversion	398,466	398,466	398,466	398,466	107,060	107,060	107,060	107,060	404,980	404,980	404,980	404,980	193,483	193,483	193,483	193,483
Environmental Habitat Release	27,769	27,769	-	-	35,703	35,703	-	-	35,703	35,703	-	-	39,670	35,703	-	-
Total Muni/Western Potential Capture	407,312	400,599	431,097	420,165	680,406	663,260	712,085	688,520	748,045	727,788	768,762	740,623	954,556	916,718	981,931	936,212
Undiverted from SAR*	38,503	45,237	42,470	53,439	48,772	66,047	52,739	76,488	59,275	79,656	74,210	102,525	60,008	102,230	72,248	118,437
Total	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874
Average Annual																
Senior Claimant Diversions	36,323	36,323	36,323	36,323	36,323	36,323	36,323	36,323	26,619	26,619	26,619	26,619	26,619	26,619	26,619	26,619
Reservoir Evaporation	83	82	83	82	85	82	87	82	147	144	148	144	155	144	156	144
Conservation District Diversion	10,217	10,217	10,217	10,217	2,745	2,745	2,745	2,745	10,384	10,384	10,384	10,384	4,961	4,961	4,961	4,961
Environmental Habitat Release	712	712	-	-	915	915	-	-	915	915	-	-	1,017	915	-	-
Total Muni/Western Potential Capture	10,444	10,272	11,054	10,773	17,446	17,007	18,259	17,654	19,181	18,661	19,712	18,990	24,476	23,506	25,178	24,005
Undiverted from SAR*	987	1,160	1,089	1,370	1,251	1,694	1,352	1,961	1,520	2,042	1,903	2,629	1,539	2,621	1,853	3,037
Maximum Annual																
Senior Claimant Diversions	58,528	58,528	58,528	58,528	58,528	58,528	58,528	58,528	45,245	45,245	45,245	45,245	45,245	45,245	45,245	45,245
Reservoir Evaporation	278	273	278	273	343	273	343	273	410	368	410	368	551	368	573	368
Conservation District Diversion	56,953	56,953	56,953	56,953	10,400	10,400	10,400	10,400	48,152	48,152	48,152	48,152	10,400	10,400	10,400	10,400
Environmental Habitat Release	3,967	3,967	-	-	3,967	3,967	-	-	3,967	3,967	-	-	7,934	3,967	-	-
Total Muni/Western Potential Capture	104,294	104,294	108,261	108,261	128,351	126,721	132,318	130,688	145,880	144,520	145,880	144,520	166,402	158,831	173,580	162,064
Undiverted from SAR*	22,101	28,505	26,068	32,472	30,024	41,347	33,991	45,314	34,538	41,841	40,703	47,971	34,745	56,408	38,382	61,109

* Estimate (on a monthly basis) of the quantity of water remaining in the channel below Cuttle Weir after all diversions have occurred.

Model input variables that are common to all scenarios include the following (variables described in OPMODEL documentation):
a) Values shown in table for Total Potential Capture and Undiverted from SAR are estimated using OPMODEL and Allocation Model
b) Synthesized hydrology based on re-operated Bear Valley Dam
c) Release of continual 3 cfs from dam to account for groundwater interruption by the dam foundation
d) USGS gage differences and rounding accounted for in senior water claimant diversions
e) Conservation District diversion capacity = 300 cfs
f) Release frequency for environmental releases is no more than every 6 months for 8 scenarios with environmental releases
g) Maximum number of environmental releases = 100% of potential releases for 6 of the scenarios with environmental releases
h) Maximum annual diversion by Muni/Western = 200,000 afy
i) Percent of available dam release un-divertable through Plunge Pool Pipeline = 0%
j) Flood/Conservation target storages from USACE Feasibility Report and Interim Water Control Plan
k) Evaporation rates from USACE Feasibility Report

MUNI/WESTERN EXHIBIT 5-70

Capture by Muni/Western

Scenario A and C are highlighted on Muni/Western Exhibit 5-71 for a Muni/Western diversion rate of 1,500 cfs

Scenario 10 represents the No Project condition

Table 3.0-3. Estimates of Unappropriated SAR Water Available for Capture by Muni/Western for Base Period WY 1961-62 through WY 1999-2000
Project Diversion Capacity of 1,500 cfs
(Values in Acre-Feet)

		Project Scenario C													Project Scenario A	
Scenario	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
Senior Claimant Diversions	User-Specified Rate of up to 88 cfs								Historical Diversions							
Conservation District Diversion	Historical Diversions				Licensed Right (up to 10,400 afy)				Historical Diversions				Licensed Right (up to 10,400 afy)			
Environmental Habitat Release	1,000 cfs / 2 days		Other Habitat Treatment		1,000 cfs / 2 days		Other Habitat Treatment		1,000 cfs / 2 days		Other Habitat Treatment		1,000 cfs / 2 days		Other Habitat Treatment	
Seasonal Storage	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Cumulative Total																
Senior Claimant Diversions	1,416,607	1,416,607	1,416,607	1,416,607	1,416,607	1,416,607	1,416,607	1,416,607	1,038,135	1,038,135	1,038,135	1,038,135	1,038,135	1,038,135	1,038,135	1,038,135
Reservoir Evaporation	3,196	3,196	3,196	3,196	3,196	3,196	3,196	3,196	5,608	5,608	5,608	5,608	5,608	5,608	5,608	5,608
Conservation District Diversion	398,466	398,466	398,466	398,466	107,060	107,060	107,060	107,060	404,980	404,980	404,980	404,980	193,483	193,483	193,483	193,483
Environmental Habitat Release	27,769	27,769	-	-	35,703	35,703	-	-	35,703	35,703	-	-	35,703	35,703	-	-
Total Muni/Western Potential Capture	445,836	445,836	473,605	473,605	729,308	729,308	765,011	765,011	807,448	807,448	843,151	843,151	1,018,945	1,018,945	1,054,648	1,054,648
Undiverted from SAR*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874	2,291,874
Average Annual																
Senior Claimant Diversions	36,323	36,323	36,323	36,323	36,323	36,323	36,323	36,323	26,619	26,619	26,619	26,619	26,619	26,619	26,619	26,619
Reservoir Evaporation	82	82	82	82	82	82	82	82	144	144	144	144	144	144	144	144
Conservation District Diversion	10,217	10,217	10,217	10,217	2,745	2,745	2,745	2,745	10,384	10,384	10,384	10,384	4,961	4,961	4,961	4,961
Environmental Habitat Release	712	712	-	-	915	915	-	-	915	915	-	-	915	915	-	-
Total Muni/Western Potential Capture	11,432	11,432	12,144	12,144	18,700	18,700	19,616	19,616	20,704	20,704	21,619	21,619	26,127	26,127	27,042	27,042
Undiverted from SAR*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maximum Annual																
Senior Claimant Diversions	58,528	58,528	58,528	58,528	58,528	58,528	58,528	58,528	45,245	45,245	45,245	45,245	45,245	45,245	45,245	45,245
Reservoir Evaporation	273	273	273	273	273	273	273	273	368	368	368	368	368	368	368	368
Conservation District Diversion	56,953	56,953	56,953	56,953	10,400	10,400	10,400	10,400	48,152	48,152	48,152	48,152	10,400	10,400	10,400	10,400
Environmental Habitat Release	3,967	3,967	-	-	3,967	3,967	-	-	3,967	3,967	-	-	3,967	3,967	-	-
Total Muni/Western Potential Capture	121,026	121,026	124,933	124,993	147,468	147,468	151,435	151,435	171,389	171,389	175,356	175,356	194,350	194,350	198,317	198,317
Undiverted from SAR*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

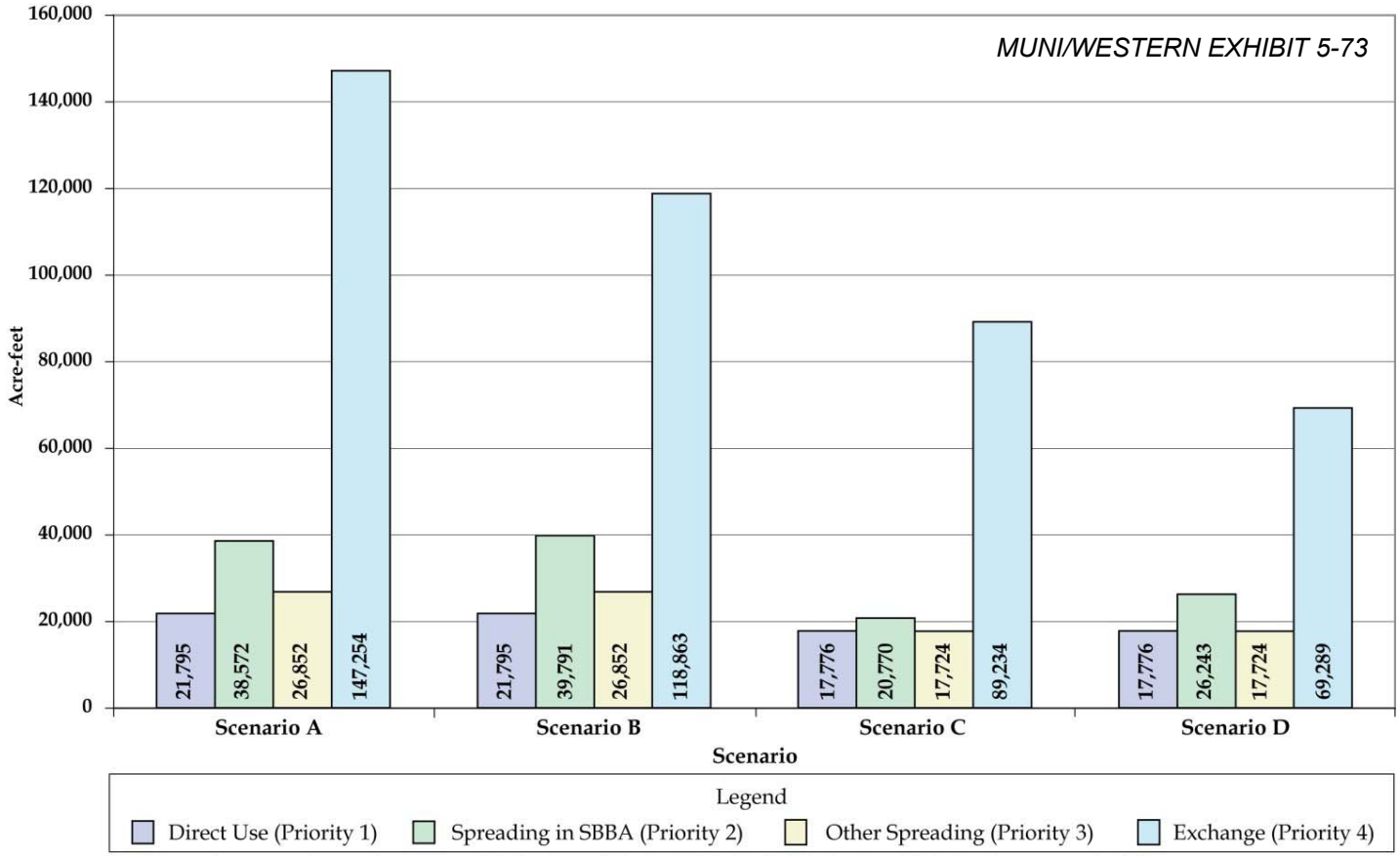
* Estimate (on a monthly basis) of the quantity of water remaining in the channel below Cuttle Weir after all diversions have occurred.

Model input variables that are common to all scenarios include the following (variables described in OPMODEL documentation):
a) Values shown in table for Total Potential Capture and Undiverted from SAR are estimated using OPMODEL and Allocation Model
b) Synthesized hydrology based on re-operated Bear Valley Dam
c) Release of continual 3 cfs from dam to account for groundwater interruption by the dam foundation
d) USGS gage differences and rounding accounted for in senior water claimant diversions
e) Conservation District diversion capacity = 300 cfs
f) Release frequency for environmental releases is no more than every 6 months for 8 scenarios with environmental releases
g) Maximum number of environmental releases = 100% of potential releases for 6 of the scenarios with environmental releases
h) Maximum annual diversion by Muni/Western = 200,000 afy
i) Percent of available dam release un-divertable through Plunge Pool Pipeline = 0%
j) Flood/Conservation target storages from USACE Feasibility Report and Interim Water Control Plan
k) Evaporation rates from USACE Feasibility Report

MUNI/WESTERN EXHIBIT 5-71

Capture by Muni/Western - Beneficial Uses

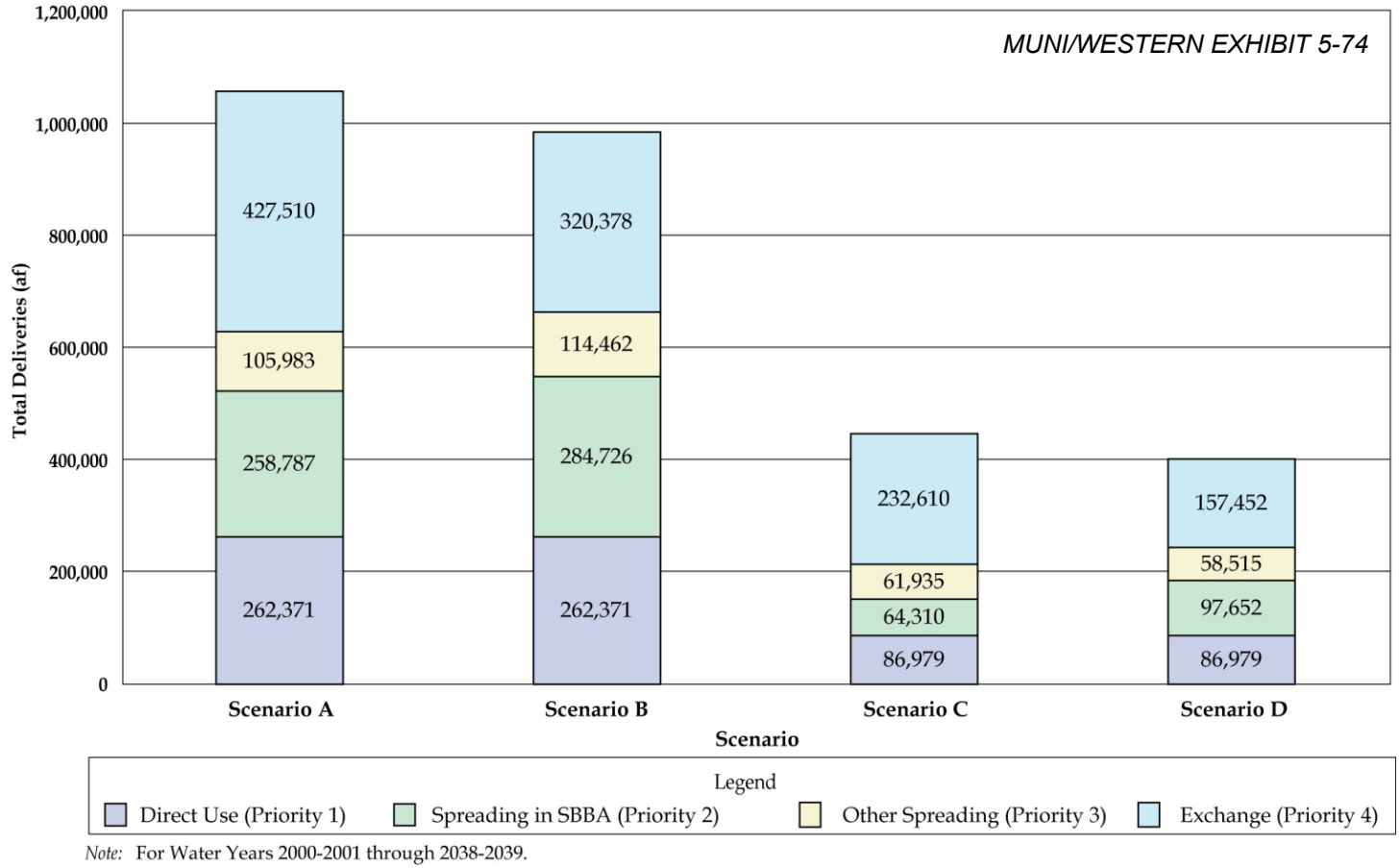
Presented on Muni/Western Exhibit 5-73 is a bar graph showing the distribution of the Muni/Western maximum annual capture for Scenarios A, B, C and D to the beneficial use priorities.



Note: For a given scenario, maximum annual deliveries to Priority 1, Priority 2, Priority 3, and Priority 4 may occur in different years.

Capture by Muni/Western - Beneficial Uses

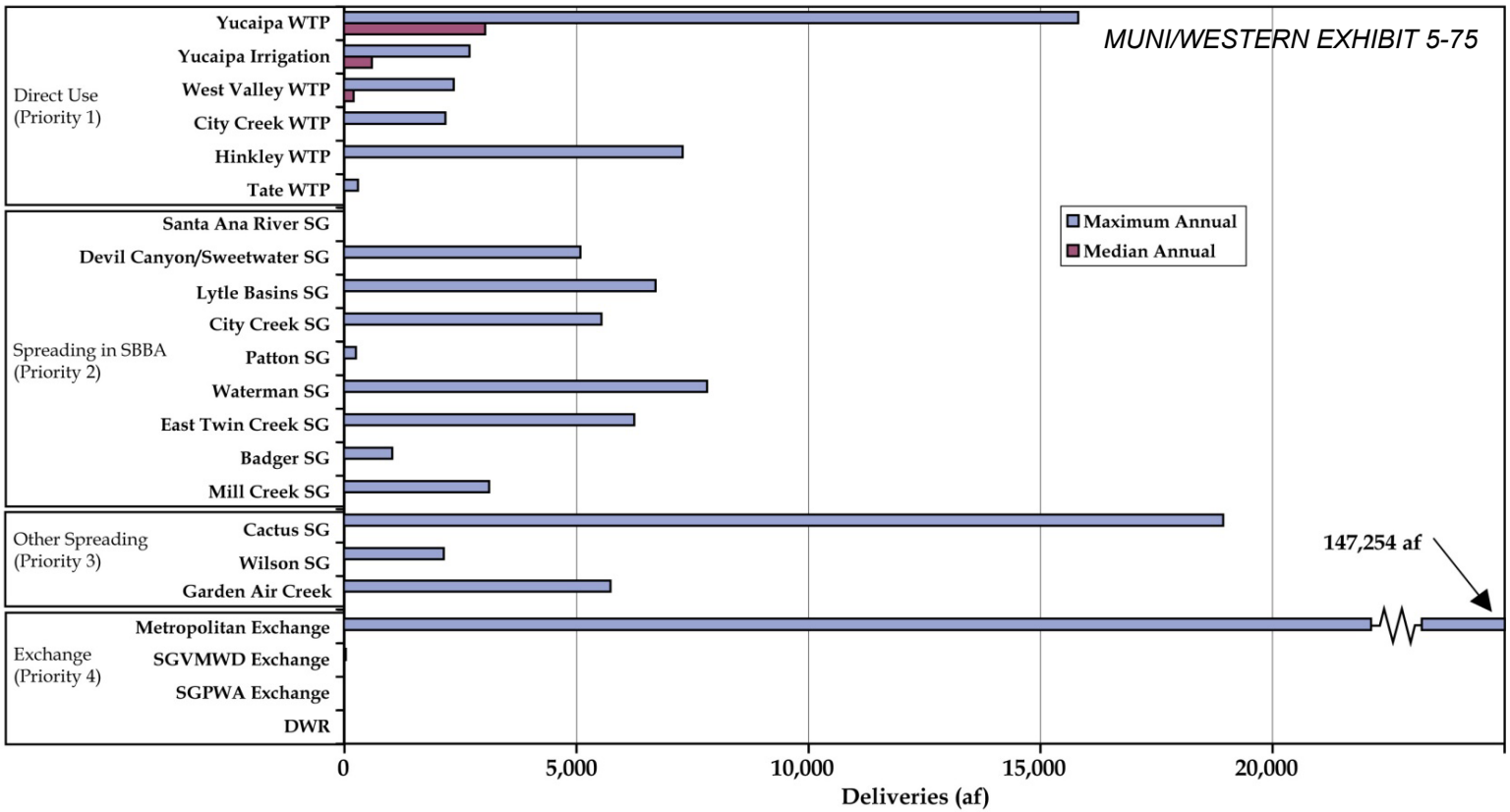
Presented on Muni/Western Exhibit 5-74 is a bar graph showing the distribution of the Muni/Western cumulative capture for Scenarios A, B, C and D to the beneficial use priorities.



Note: For Water Years 2000-2001 through 2038-2039.

Capture by Muni/Western - Beneficial Uses

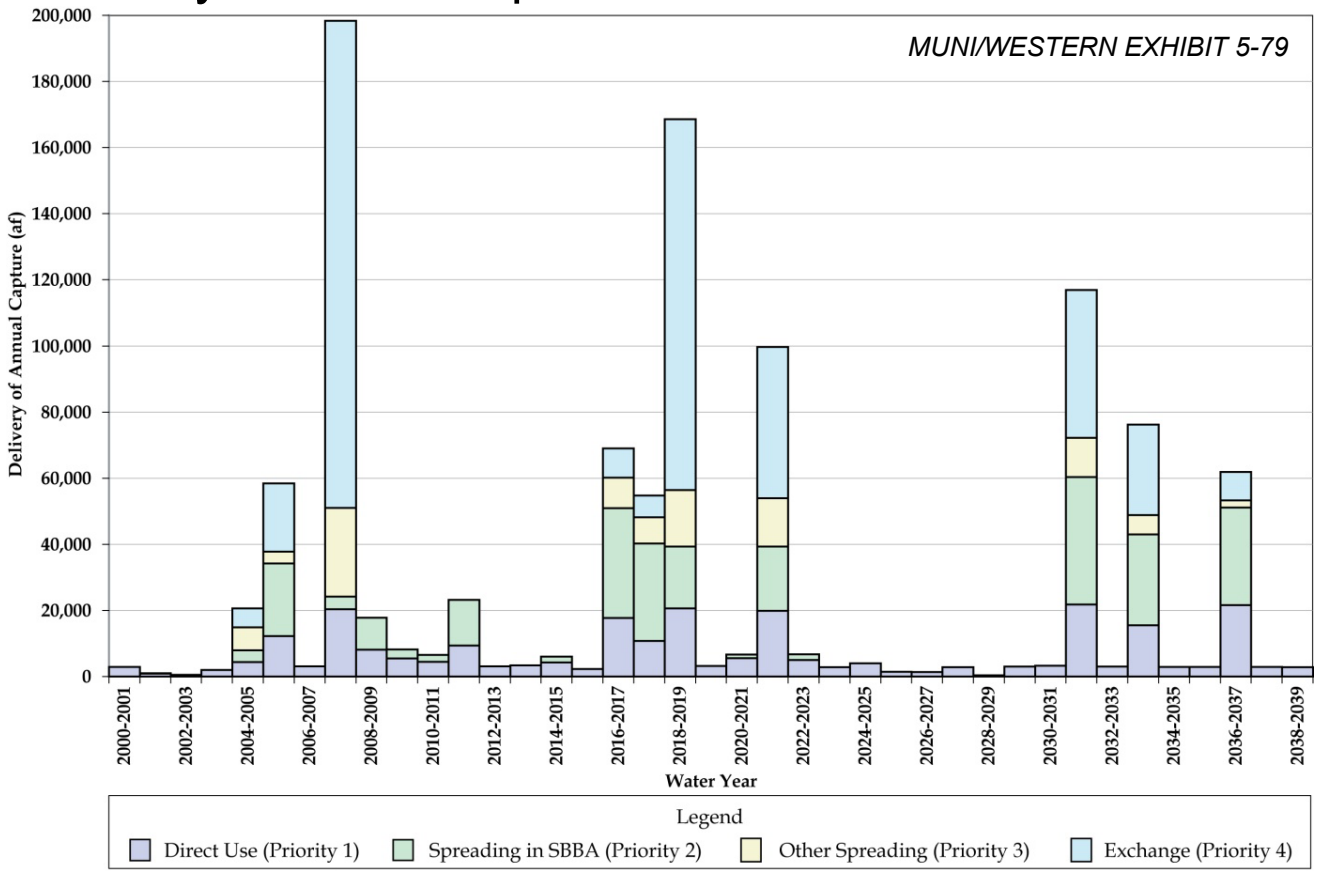
Presented on Muni/Western Exhibit 5-75 is a horizontal bar graph showing the amount of the Muni/Western cumulative capture for Scenario A, showing amounts delivered to the various facilities.



Note: WTP: Water Treatment Plant, SG: Spreading Grounds, SGVMWD: San Gabrial Valley Municipal Water District, SGPWA: San Gorgonio Pass Water Agency, DWR: Department of Water Resources

Capture by Muni/Western - Beneficial Uses

Presented on Muni/Western Exhibit 5-79 is a stacked bar graph showing the annual amount of the Muni/Western capture for Scenario A, broken down by the various priorities.



Note: For Water Years 2000-2001 through 2038-2039. Includes only initial delivery of appropriated SAR for exchange. Return from exchange not shown.

Conclusions

1. Approval of the two Muni/Western applications and granting them a permit will provide a “new” water supply for Southern California, will have three significant impacts on the water resources of California:
   a. It will allow regional water providers use of their local water supply
   b. It will make it easier for the SWP to meet its contractual obligations
   c. It will reduce demands on the already overcommitted Colorado River

Conclusions

2. Approval of the two Muni/Western applications will allow them to capture and beneficially use an average of from 10,000 to 27,000 acre-feet annually of unappropriated SAR water without affecting the rights of other water users. A summary of the capture amounts, distributed by the beneficial use is shown in Muni/Western Exhibit 5-83.

Summary of Project Diversions for Benefical Uses - Scenario A
(WY 1961-62 through WY 1999-00)

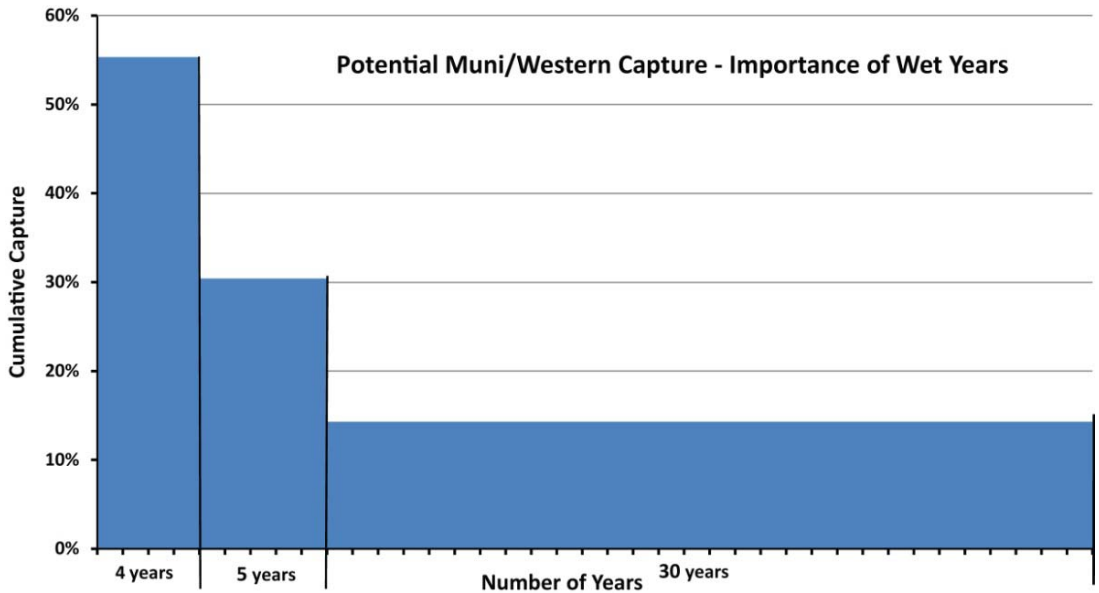
Item	Water Year	Potential Project Diversion (AF)	Direct Use - Priority 1 (AF)	SBBA Spreading - Priority 2 (AF)	Spreading in SBVMWD Service Area - Priority 3 (AF)	Exchange - Priority 4 (AF)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average	NA	27,042	6,727	6,636	2,718	10,962
Cumulative	NA	1,054,648	262,368	258,787	105,983	427,510
Five Wettest Years	1968-69	198,317	20,311	3,900	26,852	147,254
	1979-80	168,567	20,657	18,719	17,073	112,118
	1992-93	116,961	21,793	38,572	11,875	44,721
	1982-83	99,678	19,931	19,419	14,639	45,689
	1994-95	76,211	15,477	27,530	5,859	27,345

NA - Not Applicable

MUNI/WESTERN EXHIBIT 5-83

Conclusions

3. The extensive analyses of the SAR System shows that with a repetition of the historical hydrology, up to 198,000 acre-feet can be captured and beneficially used, confirming almost exactly the amount determined by SAIC in the late 1990s. In order to accomplish this maximum capture it is essential that Muni/Western be granted a diversion right of up to 200,000 acre-feet. This is illustrated in Muni/Western Exhibit 5-84 which shows that 55 percent of the cumulative Muni/Western capture occurs in only four years.



MUNI/WESTERN EXHIBIT 5-84

Conclusions

4. In simple terms, the intent of the Project is to capture unappropriated SAR water that would otherwise flow to the ocean in wet years when this capture would have negligible effects on other users.

   Presented in my final exhibit Muni/Western Exhibit 5-84 is a graphic summarizing the amount of flow in the SAR System for Water Year 1992-93, the third wettest year during our Base Period.