CHAPTER 8
ALTERNATIVE WATER SUPPLIES

8.1 OVERVIEW

Evaluating available alternative water supplies is part of a comprehensive water resources strategy that allows for long-term development and uses in the Chino Basin. The goal for alternative water supplies is to meet the region's water quality goals and provide IEUA's local retail agencies with a reliable and affordable water supply over the next twenty-five years. As discussed previously, there are already several water management strategies that IEUA is currently implementing expanding on in order to adapt to the changing water supply situation in California. This chapter discusses possible new water supplies that may be implemented which would enhance local supply reliability and enhance water quality management of the Chino Basin.

Present Water Management Strategies

IEUA's water management goals are as follows:

- Continue development of the groundwater recovery program by:
    - Continuing pumping and treating 24,000 AFY of brackish groundwater by Desalters 1 and 2.
    - Complete phase III expansion of the groundwater recovery program by adding approximately 16,000 AF of capacity, giving a total of 40,000 AFY of capacity by 2012.
    - Pumping and treating plumes of contaminated water to a potable water quality and distribute the water for beneficial purposes.
    - Continue wellhead treatment via existing and future Ion Exchange Facilities (see also conjunctive use program below).

- In 2007, IEUA and its retail agencies completed a Recycled Water Business Plan which outlined a strategy that would achieve maximum reuse of all available recycled water.
    - The Recycled Water Business Plan will increase recycled water connected capacity to 50,000 AFY (35,000 AFY for direct reuse, 15,000 AFY for groundwater recharge).

- Expand the 100,000 AF existing Chino Basin Groundwater conjunctive use program by a minimum of 50,000 AF. This strategy will provide dry year water supplies for the Chino Basin and parts of the Santa Ana River Watershed.
    - Expand and improve groundwater storage and extraction capabilities.
        - Increase the 25,000 AFY storage capacity by 15,000 AFY with Aquifer Storage Recovery wells and conveyance facilities.

        - Increase the 33,000 AFY extraction capacity by 17,000 AFY with new wells, Ion Exchange Facilities, Aquifer Storage Recovery wells and conveyance facilities.
        - Continue negotiations with MWD on expanding the conjunctive use program to include a negative capacity of -100,000 AFY and a maximum capacity of +300,000 AFY.

- Achieve maximum capture, recharge, and use of all available stormwater;
    - Continue to implement the Chino Basin Facilities Improvement Program, which could increase stormwater recharge by 1,000 AFY to 3,000 AFY.
    - Implementing programs to comply with the San Bernardino County's recently adopted MS4 permit could increase stormwater recharge by 5,000 AFY to 10,000 AFY.
    - Implement the Chino Basin Recharge Master Plan Update and increase recharge basin capacities and inlet capacities, which could increase stormwater recharge by 10,000 AFY to 18,000 AFY.
    - Continue to expand and implement Low Impact Development programs:
        - Green roofs, infiltration basins/trenches, pervious pavement, detention ponds, swales/biofilters, rainwater harvesting and landscaping are methods of capturing stormwater/runoff on site.

- Long Term Water Use Efficiency Plan – Implement an effective-innovative water use efficiency program that will continue to maximize efficient water use indoors and expand efficient water use outdoors. IEUA and its retail agencies have outlined strategies for achieving demand reduction in indoor and outdoor uses (Chapter 4). Implementation of these strategies will significantly contribute to the region's efforts to diversify its water portfolio. The strategies included in the Plan are designed to meet the requirement of the following:
    - California Urban Water Conservation Council's Best Management Practices
    - Assembly Bill 1420 Statute
    - Governor's call for 20% per capita water use reduction by 2020
    - Future conservation legislation and regulation

All of the above concepts have been discussed in previous chapters and all help to minimize dependence upon imported water supplies. By emphasizing local water supply development within the service area, the region has developed and will continue to develop a cost-effective supply that reduces the dependence on imported supplies.

8.2 GROUNDWATER RECOVERY

The projected ultimate development of the Chino Basin Desalter Program will produce 51,800 AFY of potable water; and extract an estimate 54,000 tons of salt from the Chino Basin annually. As a result, the program will clean up the area's groundwater while helping to meet the increased potable water demands in the lower Chino Basin.

After the expansion of Desalter No. 1 and completion of Desalter No. 2 in 2006, both desalters combined are producing approximately 26,000 AFY. Table 8-1 lists the respective phases of the Chino Basin Desalter Program showing the ultimate development of the program. Eventually, the expanded program will recover 40,000 AFY of groundwater for potable use from the Chino Basin.[1]

Table 8-1
Chino Basin Desalter Projected Production Including Phase III Expansion

Desalter No.	Year Constructed	2006	2010	2015	2020	2025	2030	2035
Desalter Phase I	2000	15,900	15,000	15,000	15,000	15,000	15,000	15,000
Desalter Phase II	2006	11,200	15,000	15,000	15,000	15,000	15,000	15,000
Desalter Phase III	2014	-	-	10,000	10,000	10,000	10,000	10,000
Total		**27,100**	**30,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**

As shown in Table 8-1, Chino Basin Desalter Phase III is planned for future construction possibility in the years 2010 to 2015; with an capacity of approximately 10,000 AFY.

<u>Pumping and Treatment of Plumes of Contaminated Water</u>

In the Chino Basin, there are five identified plumes of contaminated groundwater from past industrial operations: the GE Flatiron Facility Plume, and GE Test Cell Facility Plume, the Ontario Airport VOC Plume; the Kaiser Steel Corporation Plume; the Milliken Landfill Plume, and the Chino Airport Plume. Pumping and treatment and treating of contaminated water from two of these plumes is underway; namely the GE Flatiron Facility Plume; and GE Test Cell Facility Plume.

The GE Flatiron Facility Plume and GE Test Cell Facility Plume are being treated using reverse osmosis. The treated water is then discharged to a local storm drain which flows to the Ely Basins 1, 2, & 3, where this water is recharged to the Chino Basin aquifer. This treated water is of very high quality. The CBWM, IEUA and GE are studying the possibility of pumping this water into the IEUA Regional Recycled Water Distribution system for use by industries for cooling towers, and other industrial process. Public entitles could profit by using this water for schools, parks, park strips, etc.

See Chapter 10 for detailed descriptions of these plumes along with others that are monitored pursuant to regulatory orders.

<u>Wellhead Treatment of Impaired Groundwater</u>

Some purveyor owned wells in the Chino Basin have been impacted by migration of contaminants to the level that the water from these wells can no longer be used for potable purposes. Under the MWD Dry Year Yield Conjunctive Use Program, impacted

[1] Chino Basin Optimum Basin Management Program, State of the Basin Report 2004 (July 2005)

wells in the cities of Chino, Chino Hills, Ontario and Upland, plus, the special service district of Monte Vista Water District (MVWD) have ion exchange wellhead treatment installed. These projects improve yield and increase water quality in the groundwater basin especially during dry years. This program is in progress. Brine from the wellhead treatment processes is transported ultimately to the Pacific Ocean via the Non-Reclaimable Waste pipeline.

8.3 TAKING RECYCLED WATER TO THE NEXT LEVEL

Recycled water is a natural resource that has been overlooked in the past century of development in the Chino Basin. As an alternate water supply, the recycled water produced by the IEUA Recycled Water Reclamation Facilities is equivalent to most water supplies used for potable sources. As is discussed in Chapters 5 and 6, the Agency's recycled water meets all requirements for Title 22; permitting this valuable resources to be used for row crops, irrigation of parks and water features where human contact is likely; full human contact is permitted; but the recycled water is not allowed for potable uses. Beyond the current recycled water described in Chapter 6, the following recycled water applications are continued to be explored.

Dual Plumbing
For the purpose of this subsection of this report, the referenced sections of the State CCR, Title 22 Requirements for Dual Plumbed Systems are defined in Sections: 60301.250. Dual plumbed systems, 60313; General requirements and operational requirements, 60316.

Section: 60301.250, provides the definition of "dual plumbed system" or "dual plumbed: as meeting a system that utilizes separate piping systems for recycled water and potable water within a facility and where the recycled water is used for either of the following purposes:

1. To serve plumbing outlets (i.e., in restrooms or water features) (excluding fire suppression systems) within a building, or
2. Outdoor landscape irrigation at individual residences.

Both applications are viable future uses of recycled water within IEUA.

8.4 EXPANDED GROUNDWATER STORAGE

The Chino Basin Watermaster (CBWM) was formed under the 1978 Judgment of the Superior Court of the State of California for the County of San Bernardino. Under the Judgment, the CBWM was charged to develop an Optimum Basin Management Plan (OBMP) that in future years would govern the operations of the groundwater basin.

Program Element No. 8 and 9 of the OBMP were to develop and implement a groundwater storage and conjunction use program. They have taken the form of the Dry Year Yield Program described earlier.

The initial Dry Year Yield Program had a maximum storage capacity of 100,000 AF. Water can be “put” into and “taken” out of the basin at a maximum rate of 25,000 AFY and 33,000 AFY, respectively. IEUA, TVMWD, CBWM and MWD are interested in expanding the existing storage account to 150,000 AF. In December 2008, the environmental study (CEQA) was completed. There are three key components to the proposed expansion:

- Increase the existing 25,000 AFY storage capacity by 15,000 AFY with Aquifer Storage Recovery wells and conveyance facilities.
- Increase the existing 33,000 AFY extraction capacity by 13,000 AFY with new wells, Ion Exchange Facilities, Aquifer Storage Recovery wells and conveyance facilities.
- Continue negotiations with MWD on expanding the conjunctive use program to include a negative capacity of -100,000 AFY and a maximum capacity of +300,000 AFY.

The initial MWD program is expected to be the initial phase of a conjunctive use program that will increase to 500,000 AF of storage (reference CBWM Peace Agreement and IEUA PEIR, July 2000).

8.5 ENHANCED STORM WATER MANAGEMENT

As described in Chapter 7 previously, Program Element No. 2 of the OBMP was set forth to development and implement a comprehensive recharge program. A key part thereof is the establishment of a well coordinated storm water management program to capture the maximum amount of stormwater. More efficient stormwater capture can be accomplished with the Chino Basin Facilities Improvement Project (described in Chapter 7) and the Chino Basin Recharge Master Plan. In addition, there are a number of non-traditional stormwater management techniques that, if implemented, could significantly improve water management in the Chino Basin.

Principles for Stormwater Management

It is widely recognized that the patterns of urban development, including hard surfacing (roads, roofs) and storm water management systems (concrete channels) have resulted in a significant reduction in natural infiltration of storm water into the groundwater within southern California and throughout the nation. Chino Basin Watermaster estimated that the Chino Basin was losing on average about 40,000 acre-feet of storm water annually that replenished the groundwater basin as a result of historic patterns of development (WEI, 2001).

Low Impact Development (LID) measures reduce storm water runoff by capturing water at or near the sources of runoff and infiltrating the water into the soil or harvesting the water for later reuse (offset potable water supplies). LID uses a wide array of innovative designs to build (or rebuild) the capacity of the urban environment to retain, detain, filter, and recharge storm water runoff that are based on sound engineering, environmental principals and years of practical experiences.

Often perceived as a problem in the past, due to the costs of controlling storm flows and pollutants, stormwater presents an opportunity for groundwater recharge as well as water quality improvement, water conservation and flood reduction. The guiding principle of this approach is to initiate the containment and use of this valuable resource with management of each drop of precipitation as close to where it falls as is technically possible and economically feasible. This means examining the options available at the regional and local levels, i.e., parks; public and private golf courses; public and private schools; city and county streets and park strips; plus, public and privately owned buildings and their parking facilities; new subdivision developments and older neighborhood yards. Some of these measures include:

- Tree plantings. Studies have shown that tree foliage can hold and absorb up to 35% of the rain falling annually on the diameter of the tree canopy[3].

- Turf management. Aeration and other techniques can increase the infiltration rate of lawns. When mowing lawns, leave higher turf as this helps to hold water on-site longer, allowing for more percolation and reduce evaporation during hot months. Certain grass species (by virtue of denser, deeper roots) can further improve infiltration.

- Roof Leader disconnects. Appropriate redirection of the leaders, re-grading of the landscape around a building, use of dry wells with perforated lateral piping (constructed infiltration chambers), and other techniques can infiltrate roof runoff and enhance subsurface irrigation of trees and shrubs, plus perennials .

- Cisterns. Some roof runoff can be captured in rain barrels or other cisterns. Stormwater captured in such a manner, can either be used for yard and garden watering, or released to dry wells or other infiltration systems once the storm passes.

- Surface infiltration basins. In some yards and many commercial landscapes, ponds, temporal "water gardens," and other basins can be designed to gather site runoff and hold/infiltrate it over varying periods of time.

- Driveway and parking lot "cuts." Modifying driveways to increase previous area can be done in many ways.

- Street narrowing. Common now in new developments, narrow streets calm traffic, increase green space, improve property values, and reduce imperious area. Some American communities are narrowing existing streets for the multiple benefits created. Portland, Oregon refers to their efforts as the "Skinny Streets" program.

- Parking lot redesign. Creative layout can incorporate "infiltration islands," filter strips, and other storm water management features with no or little impact on the number of parking spaces.

- Porous pavements. The porous pavement techniques are well-developed and the performance well-tested. As streets and parking areas are re-paved in coming decades, porous paving options should be given strong consideration.

- Major on-site storm water pretreatment & containment facilities. The major on-site storm water pretreatment and containment facilities could be sized to capture on-site flows and treat other runoff water from upgradient properties.

- Minor total containment with subsurface detention/infiltration chambers. Made of gravel or manufactured components, varying depths and capacities of chambers can be installed under lawns and parking lots to hold large volumes of site runoff during a storm and infiltrate that water to the subsoil in the following hours or days.

The IEUA Administration complex is an excellent example of on-site containment of stormwater. All stormwater falling onto the IEUA site is held on-site to enhance recharge to the aquifer. Schools, parks, and golf courses, plus numerous parking lots are excellent sites for better management of stormwater.

Chino Basin Green is a model home project that encourages environmental friendly design. It includes a example "design center" where home buyers can evaluate environmental friendly designs such as California friendly landscaping, drip irrigation, high efficiency heating, cooling and appliances, solar heating, and solar energy.

8.6 WATER USE EFFICIENCY

Chapter 4 focuses on the specific water use efficiency goals for the IEUA service area and the plan to achieve those goals. Below is a summary of the Water Use Efficiency Business Plan.

Inland Empire Utilities Agency (IEUA) and its member agencies, recognizing the critical nature of regional and state-wide water supply challenges, joined forces to create an aggressive and long-term water use efficiency strategy. Following a comprehensive and open planning process, the agencies developed a number of valuable tools and resources to be used to implement regional water efficiency programs for the next five years and beyond.

The IEUA Data Elements, the Water Use Efficiency Business Plan and the Tracking Tool software are working tools to be used to guide IEUA and member agencies well into the future.

They are designed as flexible resources that adapt to changing circumstances. As budgets and grant funding fluctuate over time, IEUA and its member agencies will be able to enter the new parameters into the software tool and analyze the impact of the new variables. The Tracking Tool will help IEUA and its member agencies evaluate options and track results. The Tracking Tool will be used to record program and economic performance as the programs are rolled out and can be used to ensure that incremental milestones are being met on schedule.

With three previous years of drought and water delivery reductions, coupled with potential population growth, present serious water supply challenges for the Inland Empire. Further exasperating the situation, the economic downturn and decreased water sales have reduced water efficiency budgets at Metropolitan Water District (MWD) and the State Department of Water Resources, terminating years of reliable and generous conservation program funding for Southern California water agencies.

With water supplies tight and budget dollars equally as burdened, Inland Empire Utilities Agency (IEUA) and its eight member agencies strive to bring about long-term solutions for secure and reliable water supplies. Notwithstanding the complex water supply and economic challenges, IEUA has committed to a regional reduction in per capita water use of 10 percent by 2015 and 20 percent by 2020. IEUA's strategy is to meet this goal by achieving regional and local water use efficiency utilizing 1) a portfolio of active programs, 2) passive policy initiatives, and 3) recycled water supply.

Below is a chart outlining the regional per capita water use reduction strategies:

Impact of WUE Activities and Recycled Water Supply

	YEAR	
	GPCD Reduction by 2015	**GPCD Reduction by 2020**
Projected GPCD reduction from WUE Activities Only	5	13
Projected GPCD reduction from Recycled Water Use Only	38	45
TOTAL Projected GPCD Reduction	43	58
10 Year Baseline GPCD	**251**	
IEUA GPCD Target	226	201
IEUA Projected GPCD Achievement	208	193

IEUA's strategy aligns with the recently enacted State legislation requiring retail urban water providers to achieve per capita water use reductions of 10 percent by 2015 and 20 percent by 2020 (commonly referenced as "20x2020"). However, IEUA recognizes that its regional strategy does not, by itself, assist its member agencies in achieving their own legislatively mandated water use reduction goals. IEUA is, thus, further committed to assisting its retail member agencies in achieving their individual water use reduction goals through regional programs and technical assistance.

Regional planning for the next five to ten years is dependent upon the savings goals for the IEUA member agencies. The exact water savings goal to reach 20x2020 has been determined through the Department of Water Resources' methodologies for calculating baseline and compliance urban per capita water use. The 20x2020 goal will be met through a variety of efforts that will include regional and local water use efficiency activities, code and policy initiatives, and recycled water supply.

The business plan is modeled with three levels of budget and productivity assumptions, designed to deliver varying degrees of water savings. These three levels of planning assumptions have been named ***Baseline, Moderate, and High***. With current budget limitations, the Business Plan focuses primarily on the Baseline Plan.

Highlights of the ***Baseline Plan*** are:

Plan Overview	
Cost per Acre-foot*	$187 per acre-foot
Five-Year Water Savings	4,563 acre-feet
Lifetime Water Savings	14,260 acre-feet
Avoided Costs	$9,707,137
Average Annual Budget	$480,000
Five-Year Total Budget	$2,390,000

**Includes education & outreach programs*

A major strategic element of IEUA's per capita water use reduction is increased water use efficiency. IEUA's water use efficiency strategy is aggressive and designed to be accomplished through the following operational means:

- Delivery of cost-effective programs;
- Provision of necessary outreach and education programs;
- Transformation of customers' water use habits through innovation in program designs, customer financing options and technologies;
- Flexibility to react to changing budgets, program operations and technologies and create the modifications to stay on goal; and,
- Maintenance of strong working collaboration between IEUA and its member agencies through consistent data provision and regular and ongoing program management sessions.

With major challenges ahead, IEUA recognizes that a sound, fact-based business plan is needed as a tool to guide water use efficiency program implementation over the upcoming years. Working through a consultant, IEUA's Regional Water Conservation Partnership Workgroup initiated an eight-step process that resulted in the creation of the regional *Water Use Efficiency Business Plan*.

The Business Plan provides the following information:

- The current water supply situation and usage patterns;

- Specific market opportunities;

- A strategy for reaching water savings goals;

- Recommended programs with budgets, water savings, costs, marketing and operational details;

- A program implementation plan and schedule; and,

- A system for tracking and reporting performance over time.

As a result of the plan development process, a strategy was created to target IEUA's highest demand market and craft a number of cost-effective programs designed to deliver significant water savings.

Outdoor landscape water use is by far the highest demand within IEUA's territory, predominantly by single-family residential customers.

8.7 DUAL PLUMBING FOR GRAY WATER SYSETMS

An additional source of recycled water is the use of "gray water," (household water from sinks, showers, bathtubs and clothes washing machines.

In addition to the standard sewer pipes that send wastewater (or black water) to the sewer collection and treatment system, a second set of plumbing pipes would direct cleaner water (gray water) from the washing machine, bathtub or shower onto the landscaping. Using the gray water would:

1. save water by reusing this water for irrigation;
2. conserve needed capacity in future Water Treatment Facilities;
3. conserve needed capacity in future Water Reclamation Facilities; and
4. cut back on water bills for outside irrigation.

Implementation of such a practice would need to be initiated in newly constructed homes and businesses. Estimated cost for dual plumbing in a new home would be from $1,500 to $2,000. Builders could offer the gray water system as an option.

The City of Phoenix Arizona is considering the gray water option. It is a matter of convincing the general public to use this source of recycled water. After considering the subject the City decided that gray water would cut down on the infrastructure needed for all water and wastewater systems.[2]

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[2] Arizona Republic Newspaper, May 30, 2005.

Estimated daily savings per household for gray water uses is presented in Table 8-2. Weekly savings would be 1,470 gallons, enough to irrigate shrubs and most present day lawns. Irrigation of vegetable and flower gardens are a real possibility after convincing the public to use this source of water.

Table 8-2
Gray Water Reuse for Landscape Irrigation
(gallons per housing unit per day) Without Conservation

Year	Showers	Bathtubs & Whirlpools	Bathroom Sinks	Kitchen Faucets	Clothes Washing Machines	Total Gray Water Available
2000	77.0	13.9	20.7	31.0	67.4	**210.0**
2005	76.2	13.7	20.5	30.7	67.7	**208.8**
2010	75.0	13.6	20.3	30.5	68.5	**207.9**
2015	75.7	13.6	20.3	30.4	69.8	**209.8**
2020	75.4	13.5	20.1	30.1	69.2	**208.3**

With Conservation

Year	Showers	Bathtubs & Whirlpools	Bathroom Sinks	Kitchen Faucets	Clothes Washing Machines	Total Gray Water Available
2000	70.0	13.9	20.1	30.1	67.3	**201.4**
2005	67.2	13.7	19.3	29.0	67.5	**196.7**
2010	65.4	13.6	18.8	28.1	68.4	**194.3**
2015	64.3	13.6	18.4	27.6	69.7	**193.6**
2020	63.1	13.5	18.0	27.0	69.1	**190.7**

Source MWD – Main Model, Section 5: End-Use Model Output – End Use Factors (2004)