Chino Basin Watermaster
Status Report No. 11

(Covering March 2004 through May 2004)

June 2004

OPTIMUM BASIN MANAGEMENT PROGRAM

In its Order of September 28, 2000, extending the term of the nine-member Watermaster Board, the Court ordered Watermaster to provide semiannual reports regarding the progress of OBMP implementation. In Status Report Number 4, filed with the Court on September 30, 2002, Watermaster notified the Court that Watermaster intended to accelerate voluntarily the reporting schedule because of the rapid pace of OBMP implementation. By a subsequent Order of October 17, 2002, the Court added additional reporting items to the quarterly report.

This Status Report Number 11 is filed pursuant to this revised schedule and reports on the period from March 1, 2004 to May 31, 2004.

PROGRAM ELEMENT 1 – DEVELOP AND IMPLEMENT COMPREHENSIVE MONITORING PROGRAM

Groundwater-Level Monitoring

BACK-GROUND

Watermaster has three active groundwater-level monitoring programs operating in the Chino Basin – a semiannual basin-wide program; an intensive key well monitoring program associated with the Chino I / II Desalter well fields and the Hydraulic Control Monitoring Program (HCMP); and an intensive piezometric monitoring program associated with land subsidence and ground fissuring (see Land Surface Monitoring below) in Management Zone 1 (MZ1).

THIS PERIOD

For the semiannual program, Watermaster staff manually measures water levels in approximately 340 agricultural wells twice per year. In conjunction with the semiannual program, Watermaster staff manually measures water levels at about 112 key wells in the south portion of the Basin and around the Chino I / II Desalter well fields once per month. During the reporting period, Watermaster staff installed a pressure transducer/data logger in 10 of these key wells to automatically record water levels once every 15 minutes. For the MZ-1 program, Watermaster consultants collect groundwater level data at 35 wells in the southern portion of MZ1. Data are collected manually at MZ1 wells once every two months, and automatically once every 15 minutes using a pressure transducer/data logger installed at each well.

These Watermaster programs also rely on municipal producers, other government agencies, and private entities to supply their groundwater level measurements on a cooperative basis. Watermaster digitizes all these measurements and combines them into a relational database maintained at Watermaster's office.

TO COME

During fiscal year 2004/05, Watermaster staff will expand the use of pressure transducers/data loggers within the key well program. Watermaster staff will purchase and install about 30 additional pressure transducers/data loggers at wells in the key well program and at selected wells in the northern portions of Chino Basin where highly-detailed groundwater level data is scarce.

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Watermaster, Inland Empire Utilities Agency (IEUA), Orange County Water District (OCWD), and the Santa Ana Regional Water Quality Control Board (RWQCB) have agreed to construct nine new monitoring wells as part of the piezometric monitoring element of the HCMP. These monitoring wells are necessary because existing well locations and well construction are not sufficient to measure the extent of hydraulic control in the vicinity of the Desalter well fields and because of the loss of monitoring use of agricultural wells as these wells are destroyed in the conversion of land use from agriculture to urban uses. The objective of these new wells is to document the creation of a regional depression in the piezometric surface, for both the shallow and deep aquifer systems, as a result of Desalter pumping. These wells will be installed during fiscal year 2004/05.

Watermaster and IEUA are planning to construct a number of monitoring wells at recharge basins to monitor the influence of recharge on groundwater levels in general, and to monitor the water quality resulting from the recharge of supplemental and storm waters. At least one monitoring well will be installed down-gradient of each recharge facility that receives recycled water. The construction schedule will be determined during the next reporting period.

Groundwater-Quality Monitoring

BACK-GROUND **Prioritizing Wells to Serve Multiple Purposes.** The private wells chosen for the 2003-04 water quality monitoring program are located primarily between Interstate 60 and the Santa Ana River (SAR).

Water Quality Analyses

- All groundwater samples are analyzed for general mineral and general physical parameters.

ON-GOING
- Wells within or near the two volatile organic compound (VOC) plumes south of the Ontario and Chino Airports are being analyzed for VOCs, in addition to the general minerals and general physical parameters.

- All private wells in the key well program are being analyzed for perchlorate because of its widespread occurrence in the 1999-2001 sampling program, and the concerns expressed by appropriators faced with expensive ion exchange treatment costs for perchlorate-contaminated wells.

THIS PERIOD **Sampling Program of Selected Private Wells**. Watermaster developed its streamlined, key-well water quality monitoring program in which approximately 114 private "key wells" are sampled bi-annually (i.e. once every two years) in the southern portion of Chino Basin. Therefore, approximately 57 wells will be sampled on an annual basis. The steps taken in determining the key wells were:

- The basin was divided into a grid, with each cell being 2000 square meters (m^2).
- For each grid cell, the average TDS and NO_3 values were calculated (using the last five years of available data).

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- The water quality of each individual well was examined. Wells most closely matching the average constituent concentrations were chosen as representative. One to two wells in each grid square were retained (The wells not chosen in the key well program, but still matching these criteria are the alternate wells for each grid cell). Preference was given to wells with the following characteristics:
  - Known construction;
  - Choice as a groundwater level key well;
  - Likelihood of surviving the regional development.
- Basin-wide TDS and NO_3 arithmetic averages were recalculated using just the key wells and compared to the total basin arithmetic averages. New maps were made representing the water quality conditions of the key wells and qualitatively compared to the original basin maps.

Watermaster has developed a comprehensive water quality program, whereby water quality data from other sources are routinely collected, quality-control checked and loaded into Watermaster's database. Data sources included:

- Appropriators
- Department of Health Services (DHS) – these data are currently downloaded from DHS annually
- Department of Toxic Substance Control (DTSC) for the Stringfellow Acid Pits
- Regional Water Quality Control Board (RWQCB) for water quality data associated with sites under Cleanup and Abatement Orders (CAO).

TO COME Watermaster is working closely with Appropriator Pool members and their state-certified contract laboratories in order to obtain water quality data as an electronic data deliverable (EDD). These data would be transmitted either directly from the laboratory or from the Appropriator, after their QA/QC check of the laboratory data. The EDDs will enhance the quality and timeliness of the Watermaster's database.

Groundwater-Production Monitoring

BACK - GROUND **Monitoring of Agricultural Production Wells.** Initially production monitoring involved the installation of meters on wells operated by members of the Agricultural Pool. As of the end of this period, Watermaster counted about 517 active agricultural wells and has equipped 403 of these wells with operating meters. The other 114 wells have or will become inactive within 18-24 months because of urban development in the south Chino area.

ON GOING **All Producing Wells Are Monitored Quarterly.** Watermaster staff reads the newly installed and/or rehabilitated meters on the agricultural wells quarterly. A "water duty" method is used to estimate production at agricultural wells that do not have meters.

TO COME **Need For Water Use/Disposal Form To Be Reviewed.** The OBMP Implementation Plan includes a provision that requires the agricultural producers to submit a water use/disposal form describing the sources of water used by each producer and how that water is disposed of after each use. Filling out the water use and disposal form and reporting the

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results have not been implemented. Watermaster will initiate discussions of the need for this form with the Water Quality Committee.

Surface-Water Monitoring

BACK-GROUND **Measure Water Quality and Water Levels In Recharge Basins.** Watermaster conducts a surface water monitoring program to characterize the water quality of water in recharge basins and the water levels in some of these basins. The purpose of this program is to estimate the volume and quality of recharge. This information will be used in subsequent years to estimate the safe yield of the Basin and for other management purposes.

ON GOING Currently, Watermaster monitors the water quality in 20 basins: Upland, Declez, Etiwanda Spreading Grounds, Victoria, Hickory, Lower Day Lower, Banana, Ely 1, Ely 3, Wineville, San Sevaine 1, San Sevaine 5, Turner 1, Princeton, Montclair 1, Montclair 2, Montclair 3, Montclair 4, Brooks, and Grove. Generally, the water quality samples are taken after storm events, i.e., during the period from November 1 through March 30; however, monitoring of nuisance flows also occurs. Each basin has been sampled three to five times each year. Next fiscal year the sampling rate will substantially increase for basins that are scheduled to receive recycled water.

THIS PERIOD Immediately following the storm event of March 1, 2004, Watermaster staff sampled the storm water captured in Ely Basins 1 & 3, Montclair Basins 1 & 2, San Sevaine Basins 1 & 5, Lower Day Basin, and Victoria Basin.

BACK-GROUND **Surface Water Monitoring for Santa Ana River Began In June 2003**. One of the goals of the OBMP is to maximize Chino Basin yield. A key component in maximizing yield is to minimize groundwater discharge into the SAR. Watermaster developed a surface water monitoring program for the SAR that, in conjunction with Watermaster groundwater monitoring programs, is used to characterize those reaches of the River that are gaining water from the Basin, and to determine if significant discharge of Chino Basin groundwater to the SAR is occurring. A conceptual monitoring plan involving IEUA, OCWD, the RWQCB, and Watermaster was finalized. These agencies determined that the conceptual monitoring plan was adequate and developed a detailed work plan to implement a surface water and groundwater monitoring program. The work plan was completed in June 2003, and year-round water quality sampling and flow monitoring in the SAR have begun.

ON GOING Watermaster now measures the SAR flow and selected water quality parameters as key elements of the HCMP. Watermaster collects water quality samples and measures flow at the four Santa Ana River stations (Van Buren, Etiwanda, Hamner, and River Road) plus another eight locations on tributaries, year round on a bi-weekly basis. In addition, Watermaster obtains discharge data from permanent USGS and OCWD stream gauge locations on the SAR and its tributaries. Discharge and water quality data from publicly owned treatment works (POTWs) that discharge to the SAR in this reach are obtained from the POTWs.

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Land-Surface Monitoring

BACK-GROUND

Multifaceted Approach. Watermaster staff developed a multifaceted land surface monitoring program to develop data for a long-term management plan for land subsidence in Management Zone 1 (MZ1). The monitoring program consists of three main elements:

1. An aquifer system monitoring facility is located in the southern portion of MZ1, an area that has experienced concentrated and differential land subsidence and ground fissuring. A major component of the aquifer system monitoring facility is a cluster of multiple depth piezometers that measure water level and pressure changes at 11 different depths. Another major component is a dual borehole extensometer that measures deformation within the aquifer system at deep and shallow levels. Together, the two components correlate the hydraulic and mechanical responses of the aquifer system to different aquifer stresses, such as pumping at wells.

2. Synthetic aperture radar interferometry (InSAR) measures land surface deformation across the entire Chino Basin using remote sensing techniques.

3. Benchmark surveys along selected profiles of the Chino Basin. The benchmark surveys (1) establish a datum from which to measure future land surface deformation, (2) "ground-truth" the InSAR data, (3) allow determination of historical subsidence at any historical benchmarks that can be recovered, and (4) evaluate the effectiveness of the long-term management plan.

ON GOING

Depth Specific Data. Permanent transducers and data logging equipment are recording depth specific groundwater level data at the Ayala Park piezometers. Transducers also are recording groundwater level data at wells owned by the cities of Chino and Chino Hills and the California Institution for Men (CIM). These transducers record groundwater levels at all wells once every 15 minutes, and also record "on/off" pumping cycles at the active production wells.

BACK-GROUND

Deep Aquifer-System Stress Test. In October and November 2003, Watermaster attempted to conduct a controlled, deep aquifer system stress test. In summary, the test called for constant discharge from four wells owned by the City of Chino Hills (**CH-1B, CH-15B, CH-17,** and **CH19**), while most other wells in the area were to remain off. These wells have similar perforated intervals from about 300-1,100 ft-bgs and primarily influence water levels in the deep and confined portions of the aquifer system – deeper than about 300 ft-bgs.

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The primary objective of this stress test was to transition the deformation of aquifer system sediments from elastic compression to inelastic compaction. If accomplished, it would have provided "threshold" piezometric heads at the extensometer location that should not be approached in the future to avoid permanent (inelastic) compaction within the aquifer system. It would have also helped to constrain estimates of key aquifer system parameters that could be used in later modeling efforts.

The primary objective was not accomplished during this test because two of the proposed pumping wells (**CH-1B** and **CH-15B**) could not pump directly into the Chino Hills' distribution system because of high arsenic concentrations. A third well (**CH-17**) had to be

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turned off during the test because of mechanical problems. As a result, piezometric heads did not drop below the "threshold" levels to cause inelastic compaction within the confined portions of the aquifer system.

Nonetheless, valuable piezometric data was collected that revealed a potential groundwater barrier within the sediments below about 300 ft-bgs. This barrier approximately coincides with the location of the historic zone of ground fissuring as evidenced by a lack of water level response in **CH-18** (east of the fissure zone) due to pumping at **CH-19** (west of the fissure zone). That these features are coincident spatially suggests a cause-and-effect relationship between the barrier, the steep gradient of subsidence across the barrier as indicated by InSAR, and the ground fissuring.

THIS PERIOD

Shallow Aquifer System Stress Test. In May and June 2004, Watermaster attempted to conduct a controlled, shallow aquifer system stress test. In summary, the test called for constant discharge from three wells owned by the cities of Chino (Wells 4 and 6) and Chino Hills (**CH-1A**), while most other wells in the area were to remain off. These wells have similar perforated intervals from about 160-375 ft-bgs and primarily influence water levels in the shallow, un- to semi-confined portions of the aquifer system – shallower than about 300 ft-bgs.

The primary objective of this stress test was to constrain estimates of key aquifer system parameters that could be used in later modeling efforts. In addition, the data can be used to test for the existence of the groundwater barrier (discussed above) within the shallow aquifer system sediments.

Unseasonably warm weather and a temporary shut down of the Rialto Pipeline (imported water) caused the cities to turn on these pumping wells contrary to the pumping test schedule, and to turn on nearby deep wells later in the test period. Nonetheless, valuable piezometric data were collected and are currently being analyzed.

THIS PERIOD

Deep piezometer rehabilitation. During the summer drawdown in the 2003 it became evident that some degree of intercommunication was developing among the piezometers in the deep cluster (PB) at Ayala Park, and that the deepest piezometer, **PB-1,** and perhaps others, were also intermittently communicating with the much higher heads in the shallow aquifer system. The leakage apparently is occurring through faulty joints in the two-inch PVC casings, although actual breaks in the casings may also exist. Evidence suggests that many of the problems may result from defects in the casing of PB-1 that allow leakage directly into the gravel envelopes around the screened intervals of shallower piezometers. To the extent that this is true, repair of PB-1 may solve most of the problems.

Rehabilitation of the PB piezometers is currently being undertaken, using a "well-in-a-well" construction technique. This involves filling the screened interval (5 to 20 ft) of the piezometer casing with coarse, highly permeable sand, which is then topped with about 10 ft of graded medium to very fine sand and silt to form a filter cap of very low permeability. A 1-inch inner pipe, the well within the well, is jetted through the filter cap to communicate effectively with the original gravel envelope and surrounding formation. Before final jetting down into position, the inner pipe, temporarily set about 20 ft above the screen, allows water standing in the 2-inch casing to be displaced to the surface while a

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sealing bentonite grout is pumped down the annulus between the 2-inch casing and the inner pipe.

This technique has been tested and refined by experimenting in **PB-6**, the shallowest of the deep piezometer cluster. Preliminary evaluation indicates that the procedure closed a known communication between **PB-5 and PB-6**. Based on the results at **PB-6**, Watermaster will attempt to rehabilitate **PB-1** using similar methodologies (see below).

TO COME

Deep Aquifer System Stress Test. The most critical current objective of the aquifer system monitoring element of the IMP is to transition the deformation of aquifer system sediments from elastic compression to inelastic compaction (see discussion above). Watermaster is proposing to conduct another controlled, deep aquifer system stress test during the months of September and October 2004 to accomplish this objective. In summary, the test calls for constant discharge from four wells owned by the City of Chino Hills (**CH-1B, CH-15B, CH-17, and CH-19**), while most other wells in the area are to remain off.

Recall that **CH-1B** and **CH-15B** have relatively high concentrations of arsenic that do not allow for pumping these wells directly into Chino Hills' distribution system. Yet, it is imperative that these wells participate in the stress test in an attempt to transition the aquifer system deformation to inelastic compaction. Options to include these wells is the stress test include: (1) installation of temporary or semi-permanent arsenic removal facilities at the well heads, and/or (2) pumping directly to storm drains which flow to Prado Basin and ultimately to Orange County Water District's Santa Ana River recharge facilities in Anaheim. The feasibility and cost of each option are being researched and discussed with various vendors, the City of Chino Hills, permitting agencies, and the MZ-1 Technical Committee.

Deep piezometer rehabilitation. Rehabilitation of **PB-1** is scheduled to be undertaken on or about June 23, 2004 when the equipment and personnel of the contractor, Well Development Corporation, are next available. After repair of **PB-1**, WEI will conduct slug tests to confirm the effectiveness of the procedure and the need, if any, for similar repairs in other piezometers.

Background

InSAR. The objective of this task is to characterize ground surface deformation in Chino Basin using Synthetic Aperture Radar Interferometry (InSAR). This analysis will be performed for a historical period (1992-2003) and on an on-going basis thereafter. The advantage of InSAR is that it provides an aerially continuous representation of land surface deformation. These data are planned to be used to: (1) characterize the time history of land surface deformation in greater spatial and temporal detail than can be accomplished from the available historical ground level survey data, (2) calibrate computer simulation models of subsidence and groundwater flow, and (3) assist in the evaluation of the effectiveness of the long term management plan.

THIS PERIOD

During this reporting period, Vexcel Corporation of Boulder, Colorado – a company that specializes in remote sensing and radar technologies conducted a "proof of concept" study of historical SAR data that was acquired over the MZ-1 area. The objective of this study was to generate cumulative displacement maps over relatively short time steps (months). If deemed successful, a comprehensive analysis of all historical SAR data

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(1992-2003) would be performed to characterize in detail the time history of subsidence in MZ-1.

In this "proof of concept" study, five SAR images acquired from September 1992 to November 1993 were processed to create four interferograms:

- September 1992—April 1993
- April 1993 – September 1993
- September 1993 – October 1993
- October 1993 – November 1993

The first interferogram (September 1992 – April 1993) was incoherent and unusable. The remaining three interferograms were coherent, and allowed for the creation of three cumulative displacement maps:

- April – September 1993
- April – October 1993
- April – November 1993

The major features to note in these cumulative displacement maps are:

1. A north-south trending trough of subsidence extends northwest of the Ayala Park Extensometer, and depicts maximum subsidence of about 2.4 inches during the April – November 1993 period in the vicinity of the intersection of Central Avenue and Schaefer Avenue. This pattern and magnitude of subsidence are consistent with past InSAR and ground level survey analyses.

2. The coincidence of the north-south trending fissure zone (which was active during this general time period) and the sharp eastern edge of the trough of subsidence. This locational coincidence suggests a cause-and-effect relationship that may also be related to an underlying groundwater barrier within the deep aquifer system sediments (see Aquifer System Monitoring section below).

3. The slight differences between maps that depict the relatively small displacements that occurred from September to November can be recognized through this analysis. The recognition of these displacements at relatively short time steps (months) demonstrates the capability of this method to further resolve the time history of subsidence over the period of available SAR data (1992-2003).

4. An increasing number of "no data" cells as the maps progress through time. This is a result of incoherent cells in an interferogram in areas that were previously coherent in all prior interferograms. This phenomenon will progressively add "no

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data" cells to the cumulative displacement maps. However, in the opinion of Vexcel, the final map will still provide useful and spatially continuous data in areas that typically provide coherence data (e.g. urban areas).

5. The large area of "no data" in the agricultural areas of Chino Basin. The analysis did not improve the coherence of the data in these agricultural areas, as was hoped.

TO COME

The MZ-1 Technical Committee reviewed the findings of the proof of concept InSAR analysis and recommended to the Watermaster to proceed with the analysis of the entire historical record. This work will be completed by the end of 2004. The contract deliverable will include a presentation of the analysis results by the InSAR consultant.

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Benchmark Surveys

BACK GROUND

The Interim Monitoring Program (IMP) work plan called for the deep extensometer, which is anchored in sedimentary bedrock at about 1,400 ft bgs, to be used as the "starting benchmark" for all survey loops. To accomplish this, a Class-A benchmark was constructed outside the extensometer building to serve as the practical (*i.e.* actual) starting benchmark. To link this benchmark to the deep extensometer pipe, each survey event is begun by referencing the benchmark to a marked spot on one of the piers that supports the extensometer instrument platform. These piers and the instrument platform represent a stable ground surface datum that is used to measure relative vertical displacement between the ground surface and the deep extensometer pipe (recorded every 15 minutes). The vertical displacement recorded at the deep extensometer between survey events, in addition to any vertical displacement measured between the starting benchmark and the pier, is then used to calculate the elevation at the starting benchmark outside the extensometer building. Then, relative vertical displacement between benchmarks is measured across the entire work to obtain current elevations. These comprehensive surveys are planned to be repeated annually during spring season of highest regional water levels.

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A key element of the MZ-1 benchmark network is the array of closely spaced benchmarks that have been established across the historic fissure zone in the immediate vicinity of the Ayala Park extensometers (Ayala Park array). At this array, located along Edison and Eucalyptus Avenues, the IMP work plan calls for the semiannual measuring of both vertical and horizontal displacements. These horizontal and vertical displacements are expected to define two-dimensional profiles of land surface deformation that can be related to the vertical distribution of aquifer system compaction and expansion that is being recorded continuously at the extensometers. These surveys are repeated semi-annually during the late spring and early fall periods of highest and lowest water levels – in an attempt to monitor fissure movement that may be associated with elastic and/or inelastic aquifer deformation.

THIS PERIOD

In late April 2004, AE performed the annual survey event across the entire network of benchmark monuments, including the measurements of horizontal displacements at the Ayala Park Array of monuments. These data are currently being processed by AE for upload to the MZ-1 database.

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TO COME

The results of the ground level surveys to date will be presented to the MZ-1 Technical Committee at its July 21, 2004 meeting. Also at this meeting, the project manager from AE will make a presentation to describe survey methodologies, accuracy, results, and challenges, as well as to answer questions. The written results will be presented in the next MZ-1 progress report due to the MZ-1 Technical Committee at its August 25, 2004 meeting.

Well Construction, Abandonment, and Destruction Monitoring

BACK-GROUND

Watermaster staff monitors the condition of wells on a regular basis. Wells that may be improperly abandoned/destroyed are reported to Riverside and San Bernardino Counties as they are discovered.

Watermaster staff inspected 150 suspect wells during a 2002-03 field inspection and determined that 113 of these wells were properly abandoned and 37 wells will require some modification to meet the standard for a properly abandoned well. A well repair/abandonment program was prepared and approved by Watermaster. Watermaster continues to develop a wellhead protection program and makes recommendations on closure of abandoned wells. Ongoing land development will require continued well abandonment activity by Watermaster.

PROGRAM ELEMENT 2 – DEVELOP AND IMPLEMENT COMPREHENSIVE RECHARGE PROGRAM

A centerpiece of the OBMP is enhancement of the Basin recharge capacity, so that high quality storm water and available recycled water can be retained in the Basin.

Recharge Facilities Improvement Project (Seven Bid Packages)

Bid Package No. 1—Reconfiguration of Banana, College Heights, Lower Day, RP3 and Turner Basins

Completed

Bid Package No. 1, which included major earthwork at Banana, College Heights, Lower Day, RP-3, and Turner Basins, was awarded to LTE Excavating on March 24, 2003. Work was scheduled for completion by November 15, 2003, but was delayed while awaiting delivery of sluice gates and their actuator assemblies. At the end of this quarter, the final "punch list" of corrections was completed, and the bid package was accepted on May 12, 2004

Bid Package No. 2 – Basin Improvements (3 ea), Drop Inlets (3 ea), and Rubber Dams (4 ea)

BACK-GROUND

Bid Package No. 2 consisted of construction of the drop inlet structures for Brooks Street Basin, Turner Basin; and Victoria Basin; rubber dams for College Heights/Upland Basins, Turner No.1 Basin, Lower Day Basin, and RP-3 Basin; and various improvements at Declez Basin, Ely Basin, and 8th Street Basin. This package was awarded to Banshee Construction with work beginning on July 16, 2003. The contract required that work in the storm channels be completed by October 15, 2003 and that the rubber dams be operational by December 31, 2003. Work on this contract was scheduled to be completed

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by March 15, 2004; however, rain delays slowed completion of excavation and soil cement berms.

THIS PERIOD

During this quarter, work on final excavation and the soil cement berms was completed. A "punch list" of corrections was generated, and the contractor is completing those items.

THIS PERIOD

Bid Package No. 3 – Jurupa Basin to RP-3 Force Main

Bid Package No. 3 involves construction of approximately 11,000 linear feet of 36-inch CML&C force main between Jurupa Basin and RP-3 Basin. The force main will be used to convey storm water, imported water, and recycled water between the pump station at Jurupa Basin and the RP-3 Basins. This package was awarded to W. A. Rasic Construction Company with work beginning on August 6, 2003. The Contractor anticipates a construction period of 12 months with completion of the pipeline in July 2004.

THIS PERIOD

Bid Package No. 4 – Jurupa Basin to RP-3 Pump Station

Bid Package No. 4 consists of construction of the Jurupa Pump Station, 100 feet of 48-inch pipeline, and 400 feet of 36 inch, CML&C steel force main. The package was awarded to LT Engineering with work beginning on February 19, 2004. The Contractor anticipates a construction period of 8 months with completion in November 2004.

Bid Package No. 5 – SCADA System

THIS PERIOD

This bid package includes the SCADA system and electrical improvements at all the basins. The 100 percent design was submitted, reviewed, and sent out for bid in January 2004. Because of the poor response, the package was re-bid in February 2004, and was awarded to Denboer Engineering on February 24, 2004. The contractor anticipates a construction period of 8 months with completion in November 2004.

Bid Package No. 6 – MWD Turnout Design

THIS PERIOD

This bid package covers the construction of three new MWD turnouts: CB-11TB and CB-15T on the Rialto Pipeline, and CB-18 on the Etiwanda Intertie near San Sevaine Channel. MWD provided various drawings, specifications, and other information needed to complete the three designs. This package was awarded to Griffith Construction with work beginning on February 4, 2004. The contractor anticipates a construction period of 6 1/2 months with completion in August 2004.

TO COME

Bid Package No. 7 – Priority, Funding and Scope of Misc. Projects

This bid package will complete miscellaneous projects not included in the previous bid packages. Among the projects being considered for this bid package are:

- Habitat Mitigation Area at RP-3
- Upland Basin Improvements
- Victoria Basin Improvements

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- Hickory Rubber Dam, Pump Station and Force Main
- Miscellaneous Projects

The various projects will be prioritized and those that offer the greatest benefits to groundwater recharge will be included in the bid package depending on available funding after construction of the other six bid packages. Designs for Bid Package 7 are complete and it is expected to be awarded by July 2004.

THIS PERIOD

Groundwater Recharge Coordinating Committee (GRCC)

The GRCC meets monthly to monitor and coordinate the Recharge Facilities Improvement Project, focusing on design issues, construction management, and operations manuals. Watermaster's FY2003-04 budget provides $440,000 for current operation and maintenance activities.

In addition to design review, the GRCC has initiated work on individual operations and maintenance plans for all the recharge basins, as well as obtaining regulatory agency approvals and permits.

PROGRAM ELEMENT 3 – DEVELOP AND IMPLEMENT WATER SUPPLY PLAN FOR THE IMPAIRED AREAS OF THE BASIN; AND

PROGRAM ELEMENT 5 – DEVELOP AND IMPLEMENT REGIONAL SUPPLEMENTAL WATER PROGRAM

These program elements focus on the shift of production in the southern end of the Basin away from agricultural uses and toward urban uses. Without the OBMP, this land use conversion would result in a decrease in production in the southern end of the Basin, ultimately leading to rising water levels. If groundwater levels in the southern end of the Basin rise too high, then water may "spill" out of the Basin into the Santa Ana River. Such uncontrolled spillage caps the overall Safe Yield of the Basin. The Basin can be managed to avoid this possibility.

Directly tied to the threat of rising water levels in the southern area is the diminished desire of appropriators in the southern end of the Basin to pump water because of impaired water quality. The ability to compensate for the loss of agricultural production with increased appropriative production is inhibited because of these water quality concerns. Greater appropriative production in this area therefore requires water treatment, an issue addressed through the construction of desalter facilities.

The Chino I/II Desalters

BACK-GROUND

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The Chino I Desalter was originally constructed by SAWPA to provide 8.1 million gallons per day (MGD) of product water using reverse osmosis treatment. The project also included extraction wells, raw water pipeline, and product water pipelines and pump stations.

THIS PERIOD

Chino I Expansion/Chino II Desalter. This expansion includes the construction of an additional 4.9 MGD of parallel treatment capacity (nitrate removal via ion exchange) at Chino I and 10 MGD of similar ion exchange at the Chino II Desalter. A construction contract was signed and construction is underway with completion scheduled for February 2005.

ON GOING

Chino I Desalter Other Improvements. Other facilities either under design or construction include three new extraction wells (construction completed), a raw water pipeline (construction started), a Chino Hills pump station and product water pipeline (construction underway), and a volatile organic compound (VOC) treatment system (construction started) ahead of the ion exchange treatment.

ON GOING

Chino II Desalter Other Improvements. Other facilities either under design or construction include nine new extraction wells (five under construction, four wells in design), two raw water pipelines (design phase), two product water pipelines (one under construction, one in design), and site improvements (construction underway).

All the projects underway to expand the Chino I/II Desalters should be completed by February 2005.

PROGRAM ELEMENT 4 – DEVELOP AND IMPLEMENT COMPREHENSIVE GROUNDWATER MANAGEMENT PLAN FOR MANAGEMENT ZONE 1

Program Element 4 details the steps undertaken by Watermaster to reduce or abate subsidence and fissuring in Management Zone 1.

THIS PERIOD

The MZ1 Technical Committee Meeting – March 10, 2004. Committee representatives were informed of the status of the various efforts to implement the monitoring program (see Land Surface Monitoring of Program Element 1), and were briefed on the results of the aquifer stress test begun on October 1, 2003. The meeting focused on the GPS survey of the extensometer location, the Associated Engineers (AE) semi annual survey of the Ayala Park Array of benchmarks, the Vexcel cost estimate and schedule for the InSAR studies, and the extensometer results from the Comprehensive Pumping Test.

The elevation of the starting benchmark at the extensometer was established by Associated Engineers (AE) through the use of GPS receivers, and from there established the horizontal and vertical position of 24 monuments in the area of greatest subsidence. AE will continue to perform and report on their semi-annual (April and October) survey of the 24 monuments. These horizontal and vertical displacements will provide two-dimensional profiles of land surface deformation that then can be related to the vertical distribution of aquifer system compaction and expansion recorded by the extensometers.

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Vexcel provided a cost estimate and schedule for a decade (1993-2002) of InSAR data. As a "proof of concept," Vexcel analyzed the data for a single year (1993) and provided interferograms for three time periods using 1993 data.

Data from the extensometer from July 15, 2003 through March 1, 2004 were presented; and appeared to show excellent correlation with piezometric data from PA-7. A stress-strain diagram was developed for the drawdown (July 15-Nov 1, 2003) and recovery (after Nov, 2003) periods. The stress-strain diagram appears to show that deformation is primarily elastic compression and expansion within the aquifer system sediments, but complete results will not be available until July 15, 2004. Data from piezometer B recording at a depth of 500-1200' logs, were sporadically irregular and concern centered on possible leaking joints which allow water from the well column to leak out into the gravel layers at shallower elevations. Negotiations were opened with WDC, the well installer, to correct the leakage either with well packers or a "well-within-a-well."

Voluntary Forbearance. The City of Chino and the City of Chino Hills submitted certifications documenting their respective voluntary participation in forbearance of groundwater production. Through the end of May 2004, the City of Chino submitted documentation of pumping reductions of 1495 acre-feet toward its forbearance goal of 1,500 acre-feet for 2003/2004. The City of Chino Hills submitted documentation of forbearance of 667 acre-feet through January 2004.

Agency	Forbearance through May 2004	Forbearance Goal 2003/2004
City Of Chino	1495 acre-feet	1,500 acre-feet
City Of Chino Hills	667 acre-feet	1,500 acre-feet

TO COME **Pending Legal Actions Regarding Subsidence.** In its October 17, 2002 Order, the Court ordered Watermaster to keep the Court apprised of any legal actions that could question the Court's jurisdiction over subsidence. Watermaster is not aware at this time of any such actions. The hearing regarding the City of Chino's Paragraph 15 Motion concerning subsidence was continued by the court until August, 2004.

PROGRAM ELEMENT 6 – DEVELOP AND IMPLEMENT COOPERATIVE PROGRAMS WITH THE REGIONAL WATER QUALITY CONTROL BOARD, SANTA ANA REGION (REGIONAL BOARD) AND OTHER AGENCIES TO IMPROVE BASIN MANAGEMENT; AND

PROGRAM ELEMENT 7 – DEVELOP AND IMPLEMENT SALT MANAGEMENT PROGRAM

The "water quality committee" as envisioned in the OBMP Implementation Plan has been formally constituted. Since the development of the OBMP, Watermaster has worked closely with the Regional Water Quality Control Board, the Department of Toxic Substances Control, and others to define water quality challenges and to refine the water quality management criteria in the Chino Basin. Watermaster continues to review water

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quality conditions in the Basin and to consider future water quality management activities beyond the Chino Basin desalting program.

BACK-GROUND

Water Quality Management. In response to the results of RWQCB and Watermaster's groundwater quality monitoring programs (Program Element 1) Watermaster has refined its water quality monitoring to focus on the following key areas:

- Watermaster is identifying and characterizing water quality anomalies, such as the VOC anomaly south of the Ontario International Airport (OIA). Status Reports on each of the anomalies were developed by Watermaster and were presented to the Water Quality Committee for their review.
- Watermaster staff continues to participate in the process of developing TMDLs for Reach 3 of the Santa Ana River and other water bodies in the lower Chino Basin. No progress has been made during the last quarter because of the State budget crisis and the staffing issues at the RWQCB.
- Watermaster staff is assisting the RWQCB with research, monitoring, and the crafting of investigative and cleanup and abatement orders for potential dischargers involved with the OIA. Watermaster staff receives and reviews all reports that are produced by dischargers that are conducting investigations under order by the RWQCB and the Department of Toxic Substances Control (DTSC).

Water Quality Committee

THIS PERIOD

Watermaster staff and consultants continue to update our understanding of the contaminants of concern in the various plumes, and the extent of their migration. In addition, Wildermuth Environmental continued their analysis of the environmental records search performed by EDR. This consisted of a query of state and federal databases of known users and dischargers of potentially hazardous chemicals. Watermaster is analyzing the areal relationship of potential sources of perchlorate with downgradient impacted production wells. On March 30, 2004, Black & Veatch delivered their "Draft Technical Memorandum –Treatment Technology Review" which analyses current and emerging treatment technologies for specific contaminants of concern in the Chino Basin; including nitrates, perchlorate, arsenic, and specific VOCs.

With respect to the VOC plume at OIA, Wildermuth Environmental completed their data gathering effort at the RWQCB and prepared draft Letters of Notification/Cleanup and Abatement Orders for review by the RWQCB prior to their mailing to identified potential dischargers. At the Chino Airport VOC plume, Watermaster obtained permission from private well owners to release VOC water quality data to Tetra Tech, a consulting engineering firm performing quarterly groundwater monitoring of the VOC plume immediately southwest of the airport property. Tetra Tech is under contract to the County of San Bernardino, Department of Architecture and Engineering, the owner and operator of Chino Airport, and is attempting to determine the source of the VOC plume. Watermaster's water level and water quality monitoring program over the last several years has resulted in a robust database that can be used by Watermaster and other stakeholders in the basin to answer these kinds of questions.

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Watermaster and Regional Board Propose TDS and Nitrogen Objectives to Promote Maximum Benefit of Waters Available to the Chino Basin

BACK-GROUND

Watermaster staff has been working with the Total Dissolved Solids (TDS)/ Nitrogen (N) Task Force to revise the subbasin boundaries, and the TDS and N objectives for the Chino Basin to promote maximum beneficial use of waters in the Basin (as opposed to the Regional Board's current, more rigid anti-degradation based objectives). The maximum beneficial use approach will increase water supplies and lower costs over time while meeting water quality requirements. In December 2002, Watermaster proposed specific water-quality management zone boundaries, and N and TDS objectives for the Chino Basin to the RWQCB at a workshop regarding the Basin Plan update. The TDS/N Task Force and the RWQCB reacted favorably to the Watermaster proposal and incorporated Watermaster recommendations in the TDS/N Basin Plan Amendment dated November 21, 2003.

THIS PERIOD

The Basin Plan Amendment incorporating the sub-basin boundaries and maximum beneficial use concept was adopted by the RWQCB on January 24, 2004, (RWQCB Basin Plan Amendment, and Attachment to Resolution No. R8-2004-001). Watermaster staff immediately developed and submitted surface water and groundwater monitoring programs to the RWQCB on February 21, 2004. These monitoring programs will measure the progress of CBWM and IEUA in achieving the "maximum benefit" goal for TDS/TIN in the Chino and Cucamonga Basins. The Basin Plan amendment has been favorably reviewed by the State Water Resources Control Board and the Office of Administrative Law. The State Board will likely approve the Basin Plan amendment at their September 2004 meeting.

BACK-GROUND

Cooperative Effort to Determine State of Hydraulic Control. One outstanding issue regarding the Basin Plan changes was to develop a monitoring plan to evaluate the state of hydraulic control in the southern end of the Basin. Hydraulic control is one tool that can be used to maximize the safe yield of the Basin. Watermaster staff developed a monitoring program for OBMP purposes and described this effort in the Initial State of the Basin Report (October 2002). The execution of this monitoring program is included in Program Element 1. Watermaster and IEUA have collaborated with OCWD and the RWQCB to select existing wells and to site nine new multi-piezometer wells that will be used to monitor and assess the state of hydraulic control.

THIS PERIOD

In addition to being a core element of the OBMP, hydraulic control is a requirement of the Basin Plan Amendment. Watermaster, OCWD, and RWQCB staffs developed a conceptual monitoring program in June 2003 to assess the state of hydraulic control and to provide information to Watermaster to manage future production and recharge. The final work plan for the Hydraulic Control Monitoring Program was completed in May 2004, and implementation is now occurring. This program will change over time as new information is developed and will last for several years. The coordination and review of the hydraulic control monitoring data and the development of management programs to maintain hydraulic control have been added to Program Elements 6 and 7.

Watermaster and IEUA have committed to the construction of nine new multi-piezometer wells during fiscal year 2004/05. Watermaster filed an application for $250,000 from the Local Groundwater Assistance Fund, sponsored by the California Department of Water

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Resources (DWR). Watermaster received notice that the DWR will award the full $250,000 to Watermaster. This funding will support construction of two piezometric monitoring wells that, in addition to some existing wells, would be used for monitoring and assessing the state of hydraulic control. In addition to the DWR funding, IEUA and Watermaster have secured about $400,000 from the U.S. Bureau of Reclamation for new monitoring wells for the HCMP.

THIS PERIOD

Watermaster and IEUA obtained approval by OCWD and the RWQCB for the nine wells sites; completed draft plans and specifications for the new multi-piezometer monitoring wells; and began the site engineering/acquisition process for the nine wells. In addition, these agencies prepared and signed an "Agreement for Cooperative Efforts in."

TO COME

During the next reporting period, Watermaster/IEUA will obtain finalize bid documents, and select drillers for the nine wells.

Salt Budget Tool To Establish TDS Objectives

BACKGROUND

Watermaster has developed a salt budget tool to estimate the current and future salt loads to the Basin and the salt benefits of the OBMP. This tool was used to establish TDS objectives for the northern part of the Basin based on maximum beneficial use of water available to the region. These projections were based on the water supply plan in the Implementation Plan and include alternative recycled water and State Project water recharge scenarios. Watermaster consultants prepared a letter report (February 20, 2004) describing the salt budget and the Chino Basin Maximum Benefit Commitment. The commitments require Watermaster and IEUA to take specific actions triggered by ambient water quality and other time-certain conditions. An implementation schedule is specified, with the RWQCB responsible for overseeing compliance.

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PROGRAM ELEMENT 8 – DEVELOP AND IMPLEMENT GROUNDWATER STORAGE MANAGEMENT PROGRAM; AND

PROGRAM ELEMENT 9 – DEVELOP AND IMPLEMENT STORAGE AND RECOVERY PROGRAM

This section summarizes the work accomplished to date and the work planned over the next few months for the Chino Basin Dry Year Yield (DYY) and Storage and Recovery Programs. The DYY Program is a conjunctive use program between the Metropolitan Water District of Southern California (MWDSC) and several Basin appropriators, which would develop a maximum of 100,000 acre-feet of storage. These Programs also explore the potential for using up to 500,000 acre-feet of storage capacity.

BACK-GROUND

Completed Preliminary Design Report. The first draft of the DYY Preliminary Design Report was completed in July 2003 and submitted to Watermaster. The DYY Program documentation is organized into four volumes: Volumes I and II, prepared by Black &

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Veatch, comprise the Preliminary Design Report (PDR). Volume I describes the background information and design objectives of the Program, while Volume II describes the facilities to be designed to help the agencies meet their shift obligation. Volume III presents the groundwater modeling report developed by Wildermuth Environmental, Inc., and Volume IV contains the CEQA Findings of Consistency environmental documentation prepared by Tom Dodson and Associates.

ON GOING

DYY Shift Obligation. Participants in the DYY Program will be required to reduce (shift) their imported water usage by a predetermined amount during a dry year. Each participating agency will have a specific shift obligation that, when added together, will provide MWDSC with 33,000 acre-feet of dry year yield. The shift obligations were determined through meetings and correspondence among IEUA, Watermaster, Black & Veatch, and representatives from each participating agency.

The nine participating agencies are as follows:

• City of Chino	• Monte Vista Water District (MVWD)
• City of Chino Hills	• City of Ontario
• Cucamonga Valley Water District (CVWD)	• City of Pomona
• City of Upland	
• Jurupa Community Services District (JCSD)	

Facility Requirements and Site Selection. A preliminary screening of potential sites identified the most feasible locations for the DYY Program facilities. The information was presented to the agencies and a final selection was made. The Program facilities consist of five new ion exchange (IX) facilities, expansion of two existing IX facilities, construction of seven new non-water quality impaired wells, and two new perchlorate wellhead treatment facilities. The new wellhead IX facilities would contribute approximately 18,000 acre-feet of dry year yield, while the new well facilities would contribute approximately 15,000 acre-feet of additional yield. The total capital cost for the facilities is estimated to be $38 million. MWDSC will contribute approximately $27 million. The Groundwater Storage Program Funding Agreement between MWDSC, IEUA, Three Valleys Municipal Water District (TVMWD), and Watermaster was signed in July 2003.

ON GOING

Final Design of PDR Facilities. The designs for the facilities outlined in the PDR are either under way, completed, or will commence shortly. All design documents are scheduled to be completed by September 2004.

BACK-GROUND

Final Approval of DYY Storage Account. Pursuant to Article X of Watermaster's Rules and Regulations, IEUA submitted an Application to enter into a Storage and Recovery Program Storage Agreement. This Application was approved unanimously by all Pools and received unanimous approval from the Advisory Committee and Board on October 23, 2003. Watermaster and IEUA developed a storage agreement pursuant to the Application and processed that agreement through the Watermaster approval process in March 2004. The agreement was submitted to the Court for approval. Prior to Court approval, MWDSC is utilizing its existing Trust Storage Account with the intention of

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transferring its water stored in the Trust Account into the DYY account upon approval of the Storage Agreement.

BACK-GROUND

Groundwater Modeling. The new Chino Basin groundwater model was completed and the draft modeling report was submitted to Watermaster in July 2003. In addition to evaluating the effects of the DYY program on the Basin, the model was used to:

- Develop draft future replenishment and wet water recharge criteria based on requirements described in the Section 7.1b of the Watermaster Rules and Regulations regarding the balance of recharge and discharge. (See Wildermuth, Analysis of Supplemental Water Recharge Pursuant to the Peace Agreement. To be filed with the Court.)
- Evaluate the cumulative effects of transfers among the Parties as described in Section 9.3 of the Watermaster Rules and Regulations. (See Wildermuth, Evaluation of the Cumulative Effects of Transfers Pursuant to the Peace Agreement. To be filed with the Court.)
- Describe pumping patterns in Management Zone 1 that will not reduce piezometric levels below current conditions.

These management criteria were incorporated into the DYY program. The results of this work were presented to the Pool Committees, Advisory Committee, and the Watermaster Board in June and August 2003, and the final report was submitted in September 2003.

BACK-GROUND

Engineering Review and Determination of the Operational Storage Requirement and Safe Storage. The Operational Storage Requirement was defined in the Peace Agreement as part of the storage in the Chino Basin "necessary to maintain the safe yield" of the Basin (Peace Agreement, Exhibit B – Implementation Plan, page 37). Safe storage is the maximum storage in the Basin that can occur without significant water quality and high groundwater related problems. The draft results of this work were presented to the Pool Committees, Advisory Committee, and the Watermaster Board in August 2003.

ON-GOING

Other Uses of the Groundwater Model in the OBMP Implementation. The groundwater model is currently being used to investigate alternative management strategies including reduced storage in the eastern part of the basin, expanded storage and recovery programs, and assessing hydraulic control with various appropriator proposed pumping alternatives in the southern Chino Basin.

CONCLUSION

THIS PERIOD

This has been an active reporting period for Watermaster, with major activities on a number of issues:

- Construction on Bid Packages 1 and 2 of the Recharge Facilities Improvement Project was completed, and construction on Bid Packages 3-6 is progressing on

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schedule. Demonstration projects for recharge in College Heights and Brooks Basins were undertaken.

- The groundwater level and quality monitoring programs have been reorganized to better support new initiatives, such as MZ1, HCMP, Nitrogen Loss, and Desalter Expansion. Selected wells are being equipped with automatic measuring and recording devices to continually collect water level data at wells at frequent intervals. Current field sampling and laboratory analyses have transitioned to the new monitoring program.
- Updated status reports were developed for Chino Basin plumes at Kaiser, GE Flat Iron, GE Test Cell, OIA and Chino Airport. An initial evaluation of potential perchlorate sources and plumes was undertaken based on an EDR database.
- Data from the Ayala Park Extensometer indicated that deformation within the aquifer system sediments has been primarily elastic compression and expansion during the 2003 pumping season and the 2003/04 recovery season. Additional test protocols are being developed for FY2004-05.
- The semi-annual benchmark survey was completed in April 2004, and the "proof of concept" InSAR study was successfully concluded.

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