

# Optimum Basin Management Program

Staff Status Report 2011-2: July to December 2011



CHINO BASIN WATERMASTER

## Highlighted Activities

- While the basin recharge appetite was whetted by an unusually strong early October storm, the Fall of 2011 was dry in contrast to the wet Fall of 2010. Fortunately, the Summer of 2011 was mild, many conservation efforts remained in place, and state water reservoirs are nearly full.
- About 4,273 acre-feet of recycled water and 3,103 acre-feet of storm/local runoff were recharged within Chino Basin facilities during the July to December 2011 reporting period.
- Metropolitan Water District of Southern California (MWD) ended replenishment water deliveries on September 30, 2011, nearly three months earlier than anticipated. Over 23,634 acre-feet of imported water was recharged during July, August and September, resulting in a total 2011 replenishment water delivery of nearly 33,100 acre-feet, valued at over \$14 million.
- During October 2011, the Chino Basin Desalter Authority (CDA) issued a contract to Best Drilling for construction of Chino Creek Well Field (CCWF or CDA Phase III) Wells I-19, I-20, and I-21. When operational, these wells should allow Watermaster to functionally achieve hydraulic control and demonstrate compliance with Optimum Basin Management Plan (OBMP) objectives.
- In September 2011, initial excavation of soils for the Milliken Avenue Grade Separation also coincided with ground breaking for the Turner Basins Recharge Expansion Project. The City of Ontario, County of San Bernardino, and San Bernardino Association of Governments (SANBAG) jumpstarted the Turner Project, with \$4.5 million in savings, resulting from their project's need for 200,000 cubic yards of soil.
- In December 2011, Watermaster committed \$166,236, the Bureau of Reclamation granted \$406,712, and Inland Empire Utilities Agency (IEUA) committed \$1 million, to design and construct 300 acre-feet per year of additional storm, imported and recycled water recharge capacity at Turner Basins and Guasti Park.
- Construction and initial calibration of the Daniels Street Horizontal Extensometer was completed.
- Several potential sites for the Chino Creek Well Field Vertical (Cable) Extensometer were identified, with the preferred site being on County owned land just south of the Chino Airport. Installation and calibration of this facility is a prerequisite for timely activation of the CCWF.
- Reduced groundwater production projections, reported in 2010 Urban Water Management Plans, suggest a reduced aggregate need for supplemental recharge water in the greater Chino Basin; however, as observed during the summer 2011 MWD replenishment water recharge effort, not all of the Chino Basin Management Zones have comparable recharge capabilities and capacities.
- The 2010 Recharge Master Plan Update Steering Committee was initiated and convened, as directed by the Court Order of October 8, 2010 order. The Committee will continue to meet in 2012 and, based on developing studies, recommend how to implement the Recharge Master Plan.
- Revised HCMP monitoring requirements were negotiated with the Santa Ana Regional Water Quality Control Board and are expected to be implemented through a Basin Plan Amendment.



Turner Basins Recharge Expansion Project Excavation  
Milliken Grade Separation Stockpiles in Background

## Important Court Hearings and Orders

- OCTOBER 28—CHINO BASIN WATERMASTER COURT HEARING ON MANAGEMENT AND IMPLEMENTATION STATUS
- NOVEMBER 1 - ORDER APPROVING CDA RESOLUTION 10-04, PLACING GENERAL ELECTRIC IN OVERLYING (NON-AGRICULTURE) POOL, REQUESTING RESUBMITTAL OF RESTATED JUDGMENT
- DECEMBER 8—ORDER GRANTING EXTENSION TO FILE RECHARGE MASTER PLAN STATUS REPORT THROUGH JUNE 14, 2012

# Optimum Basin Management Program

## Program Element 1: Develop and Implement a Comprehensive Monitoring Program

### *Groundwater Level Monitoring*

The current Watermaster groundwater level monitoring program is comprised of about 700 wells. For about 500 of these wells, the well-owner records water levels monthly and forwards the data to Watermaster quarterly. The remaining 200 wells are mainly south of the 60 Freeway and assess hydraulic control, land subsidence, and impacts from the desalter wells. Watermaster manually measure water levels at these wells monthly or by using pressure transducers that record data in 15 minute increments. These data are quality control checked, loaded into a relational database, and used to develop groundwater level contour maps and implementation assumptions.

### *Groundwater Quality Monitoring*

The groundwater quality monitoring program assembles results from various regional remediation efforts, then integrates the data to provide a comprehensive assessment of groundwater quality:

1. Groundwater quality data developed by Appropriators, Department of Toxic Substance Control (DTSC), Regional Water Quality Control Board (RWQCB), US Geological Survey (USGS), and the Counties for their own requirements are cooperatively provided to the Chino Basin Data Collection (CBDC) program. Watermaster routinely collects, assesses, and loads this data into a centralized relational database management system for subsequent analyses.
2. The Watermaster Key Well Program tests an additional 120 private wells in the southern Chino Basin, that would not otherwise require monitoring. Twenty wells, associated with the southern edge of the Archibald South (formerly OIA), Chino Airport, and Kaiser Steel plumes, are sampled annually, while the remainder are sampled triennially. The Key Well Program also contributes data for triennial ambient water assessment, hydraulic control assessment, Biennial State of the Basin Report, and other Chino Basin groundwater studies.

### *Groundwater Production Monitoring*

Most active wells (except Agricultural Pool minimal producers of less than 10 acre-feet annually) are metered, production read quarterly, and the data entered into Watermaster's database.

### *Surface Water Monitoring*

**Water Quality and Quantity in Recharge Basins.** Watermaster and IEUA estimate the volume of storm and supplemental water recharged, using pressure transducers and staff gauges. MWD provides State Water Project and IEUA provides RP-1 and RP-4 recycled water quality data. Using a mass balance calculation and the volume and quality of each water type, the blended recycled dilution water quality can be projected and, in the near future, a "new yield" estimated.

**Surface Water Monitoring in the Santa Ana River (SAR).** Watermaster regularly measures flow and select water quality parameters to assess whether Chino Basin might impact SAR water quality. These data, combined with groundwater modeling, assess the extent and integrity of hydraulic control from the southern Chino Basin to the greater Santa Ana River Watershed.

### *HCMP Annual Report*

In January 2004, the RWQCB amended the Santa Ana River Basin, Water Quality Control Plan (Basin Plan) to incorporate "maximum benefit" and antidegradation objectives for Total Dissolved Solids (TDS) and Nitrate-Nitrogen (N) for the Chino Basin and Cucamonga Management Zones. Access to the "maximum benefit" objectives relies on Watermaster and IEUA's implementation of specific OBMP projects and monitoring requirements. Annual reports are due each April 15, while this periods quarterly Surface Water Monitoring Program Reports were submitted to the RWQCB on October 15, 2011 and January 16, 2012. During this reporting period, Watermaster manually measured water levels at 427 private wells, downloaded two quarterly data sets from 112 wells containing pressure transducers, collected 90 groundwater, 188 surface and 72 recycled water (direct treatment facility effluent discharge) water quality samples respectively.

ON JANUARY 1,  
2012, DEPTH TO  
GROUNDWATER  
LEVELS AT PA-7  
(AYALA PARK  
PIEZOMETER)  
WERE 104 FEET  
BELOW GROUND  
SURFACE, OVER  
140' ABOVE THE  
MZ-1 GUIDANCE  
CRITERIA LEVEL  
OF 245 FEET.

# Optimum Basin Management Program

## Program Element 1: Develop and Implement a Comprehensive Monitoring Program (Continued)

### Land Surface Monitoring

In response to land subsidence in the City of Chino, Watermaster submitted the MZ-1 Subsidence Management (MZ-1) Plan to the court for approval and, in November 2007, Watermaster Court ordered its implementation (see Program Element 4: Develop and Implement a Comprehensive Groundwater Management Plan for Management Zone 1). The MZ-1 Plan proposed several monitoring and mitigation measures to minimize or abate land subsidence and ground fissuring in the western Chino Basin. These measures and activities include:

- Continued water level monitoring, within the Managed Area, comparable to that which occurred during development of the MZ-1 Plan.
- Expand the aquifer and land subsidence monitoring into other areas of MZ-1, and the Chino Basin, where data indicate a potential concern for subsidence and ground fissuring.
- Construct a horizontal strain monitor (extensometer) across the observed fissure zone.
- Evaluate the potential contribution of groundwater production, in northern MZ-1, on conditions in southern MZ-1.
- Provide for recovery of MZ-1 groundwater levels, while conducting additional testing and monitoring to refine the PA-7 Guidance Criteria.
- Develop an alternative pumping plan for producers impacted by the MZ-1 Plan and post the PA-7 groundwater levels on the Watermaster website to guide its use.
- Construct, and comparison test, vertical and cable extensometers at Ayala Park.
- Evaluate and compare ground-level surveying with Interferometric Synthetic Aperture Radar (InSAR), and recommend future monitoring protocols for both techniques.
- Conduct an ASR (aquifer storage recovery) feasibility study at a City of Chino Hills MZ-1 production well (tentatively well 16).

Watermaster undertook the following monitoring and testing activities called for in the MZ-1 Plan:

- The Watermaster Land Subsidence Committee met twice during the period, to assess future monitoring priorities and identify funding support for those activities.
- Compared vertical and cable extensometers at Ayala Park, to validate use of the more cost-effective cable system for application in other parts of the basin, as necessary.
- Evaluated InSAR data from alternate satellite system, which may be further analyzed to detect potential land surface displacement (subsidence) in early 2012.
- Continued implementation of the MZ-1 Managed Area Monitoring Program with the goals of: (1) refining the Guidance Criteria; (2) confirming existence of the Riley Barrier; (3) testing ASR feasibility in the Managed Area; and (4) evaluating the effect of groundwater production and injection on subsidence and recovery in the fissure zone.
- Completed installation and began calibration of the Daniels Street horizontal extensometer across the City of Chino observed zone of surface ground fissuring.
- Identified a location and began negotiating agreements to construct the Chino Creek Well Field (CCWF) cable extensometer (located South of Chino Airport).

### Well Construction, Abandonment and Destruction Monitoring

During the reporting period, the County of San Bernardino provided Watermaster with copies of six well construction permits and five well destruction permits. Watermaster continues to request geologic and post-construction operational characteristics for new wells, as the data can be made available. Following the December 17, 2009 Determination of No Further Action (NFA) by the RWQCB, Watermaster requested continued access for water level and groundwater quality monitoring at sixteen wells owned by the State of California at the Chino Institute for Men through a February 23, 2011 letter. Watermaster will continue to assess whether other wells, planned for destruction can be cost effectively incorporated into our monitoring network, as occurred previously for several Alcoa Wells.



Horizontal Extensometer Construction

# Optimum Basin Management Program

## Program Element 2: Develop and Implement a Comprehensive Recharge Program

Watermaster, IEUA, Chino Basin Water Conservation District (CBWCD), and San Bernardino County Flood Control District (SBCFCD) jointly sponsor the Chino Basin Groundwater Recharge Program; a comprehensive water supply and reliability program to improve basin water quality, by increasing the recharge of storm, imported, and recycled water. The mean stormwater runoff and theoretical maximum supplemental water recharge capacity, of the Chino Basin Facilities Improvement Program (CBFIP) recharge basins, is about 14,000 and 99,000 acre-feet/yr (AFY) respectively. From July 1 to December 31, 2011, an estimated 30,828 acre-feet of water was recharged throughout the Chino Basin. Imported water made up 23,452 acre-feet of the total, with 16,610 recharging in Monitoring Zone (MZ)-1, 5,118 acre-feet in MZ-2, and 1,724 acre-feet in MZ-3. About 3,103 acre-feet of storm and local runoff infiltrated, with 704 recharging in MZ-1, 1,464 acre-feet in MZ-2, and 935 acre-feet in MZ-3. Since imported and runoff water are preferentially recharged and were relatively available during this reporting period, the volume of recycled water was constrained to about 4,273 acre-feet with 350 acre-feet recharging in MZ-1, 1,842 acre-feet in MZ-2, and 2,081 acre-feet in MZ-3.



Recharging the Chino Basin Groundwater at Victoria Basin

During this period, the 2010 Recharge Master Plan Steering Committee met and began to identify additional cost effective recharge opportunities and projects that could be undertaken in the future. This includes the identification of accounting measures that might recognize and even encourage potential contributions to water harvesting through the requirements of the recently adopted Municipal Separate Storm Sewer System (MS4) Permit, which identifies the need for Water Quality Management Plans (WQMP) with Low Impact Development (LID) characteristics. This Program Element will become increasing important in preserving the Operational Safe Yield of the basin, flushing TDS and TIN out of the South Chino Basin and for blending with recycled water.

In December 2011 Watermaster committed to IEUA, up to \$162,236 towards the projected \$664,712 Turner Basins/Guasti Park Recharge Expansion Project in MZ-2. In a commendable example of inter-agency cooperation, this supplemental project became feasible through coordinated materials extraction for the Milliken Avenue Grade Separation project, supported by the City of Ontario, SanBAG, and San Bernardino County. Following completion in 2014, the expansion project is projected to recharge an addition 300 acre feet of storm runoff annually.

**Reporting.** Watermaster and IEUA submitted to the RWQCB the Second and Third Quarter Groundwater Recharge Program Reports on August 15 and November 15, 2011, respectively.

## Program Element 3: Develop and Implement Water Supply Plan for the Impaired Areas of the Basin

The Chino Basin Desalter Authority (CDA) reported 2010-11 production of 29,319 acre-feet of TDS and TIN impaired groundwater. This raw water was variously treated with air stripping, ion exchange, and reverse osmosis to remove contaminants and, now purified, supplied to the Authority Member Agencies to meet the need for high quality water supply needs in expanding urban areas of the southern Chino Basin. Without expansion of the CDA, the potential for adverse downstream impacts on Orange County Water District recharge facilities would likely have grown as a result of agricultural land conversion and reduced use of the impaired groundwater. Furthermore, increased groundwater losses from the basin might have led to a future reduction in safe yield. The continued operation of the CDA facilities, and eventual expansion to a planned annual capacity of over 40,000 acre-feet, is a prerequisite of the OBMP and will be necessary to achieve effective hydraulic control of the Chino Basin. Towards this production objective, Watermaster and CDA demonstrated continued progress on the RWQCB approved project schedule of June 2010, which should be completed sometime in 2015. The Desalter II expansion has been completed, wells I-16 and I-18 drilled, while wells I-20 and I-21 began construction. Existing design contracts for pipeline, well and pump facilities continue to lead toward task and eventual project completion.

# Optimum Basin Management Program

## Program Element 4: Develop and Implement a Comprehensive Groundwater Management Plan for Management Zone 1

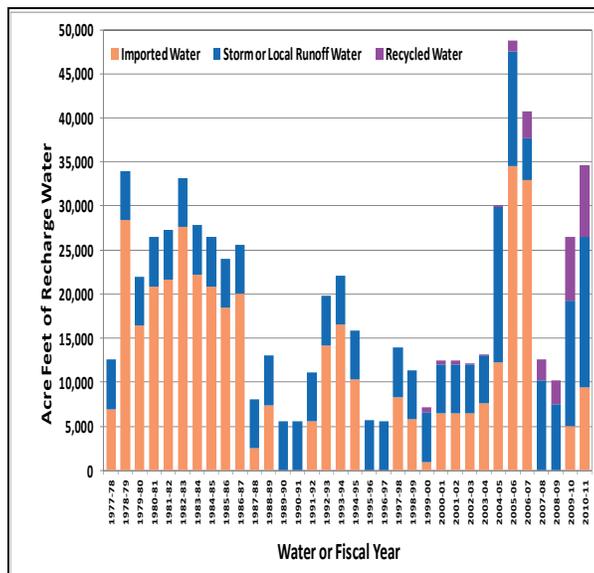
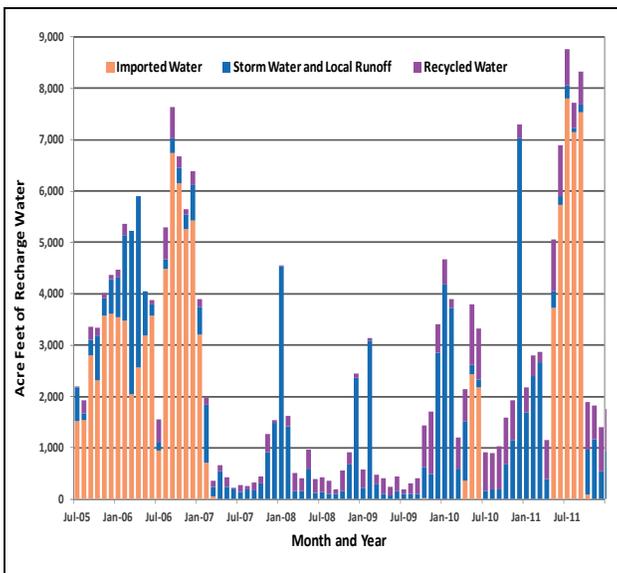
The OBMP called for the development and implementation of an MZ-1 Interim Management Plan (IMP) to mitigate historical, pumping-induced, land subsidence and ground fissuring in southwestern Chino Basin (southern MZ-1). Watermaster prepared the MZ-1 Plan, with Guidance Criteria, which was approved in November 2007 and its implementation ordered by the Court. With this year's expedited recharge of replenishment water, the cumulative Peace II Agreement MZ-1 supplemental water obligation of 32,500 acre-feet, has been satisfied with about 37,063 acre-feet of supplemental water, leaving an obligation excess (credit) of 4,563 acre-feet. The Guidance Criteria also designated a "Managed Area" and contained a list of Managed Wells, from which production is subject to maintaining an initial threshold water level (Guidance Level) above 245 feet below the top of the PA-7 well casing. With sustained replenishment water recharge during this period, groundwater levels at the PA-7 piezometer continued to rise and on January 1, 2012 the level was over 140 feet about the Guidance Level. Correspondingly, the Ayala Park Extensometer has recorded little, if any, permanent compaction.

The Land Subsidence Committee met on July 21, November 16, and December 15, 2011 and continues to implement elements of the MZ-1 Plan including InSAR monitoring using Envisat and other satellite data, construction of the Chino Creek Well Field Cable Extensometer, and necessary budget transfers to support the proposed tasks.

## Program Element 5: Develop and Implement Regional Supplemental Water Program

In the Chino Basin, supplemental water is defined as imported and recycled water. A review of the 2010 Urban Water Management Plans (UWMPs) suggest that local appropriators plan to become increasingly dependent on imported water to relieve stress resulting from historic basin groundwater production. During the reporting period about 23,452 acre-feet of imported replenishment water was recharged and another 889 acre-feet injected via Monte Vista Water District ASR wells. Despite the success of the replenishment water program, MWD has purposed to change the imported water program and may eventually decide to discontinue the replenishment water program and substantially change their fee schedules for all imported waters. Watermaster continues to investigate opportunities to increase supplemental water supplies along with IEUA, Three Valleys Municipal Water District, Western Municipal Water District, and the Water Facilities Authority.

**Recycled Water Recharge Monitoring Activities.** The recycled water recharge program is partially regulated under RWQCB Orders R8-2007-0039 and R8-2009-0057. Watermaster and IEUA collect weekly water quality samples at basins actively recharging recycled water. During this reporting period, 27 recycled product and 261 lysimeter water samples were collected from 7 of the 13 basins that may receive recycled water. Monitoring wells, down-gradient of recharge basin that receive recycled water, were sampled at least quarterly, but more frequently during basin start up or soil aquifer treatment (SAT) evaluation, for a total of 87 samples.



# Optimum Basin Management Program

## Program Element 6: Develop and Implement Cooperative Programs with the Regional Water Board and Other Agencies to Improve Basin Management

The Potentially Responsible Parties (PRPs), identified by the RWQCB as responsible for the Ontario International Airport (OIA) or Archibald South Plume, are also known as the ABGL (Aerojet, Boeing, GE, and Lockheed) group. Watermaster participates in meetings with ABGL, their consultants and counsel, the Regional Board, and CDA in order to identify remedies to continued plume mitigation. The ABGL group consultant prepared and submitted a Remedial Investigation Report, proposing that remediation by natural attenuation and containment would be adequate, for consideration by the RWQCB on October 13, 2011.

County of San Bernardino, Department of Airports and agency consultants continue to investigate plume migration and its impact on the Chino Creek Well Field (CCWF) and CDA operations. The Watermaster groundwater model was used to estimate the hydraulic control that would be achieved after the CCWF is completed, prepare maps, charts and concentration data regarding the fate of the Chino Airport plume.

Watermaster continues to monitor water samples, model transport and concentration, and other technical analyses related to several other pollutant plumes in the Chino Basin, with the ultimate objective of having their negative impact on basin water quality substantially reduced. This includes plumes believed to be associated with Alumax Aluminum Recycling, the California Institute for Men, Crown Coach, GE Test Cell and Flatiron, Kaiser Steel, Milliken Landfill, Upland Landfill and the Stringfellow National Priorities List sites.

## Program Element 7: Develop and Implement a Salt Management Program

The Chino Basin Salt Management Program overlaps with three other Program elements. The most proactive element is operation of the CDA desalters facilities and wells which, during Fiscal Year 2010-11, reported production of 29,319 acre-feet of high salt (up to 1,700 mg/L TDS) containing groundwater, that might otherwise impair downstream receiving waters. The brine resulting from membrane treatment is removed from the Basin via the Santa Ana Regional Interceptor (SARI). Pilot studies of brine minimization, to conserve SARI line capacity, continue and are expected to lead to a 2012 facility design contract. By 2015, CDA capacity is expected to increase to over 40,000 acre feet through completion of the Chino Creek Well Field and expansion of the existing desalters. A second active element of salt management is the groundwater recharge program. During recharge, preference is given to storm runoff, then imported water, then recycled water, in recognition of their respective qualities and costs. The concentration of salts and nitrate in the blended recharge water are managed through monitoring at basin lysimeters and at downstream wells. The third element is passively tracking the conversion of agriculture, which tends to concentrate salts through evapotranspiration of water, to urban land uses. The effectiveness of these programs is assessed through modeling of groundwater flows and verified by monitoring salt concentrations at nine HCMP multi-port wells, strategically placed between the desalter well fields, and several wells along the Santa Ana River.

## Program Element 8: Develop and Implement a Groundwater Storage Management Program

Recent events demonstrate the importance of groundwater storage to the Chino Basin. Watermaster has committed to investigate the technical and management implications of Local Storage Agreements, improve related policies and procedures, and then revisit all existing applications of Local Storage Agreements.

## Program Element 9: Develop and Implement a Storage and Recovery Program

The existing Watermaster/IEUA/MWDSC/Three Valley Municipal Water District (TVMWD) Dry-Year Yield (DYY) program continued during the reporting period. By April 30, 2011, all DYY program construction projects and a full “put” and “take” cycle had been completed, leaving the storage account with a zero balance. Watermaster, IEUA, and MWDSC are negotiating amendments to the current contract and, once amended, preparing to initiate a new “put” cycle.

AMBIENT SANTA ANA RIVER HCMP MONITORING APPEARS TO BE STATISTICALLY INSENSITIVE FOR ASSESSING THE IMPACT OF TDS IN CHINO BASIN GROUNDWATER ON THE SANTA ANA RIVER.

WATERMASTER HAS PROPOSED A DRAFT RWQCB BASIN PLAN AMENDMENT THAT WOULD REDISTRIBUTE THE COST OF THIS UNINFORMATIVE MONITORING TO OTHER EFFORTS.