EXECUTIVE SUMMARY

The Chino Basin Watermaster (Watermaster) and the Stakeholders of the Chino Optimum Basin Management Program (OBMP) have authorized Black & Veatch and Wildermuth Environmental, Inc., to develop an implementation plan to increase groundwater recharge within the Chino Basin (Basin).

This Recharge Master Plan Phase II Report (Phase II Report) builds upon a series of local collaborative efforts, documented in part in the Chino Basin Recharge Master Plan Phase I Final Report [Ref. 1] and the OBMP Phase I Report [Ref. 2]. Both Phase I Reports state the need for a comprehensive recharge program and identify existing recharge basins and potential new recharge sites.

This Phase II Report takes the next step by recommending improvements to facilities and potential new sites identified in the Phase I Reports. Additional opportunities are also identified, including innovative concepts for storm water retention.

The Santa Ana Watershed is the fastest growing watershed in the United States (current population of 4.5 million is projected to increase by 2 million over the next 25 years). In the Chino Basin alone, the current population of 1.2 million is estimated to reach 1.6 million or more by 2020. As people, industry, and business move to the area, the demand for water will steadily rise. Figure ES-1 shows the Chino Basin and the major groundwater recharge facilities within the Basin. Figure ES-2 shows population and housing projections for the next 20 years. Figure ES-2 also shows the projected water demand over the same time period. (Estimates are from the June 29, 2000 Chino Basin Peace Agreement Exhibit B, Implementation Plan.) Conservation and efficient use of the Basin's water supply is paramount to meet these growing future demands.

Need for Recharge Capacity

The San Bernardino County Flood Control District (SBCFCD), Riverside County Flood Control and Water Conservation District (RCFCWCD), and the US Army Corps of Engineers (USACE) have constructed flood control projects that efficiently capture and convey storm water to the Santa Ana River.

Figure ES-3 is a double mass curve plot of precipitation at the San Bernardino Hospital versus storm water discharge at below Prado Dam. Note that the slope of the double mass curve after October 1977 is much steeper than prior to October 1977. The change in curvature means that

significant changes occurred in the precipitation – runoff relationship. These changes were caused by an increase in imperviousness in the watershed due to urbanization and associated improvements in drainage systems. Figure ES-4 is a double mass curve plot of precipitation at the San Bernardino Hospital versus storm water discharge from the watershed between Riverside Narrows and Prado dam and includes the Chino Basin, Temescal, and part of the City of Riverside. The relationship of storm water discharge and precipitation in Figure ES-4 is similar to that shown on Figure ES-3 with Chino Basin representing about 75 percent of the storm water produced between Riverside Narrows and Prado Dam. The volume of storm water not captured for recharge in the Basin during the period October 1977 and September 1999 averaged about 41,000 acre-feet per year (acre-ft/yr) and ranges from a low of 2,000 acre-ft/yr to a high of about 174,000 acre-ft/yr. The volume of storm water produced in the Basin will increase substantially in the future as the remaining undeveloped and agricultural land uses are converted to developed uses.

Increasing the yield of the Basin by increasing the capture of new storm water discharge will improve ambient groundwater quality, improve surface water quality in the Santa Ana River and its tributaries, and increase the assimilative capacity of the Basin. Increasing the capture of new storm water will reduce the cost of mitigation requirements for recharge of recycled water. The volume of new storm water recharge will have a dramatic impact on the future cost of recycled water recharge. New storm water recharge will be used to offset part of the replenishment obligation of the desalters that are being constructed as part of the OBMP.

Pursuant to the Phase I Reports and the Peace Agreement, Watermaster will assure there is enough physical recharge capacity to meet its replenishment obligation under the Judgment. The estimated annual replenishment obligation for the Basin for ultimate conditions is about 75,000 acre-ft/yr. The ultimate physical recharge requirement is equal to the ultimate replenishment obligation (about 75,000 acre-ft/yr) minus the under production (about 31,000 acre-ft/yr) and is equal to about 44,000 acre-ft/yr. The OBMP assumes that imported water will be available from Metropolitan Water District of Southern California (Metropolitan) seven out of ten years. Therefore, Watermaster will need an annual physical recharge capacity of about 63,000 acre-ft/yr (63,000-44,000/0.7).

Methodology

The main tasks of this investigation were: to estimate the potential increase in groundwater recharge using the most recent information, to describe the improvements in facilities and

operations necessary to maximize recharge, and to identify the institutional arrangements that may be necessary to implement the recharge master plan. The analysis targeted several existing and proposed stormwater retention, debris, and conservation basins that were identified in the Phase I Reports. Black & Veatch performed a system inventory including site reconnaissance and data review for the basins. Wildermuth Environmental, Inc., provided updated storm water and recharge modeling simulations to identify the range of potential future recharge capacity. In addition to existing and proposed basins, the analysis assessed the potential for new areas for groundwater recharge, including developing new recharge basins, on-site recharge, and groundwater injection. Figure ES-5 presents the locations of new potential recharge areas.

The physical ability to recharge water from three potential water sources was assessed: storm water, recycled water, and imported water. The assessment of average annual storm water recharge capacity estimates that the ultimate (Year 2020) capacity ranges between 18,790 and 23,700 acre-ft/yr.

The potential recycled water recharge capacity that could be developed through the implementation plan presented in this Phase II Report ranges from 18,790 to 23,700 acre-ft/yr. It has been assumed that the long-term average recharge of recycled water will be the same as storm water and will not exceed 20 percent of the total recharge in any recharge basin. This assumption is conservative and is based on the current California Department of Health Services (DHS) guidelines for recycled water recharge projects. As described in Chapter 2, the Inland Empire Utility Agency (IEUA) is conducting a Recycled Water System Feasibility Study. The recycled water projects described in this Phase II Report will be incorporated into the IEUA program and will move forward on a slightly different schedule than the storm water and imported water recharge facilities improvement projects.

The potential imported water recharge capacity that could be developed through the implementation plan presented in this Phase II Report ranges from 81,800 to 122,100 acre-ft/yr. The source of imported water used for recharge in the Basin was assumed to be the State Water Project (SWP). The combined potential recycled and imported water recharge capacity ranges from 100,590 to 145,800 acre-ft/yr. Based on current and future pumping, the replenishment obligation is estimated to be about 63,000 acre-ft/yr. Thus, excess recharge capacity could be available. If this capacity is fully developed, it will provide greater flexibility in managing recharge in general (e.g., maintaining hydrologic balance), and could be used for conjunctive use.

Assessment of Recharge Facilities

Based on the site reconnaissance results and the analysis of available water sources, Black & Veatch developed preliminary improvements needed to increase the recharge capabilities of the existing recharge basins. Figure ES-1 shows the existing recharge basins as well as other major water facilities in the area. The current status of these basins ranges from fully operational conservation facilities to inoperable or out-of-service facilities. These basins include: Brooks Basin, Montclair Basins, Seventh and Eighth Street Basins, Upland Basin, Ely Basins, Etiwanda Spreading Basins, Hickory Basin, Lower Day Basin, San Sevaine Basins, Turner Basins, Victoria Basin, Banana Basin, Declez Basin, Etiwanda Conservation Ponds, Jurupa Basin, and Wineville Basin. New basins include the College Height Basins and RP-3 Basin. Improvements to increase storm water recharge consist mainly of earthwork to improve percolation and increase basin storage capacity, new basin inlets or modification to existing inlets, and new outlets or modifications to basin outlets. Improvements for recycled water recharge include the construction of inlet structures, conveyance facilities, and turnouts from the proposed IEUA Regional Recycled Water Distribution System. Improvements for imported water recharge include the construction of inlet structures, conveyance facilities, and turnouts from Metropolitan's Foothill Feeder, also referred to as the Rialto Pipeline. To the extent possible, use of existing facilities was assumed. Capital cost opinions and present value cost opinions were developed for each basin.

Alternative Recharge Opportunities

IEUA and Watermaster are working with the Rocky Mountain Institute to develop local onsite and other alternative recharge opportunities for inclusion in the Recharge Master Plan. As with recharge basins, these alternative recharge opportunities will assist local communities in implementing future Total Maximum Daily Loads (TMDLs) and in compliance with NPDES permits and with future storm water management requirements such as those adopted by the Los Angeles Regional Water Quality Control Board – Standard Urban Storm Water Mitigation Plan. These alternative recharge opportunities are currently being developed and will be included in a supplement to this Phase II Report later in 2001.

Implementation Plan

The Implementation Plan addresses storm water recharge and imported water recharge facilities improvements. To facilitate the implementation of these improvements, a Chino Basin Recharge Implementation Committee was established. The committee includes representatives from the

Watermaster, IEUA, SBCFCD, and CBWCD. Table ES-1 presents a summary of the improvements proposed for each recharge facility. Table ES-2 summarizes the management zone, recharge capacity, and estimated capital cost for the recharge basin improvements described in this Phase II Report.

Table ES-1
Summary of Proposed Basin Improvements for Storm Water and Imported Water Recharge

Recharge Basin	Proposed Improvement							
	Expand/Construct New Metropolitan Turnout	Construct Pipeline from Turnout to Creek/Channel	Construct Channel Diversion Structure	Construct Pipeline from Diversion Structure to Basin	Modify/Construct Inlet/Outlet Works	Modify/Provide SCADA Monitoring	Optimize Basin Geometry	Construct Facilities for Conveyance Between Two Basins
Brooks Street Basin			●	●	●			
Montclair Basins							●	
7th & 8th Street Basins	● (1)	●			●	●	●	
Upland Basin					●		●	● (7)
Ely Basins	●	●			●	●		
Etiwanda Spreading Basins	● (2)							
Hickory Basin	● (3)	●	●		●		●	● (8)
Lower Day Basin	● (4)	●			●			
San Sevaine Basin Nos. 1-3	● (5)							
San Sevaine Basin Nos. 4 and 5	●				●		●	
Turner Basin No. 1	● (6)		●		●		●	
Turner Basin Nos. 2, 3, and 4	●		●		●		●	
Victoria Basin	●				●			
Banana Basin	●	●	●		●		●	●
Declez Basin	●	●			●			
Etiwanda Conservation Ponds	●				●		●	
Jurupa Basin	●	●			●			● (9)
Wineville Basin	●	●			●	●	●	
College Heights Basin	●		●		●		●	●
RP3 Recharge Basins	●	●	●		●		●	●

Notes:
(1) Shared with Ely Basin.
(2) Shared with Victoria Basin and Etiwanda Conservation Ponds.
(3) Shared with Banana, Declez, Jurupa, and RP-3 Basins.
(4) Shared with Wineville Basin.
(5) Shared with San Sevaine Basin Nos. 4 and 5.
(6) Shared with Turner Basin Nos. 2, 3, and 4.
(7) Facilities provided for conveyance with College Heights Basin.
(8) Facilities provided for conveyance with Banana Basin.
(9) Facilities provided for conveyance with RP-3 Basin.

Table ES-2
Recharge Capacity and Costs

Recharge Facility	Mgmt. Zone	Potential Recharge Capacity (acre-ft/yr) [1]									Project Capital Cost
		Storm Water			Imported Water			Recycled Water [2]			
Existing Basins											
Brooks Street Basin	1	1,600	to	1,800	2,200	to	3,300	1,600	to	1,800	$1,466,000
Montclair Basin Nos. 1-4	1	2,100	to	2,100	10,300	to	15,300	2,100	to	2,100	$1,858,000
Seventh and Eighth Street Basin	1	1,100	to	1,600	1,400	to	2,100	1,100	to	1,600	$2,048,000
Upland Basin	1	1,000	to	1,000	5,800	to	8,700	1,000	to	1,000	$1,205,000
Ely Basins	2	2,300	to	2,800	3,400	to	5,100	2,300	to	2,800	$2,686,000
Etiwanda Spreading Basins	2	1,200	to	1,700	5,800	to	8,600	1,200	to	1,700	$523,000
Hickory Basin	2	600	to	900	3,100	to	4,600	600	to	900	$2,340,000
Lower Day Creek Basin	2	400	to	500	2,800	to	4,200	400	to	500	$2,540,000
San Sevaine Basin Nos. 1-3	2	1,420	to	1,700	15,200	to	22,700	1,420	to	1,700	$783,000
San Sevaine Basin Nos. 4 and 5	2	400	to	500	5,400	to	8,100	400	to	500	$4,123,000
Turner Basin No. 1	2	700	to	900	600	to	900	700	to	900	$3,995,000
Turner Basin Nos. 2, 3, and 4	2	1,300	to	1,800	2,300	to	3,400	1,300	to	1,800	$3,364,000
Victoria Basin	2	800	to	1,000	3,400	to	5,100	800	to	1,000	$589,000
Banana Basin	3	600	to	800	2,400	to	3,600	600	to	800	$3,134,000
Declez Basin	3	200	to	300	1,200	to	1,800	200	to	300	$2,049,000
Etiwanda Conservation Ponds	3	800	to	1,100	3,900	to	5,800	800	to	1,100	$3,118,000
Jurupa Basin	3	500	to	700	800	to	1,200	500	to	700	$1,700,000
Wineville Basin	3	500	to	700	700	to	1,100	500	to	700	$2,884,000
New Basins											
College Heights Basin	1	70	to	100	5,300	to	7,900	70	to	100	$5,625,000
RP-3 Basins	3	1,200	to	1,700	5,800	to	8,600	1,200	to	1,700	$5,595,000
Total	--	18,790	to	23,700	81,800	to	122,100	18,790	to	23,700	$51,625,000

Notes:

(1) Based on optimum recharge operations. Low estimate assumes a recycled water contribution of 20% and the high estimate assumes a recycled water contribution of 50%

(2) It has been assumed that the average annual recharge of recycled water will be the same as storm water. The recycled water recharge capacity is currently under evaluation by IEUA in it's Recycled Water System Feasibility Study.

Several institutional arrangements will need to be developed before the proposed improvements are constructed. Currently, CEQA compliance coordination has been initiated for the proposed improvements outlined in this Phase II Report. It is anticipated that CEQA coordination will be completed within the next two months. Long-term operation/maintenance agreements between Watermaster, IEUA, SBCFCD, and CBWCD are also needed to insure maximum operational efficiency.

Design of the improvements will commence with completion of the environmental work and should be completed by April 2002. It is currently planned to design all physical improvements, such as inlets, outlets, monitoring wells, and associated piping. The excavation elements may be

excluded from some of the site work to allow the removal of material by third-party contractors, who would pay to remove and sell material from the basins. This approach would be driven by the market needs for material and could extend completion of some work. However, significant cost savings would result.

The length of construction for all of the improvements (except for various excavations using third-party contractors) is estimated to be approximately 14 months. The construction period is somewhat extended because of the need to limit construction activities to between April 15th – October 15th to avoid potential conflict with essential flood control operations.

Continuous monitoring of the facilities will commence upon completion of the construction phase. It is anticipated that the improvements will be constructed by June 30, 2003. The preliminary implementation schedule is presented on Figure ES-6.

INSERT FIGURE ES-1

INSERT FIGURE ES-2

INSERT FIGURE ES-3

INSERT FIGURE ES-4

INSERT FIGURE ES-5

Figure ES-6
Preliminary Implementation Schedule