2010 State of the Basin Exhibits

December 2011

Prepared for

Chino Basin Watermaster

Partners in Basin Management

Prepared by

Wildermuth Environmental Inc.

Table of Contents

Acronyms, Abbreviations, and Initialisms	
µg/L	micrograms per liter
1,1,1-TCA	1,1,1-trichloroethane
1,1-DCE	1,1-dichloroethene
1,2,3-TCP	1,2,3-trichloropropane
1,2-DCA	1,2-dichloroethane
acre-ft	acre-feet
acre-ft/yr	acre-feet per year
AWQ	ambient water quality
Basin Plan	Water Quality Control Plan for the Santa Ana River Basin
BM	bench mark
CAO	Cleanup and Abatement Order
CBWM ID	Chino Basin Watermaster Well Identification
CDA	Chino Desalter Authority
CDFM	cumulative departure from mean
CDPH	California Department of Public Health (formerly the Department of Health Services)
CIM	California Institution for Men
cis-1,2-DCE	cis-1,2-dichloroethene
CVWD	Cucamonga Valley Water District
DLR	detection limit for reporting
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EPA	US Environmental Protection Agency
ft	feet
ft-bgs	feet below ground surface
ft-brp	feet below reference point (*e.g.* static surveyed measurement point)
FY	fiscal year
GE	General Electric
GIS	Geographic Information System
GSWC	Golden State Water Company
HCMP	Hydraulic Control Monitoring Program

Acronyms, Abbreviations, and Initialisms	
IEUA	Inland Empire Utilities Agency
InSAR	Synthetic Aperture Radar Interferometry
ISOB	Initial State of the Basin
JCSD	Jurupa Community Services District
KM	kilometer
MCL	maximum contaminant level
mg/L	milligrams per liter
MSL	Milliken Sanitary Landfill
MVWD	Monte Vista Water District
MWDSC	Metropolitan Water District of Southern California
MZ	Management Zone
NO_3 - N	nitrate expressed as nitrogen
ND	non-detect
OBMP	Optimum Basin Management Program
PBMZ	Prado Basin Management Zone
PCE	tetrachloroethene
POTW	Publicly Owned Treatment Works
RP	Regional Plant
RWQCB	Regional Water Quality Control Board
SARWC	Santa Ana River Water Company
SBCFCD	San Bernardino County Flood Control District
SOB	State of the Basin
SWP	State Water Project
TCE	trichloroethene
TDS	total dissolved solids
US EPA	US Environmental Protection Agency
USGS	US Geological Survey
VOC	volatile organic compound
Watermaster	Chino Basin Watermaster
WEI	Wildermuth Environmental, Inc.
XRef	anonymous well reference ID assigned by Watermaster

The Chino Basin Optimum Basin Management Program (OBMP) was developed pursuant to the Judgment (*Chino Basin Municipal Water District v. City of Chino, et al.*) and a ruling by the Court on February 19, 1998. The OBMP maps a strategy that provides for the enhanced yield of the Chino Basin and seeks to provide reliable, high-quality, water supplies for the development that is expected to occur within the Basin. An important element of the OBMP is the monitoring of the Chino Basin and the periodic analysis and reporting of these data.

Monitoring is performed in accordance with *OBMP Program Element 1 – Develop and Implement a Comprehensive Monitoring Program*; this includes the monitoring of basin hydrology, operations (pumping and recharge), groundwater levels, groundwater quality, and ground levels (subsidence). This monitoring is performed by basin pumpers, Chino Basin Watermaster (Watermaster) staff, and other cooperating entities. Watermaster staff collects and compiles the monitoring data into relational databases for analysis.

As a reporting mechanism and pursuant to the OBMP Phase 1 Report, the Peace Agreement and its associated Implementation Plan, and the November 15, 2001 Court Order, Watermaster staff prepares a *State of the Basin* report every two years. In October 2002, Watermaster completed the *Initial State of the Basin* report (WEI, 2002). The baseline for this report was on or about July 1, 2000—the point in time that represents the start of OBMP implementation. Subsequent *State of the Basin* reports (WEI, 2005; 2007; 2009) were used to:

- Demonstrate the progress made since fiscal year 2000/01, when Watermaster commenced several OBMP-spawned investigations and initiatives, encompassing groundwater levels and quality, ground levels, annual recharge assessments, recharge master planning, hydraulic control, desalter planning and engineering, and production meter installation.

- Show the current state of the Basin as of fiscal year 2009/10 with respect to groundwater levels, groundwater quality, ground levels (subsidence), recharge, and hydraulic control.

This 2010 *State of the Basin* report is an atlas-style document. It consists of detailed exhibits that characterize groundwater-level, groundwater quality, ground-level, and production data through fiscal year 2009/10. These exhibits are grouped into the following sections:

Introduction: This section describes the project background and objectives, a brief overview of the OBMP, and contains exhibits that show the Chino Basin Management Zones (MZ) and water service areas.

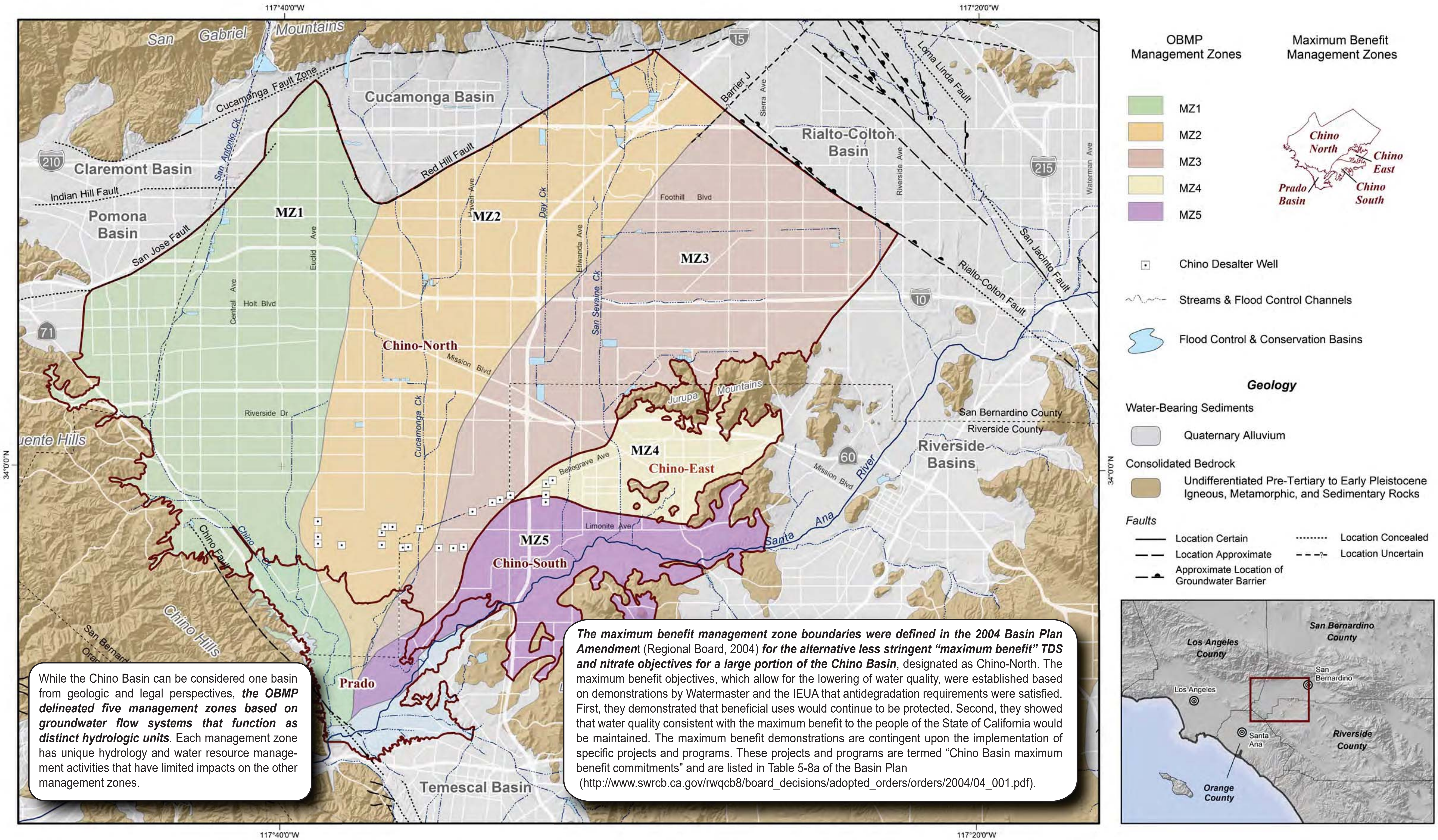
General Hydrologic Conditions: This section contains exhibits that characterize the broader hydrologic history of the Basin, specifically the Judgment period (1978 to the present), the Judgment base period (1965-1974), and the Peace Agreement period (2000 to the present). This information is useful for characterizing changes in Basin conditions (groundwater levels, storage, water quality, recharge and subsidence).

Basin Production and Recharge: This section contains exhibits that characterize groundwater production and recharge over time and space. This information is useful in understanding historical changes in groundwater levels and quality and for assessing future changes.

Groundwater Levels: This section contains exhibits that characterize the time history of groundwater levels throughout the Chino Basin and correlates the change in groundwater levels to observed precipitation, recharge, and groundwater pumping. This section also includes groundwater-level elevation contour maps for spring 2000 and spring 2010 and a groundwater elevation change map for 2000 to 2010.

Groundwater Quality: This section contains exhibits that characterize the time history of water quality throughout the Chino Basin. Constituents investigated include total dissolved solids (TDS), nitrate, and other constituents of concern. This characterization includes time history plots of TDS and nitrate, the spatial distribution of constituent concentrations in the Basin, and the current depiction of VOC plumes and other known point source plumes in the Chino Basin as of 2010.

Ground-Level Monitoring: This section contains exhibits that characterize the time history of vertical ground motion data for the monitoring done in MZ1 and MZ2—where land subsidence is a concern—and includes time histories of groundwater pumping, aquifer recharge, groundwater levels, and ground motion.



While the Chino Basin can be considered one basin from geologic and legal perspectives, ***the OBMP delineated five management zones based on groundwater flow systems that function as distinct hydrologic units***. Each management zone has unique hydrology and water resource management activities that have limited impacts on the other management zones.

The maximum benefit management zone boundaries were defined in the 2004 Basin Plan Amendment (Regional Board, 2004) ***for the alternative less stringent "maximum benefit" TDS and nitrate objectives for a large portion of the Chino Basin***, designated as Chino-North. The maximum benefit objectives, which allow for the lowering of water quality, were established based on demonstrations by Watermaster and the IEUA that antidegradation requirements were satisfied. First, they demonstrated that beneficial uses would continue to be protected. Second, they showed that water quality consistent with the maximum benefit to the people of the State of California would be maintained. The maximum benefit demonstrations are contingent upon the implementation of specific projects and programs. These projects and programs are termed "Chino Basin maximum benefit commitments" and are listed in Table 5-8a of the Basin Plan (http://www.swrcb.ca.gov/rwqcb8/board_decisions/adopted_orders/orders/2004/04_001.pdf).

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

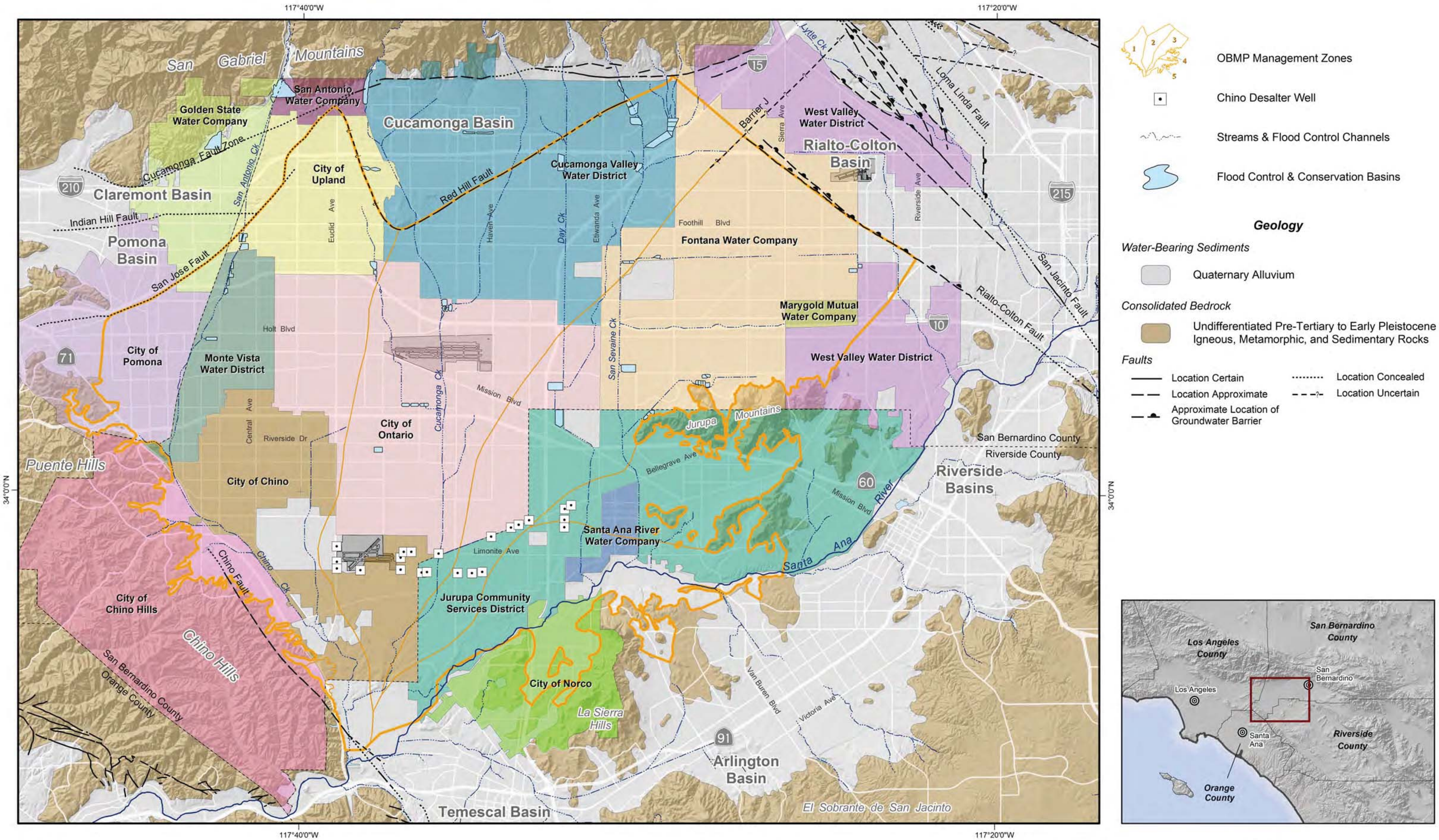
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110618
File: Exhibit_1.mxd

Chino Groundwater Basin

OBMP and Maximum Benefit Management Zones

Exhibit 1



Produced by:

WILDERMUTH ENVIRONMENTAL INC

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20111019
File: Exhibit_2

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Introduction

Water Service Areas of the Major Appropriative Pool Parties of the Chino Basin Watermaster

Exhibit 2

The exhibits in this section demonstrate the hydrologic setting of the Chino Basin and its importance to water supply and groundwater management within the Basin.

The Chino Basin covers about 240 square miles and is located centrally within the Santa Ana River Watershed. Exhibit 3 shows the location of the Chino Basin within the context of the upper portion of the Santa Ana River Watershed. The Santa Ana River flows southwest through the Chino Basin from the Riverside Narrows to the Prado Dam. Downstream of Prado Dam, the Santa Ana River flows through the Orange County Basin and out to the ocean. In total, the drainage area of the Santa Ana River Watershed prior to Prado Dam is about 1,490 square miles. In Chino Basin the following streams are tributary to the Santa Ana River: San Sevaine Creek, Day Creek, Deer Creek, Cucamonga Creek, and San Antonio/Chino Creek. These tributaries generally flow from north to south. The time of concentration[1] for the Santa Ana River at Riverside Narrows is estimated to be between one to two days. By contrast the time of concentration for tributaries that flow from north to south in the Chino Basin is a few hours.

Exhibit 3 shows the locations of three San Bernardino County Flood Control District (SBCFCD) precipitation stations: the San Bernardino Hospital station, located centrally in the Santa Ana River Watershed tributary to the Chino Basin; an Ontario hybrid station (combined records of SBCFCD 1017 and 1075), located in the central Chino Basin; and the Montclair station, located in the northwestern portion of the Basin. Exhibit 3 also shows the U.S. Geological Survey's stream-gaging stations on the Santa Ana River at Riverside Narrows (*SAR at MWD Xing*) and below Prado Dam (*SAR at Below Prado Dam).*

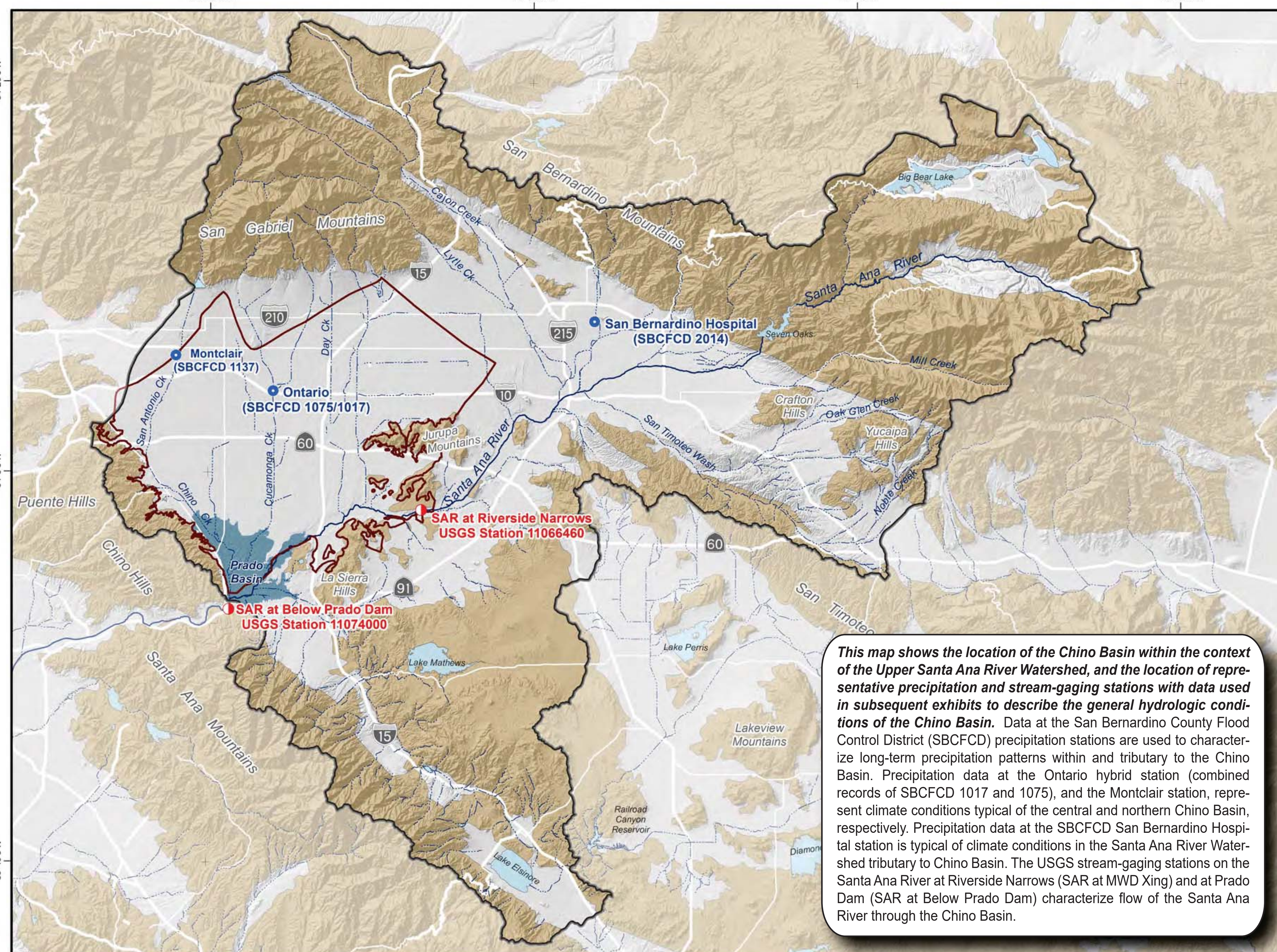
Precipitation is a major source of groundwater recharge in the Chino Basin; thus, the magnitude and temporal pattern of this recharge can be understood by analyzing long-term precipitation records. In Exhibit 4, annual precipitation totals are plotted from the Ontario station (1915 to 2010) and the San Bernardino Hospital station (1901 to 2010). Exhibit 4 characterizes the long-term precipitation trends within and upstream of the Chino Basin. The mean annual precipitation totals at the Ontario and San Bernardino Hospital stations are 15.41 inches and 16.38 inches, respectfully. Exhibit 4 also includes a plot of the cumulative departure from mean precipitation (CDFM), which is used to characterize the occurrence and magnitude of the wet and dry periods. Positive sloping segments of the CDFM plot (trending upward to the right) indicate wet periods, and negative sloping segments of the CDFM plot (trending downward to the right) indicate dry periods. The longest dry period for the 1900 to 2010 historical record is from 1945 to 1976—a 32 year period.

The safe yield of the Chino Basin was computed for the stipulated Judgment in 1978. The base period used to compute the safe yield was 1965 through 1974, a period of ten years. This base period had two years of above average precipitation, eight years of below average precipitation, and falls within the 1945 through 1976 dry period. The average annual precipitation for the base period was 14.64 inches, or 0.77 inches less than the long-term annual average. The post-Peace-Agreement period runs from July 2000 to present, an eleven-year period. The post-Peace-Agreement period contains three years of above-average precipitation and eight years below average precipitation. The average annual precipitation during the post-Peace-Agreement period is 13.32 inches, or 2.09 inches less than the long-term annual average, which is comparable to the 1945 through 1976 dry period. Recharge from precipitation during the base period in which the safe yield was initially estimated— and the post-Peace-Agreement period, are less than average; thus the yield developed during these periods is likely less than the yield that would be developed from a longer more hydrologically representative period.

Exhibit 5 shows the historical relationship between precipitation and storm water discharge in the Chino Basin and uses a double-mass curve analysis to illustrate the change in the precipitation-discharge relationship. A double-mass analysis is an arithmetic plot of the accumulated values of observations for two related variables that are paired in time and thought to be related. As long as the relationship between those two variables remains constant, the double-mass curve will appear as a straight line (constant slope). A change in slope indicates that the relationship has changed; the break in slope denotes the timing of that change.

Specifically, in Exhibit 5, the double-mass curve analysis was used to look at precipitation versus storm water discharge reckoned at Prado Dam (*SAR at Below Prado Dam),* and precipitation versus storm water discharge generated between Riverside Narrows and Prado Dam (storm water reckoned at *SAR at Below Prado Dam* minus storm water reckoned at *SAR at MWD Xing).* In each plot, the slope of the double-mass curve after water year 1976/77 is much steeper than prior years. The change in curvature suggests that a significant change occurred in the precipitation-discharge relationship: there is an increase in the magnitude of storm water discharge starting in the late 1970s. This increase in storm water discharge is due to land surface modifications caused by the conversion from agricultural to urban uses, the rapid post-1969 lining of stream channels in the Chino Basin and elsewhere in the upper Santa Ana Watershed, and other associated drainage system modifications. The hydrologic effects of land use changes and channel lining were apparently masked by the below average precipitation years that preceded the 1978 through 1983 wet period. These charts indicate that storm water recharge in the Chino Basin declined as the channels were lined and that storm water available for recharge in the Basin has increased significantly with the urbanization. In fact, the average annual decrease in storm water recharge due to lining of stream channels in the Chino Basin was recently estimated to be about 16,000 acre-ft/yr (WEI, 2010).

[1] The time of concentration is the time it takes for runoff from the most distant upstream part of the watershed to reach a specified point of interest.



This map shows the location of the Chino Basin within the context of the Upper Santa Ana River Watershed, and the location of representative precipitation and stream-gaging stations with data used in subsequent exhibits to describe the general hydrologic conditions of the Chino Basin. Data at the San Bernardino County Flood Control District (SBCFCD) precipitation stations are used to characterize long-term precipitation patterns within and tributary to the Chino Basin. Precipitation data at the Ontario hybrid station (combined records of SBCFCD 1017 and 1075), and the Montclair station, represent climate conditions typical of the central and northern Chino Basin, respectively. Precipitation data at the SBCFCD San Bernardino Hospital station is typical of climate conditions in the Santa Ana River Watershed tributary to Chino Basin. The USGS stream-gaging stations on the Santa Ana River at Riverside Narrows (SAR at MWD Xing) and at Prado Dam (SAR at Below Prado Dam) characterize flow of the Santa Ana River through the Chino Basin.

- SBCFCD Precipitation Station
- USGS Stream-gaging Station
- Santa Ana River Watershed Tributary to Prado Dam (Upper Watershed)
- Chino Basin Hydrologic Boundary
- Streams & Flood Control Channels
- Santa Ana River
- Lakes and Reservoirs
- Prado Basin

Geology

Water-Bearing Sediments

- Quaternary Alluvium

Consolidated Bedrock

- Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Produced by:

WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

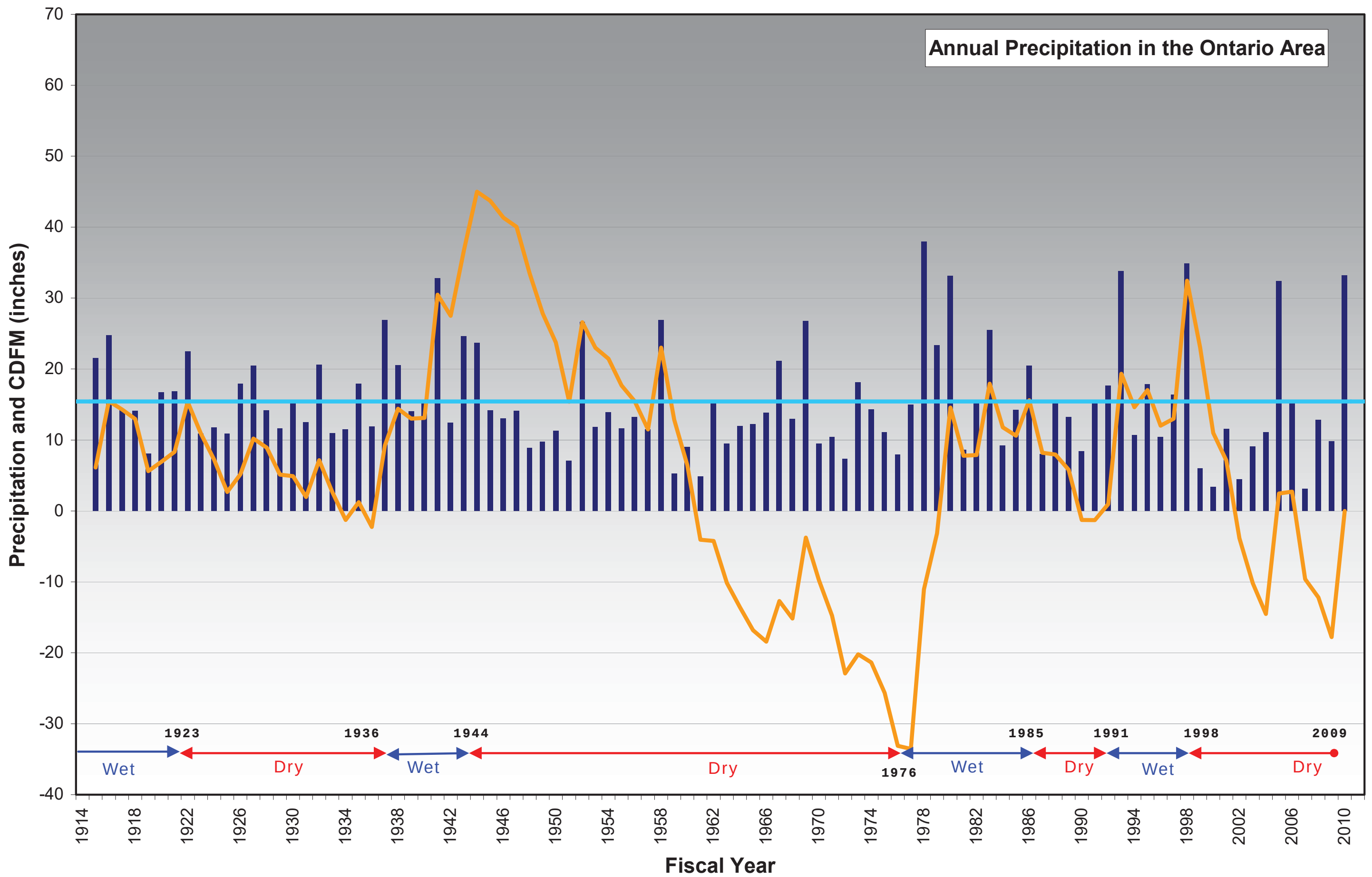
Author: MAB
Date: 20110627
File: Exhibit_3.mxd

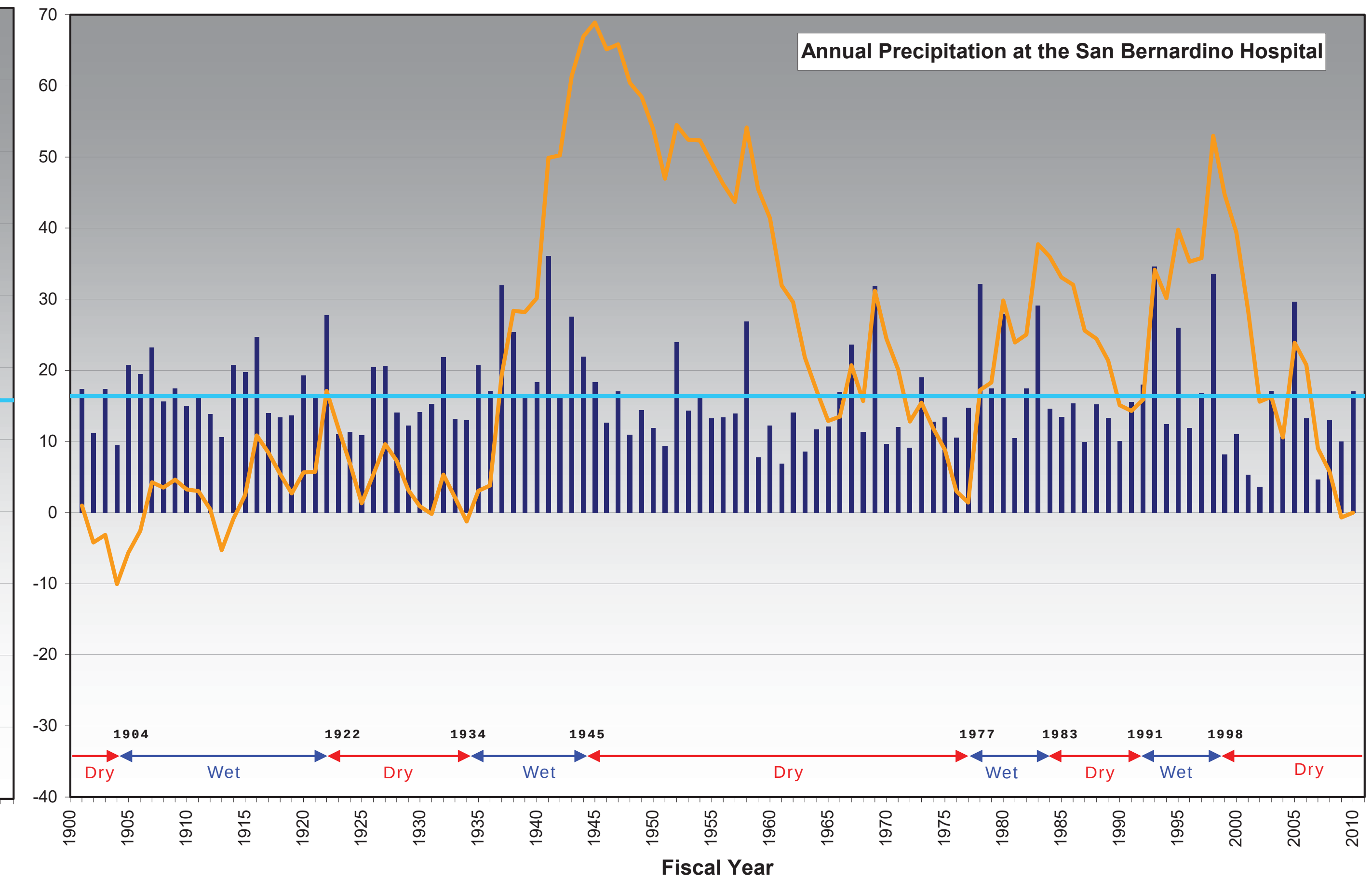
0 5 10 15 Miles
0 10 20 KM

2010 State of the Basin
General Hydrologic Conditions

Santa Ana River Watershed Tributary to Prado Dam

Exhibit 3





Annual Statistics of Long-Term Precipitation Records
(inches)

Statistics	Ontario Area*	San Bernardino Hospital
Period of Record (Fiscal Year)	1915 to 2010	1901 to 2010
Mean	15.41	16.36
Minimum	3.09	3.61
Maximum	37.92	36.10
Standard Deviation	7.56	6.70
Mean + 1 Standard Deviation	22.97	23.06
Coefficient of variation	49%	41%

*Note: Two precipitation stations in the Ontario Area (SBCFCD 1075 and 1017) were combined to create a long-term record. These two precipitation stations are in close proximity to each other, and their overlapping records are highly correlated. Recent data is from SBCFCD Station 1017.

The Chino Basin has a semi-arid Mediterranean climate. Precipitation is a major source of groundwater recharge for the Basin; thus, the magnitude and temporal pattern of this recharge can be understood by analyzing long-term precipitation records. Shown here are the long-term precipitation records for the Ontario Area (located centrally within the Chino Basin) and the San Bernardino Hospital (located within the Santa Ana River Watershed, upstream of the Chino Basin). These figures show the fiscal year annual precipitation totals, long-term average annual precipitation, and the cumulative departure from mean precipitation (CDFM). ***The CDFM plot is a useful way to characterize the occurrence and magnitude of wet and dry periods: positive sloping segments (trending upward to the right) indicate wet periods, and negative sloping segments (trending downward to the right) indicate dry periods.*** In the Ontario area, four series of wet-dry cycles are apparent: prior to 1914 through 1936, 1937 through 1976, 1977 through 1991, and 1992 through 2009. The record of the San Bernardino Hospital station shows the same pattern of wet-dry cycles. The ratio of dry years to wet years is about three to two. That is, for every ten years, about six years will have below average precipitation and four years will have greater than average precipitation. That said, the 1945 through 1976 dry period is 32 years long. During this dry period, in the Ontario area there were 26 dry years to 6 wet years, averaging about 2.38 inches/year below the average annual precipitation, and at the San Bernardino station, there were 24 dry years to 8 wet years, averaging about 2 inches/year below the average annual precipitation.

The base period used to compute the safe yield of the Chino Basin in the 1978 Judgment was 1965 through 1974, a period of ten years. This base period had three years of above-average precipitation and seven years of below-average precipitation, and falls within the 1945 through 1976 dry period. The average annual precipitation for the base period was 14.64 inches, or 0.77 inches less than the long-term annual average. The post-Peace-Agreement period runs from July 2000 to present, an eleven-year period. The post-Peace-Agreement period contains three above-average precipitation years: 2005, 2006, and 2010; the remaining years had below average precipitation. The average annual precipitation during the post Peace Agreement period was 13.32 inches, or 2.09 inches less than the long-term annual average, which is comparable to the 1945 through 1976 dry period. ***One of the takeaways from these charts is that the recharge from precipitation during the base period in which the safe yield was initially estimated— and the post-Peace-Agreement period, should be less than average; thus, the yield developed during these periods is likely less than the yield that would be developed from a longer more hydrologically-representative period.***

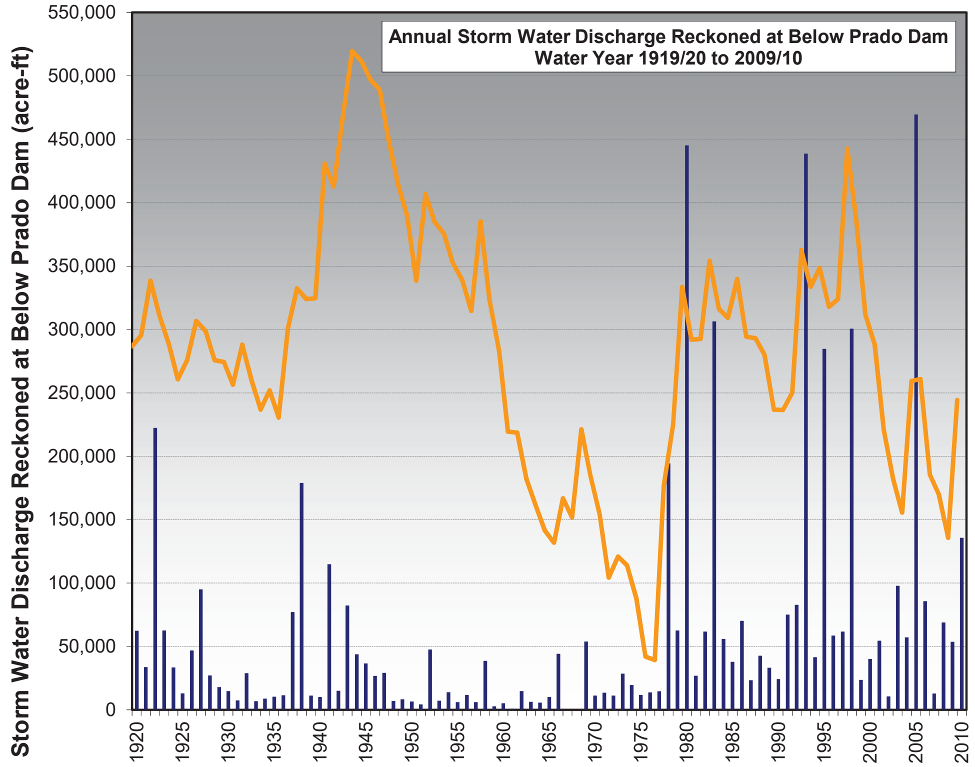
Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com
Author: SSA/VMW
Date: 20110620
File: Exhibit_4.grf

Cumulative Departure from Mean Precipitation
Long-Term Average Precipitation
Annual Precipitation

2010 State of the Basin
General Hydrologic Conditions

Long-Term Precipitation Within and Upstream of the the Chino Basin

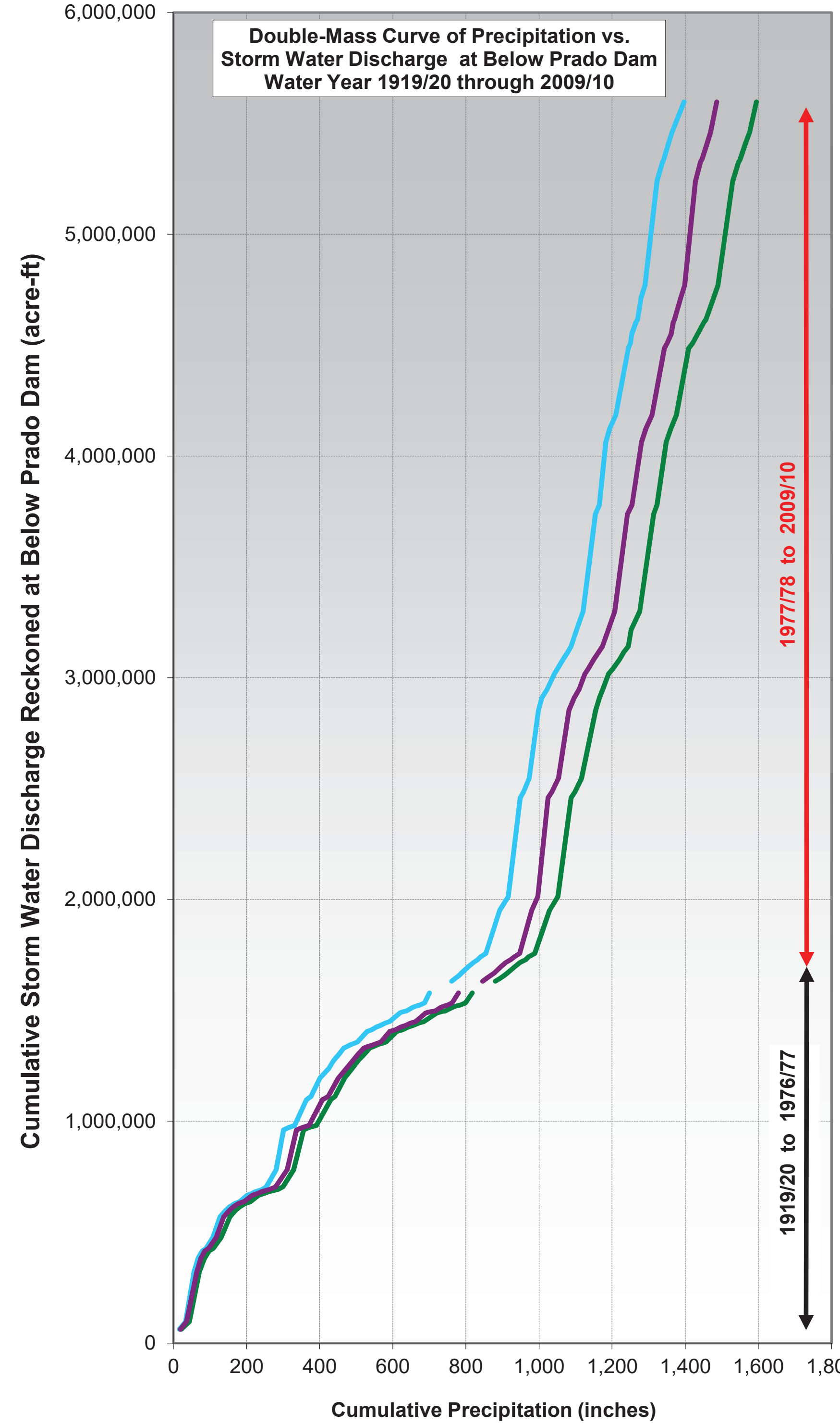
Exhibit 4

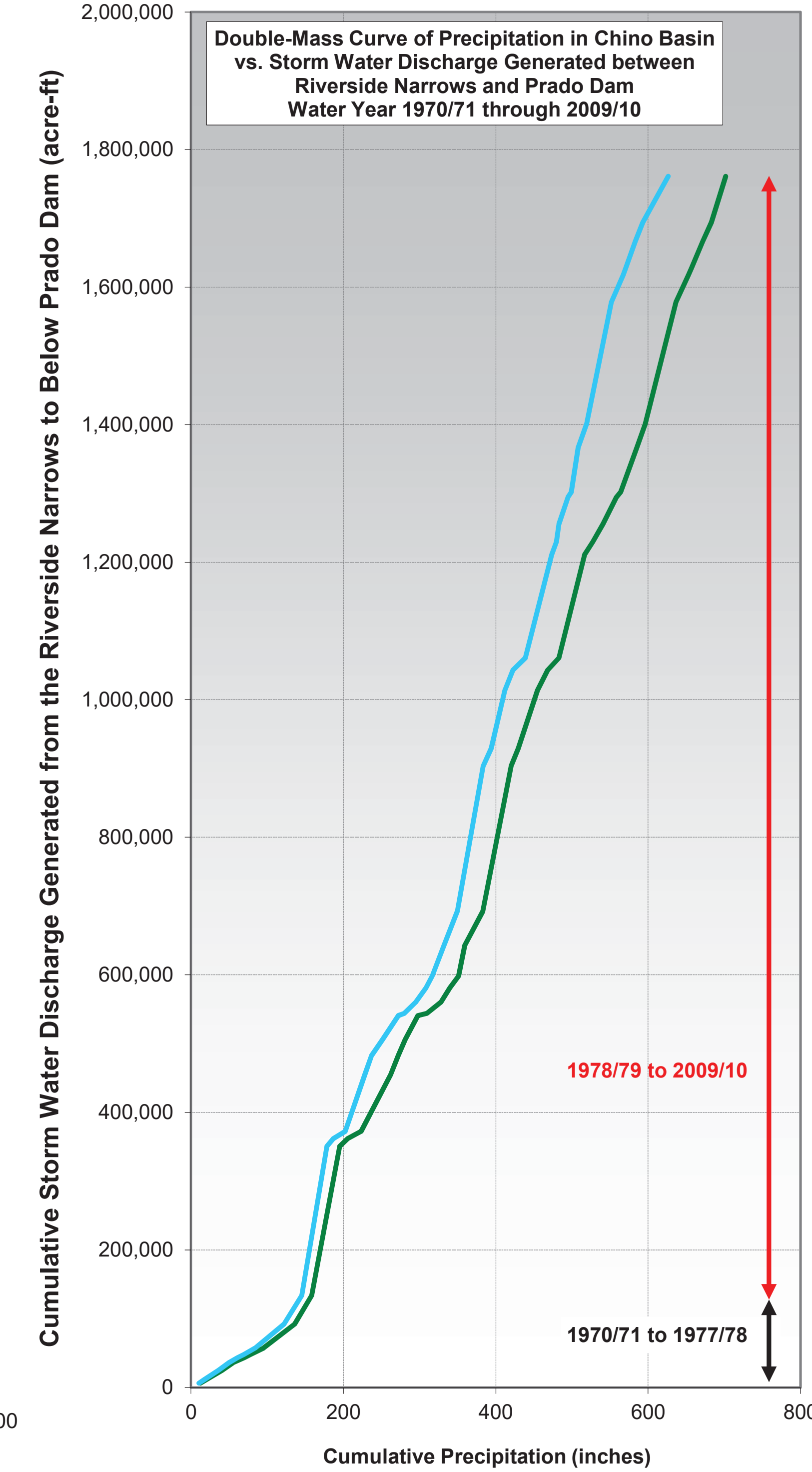


*Storm Water Discharge data at Below Prado Dam is not available for 1967 or 1968

As seen in the graph entitled Annual Storm Water Discharge Reckoned at Below Prado Dam, around water year 1976/77, the relationship of precipitation to storm water discharge changed significantly such that there was more discharge per unit of precipitation produced after this time (compare the amount of storm water runoff for the 1936 to 1944 wet period with the 1977 to 1983 wet period).

A double-mass curve analysis can illustrate the change in the precipitation-runoff relationship. ***A double-mass curve analysis is an arithmetic plot of the accumulated values of observations for two related variables that are paired in time and thought to be related.*** As long as the relationship between those two variables remains constant, the double-mass curve will appear as a straight line (constant slope). A change in slope indicates that the relationship has changed; the break in slope denotes the timing of that change. Shown here are double-mass curves of precipitation at stations in and around the Chino Basin versus: storm water discharge reckoned at Below Prado Dam; and storm water discharge generated between Riverside Narrows and Prado Dam (storm water discharge reckoned at *SAR at Below Prado Dam* minus storm water discharge reckoned at *SAR at MWD Xing*). Note that in each plot, the slope of the double-mass curve after water year 1976/77 is much steeper than prior years. The change in curvature suggests that a significant change occurred in the precipitation-discharge relationship: there is an increase in the magnitude of storm water discharge starting in the late 1970s. This increase in storm water discharge is due to land surface modifications caused by the conversion from agricultural to urban uses, the rapid post-1969 lining of stream channels in the Chino Basin and elsewhere in the upper Santa Ana Watershed, and other associated drainage system improvements. The hydrologic effects of the land use changes and channel lining were apparently masked by the below average precipitation years preceding the 1977 through 1983 wet period. ***These charts indicate that storm water recharge in the Chino Basin declined as the channels were lined and that the storm water available in the Basin for recharge has increased significantly with the urbanization.*** The average annual decrease in storm water recharge due to the lining of stream channels in the Chino Basin was estimated to be about 16,000 acre-ft/yr (WEI, 2010).





Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com
Author: SSA
Date: 20110620
File: Exhibit_4.gpj

Cumulative Departure from Mean Precipitation (Ontario Station)

Storm Water at Prado Dam

Cumulative Precipitation at Montclair

Cumulative Precipitation at Ontario

Cumulative Precipitation at San Bernardino Hospital

2010 State of the Basin
General Hydrologic Conditions

Relationship of Precipitation and Storm Water Discharge in the Chino Basin

1919/20 - 2009/10

Exhibit 5

The exhibits in this section characterize the physical state of the Chino Basin with respect to groundwater production, artificial recharge, and groundwater storage.

Future re-determinations of safe yield for the Chino Basin will be based largely on accurate estimations of groundwater production, artificial recharge, and basin storage changes over time. Since its establishment in 1978, Watermaster has collected information to develop groundwater production estimates. Appropriative Pool, Overlying Non-Agricultural Pool, and Chino Desalter well production estimates are based on flow-meter data that are provided by producers on a quarterly basis. Agricultural Pool estimates are based on water duty methods and meter data. The Watermaster Rules and Regulations require groundwater producers that produce in excess of 10 acre-feet per year (acre-ft/yr) to install and maintain meters on their well(s). In 2000, Watermaster initiated a meter installation and meter-reading program for agricultural pool wells. Watermaster staff the completed installation of these meters. Watermaster records production data from these meters on a quarterly basis. All production data in the Chino Basin are entered into Watermaster's database. Exhibit 6 shows, by pool, the locations of all active wells in fiscal year (FY) 2009/10.

Exhibit 7 depicts the distribution of production by pool for FY 1977/78 through 2009/10. The annual production amounts by pool for FY 1977/78 through 2009/10 are listed in Exhibit 13. During this period, annual groundwater production ranged from a high of about 189,000 acre-ft (FY 2008/09) to a low of about 122,000 acre-ft (FY 1982/83) and averaged about 154,000 acre-ft/yr. The distribution of production by pool has shifted since 1977. Agricultural Pool production, which has been mainly concentrated south of the 60 Freeway, dropped from about 56 percent of total production in FY 1977/78 to about 12 percent in FY 2009/10. During the same period, Appropriative Pool production, which has been mainly concentrated north of 60 Freeway, increased from about 38 percent of total production in FY 1977/78 to 81 percent in FY 2009/10 (for this characterization, this is the sum of production for the Appropriative Pool and the Chino Desalter Authority [CDA]). Increases in Appropriative Pool production have approximately kept pace with the decline in agricultural production. Production in the Overlying Non-Agricultural Pool declined from about 6 percent of total production in FY 1977/78 to about 1 percent in FY 2009/10.

Exhibits 8 through 10 illustrate the location and magnitude of groundwater production at wells in the Chino Basin for FYs 1977/78 (Watermaster established), 1999/2000 (commencement of the OBMP), and 2009/2010 (current conditions). These figures indicate the following:

- There was a basin-wide increase in the number of wells producing over 1,000 acre-ft/yr between 1978 and 2010. This is consistent with (1) the land use transition from agricultural to urban, (2) the trend of increasing imported water costs, and (3) the use of desalters.
- From FY 1977/78 to FY 1999/2000, production at wells south of the 60 Freeway deceased from 59 percent to 32 percent of total production in the Chino Basin, while production at wells north of the 60 Freeway increased from 41 percent to 68 percent of total production. This shift in production patterns is due to a decline in irrigated agriculture and urbanization south of the 60 Freeway and an increase in urbanization north of the 60 Freeway.
- Since the implementation of the OBMP in 2000, desalter pumping has progressively increased; in 2008/09, desalter pumping reached a historical high of 30,121 acre-ft.
- From FY 1999/2000, production at wells north of the 60 Freeway slightly deceased from 68 percent to 64 percent of total production in the Chino Basin, while production at wells south of the 60 Freeway increased from 32 percent to 36 percent of total production. Since 2000, the number of active agricultural wells in the southern portion of the basin continued to decrease by about 50 percent; the 4 percent increase in total groundwater production at wells south of the 60 Freeway since FY 1999/2000 is due to the onset of desalter well production, which began in late 2000 and progressively increased to about 29,000 acre-ft in fiscal 2009/2010.

Watermaster initiated the Chino Basin Groundwater Recharge Program. This is a comprehensive program to enhance water supply reliability and improve the groundwater quality of local drinking water wells throughout the Chino Basin by increasing the recharge of storm water, imported water, and recycled water. The general recharge requirements for the Chino Basin are outlined in Section 5.1 of the Peace Agreement—Recharge and Replenishment—and Article 8 of the Peace II Agreement. The requirements of the Peace Agreement are further discussed and expanded on in the 2010 Recharge Master Plan Update (WEI, 2010).

The Recycled Water Groundwater Recharge Program, which is implemented by the IEUA and Watermaster, is subject to the following requirements:

- California Regional Water Quality Control Board, Santa Ana Region. Order No. R8-2007-0039. Water Recycling Requirements for Inland Empire Utilities Agency and Chino Basin Watermaster, Chino Basin Recycled Groundwater Recharge Program, Phase I and Phase II Projects, San Bernardino County. June 29, 2007.
- California Regional Water Quality Control Board, Santa Ana Region. Order No. R8-2009-0057. Amending Order No. R8-2007-0039, Water Recycling Requirements for Inland Empire Utilities Agency and Chino Basin Watermaster, Chino Basin Recycled Groundwater Recharge Program, Phase I and Phase II Projects, San Bernardino County. October 30, 2009
- California Regional Water Quality Control Board, Santa Ana Region. Revised Monitoring and Reporting Program No. R8-2007-0039 for the Inland Empire Utilities Agency and Chino Basin Watermaster, Chino Basin Recycled Groundwater Recharge Program, Phase I and Phase II Projects, San Bernardino County. October 27, 2010.

Exhibit 11 shows the locations of the groundwater recharge basins. Storm water, urban runoff, recycled water, and imported water amounts recharged to basins are monitored and recorded by the IEUA. Exhibit 12 lists the operable recharge facilities in the Chino Basin and summarizes annual recharge (by type) for the period of June 1, 2000 through June 30, 2010.[2] The following are the general trends in groundwater recharge:

- Storm water runoff recharge amounts prior to FY 2004/05 were not measured. Since FY 2004/05, total storm water recharge amounts have ranged from 4,745 acre-ft/yr to 17,648 acre-ft/yr and have averaged approximately 11,200 acre-ft/yr. The recharge and monitoring of storm water is important to Watermaster, as storm water recharge above 5,600 acre-ft/yr is considered new yield.
- Since 2000, the imported water recharge amounts have ranged from 0 acre-ft/yr to 34,567 acre-ft/yr and have

[2] The IEUA does not distinguish storm water from urban runoff in the recharge tabulations it submits to Watermaster.

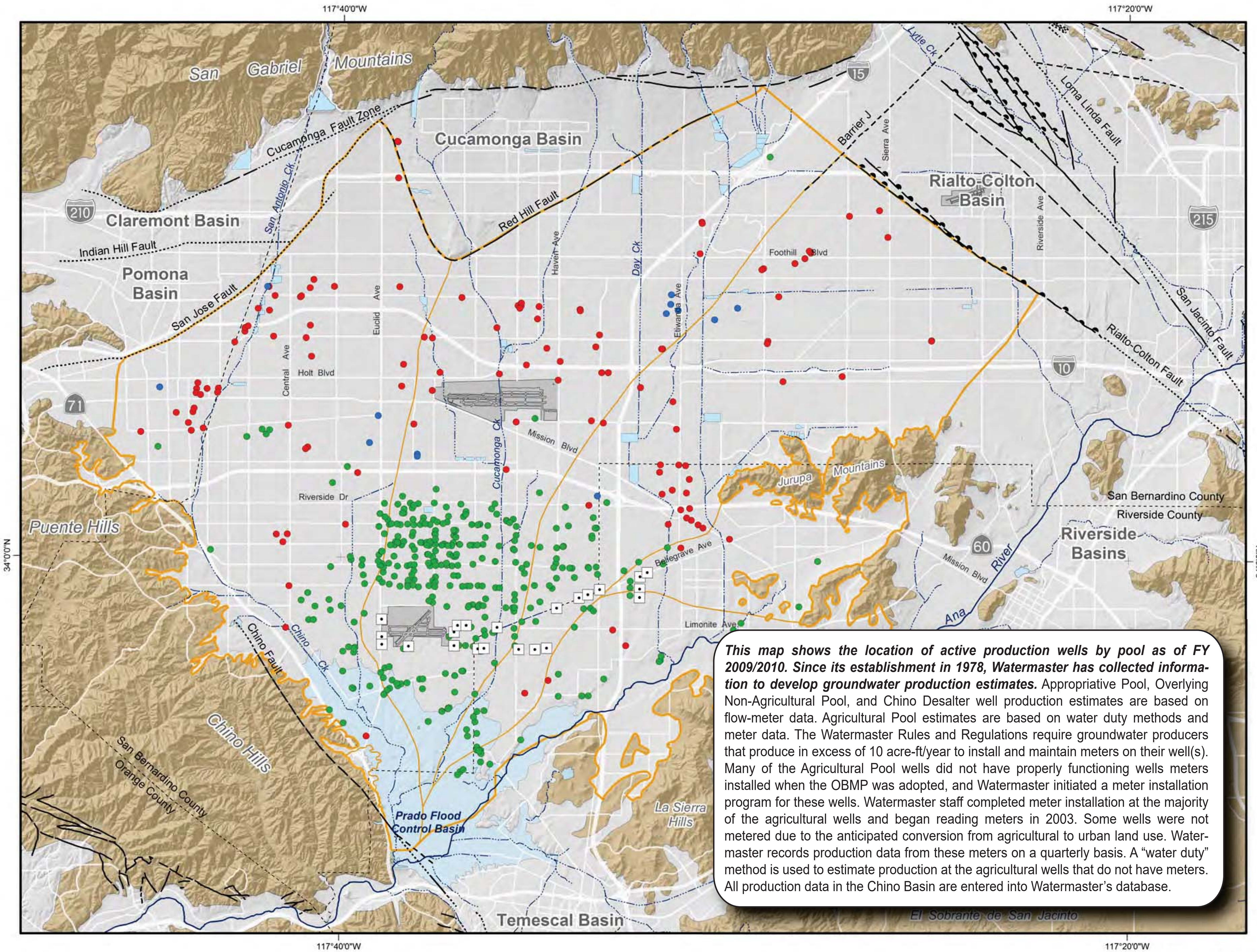
averaged about 11,100 acre-ft/yr. The wide range in annual imported water recharged is reflective of the MWDSC Dry Year Yield (DYY) program. During FY 2004/05, 2005/06, and 2006/07, imported water recharge was well above the period average because the MWDSC was doing a "put" operation pursuant to its DYY agreement with Watermaster and the IEUA. During FY 2007/08, 2008/09, and 2009/10, imported water recharge was below the period average or zero due to the lack of low cost replenishment service water from MWDSC.

- Since 2000, the amount of recycled water recharged ranged from 49 to 7,210 acre-ft/yr. In FY 2005/06, recycled water recharge increased from an average of about 280 acre-ft/yr to about 3,300 acre-ft/yr after the implementation of the Recycled Water Groundwater Recharge Program. After the expansion of the program in 2007, recycled water recharge continued to increase and reached a historical high of 7,210 acre-ft/yr in FY 2009/2010.

Exhibit 13 shows an accounting of the recharge and discharge in the Chino Basin for the period of 1977/78 to 2009/10, based on Watermaster records. The recharge components include: the safe yield; wet water recharge of replenishment water, including water for cyclic storage and other conjunctive use programs and the MZ1 recharge program; wet water recharge of recycled water; and new yield from new storm water recharge over 5,600 acre-ft/yr. From July 1, 1977 through June 30, 2010, total recharge in the Basin was about 5,072,626 acre-ft. The wet water recharge amounts for replenishment, recycled, and storm water amounts were obtained from Watermaster and IEUA records.

The discharge components include groundwater production by all Watermaster parties. All other discharges are assumed to be netted out in the safe yield. From July 1, 1977 through June 30, 2010, total discharge from the Chino Basin was about 5,065,951 acre-ft. Production amounts are the totals obtained from Watermaster's well production database.

The difference between recharge and discharge since the Judgment (July 1, 1977 through June 30, 2010) is 6,675 acre-ft. The difference between recharge and discharge since OBMP implementation (July 1, 1999 through June 30, 2010) is -162,104 acre-ft.



This map shows the location of active production wells by pool as of FY 2009/2010. Since its establishment in 1978, Watermaster has collected information to develop groundwater production estimates. Appropriative Pool, Overlying Non-Agricultural Pool, and Chino Desalter well production estimates are based on flow-meter data. Agricultural Pool estimates are based on water duty methods and meter data. The Watermaster Rules and Regulations require groundwater producers that produce in excess of 10 acre-ft/year to install and maintain meters on their well(s). Many of the Agricultural Pool wells did not have properly functioning wells meters installed when the OBMP was adopted, and Watermaster initiated a meter installation program for these wells. Watermaster staff completed meter installation at the majority of the agricultural wells and began reading meters in 2003. Some wells were not metered due to the anticipated conversion from agricultural to urban land use. Watermaster records production data from these meters on a quarterly basis. A "water duty" method is used to estimate production at the agricultural wells that do not have meters. All production data in the Chino Basin are entered into Watermaster's database.

Groundwater Production Wells by Pool

- Agricultural Pool (Pool 1)
- Overlying Non-Agricultural Pool (Pool 2)
- Appropriative Pool (Pool 3)
- Chino Desalter Authority
- OBMP Management Zones
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

- Quaternary Alluvium

Consolidated Bedrock

- Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110525
File: Exhibit_6.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Basin Production and Recharge

Active Groundwater Production Wells

Fiscal Year 2009/2010

Exhibit 6

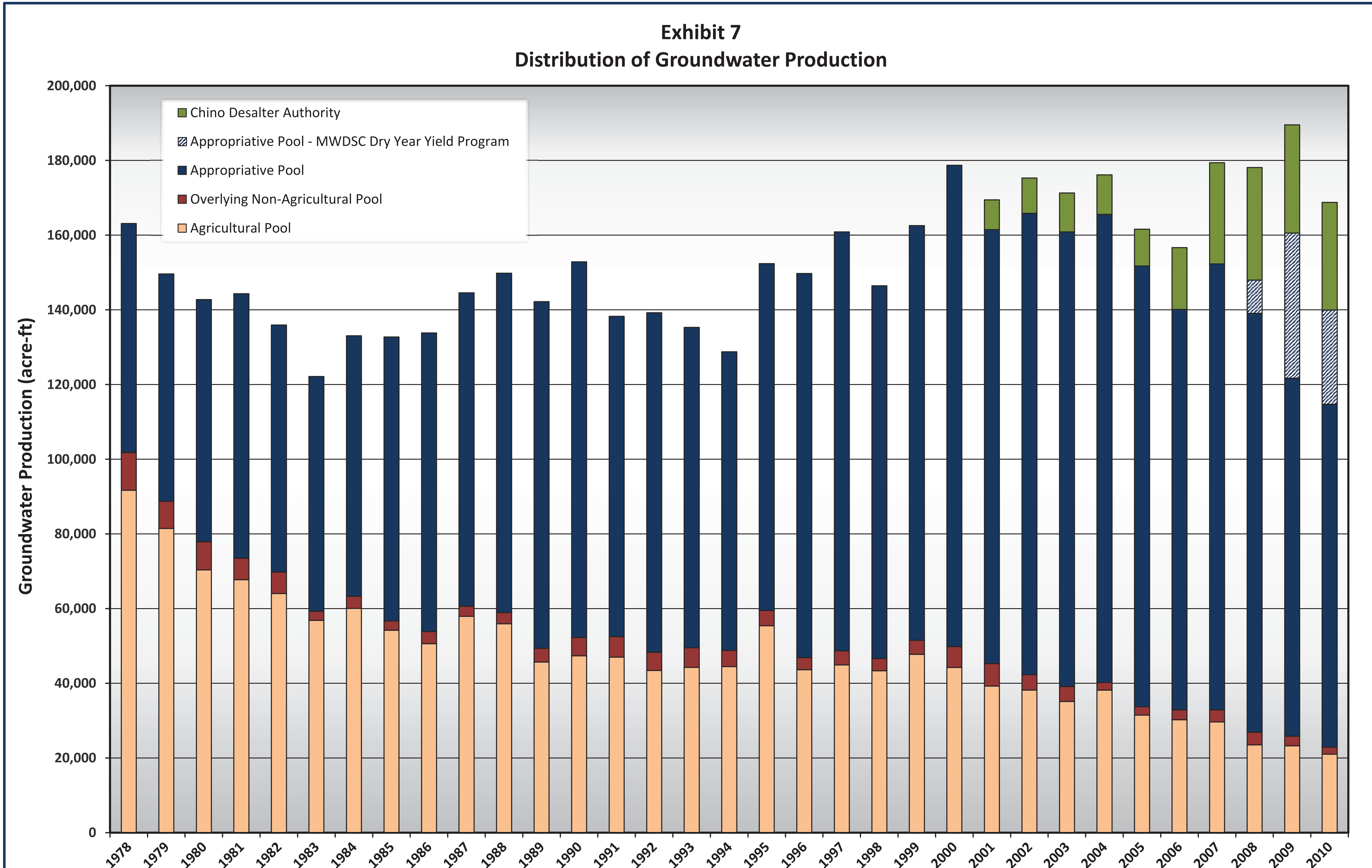
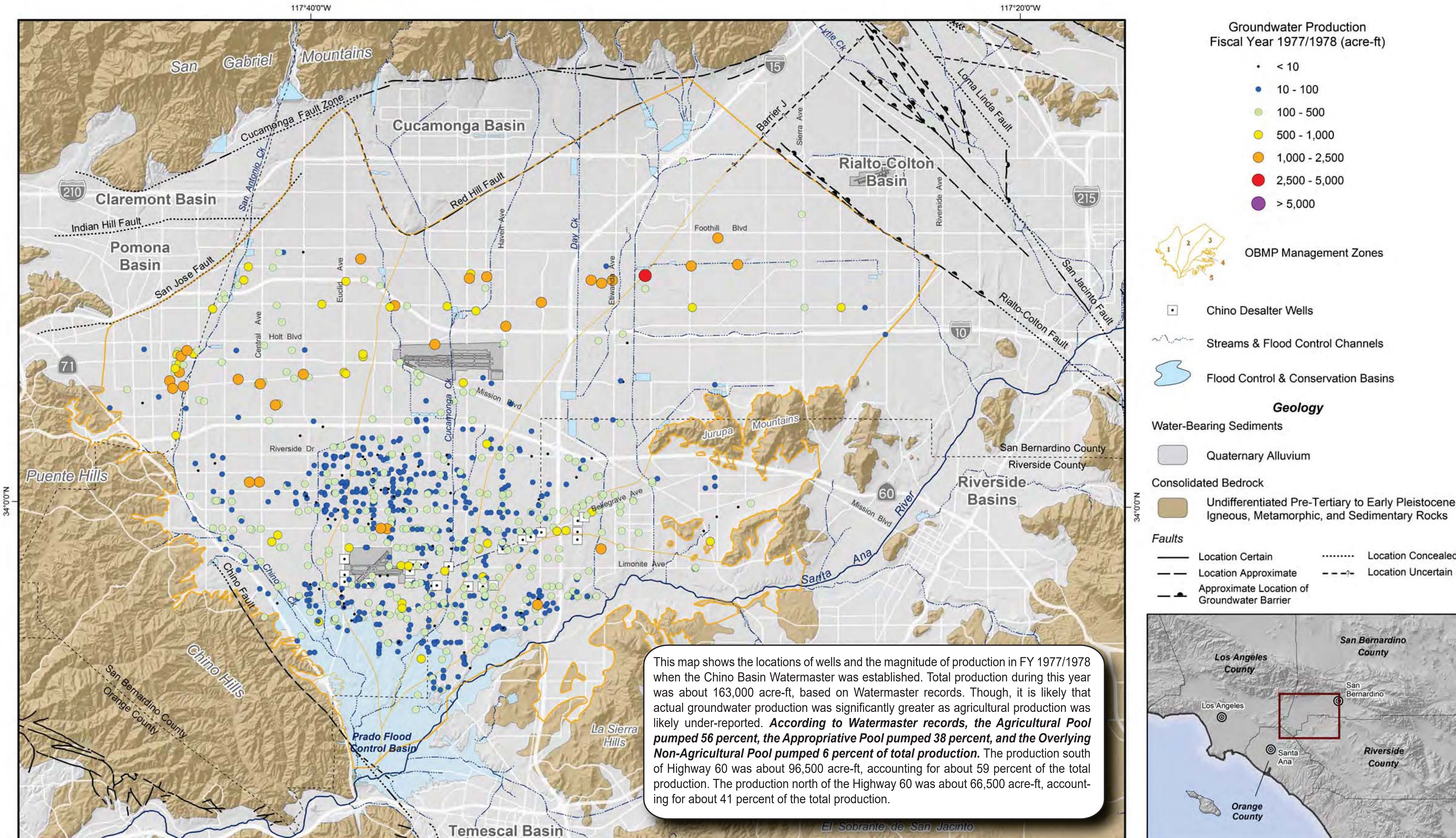


Exhibit 7
Distribution of Groundwater Production
Chino Desalter Authority
Appropriative Pool - MWDSC Dry Year Yield Program
Appropriative Pool
Overlying Non-Agricultural Pool
Agricultural Pool
Groundwater Production (acre-ft)
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010



This map shows the locations of wells and the magnitude of production in FY 1977/1978 when the Chino Basin Watermaster was established. Total production during this year was about 163,000 acre-ft, based on Watermaster records. Though, it is likely that actual groundwater production was significantly greater as agricultural production was likely under-reported. ***According to Watermaster records, the Agricultural Pool pumped 56 percent, the Appropriative Pool pumped 38 percent, and the Overlying Non-Agricultural Pool pumped 6 percent of total production.*** The production south of Highway 60 was about 96,500 acre-ft, accounting for about 59 percent of the total production. The production north of the Highway 60 was about 66,500 acre-ft, accounting for about 41 percent of the total production.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

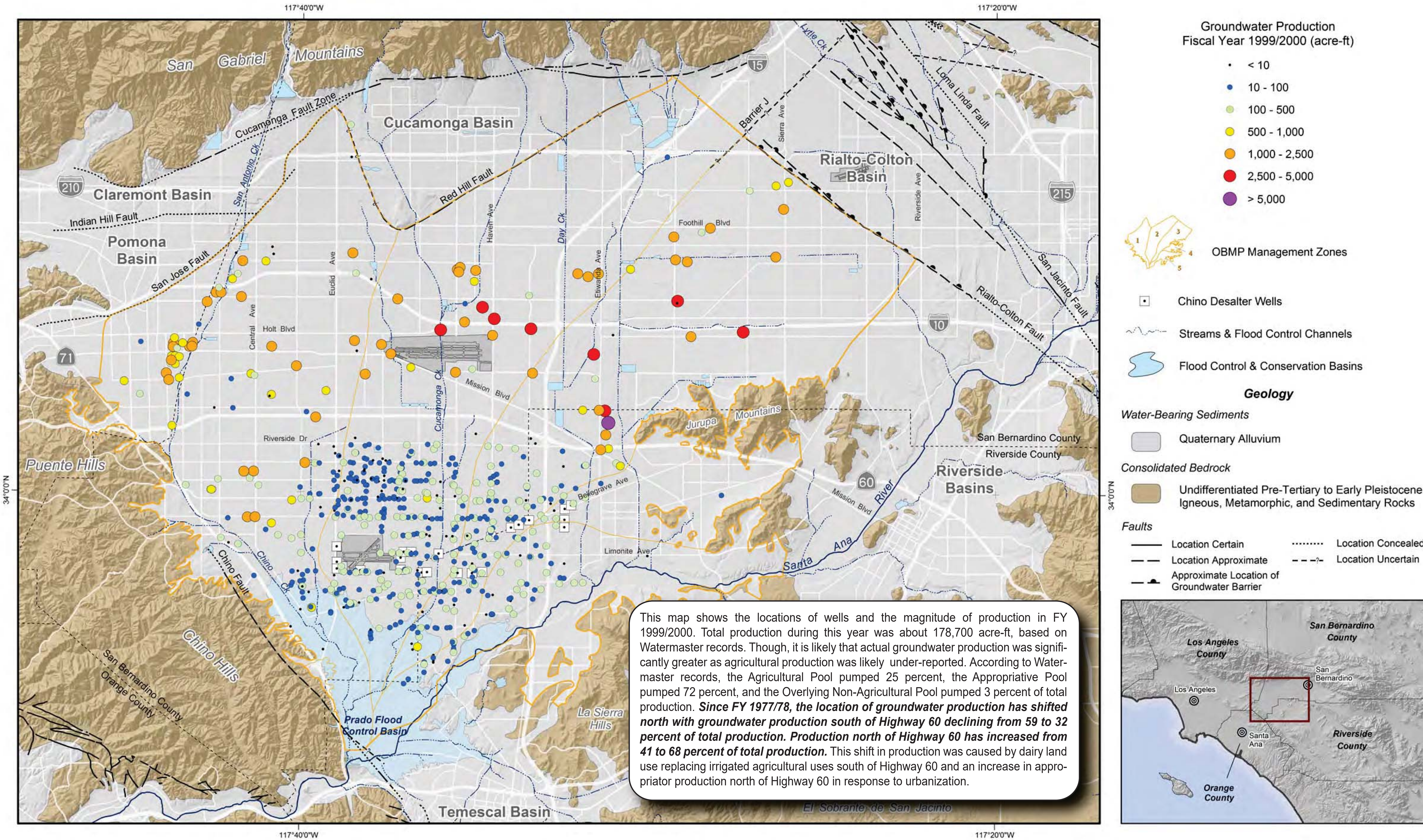
Author: VMW
Date: 20110618
File: Exhibit_8.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Basin Production and Recharge

Groundwater Production by Well
Fiscal Year 1977/1978

Exhibit 8



This map shows the locations of wells and the magnitude of production in FY 1999/2000. Total production during this year was about 178,700 acre-ft, based on Watermaster records. Though, it is likely that actual groundwater production was significantly greater as agricultural production was likely under-reported. According to Watermaster records, the Agricultural Pool pumped 25 percent, the Appropriative Pool pumped 72 percent, and the Overlying Non-Agricultural Pool pumped 3 percent of total production. ***Since FY 1977/78, the location of groundwater production has shifted north with groundwater production south of Highway 60 declining from 59 to 32 percent of total production. Production north of Highway 60 has increased from 41 to 68 percent of total production.*** This shift in production was caused by dairy land use replacing irrigated agricultural uses south of Highway 60 and an increase in appropriator production north of Highway 60 in response to urbanization.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110618
File: Exhibit_9.mxd

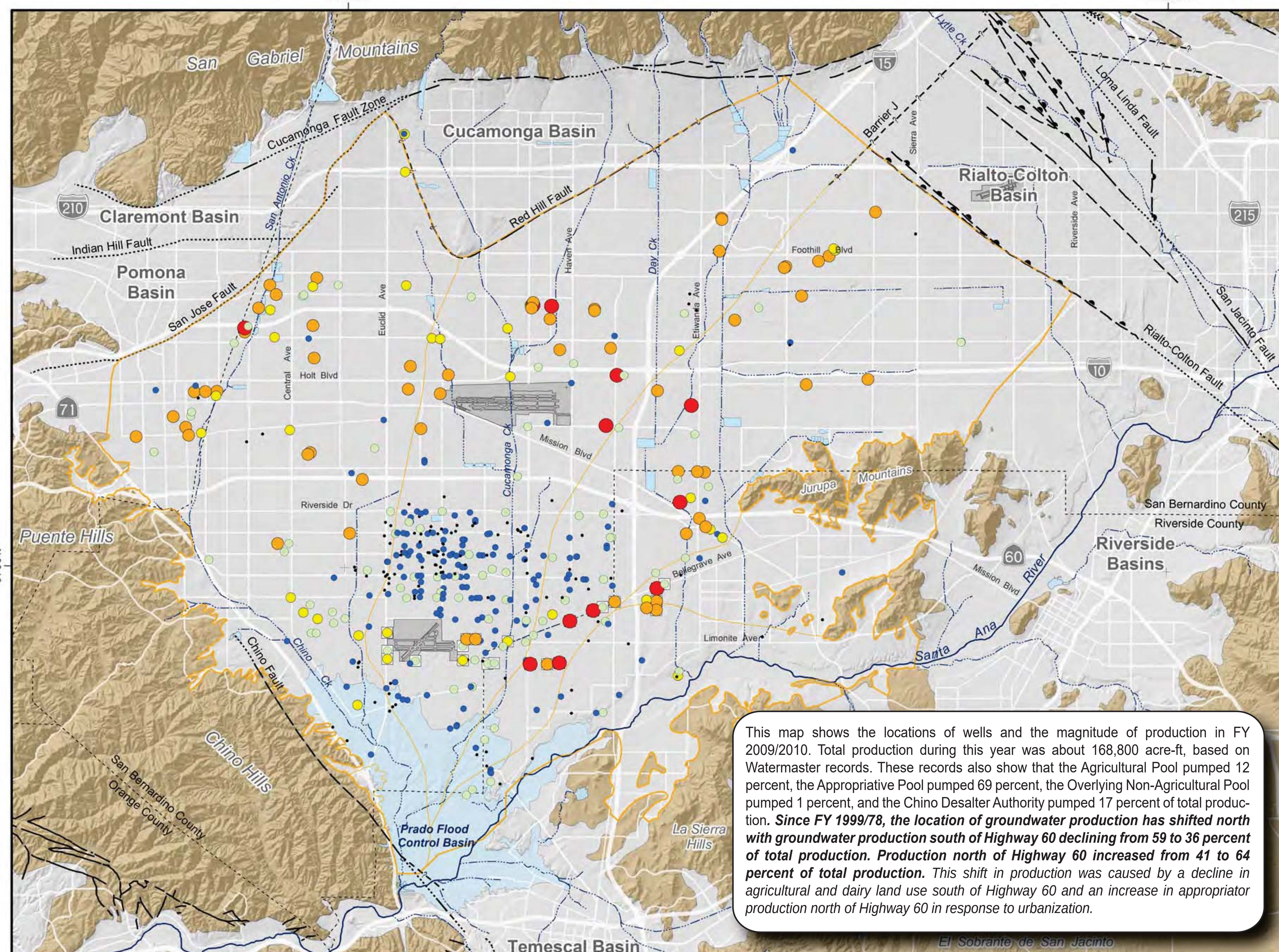
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Basin Production and Recharge

Groundwater Production by Well

Fiscal Year 1999/2000

Exhibit 9



This map shows the locations of wells and the magnitude of production in FY 2009/2010. Total production during this year was about 168,800 acre-ft, based on Watermaster records. These records also show that the Agricultural Pool pumped 12 percent, the Appropriative Pool pumped 69 percent, the Overlying Non-Agricultural Pool pumped 1 percent, and the Chino Desalter Authority pumped 17 percent of total production. ***Since FY 1999/78, the location of groundwater production has shifted north with groundwater production south of Highway 60 declining from 59 to 36 percent of total production. Production north of Highway 60 increased from 41 to 64 percent of total production.*** *This shift in production was caused by a decline in agricultural and dairy land use south of Highway 60 and an increase in appropriator production north of Highway 60 in response to urbanization.*

Groundwater Production
Fiscal Year 2009/2010 (acre-ft)

- < 10
- 10 - 100
- 100 - 500
- 500 - 1,000
- 1,000 - 2,500
- 2,500 - 5,000
- > 5,000

OBMP Management Zones

Chino Desalter Wells

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain
Location Approximate
Approximate Location of Groundwater Barrier
Location Concealed
Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110618
File: Exhibit_10.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

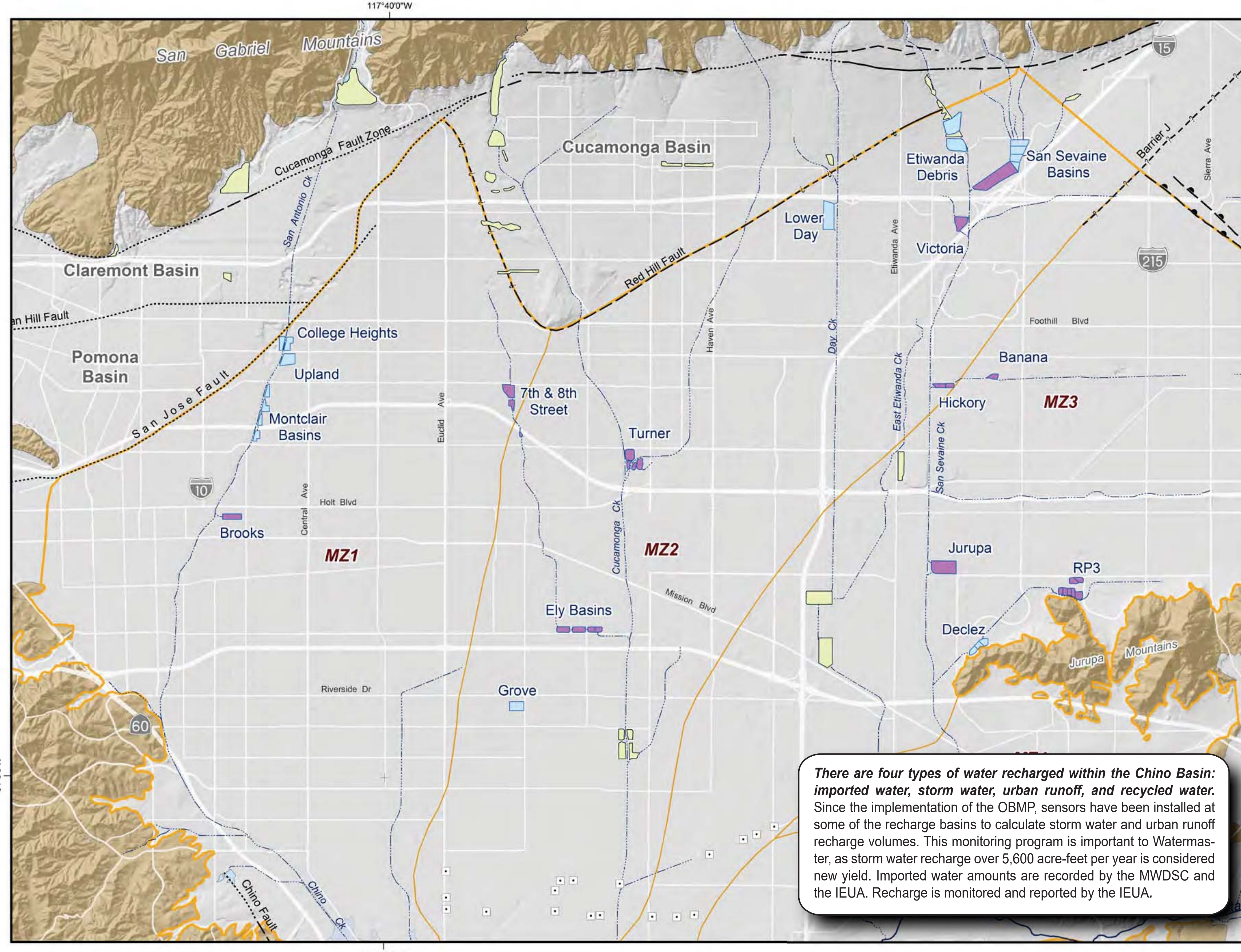
CHINO BASIN WATERMASTER

2010 State of the Basin
Basin Production and Recharge

Groundwater Production by Well

Fiscal Year 2009/2010

Exhibit 10



There are four types of water recharged within the Chino Basin: imported water, storm water, urban runoff, and recycled water. Since the implementation of the OBMP, sensors have been installed at some of the recharge basins to calculate storm water and urban runoff recharge volumes. This monitoring program is important to Watermaster, as storm water recharge over 5,600 acre-feet per year is considered new yield. Imported water amounts are recorded by the MWDSC and the IEUA. Recharge is monitored and reported by the IEUA.

Basins in the Recycled Water Groundwater Recharge Program (Recycled Water Initiated)

Basins in the Recycled Water Groundwater Recharge Program (Recycled Water Not Initiated)

Flood Control & Conservation Basins

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Approximate Location of Groundwater Barrier

Location Concealed

Location Uncertain

Miles 0 1 2 3 4 5

KM 0 2 4 6 8

Produced by:

WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110618
File: Exhibit_5.mxd

2010 State of the Basin
Basin Production and Recharge

Recharge Basin Locations

Exhibit 11

Exhibit 12
Summary of Annual Wet Water Recharge Records in the Chino Basin
(acre-ft)

Basin Name	FY 2000/2001				FY 2001/2002				FY 2002/2003				FY 2003/2004				FY 2004/2005			
	Storm Water	Imported Water	Recycled Water	Total Recharge	Storm Water	Imported Water	Recycled Water	Total Recharge	Storm Water	Imported Water	Recycled Water	Total Recharge	Storm Water	Imported Water	Recycled Water	Total Recharge	Storm Water	Imported Water	Recycled Water	Total Recharge
Banana Basin	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	425	0	0	425
Declez Basin	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	19	0	0	19
Hickory Basin	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	298	197	0	495
Jurupa Basin	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	0	0	0	0
RP-3 Basins	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	1,105	0	0	1,105
Turner Basins	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	1428	310	0	1,738
7th and 8th Street Basins	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	620	0	0	620
Brooks Street Basin	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	1776	0	0	1,776
College Heights Basins	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	0	0	0	0
Ely Basins	NM	0	500	500	NM	0	504	504	NM	0	184	184	NM	0	49	49	2,010	0	158	2,168
Grove Basin	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	0	0	0	0
Etiwanda Debris Basins	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	2,812	0	2,812	0	2,137	0	2,137
Lower Day Basin	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	2798	107	0	2,905
Montclair Basins	NM	6,530	0	6,530	NM	6,500	0	6,500	NM	6,499	0	6,499	NM	3,558	0	3,558	3,350	7,887	0	11,237
San Sevaine	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	1,211	0	1,211	2,830	1,621	0	4,451
Upland Basin	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	989	0	0	989
Victoria Basin	NM	0	0	0	NM	0	0	0	NM	0	0	0	NM	0	0	0	0	0	0	0
Totals:	NM	6,530	500	7,030	NM	6,500	504	7,004	NM	6,499	184	6,683	NM	7,582	49	7,631	17,648	12,258	158	30,064

Basin Name	FY 2005/2006				FY 2006/2007				FY 2007/2008				FY 2008/2009				FY 2009/2010			
	Storm Water	Imported Water	Recycled Water	Total Recharge	Storm Water	Imported Water	Recycled Water	Total Recharge	Storm Water	Imported Water	Recycled Water	Total Recharge	Storm Water	Imported Water	Recycled Water	Total Recharge	Storm Water	Imported Water	Recycled Water	Total Recharge
Banana Basin	300	193	529	1,022	226	783	643	1,652	278	0	157	435	383	0	40	423	416	0	898	1,314
Declez Basin	737	0	0	737	0	0	0	0	730	0	0	730	656	0	0	656	774	0	0	774
Hickory Basin	438	636	586	1,660	536	212	646	1,394	949	0	567	1,516	200	0	46	246	700	7	856	1,563
Jurupa Basin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RP-3 Basins	767	0	0	767	802	0	0	802	511	0	0	511	613	0	106	719	1,902	1	2,051	3,954
Turner Basins	2,575	346	0	2,921	406	313	1,237	1,956	1,542	0	0	1,542	1,226	0	171	1,397	2,165	0	397	2,562
7th and 8th Street Basins	1,271	0	0	1,271	640	0	0	640	959	0	1,054	2,013	1,139	0	352	1,491	1,745	6	1,067	2,818
Brooks Street Basin	524	2,032	0	2,556	205	1,604	0	1,809	475	0	0	475	434	0	1,605	2,039	666	0	1,695	2,361
College Heights Basins	108	5,326	0	5,434	1	3,125	0	3,126	172	0	0	172	0	0	0	0	65	382	0	447
Ely Basins	1,531	0	188	1,719	631	0	466	1,097	1,603	0	562	2,165	937	0	364	1,301	1,164	0	246	1,410
Grove Basin	133	0	0	133	166	0	0	166	326	0	0	326	402	0	0	402	351	0	0	351
Etiwanda Debris Basins	20	2,488	0	2,508	0	1,160	0	1,160	10	0	0	10	28	0	0	28	775	7	0	782
Lower Day Basin	624	2,810	0	3,434	78	2,266	0	2,344	303	0	0	303	165	0	0	165	540	3	0	543
Montclair Basins	1,296	5,579	0	6,875	355	10,681	0	11,036	859	0	0	859	611	0	0	611	858	4,593	0	5,451
San Sevaine	2,072	9,172	0	11,244	244	5,749	0	5,993	749	0	0	749	225	0	0	225	993	0	0	993
Upland Basin	214	5,985	0	6,199	195	7,068	0	7,263	312	0	0	312	274	0	0	274	532	0	0	532
Victoria Basin	330	0	0	330	260	0	0	260	427	0	0	427	250	0	0	250	494	2	0	496
Totals:	12,940	34,567	1,303	48,810	4,745	32,961	2,992	40,698	10,205	0	2,340	12,545	7,543	0	2,684	10,227	14,140	5,001	7,210	26,351

NM - Not measured

Exhibit 13
Summary of Recharge and Discharge Based on Watermaster Records
(acre-ft)

Fiscal Year	Recharge						Discharge [5]					Pumping Distribution (% of Total)			
		Wet Water Recharge [1]					Pumping [6]								
	Safe Yield	Recharge and Replenishment Water[2]	Recycled Water	New Storm Water	Total Recharge	Total Inflow	Appropriative Pool [7]	Chino Desalter Authority	Agricultural Pool	Overlying Non-Ag Pool	Total Outflow	Appropriative Pool	Chino Desalter Authority	Agricultural Pool	Overlying Non-Ag Pool
1977 - 1978	140,000	6,978	0	0	6,978	146,978	61,308	0	91,714	10,102	163,123	38%	0%	56%	6%
1978 - 1979	140,000	28,395	0	0	28,395	168,395	60,868	0	81,479	7,263	149,610	41%	0%	54%	5%
1979 - 1980	140,000	16,428	0	0	16,428	156,428	64,877	0	70,367	7,541	142,784	45%	0%	49%	5%
1980 - 1981	140,000	20,890	0	0	20,890	160,890	70,836	0	67,726	5,777	144,338	49%	0%	47%	4%
1981 - 1982	140,000	21,656	0	0	21,656	161,656	66,123	0	64,032	5,801	135,956	49%	0%	47%	4%
1982 - 1983	140,000	27,588	0	0	27,588	167,588	62,868	0	56,858	2,448	122,175	51%	0%	47%	2%
1983 - 1984	140,000	22,237	0	0	22,237	162,237	69,747	0	60,076	3,258	133,080	52%	0%	45%	2%
1984 - 1985	140,000	20,897	0	0	20,897	160,897	76,049	0	54,248	2,446	132,744	57%	0%	41%	2%
1985 - 1986	140,000	18,427	0	0	18,427	158,427	79,986	0	50,611	3,255	133,852	60%	0%	38%	2%
1986 - 1987	140,000	20,007	0	0	20,007	160,007	83,905	0	57,964	2,696	144,565	58%	0%	40%	2%
1987 - 1988	140,000	2,494	0	0	2,494	142,494	90,845	0	55,949	3,018	149,812	61%	0%	37%	2%
1988 - 1989	140,000	7,407	0	0	7,407	147,407	92,840	0	45,683	3,692	142,215	65%	0%	32%	3%
1989 - 1990	140,000	0	0	0	0	140,000	100,583	0	47,358	4,927	152,868	66%	0%	31%	3%
1990 - 1991	140,000	3,607	0	0	3,607	143,607	85,806	0	47,011	5,479	138,296	62%	0%	34%	4%
1991 - 1992	140,000	5,551	0	0	5,551	145,551	90,890	0	43,456	4,900	139,246	65%	0%	31%	4%
1992 - 1993	140,000	14,212	0	9,041 [3]	23,253	163,253	85,771	0	44,300	5,226	135,298	63%	0%	33%	4%
1993 - 1994	140,000	16,493	0	0	16,493	156,493	79,943	0	44,492	4,344	128,779	62%	0%	35%	3%
1994 - 1995	140,000	10,300	0	0	10,300	150,300	92,904	0	55,415	4,091	152,409	61%	0%	36%	3%
1995 - 1996	140,000	82	0	0	82	140,082	102,876	0	43,635	3,241	149,752	69%	0%	29%	2%
1996 - 1997	140,000	17	0	0	17	140,017	112,201	0	44,921	3,779	160,901	70%	0%	28%	2%
1997 - 1998	140,000	8,323	0	0	8,323	148,323	99,805	0	43,369	3,274	146,448	68%	0%	30%	2%
1998 - 1999	140,000	5,796	0	0	5,796	145,796	111,045	0	47,791	3,734	162,570	68%	0%	29%	2%
1999 - 2000	140,000	1,001	507	0	1,508	141,508	128,888	0	44,241	5,605	178,734	72%	0%	25%	3%
2000 - 2001	140,000	6,530	500	0 [4]	7,030	147,030	116,201	7,989	39,280	5,991	169,461	69%	5%	23%	4%
2001 - 2002	140,000	6,500	504	0 [4]	7,004	147,004	123,527	9,458	38,194	4,150	175,330	70%	5%	22%	2%
2002 - 2003	140,000	6,499	184	0 [4]	6,683	146,683	121,744	10,439	35,167	3,979	171,329	71%	6%	21%	2%
2003 - 2004	140,000	7,578	49	0 [4]	7,627	147,627	125,318	10,605	38,190	2,057	176,170	71%	6%	22%	1%
2004 - 2005	140,000	12,259	158	12,048 [4]	24,465	164,465	117,991 [8]	9,854	31,502	2,246	161,592	73%	6%	19%	1%
2005 - 2006	140,000	34,567	1,303	7,340 [4]	43,210	183,210	107,248 [8]	16,542	30,250	2,641	156,681	68%	11%	19%	2%
2006 - 2007	140,000	32,960	2,992	0 [4]	35,952	175,952	119,417 [8]	27,077	29,649	3,251	179,394	67%	15%	17%	2%
2007 - 2008	140,000	0	2,340	4,605 [4]	6,945	146,945	121,034 [9]	30,121	23,530	3,421	178,107	68%	17%	13%	2%
2008 - 2009	140,000	0	2,684	1,943 [4]	4,627	144,627	134,723 [9]	28,985	23,268	2,575	189,551	71%	15%	12%	1%
2009 - 2010	140,000	5,001	7,210	8,540 [4]	20,751	160,751	117,044 [9]	28,823	21,034	1,883	168,784	69%	17%	12%	1%
FY 2001 - 2010															
Total	1,400,000	111,894	17,924	34,476	164,294	1,564,294	1,204,247	179,891	310,063	32,196	1,726,398	-	-	-	-
Average	140,000	11,189	1,792	3,448	16,429	156,429	120,425	17,989	31,006	3,220	172,640	70%	9%	19%	2%
Max	140,000	34,567	7,210	12,048	43,210	183,210	134,723	30,121	39,280	5,991	189,551	73%	17%	23%	4%
Min	140,000	0	49	0	1,508	144,627	107,248	7,989	21,034	1,883	156,681	67%	5%	12%	1%
FY 1978 - 2010															
Total	4,620,000	390,678	18,431	43,517	452,626	5,072,626	3,175,211	179,891	1,572,757	138,092	5,065,951	-	-	-	-
Average	140,000	11,839	559	1,319	13,716	153,716	96,219	17,989	47,659	4,185	153,514	60%	3%	32%	3%
Max	140,000	34,567	7,210	12,048	43,210	183,210	134,723	30,121	91,714	10,102	189,551	73%	17%	56%	6%
Min	140,000	0	0	0	0	140,000	60,868	7,989	21,034	1,883	122,175	38%	0%	12%	1%

[1] Includes only water actually spread
[2] Includes wet water recharge for replenishment, cyclic, conjunctive use, and the MZ1 Program (Peace Agreement, Section V. 5.1)
[3] 9,041 acre-ft of surface water recharge in the Chino Basin that would otherwise have recharged the Claremont Heights Basin in FY 1992/1993
[4] New storm water amounts are less 5,600 AFY which is established as a baseline condition in the safe yield. Storm water recharge above 5,600 AFY is considered new yield. (Peace Agreement Rules and Regulations Article VI.6.2.e.). If recharged storm water minus 5,600 AF is less than zero, new storm water is zero
[5] The only discharge considered herein is pumping, the other discharges are assumed netted out in the safe yield
[6] Actual production reported in the Watermaster database
[7] Appropriative production values are actual production amounts at wells owned by the Appropriative Pool and reported in the Watermasters database.
[8] Appropriative Pool actual production amounts are less than normal due to MWDSC "puts" in the basin for the Dry Year Yield Program.
[9] Appropriative Pool actual production amounts are more than normal due to MWDSC "takes" from the basin for the Dry Year Yield Program.

The exhibits in this section show the physical state of the Chino Basin with respect to groundwater levels. The groundwater-level data used to generate these exhibits were collected and compiled as part of Watermaster's groundwater-level monitoring program.

Groundwater-level monitoring was inadequate prior to OBMP implementation. Problems with historical groundwater-level monitoring included an inadequate areal distribution of wells in monitoring programs, short time histories, questionable data quality, and insufficient resources to develop and conduct a comprehensive program. In 2000, the OBMP defined a new, comprehensive, basin-wide groundwater-level monitoring program pursuant to *OBMP Program Element 1 – Develop and Implement a Comprehensive Monitoring Program*. The monitoring program has been refined over time to fulfill the Watermaster's objectives and to increase efficiency.

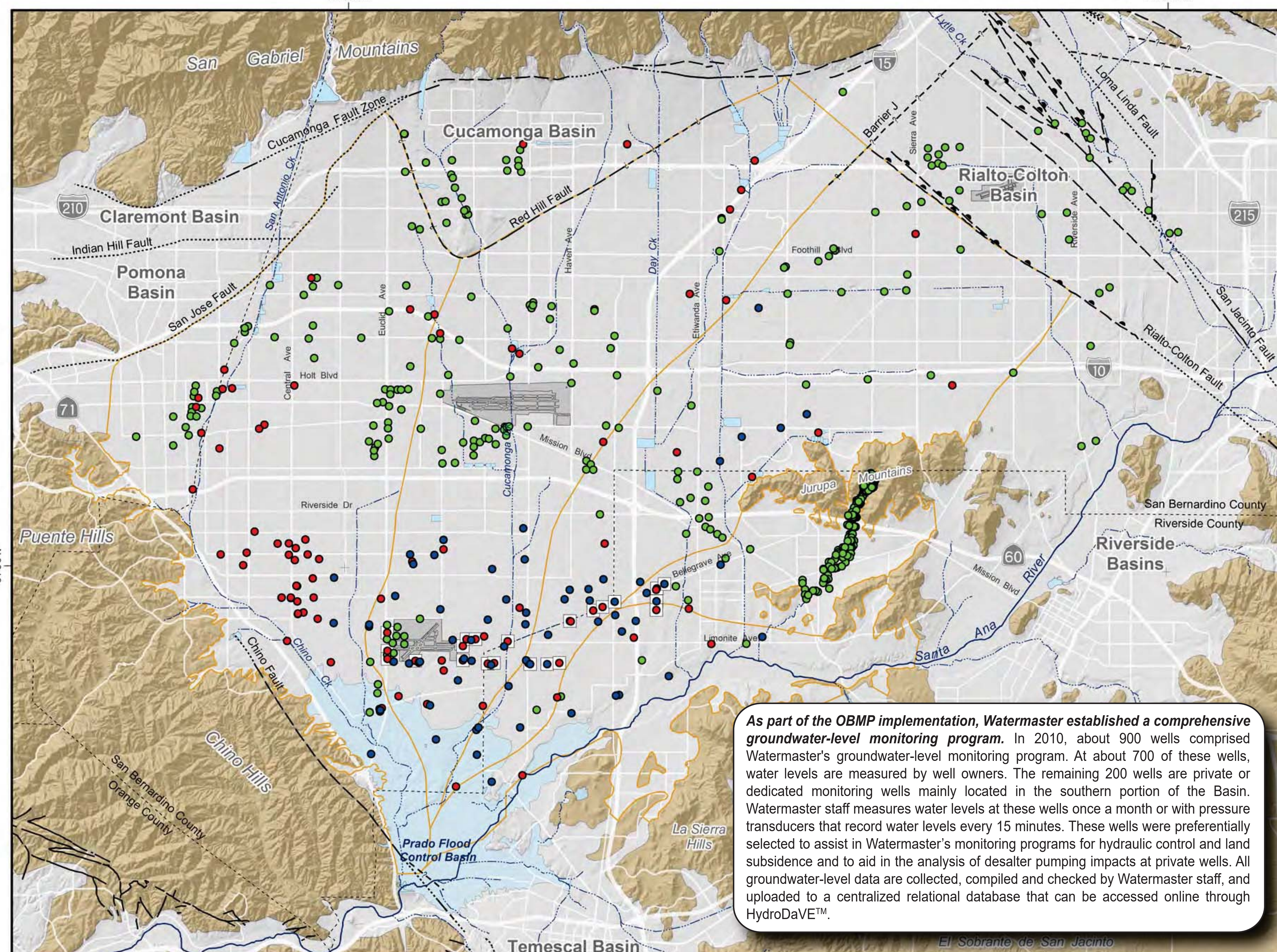
The groundwater-level monitoring program supports many Watermaster functions, such as the periodic reassessment of safe yield, the monitoring and management of land subsidence, and the assessment of hydraulic control. These data are also used to update and recalibrate Watermaster's computer-simulation groundwater-flow model, to understand directions of groundwater flow, to compute storage changes, and to identify areas of the basin where recharge and discharge are not in balance.

Exhibit 14 shows the locations and measurement frequencies of all wells currently in Watermaster's groundwater-level monitoring program. Water levels are measured at private wells and dedicated monitoring wells by Watermaster staff using manual methods once per month or with pressure transducers that record water levels once every 15 minutes. Water levels are also measured by well owners, including municipal water agencies, the California Department of Toxic Substance Control (DTSC), the County of San Bernardino, and various private consulting firms. Typically, water levels are measured by well owners monthly, and Watermaster staff collects these data quarterly. All water-level data are checked by Watermaster staff and uploaded to a centralized database that can be accessed online through HydroDaVE™.

Exhibit 15 shows the location of selected wells distributed across the Chino Basin that have long time-histories of water-level data. The wells were selected based on geographic location within the major groundwater flow systems of the Chino Basin, well-screen intervals, and the length, density, and quality of water-level records. Exhibits 16 through 20 show water-level time-series charts for these wells by management zone for the period of 1978 to 2010. On these exhibits, the behavior of water levels at these wells is compared to climate, groundwater production, and recharge to reveal the cause-and-effect relationships. To show the relationship between groundwater levels and climate, a cumulative departure from mean precipitation (CDFM) curve is shown. Positive sloping lines on the CDFM curve indicate wet years or wet periods. Negatively sloping lines indicate dry years or dry periods. For example, 1978 to 1983 was an extremely wet period, and it is represented by a positively sloping line. To show the relationships between groundwater levels and pumping and/or artificial recharge, bar charts of pumping and recharge by management zone are shown and described.

The groundwater-level data were used to create groundwater-elevation contour maps for the shallow aquifer system in the Chino Basin for spring 2000 (Exhibit 21) and spring 2010 (Exhibit 22). These contour maps were subtracted to generate a map of water-level change over this ten-year period (Exhibit 23). These exhibits include brief characterizations of groundwater elevation, groundwater flow, and groundwater storage changes during 2000 to 2010.

In the southern portion of the basin, the water-level data is used to assess the state of hydraulic control. Hydraulic control is defined as eliminating groundwater discharge from the Chino-North Management Zone or controlling the discharge to de minimis levels. One of the intended purposes of the Chino Desalter well fields is to intercept (capture) groundwater originating in Chino-North before it discharges to the Prado Basin or the Santa Ana River as surface water. Water-level data is collected from a selected set of "key wells" and analyzed to determine the state of hydraulic control annually. Exhibit 24 shows groundwater-elevation contours and data for the shallow aquifer system within the hydraulic control monitoring area in spring 2000—prior to any significant pumping by the Chino-I Desalter wells. Exhibit 25 shows groundwater-elevation contours and data for the shallow aquifer system in spring 2010—approximately ten years after the commencement of Chino-I Desalter pumping and four years after the commencement of Chino-II Desalter pumping. These exhibits include a brief interpretation of the state of hydraulic control. For a further discussion of hydraulic control, see *Chino Basin Maximum Benefit Monitoring Program 2010 Annual Report* (WEI, 2011a).



As part of the OBMP implementation, Watermaster established a comprehensive groundwater-level monitoring program. In 2010, about 900 wells comprised Watermaster's groundwater-level monitoring program. At about 700 of these wells, water levels are measured by well owners. The remaining 200 wells are private or dedicated monitoring wells mainly located in the southern portion of the Basin. Watermaster staff measures water levels at these wells once a month or with pressure transducers that record water levels every 15 minutes. These wells were preferentially selected to assist in Watermaster's monitoring programs for hydraulic control and land subsidence and to aid in the analysis of desalter pumping impacts at private wells. All groundwater-level data are collected, compiled and checked by Watermaster staff, and uploaded to a centralized relational database that can be accessed online through HydroDaVE™.

Basin-Wide Groundwater Level Monitoring Program
Wells by Measurement Frequency

- Monthly Measurement (68 Wells)
- Measurement by Transducer (130 Wells)
- Owner Measures Water Level (699 Wells)

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110618
File: Exhibit_14.mxd

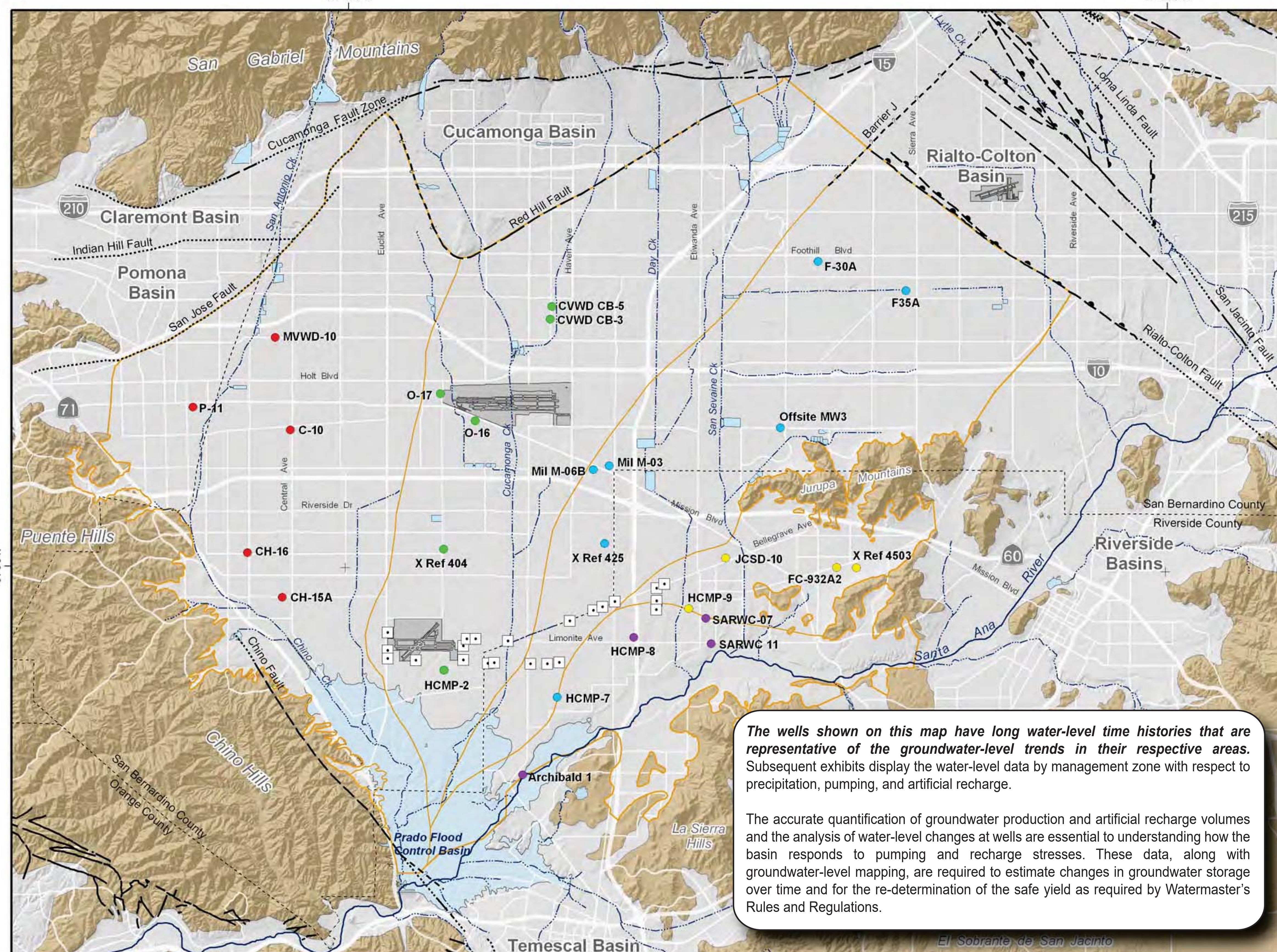
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Levels

Groundwater Level Monitoring Network

Well Location and Measurement Frequency as of 2010

Exhibit 14



The wells shown on this map have long water-level time histories that are representative of the groundwater-level trends in their respective areas. Subsequent exhibits display the water-level data by management zone with respect to precipitation, pumping, and artificial recharge.

The accurate quantification of groundwater production and artificial recharge volumes and the analysis of water-level changes at wells are essential to understanding how the basin responds to pumping and recharge stresses. These data, along with groundwater-level mapping, are required to estimate changes in groundwater storage over time and for the re-determination of the safe yield as required by Watermaster's Rules and Regulations.

- Wells in MZ1
- Wells in MZ2
- Wells in MZ3
- Wells in MZ4
- Wells in MZ5
- OBMP Management Zones
- Chino Desalter Well
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

- Quaternary Alluvium

Consolidated Bedrock

- Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

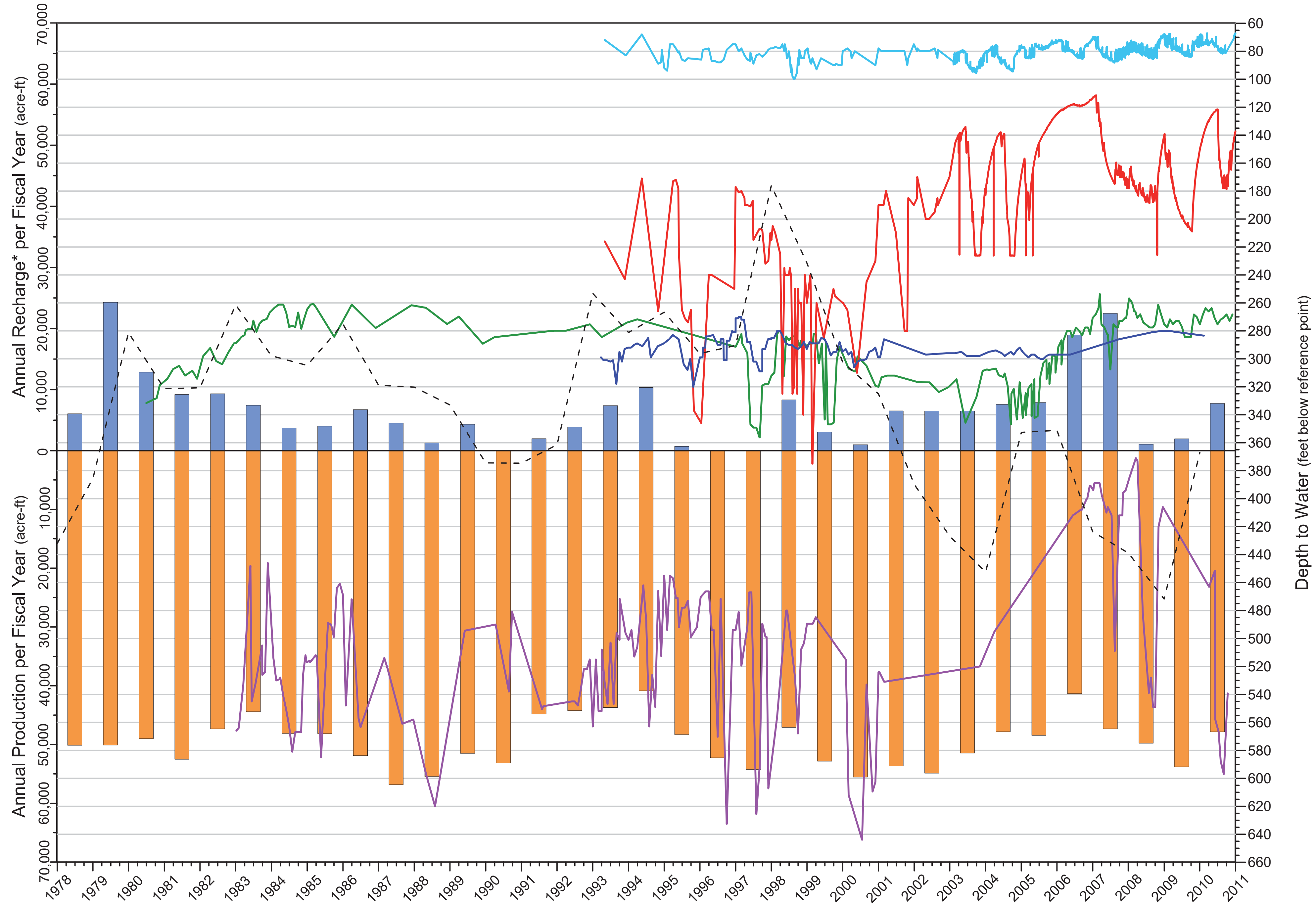
Produced by:
WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20111027
File: Exhibit_15

2010 State of the Basin
Groundwater Levels

Wells Used to Characterize Long-Term Trends in Groundwater Levels Versus Climate, Production, and Recharge

Exhibit 15



Water levels at wells MVWD-10, P-11, and C-10 are representative of groundwater-level trends in the central and northern portions of MZ1. From about 1995 to 2003, water levels generally declined in these areas due to increased pumping and relatively small volumes of wet water recharge in MZ1. From about 2003 to 2007, water levels increased in these areas; from 2007 to 2010, water levels generally decreased in these areas. The changes in water levels since 2003 coincide with and are likely due to above average precipitation in 2005 and a "put and take" cycle associated with Metropolitan Water District of Southern California's Dry Year Yield Program in Chino Basin.

Water levels at well CH-16 are representative of groundwater-level trends in the deep, confined aquifer system in the southern portion of MZ1. Water levels at this well are influenced by pumping from nearby wells that are also screened within the deep aquifer system. During the 1990s, water levels at this well declined by up to 200 feet due to increased pumping from the deep aquifer system in this area. From 2000 to 2010, water levels at this well increased primarily due to decreased pumping from the deep aquifer system associated with the implementation of the MZ1 Subsidence Management Plan (WEI, 2007b).

Water levels at well CH-15A are representative of groundwater-level trends in the shallow, unconfined aquifer system in the southern portion of MZ1. Historically, water levels in CH-15A have been stable, from 80 to 90 ft-bgs, and showed only small fluctuations in response to nearby pumping. Since 2000, water levels have risen by about 10 feet, which is primarily due to a decrease in nearby pumping.

* Recharge includes imported water and recycled water delivered to recharge basins, and does not include in-lieu replenishment water.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com
Author: TCR
Date: 20111107
File: Exhibit_16.grf

MZ1 Water Levels (top-bottom of well screen)

- MVWD-10 (540-1,084 ft-bgs)
- P-11 (168-550 ft-bgs)
- C-10 (350-1,090 ft-bgs)
- CH-16 (430-940 ft-bgs)
- CH-15A (190-310 ft-bgs)

MZ1 Production and Recharge

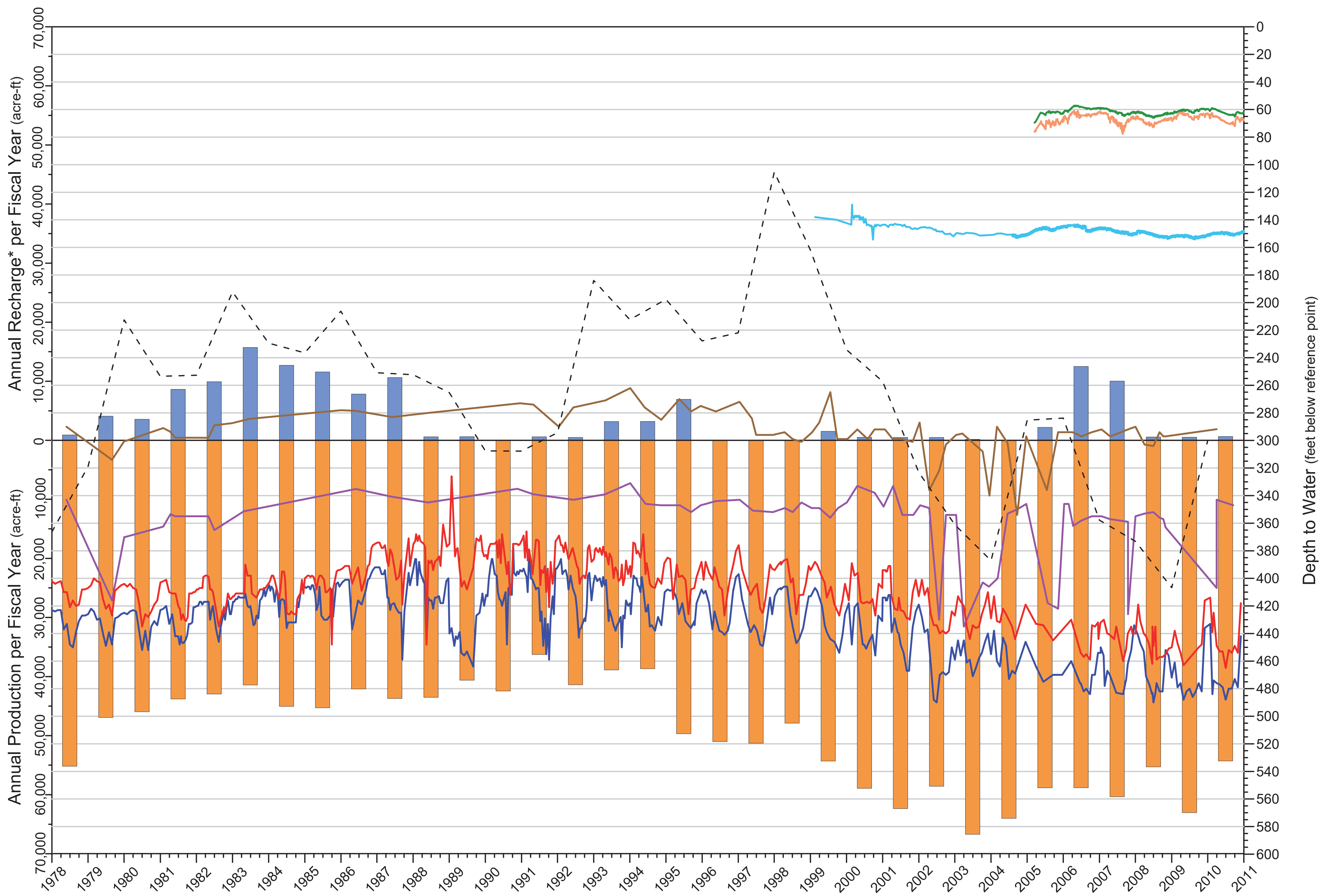
- Recharge*
- Groundwater Production
- Cumulative Departure from Mean Precipitation

2010 State of the Basin
Groundwater Levels

Long-Term Trends in Groundwater Levels versus Climate, Production, and Recharge - *MZ1*

1978 to 2010

Exhibit 16



Water levels at wells CB-3 and CB-5 are representative of groundwater-level trends in the northern portions of MZ2. Water levels at these wells increased from 1978 to about 1990—likely due to a combination of the 1978 to 1983 wet period, decreased pumping following the execution of the Judgment, and the initiation of artificial recharge of imported water in the San Sevaine and Etiwanda Basins. From 1990 to 2010, water levels at these wells have progressively declined by about 40 feet due to increased pumping in MZ2.

Water levels at wells O-16, O-17, and XRef 404 (private well) are representative of groundwater-level trends in the central portions of MZ2, north of the Chino-I Desalter well field. Water levels at these wells followed a similar pattern of increase from 1978 to 1990, and decrease from 1990 to 2000. From 2000 to 2010, water levels in these wells have remained relatively stable, which indicates a relative balance of recharge and discharge in this area of Chino Basin.

Water levels at wells HCMP-2/1 (shallow aquifer) and HCMP 2/2 (deep aquifer) are representative of groundwater-level trends at the southern end of MZ2, just south of the Chino-I Desalter well field. One of the objectives of the desalter well field is to draw down water levels in the southern portion of Chino Basin to achieve hydraulic control. Water levels at these wells have remained relatively stable since they were constructed in 2005, which suggests that hydraulic control is not yet being achieved in this portion of the desalter well field. See Exhibits 24 and 25 for further explanation of hydraulic control.

* Recharge includes imported water and recycled water delivered to recharge basins, and does not include in-lieu replenishment water.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
Birt er Dri e
a e ore t A
www wilderm t en ironmental om
Author: TCR
Date: 20111107
File: Exhibit_17.grf

MZ2 Water Levels (top-bottom of well screen)

- CVWD CB-5 (538-1,238 ft-bgs)
- CVWD CB-3 (341-810 ft-bgs)
- O-17 (415-1,007 ft-bgs)
- O-16 (366-630 ft-bgs)
- X Ref 404 (274-354 ft-bgs)
- HCMP-2/2 (296-316 ft-bgs)
- HCMP-2/1 (124-164 ft-bgs)

MZ2 Production and Recharge

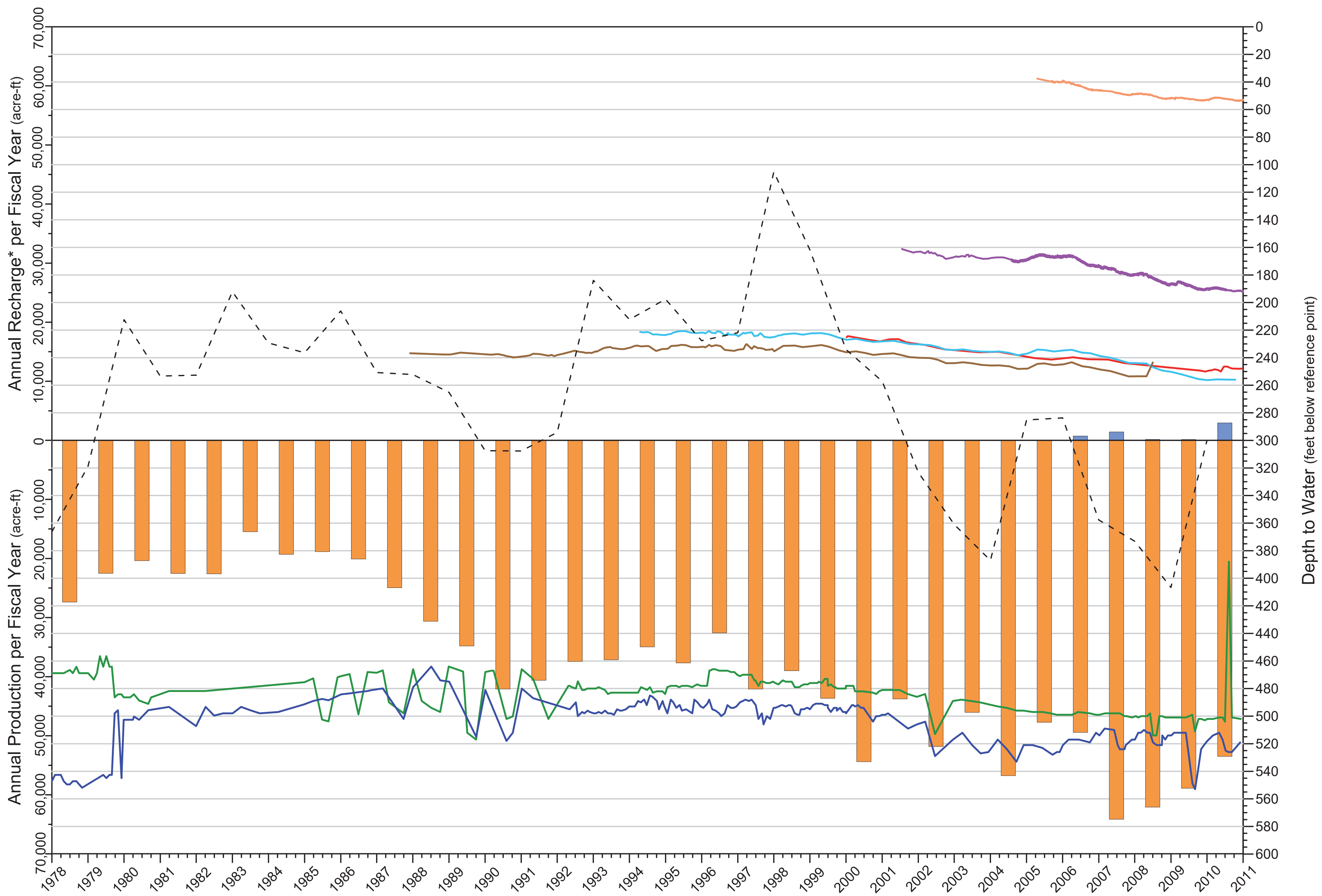
- Recharge*
- Groundwater Production
- Cumulative Departure from Mean Precipitation

2010 State of the Basin
Groundwater Levels

Long-Term Trends in Groundwater Levels versus Climate, Production, and Recharge - *MZ2*

to

Exhibit 17



Water levels at wells F30A and F35A are representative of groundwater-level trends in the northeastern portions of MZ3. Water levels were relatively stable from 1978 to about 1995. From 1995 to 2006, water levels declined by approximately 25-30 feet due to a dry climatic period and increased pumping in MZ3. Since 2006, water levels at these wells have remained relatively stable.

Water levels at wells Mill M-03, Mill M-06B, Offsite MW3, and XRef 425 (private well) are representative of groundwater-level trends in the central portion of MZ3. From about 1998 to 2010, water levels at these wells progressively declined by about 30 feet due to a dry climatic period and increased pumping in MZ3. However, at Offsite MW3, water levels have increased by about 5 feet from 2009 to 2010. This water level increase is likely due to improvements to and increased artificial recharge of storm water and recycled water at the RP3 recharge basins.

Water levels at well HCMP-7/1 are representative of groundwater-level trends in the southernmost portion of MZ3—just south of the Chino-II Desalter well field and just north of the Santa Ana River. From 2005 to 2010, water levels at this well progressively declined by about 20 feet. This drawdown is mainly due to pumping at the Chino Desalter well fields and suggests that hydraulic control is being achieved in this portion of the Chino Basin, and that recharge of the Santa Ana River is being enhanced by desalter pumping. See Exhibits 24 and 25 for further explanation of hydraulic control.

* Recharge includes imported water and recycled water delivered to recharge basins, and does not include in-lieu replenishment water.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
Birt er Dri e
a e ore t A
www wilderm t en ironmental om
Author: TCR
Date: 20111107
File: Exhibit_18.grf

MZ3 Water Levels (top-bottom of well screen)

- F-30A (507-864 ft-bgs)
- F-35A (700-852 ft-bgs)
- Mil M-03 (244-262 ft-bgs)
- Mil M-06B (255-275 ft-bgs)
- Offsite MW3
- XRef 425 (no perf data)
- HCMP-7/1 (70-110 ft-bgs)

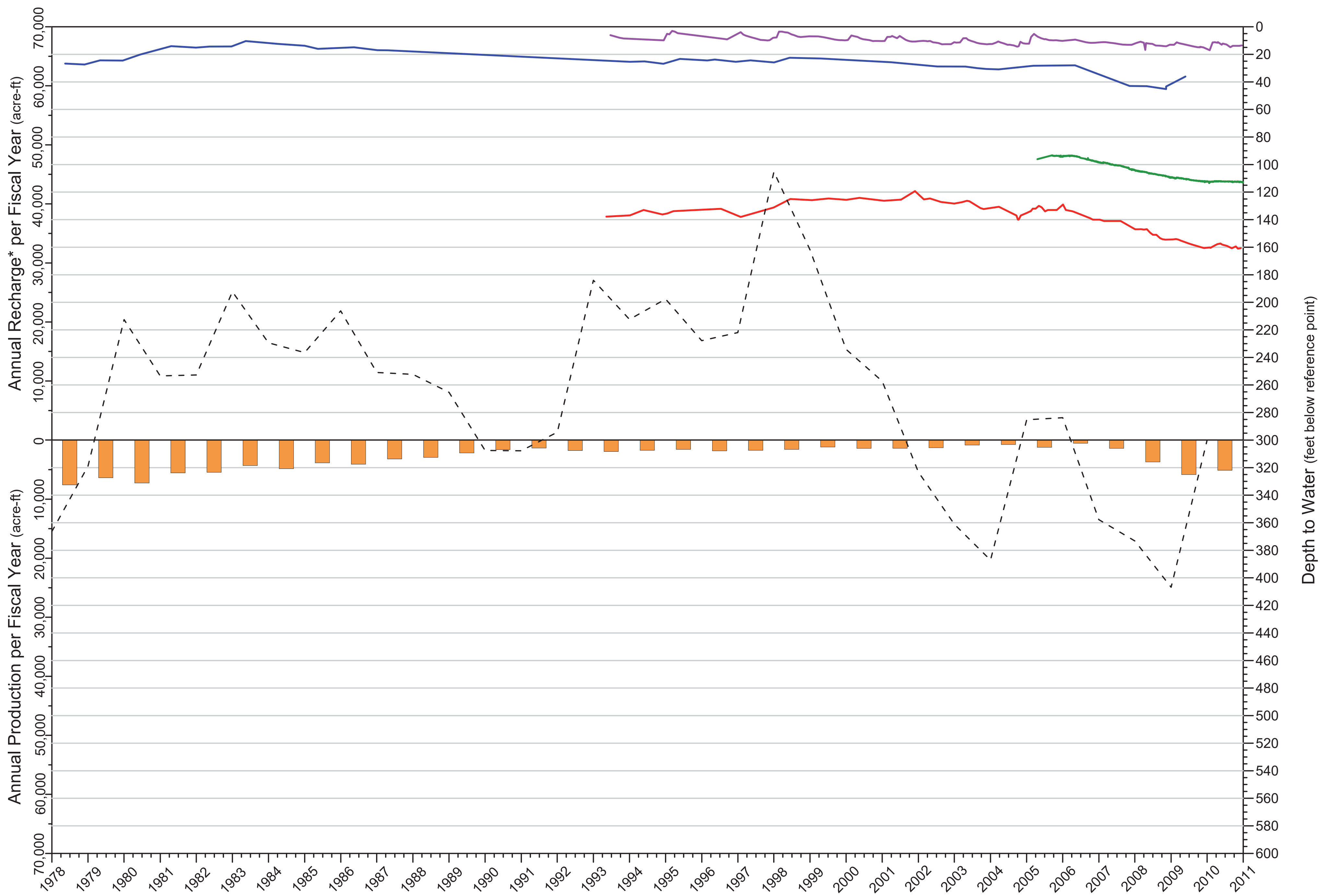
MZ3 Production and Recharge

- Recharge*
- Groundwater Production
- Cumulative Departure from Mean Precipitation

2010 State of the Basin
Groundwater Levels

Long-Term Trends in Groundwater Levels versus Climate, Production, and Recharge - *MZ3*
to

Exhibit 18



Water levels at wells JCSD-10 and HCMP-9/1 are representative of groundwater-level trends near the western boundary of MZ4—in the vicinity of the major well fields of the Jurupa Community Services District (JCSD) and the Chino-II Desalter. From 2000 to 2010, water levels at these wells have decreased by up to 30 feet. This drawdown suggests that hydraulic control is being achieved in this portion of the Chino Basin. See Exhibits 24 and 25 for further explanation of hydraulic control. The drawdown in this area is also a concern of JCSD with regard to the production capacity at their well field.

Water levels at wells XRef 4503 (private well) and FC-932A2 are representative of groundwater-level trends in the eastern and central parts of MZ4. From 1980 to 2010 the water levels at these wells have declined by over 10-20 feet.

* Recharge includes imported water and recycled water delivered to recharge basins, and does not include in-lieu replenishment water. There is no imported water or recycled water delivered to basins within MZ4.

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

Birt er Dri e
a e ore t A

www wilderm t en ironmental om

Author: TCR
Date: 20111107
File: Exhibit_19.grf

MZ4 Water Levels (top-bottom of well screen)

- JCSD-10 (no perf data)
- HCMP-9/1 (110-150 ft-bgs)
- X Ref 4503 (no perf data)
- FC-932A2 (no perf data)

MZ4 Production and Recharge

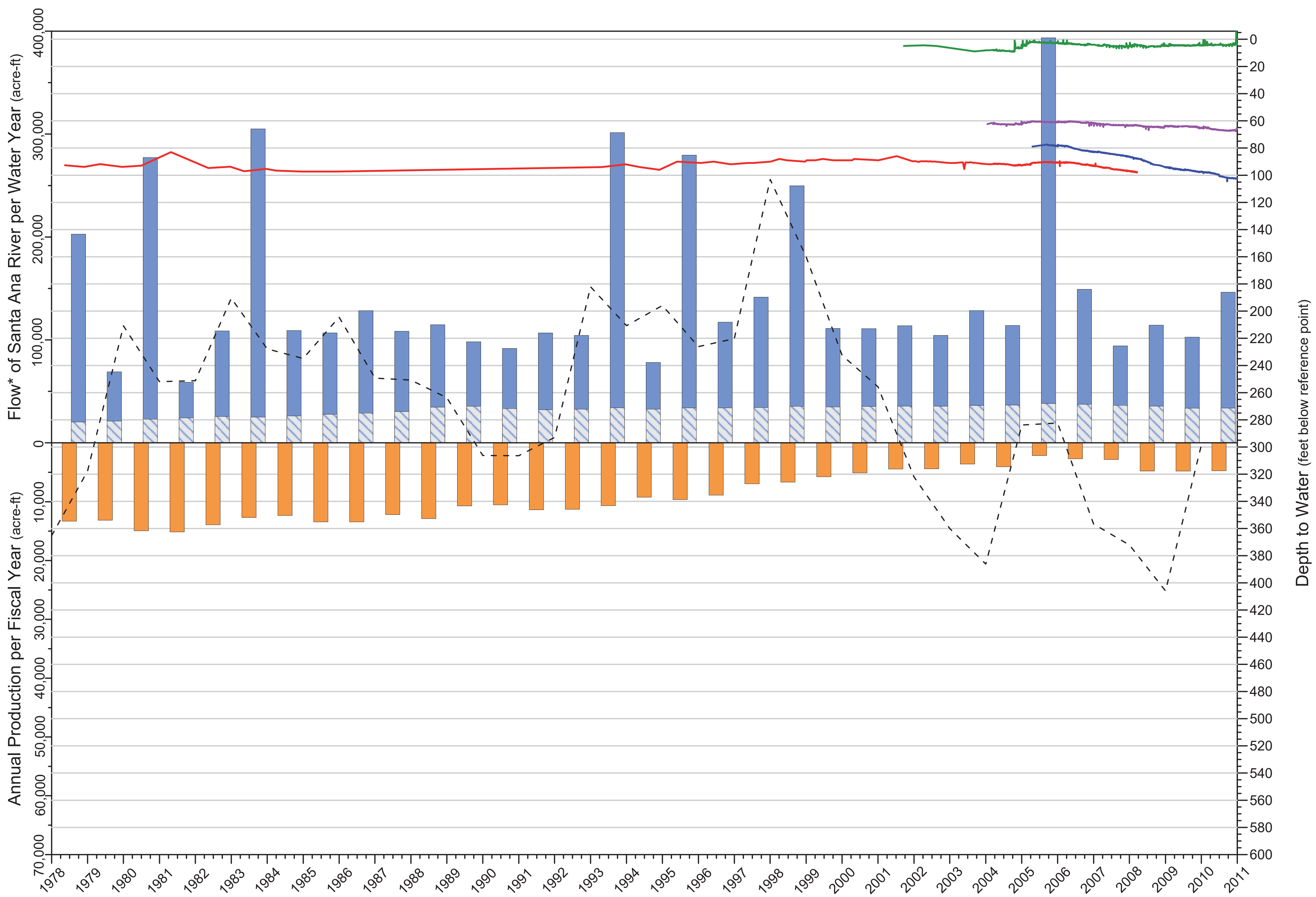
- Groundwater Production
- Cumulative Departure from Mean Precipitation

2010 State of the Basin
Groundwater Levels

Long-Term Trends in Groundwater Levels versus Climate, Production, and Recharge - *MZ4*

to

Exhibit 19



MZ5 is a groundwater flow system that parallels the Santa Ana River. ***Water levels at wells SARWC-7, SARWC-11, and HCMP-8/1 are representative of groundwater levels in the eastern portion of MZ5 where the Santa Ana River is recharging the Chino Basin.*** From 2005 to 2010, water levels at these wells have progressively declined by about 5 to 25 feet. This drawdown is consistent with increased pumping at the desalter wells and is a necessary occurrence to achieve hydraulic control in this portion of the Chino Basin. This drawdown also indicates that recharge of the Santa Ana River is being enhanced in this vicinity. See Exhibits 24 and 25 for further explanation of hydraulic control.

Water levels at the Archibald 1 well are representative of groundwater levels in the southwestern portion of MZ5, where groundwater is very near the ground surface and is likely rising to become flow in the Santa Ana River. Water levels at this near-river well have remained relatively stable since monitoring began in 2000.

* Flow of the Santa Ana River through Management Zone 5 includes the flow measured at the USGS gauging station at Riverside Narrows plus effluent discharge from City of Riverside Wastewater Treatment Plant.

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

Birt er Dri e
a e ore t A

www wilderm t en ironmental om

Author: TCR
Date: 20111107
File: Exhibit_20.grf

MZ5 Water Levels (top-bottom or well screen)

- SARWC-07 (100-172 ft-bgs)
- HCMP-8/1 (75-115 ft-bgs)
- SARWC-11 (75-230 ft-bgs)
- Archibald-1 (75-85 ft-bgs)

MZ5 Production and Recharge

- City of Riverside WWTP
- Santa Ana River at Riverside Narrows
- Groundwater Production
- Cumulative Departure from Mean Precipitation

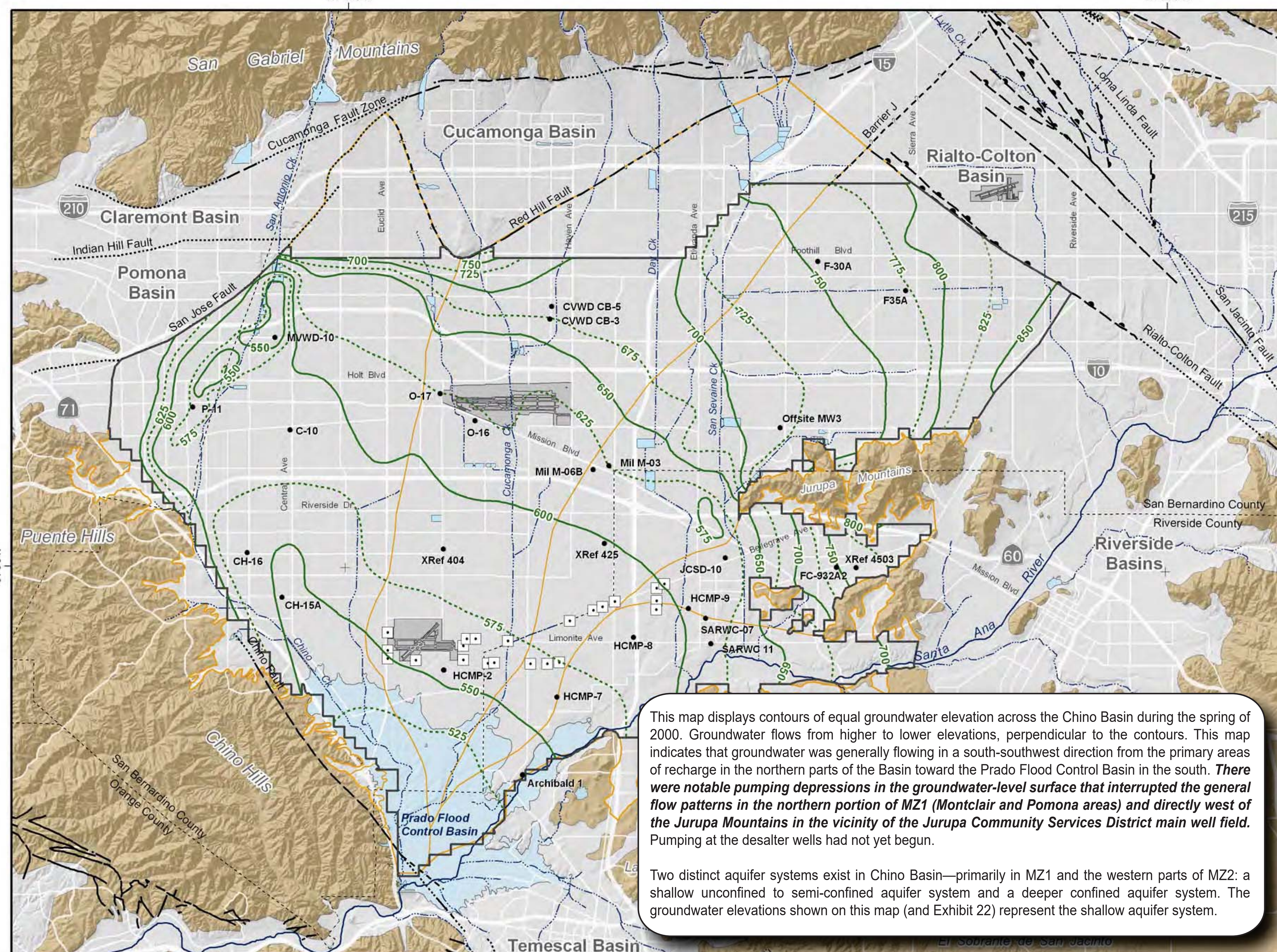
CHINO BASIN WATERMASTER — Partners in Basin Management

2010 State of the Basin
Groundwater Levels

Long-Term Trends in Groundwater Levels versus Climate, Production, and Recharge - *MZ5*

to

Exhibit 20



This map displays contours of equal groundwater elevation across the Chino Basin during the spring of 2000. Groundwater flows from higher to lower elevations, perpendicular to the contours. This map indicates that groundwater was generally flowing in a south-southwest direction from the primary areas of recharge in the northern parts of the Basin toward the Prado Flood Control Basin in the south. ***There were notable pumping depressions in the groundwater-level surface that interrupted the general flow patterns in the northern portion of MZ1 (Montclair and Pomona areas) and directly west of the Jurupa Mountains in the vicinity of the Jurupa Community Services District main well field.*** Pumping at the desalter wells had not yet begun.

Two distinct aquifer systems exist in Chino Basin—primarily in MZ1 and the western parts of MZ2: a shallow unconfined to semi-confined aquifer system and a deeper confined aquifer system. The groundwater elevations shown on this map (and Exhibit 22) represent the shallow aquifer system.

Groundwater Elevation Contours (feet above mean sea-level)

Boundry of Contoured Area (contours are not shown outside of this boundary due to lack of water level data)

Well used for Time History Analysis (Exhibits 16 through 20)

OBMP Management Zones

Chino Desalter Wells

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Approximate Location of Groundwater Barrier

Location Concealed

Location Uncertain

Produced by:
WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20111027
File: Exhibit_21.mxd

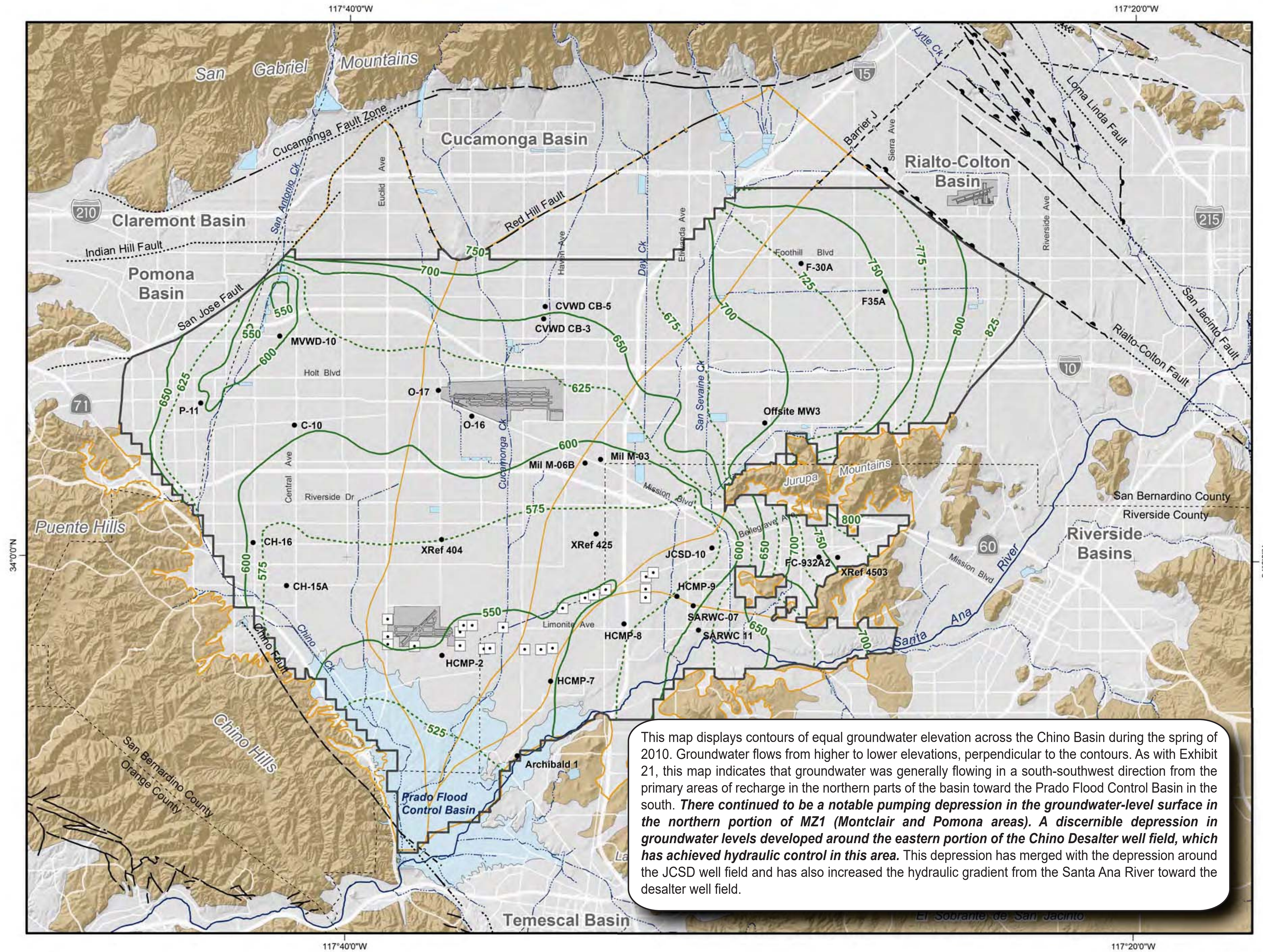
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Levels

Groundwater Elevation Contours

Spring 2000

Exhibit 21



Groundwater Elevation Contours (feet above mean sea-level)

Boundry of Contoured Area (contours are not shown outside of this boundary due to lack of water level data)

Well used for Time History Analysis (Exhibits 16 through 20)

OBMP Management Zones

Chino Desalter Wells

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Approximate Location of Groundwater Barrier

Location Concealed

Location Uncertain

This map displays contours of equal groundwater elevation across the Chino Basin during the spring of 2010. Groundwater flows from higher to lower elevations, perpendicular to the contours. As with Exhibit 21, this map indicates that groundwater was generally flowing in a south-southwest direction from the primary areas of recharge in the northern parts of the basin toward the Prado Flood Control Basin in the south. ***There continued to be a notable pumping depression in the groundwater-level surface in the northern portion of MZ1 (Montclair and Pomona areas). A discernible depression in groundwater levels developed around the eastern portion of the Chino Desalter well field, which has achieved hydraulic control in this area.*** This depression has merged with the depression around the JCSD well field and has also increased the hydraulic gradient from the Santa Ana River toward the desalter well field.

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20111027
File: Exhibit_22.mxd

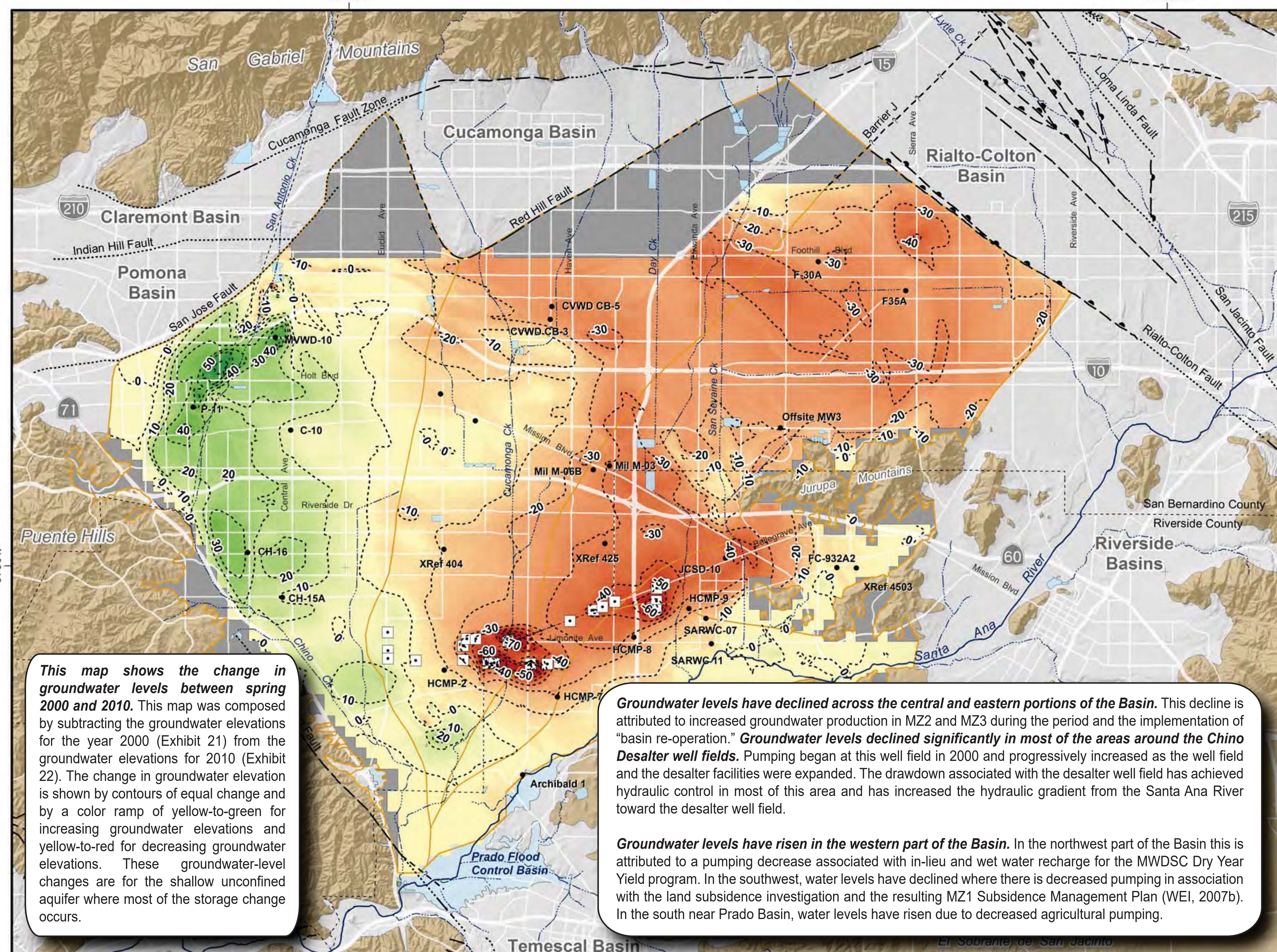
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Levels

Groundwater Elevation Contours

Spring 2010

Exhibit 22



This map shows the change in groundwater levels between spring 2000 and 2010. This map was composed by subtracting the groundwater elevations for the year 2000 (Exhibit 21) from the groundwater elevations for 2010 (Exhibit 22). The change in groundwater elevation is shown by contours of equal change and by a color ramp of yellow-to-green for increasing groundwater elevations and yellow-to-red for decreasing groundwater elevations. These groundwater-level changes are for the shallow unconfined aquifer where most of the storage change occurs.

Groundwater levels have declined across the central and eastern portions of the Basin. This decline is attributed to increased groundwater production in MZ2 and MZ3 during the period and the implementation of "basin re-operation." ***Groundwater levels declined significantly in most of the areas around the Chino Desalter well fields.*** Pumping began at this well field in 2000 and progressively increased as the well field and the desalter facilities were expanded. The drawdown associated with the desalter well field has achieved hydraulic control in most of this area and has increased the hydraulic gradient from the Santa Ana River toward the desalter well field.

Groundwater levels have risen in the western part of the Basin. In the northwest part of the Basin this is attributed to a pumping decrease associated with in-lieu and wet water recharge for the MWDSC Dry Year Yield program. In the southwest, water levels have declined where there is decreased pumping in association with the land subsidence investigation and the resulting MZ1 Subsidence Management Plan (WEI, 2007b). In the south near Prado Basin, water levels have risen due to decreased agricultural pumping.

Contour of Piezometric Change (ft)
Spring 2000 to Spring 2010

Piezometric Change (ft)
Spring 2000 to Spring 2010

+60 Increase
-60 Decrease

Area not included in piezometric change calculation due to lack a of water level data

Well used for Time History Analysis (Exhibits 16 through 20)

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain
Location Approximate
Approximate Location of Groundwater Barrier
Location Concealed
Location Uncertain

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20111031
File: Exhibit_23.mxd

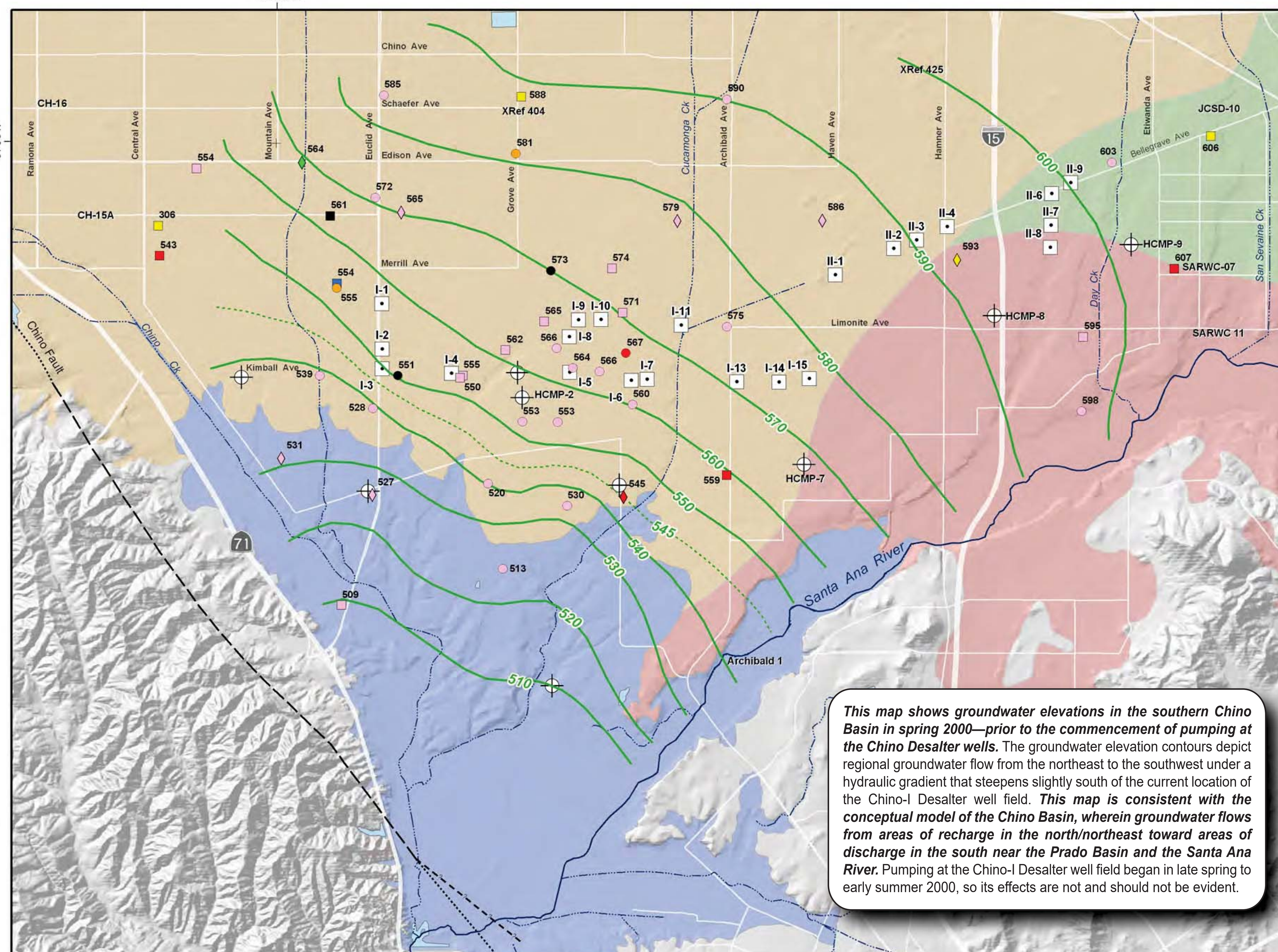
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Levels

Groundwater Level Change

Spring 2000 to Spring 2010

Exhibit 23



This map shows groundwater elevations in the southern Chino Basin in spring 2000—prior to the commencement of pumping at the Chino Desalter wells. The groundwater elevation contours depict regional groundwater flow from the northeast to the southwest under a hydraulic gradient that steepens slightly south of the current location of the Chino-I Desalter well field. This map is consistent with the conceptual model of the Chino Basin, wherein groundwater flows from areas of recharge in the north/northeast toward areas of discharge in the south near the Prado Basin and the Santa Ana River. Pumping at the Chino-I Desalter well field began in late spring to early summer 2000, so its effects are not and should not be evident.

Groundwater Elevation Contours (feet above mean sea-level)

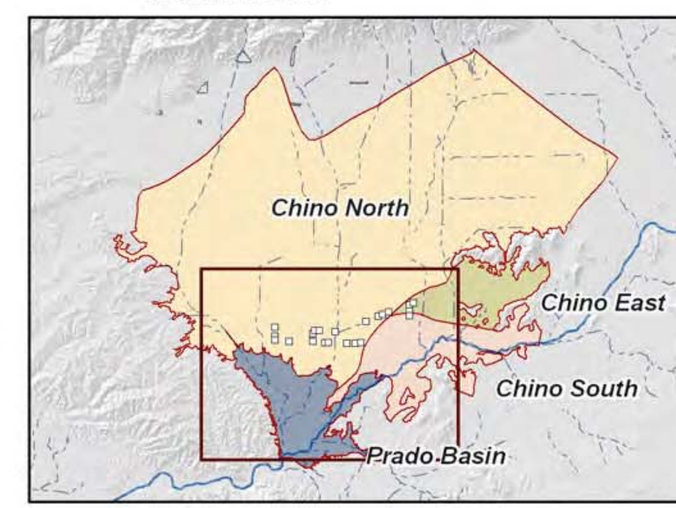
Water-Level Qualification Symbol Code (Showing Groundwater Elevation)
- Static
- Recovering
- Estimated Static
- Dynamic

Aquifer Layer Where Well Casing is Perforated
- Layer 1
- Layers 1 & 2
- Layer 2
- Layers 2 & 3
- Layer 3
- Layers 1 & 2 & 3
- Unknown Well Construction

- HCMP Monitoring Well (Installed During 2004 and 2005)
- Chino Desalter Well
- Well Used for Time History Analysis (Exhibits 16 through 20)
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

Maximum Benefit Management Zones
- Chino-North
- Chino-South
- Chino-East
- Prado

Faults
- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain



Produced by:
WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

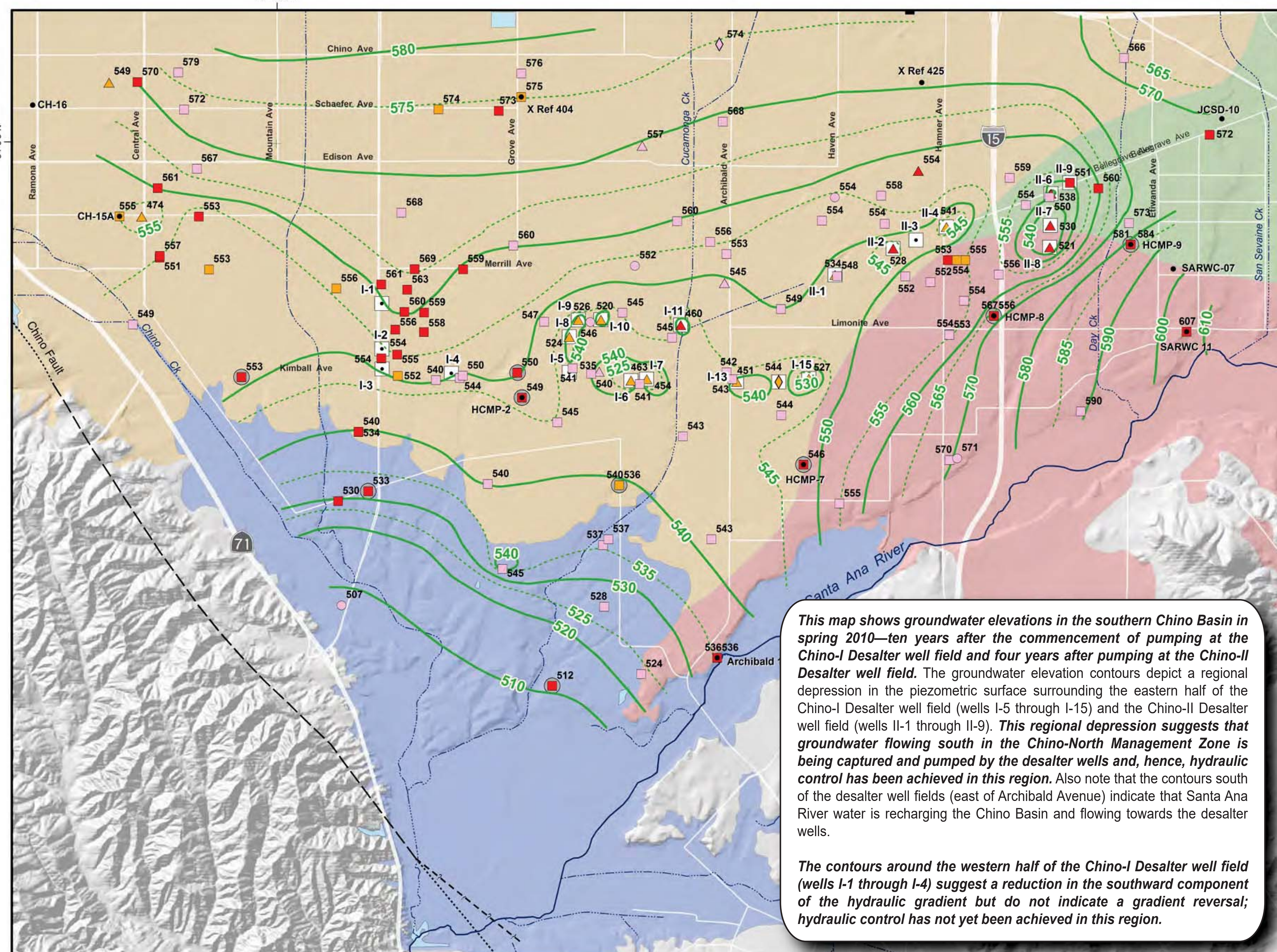
Author: TCR
Date: 20111031
File: Exhibit_24.mxd

0 1 2 Miles
0 1 2 3 KM

2010 State of the Basin
Groundwater Levels

State of Hydraulic Control in Spring 2000
Shallow Aquifer System

Exhibit 24



This map shows groundwater elevations in the southern Chino Basin in spring 2010—ten years after the commencement of pumping at the Chino-I Desalter well field and four years after pumping at the Chino-II Desalter well field. The groundwater elevation contours depict a regional depression in the piezometric surface surrounding the eastern half of the Chino-I Desalter well field (wells I-5 through I-15) and the Chino-II Desalter well field (wells II-1 through II-9). ***This regional depression suggests that groundwater flowing south in the Chino-North Management Zone is being captured and pumped by the desalter wells and, hence, hydraulic control has been achieved in this region.*** Also note that the contours south of the desalter well fields (east of Archibald Avenue) indicate that Santa Ana River water is recharging the Chino Basin and flowing towards the desalter wells.

The contours around the western half of the Chino-I Desalter well field (wells I-1 through I-4) suggest a reduction in the southward component of the hydraulic gradient but do not indicate a gradient reversal; hydraulic control has not yet been achieved in this region.

Groundwater Elevation Contours (feet above mean sea-level)

Water-Level Qualification Symbol Code (Showing Groundwater Elevation)

- Static
- Recovering
- Estimated Static
- Dynamic

Aquifer Layer Where Well Casing is Perforated

- Layer 1
- Layers 1 & 2
- Layer 2
- Layers 2 & 3
- Layer 3
- Layers 1 & 2 & 3
- Unknown Well Construction

- HCMP Piezometric Monitoring Well
- Chino Desalter Well
- Well used for Time History Analysis (Exhibits 16 through 20)
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

Maximum Benefit Management Zones

- Chino-North
- Chino-South
- Chino-East
- Prado

Faults

- Location Certain
- Location Concealed
- Location Approximate
- Location Uncertain
- Approximate Location of Groundwater Barrier

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20111031
File: Exhibit_25.mxd

0 1 2 Miles
0 1 2 3 KM

2010 State of the Basin
Groundwater Levels

State of Hydraulic Control in Spring 2010

Shallow Aquifer System

Exhibit 25

The exhibits in this section show the physical state of the Chino Basin with respect to groundwater quality, using data from the Chino Basin groundwater quality monitoring programs.

Prior to OBMP implementation, historical water quality data were obtained from the California Department of Water Resources (DWR) and supplemented with data from some producers in the Appropriative Pool and data from the State of California Department of Public Health (CDPH) database. As part of the OBMP implementation *Program Element 1 – Develop and Implement a Comprehensive Monitoring Program,* Watermaster began conducting a more robust water quality monitoring program, which includes obtaining data from well owners through a routine cooperative data collection program and supplementing with data obtained through its own sampling programs. Watermaster obtains the requisite data through several groundwater quality monitoring programs:

- **Annual Key Well Groundwater Quality Monitoring Program.** Historically, water quality data were very limited for the private wells in the southern portion of the Basin. In 1999, the comprehensive monitoring program initiated the systematic sampling of private wells south of State Route 60 in the Chino Basin. Over a three-year period from 1999 to 2001, Watermaster sampled all available wells at least twice to develop a robust baseline dataset. This program has since been reduced to approximately 110 key wells, located predominantly in the southern portion of the Basin: 100 wells are sampled on a triennial basis, and 10 are sampled on an annual basis.

- **HCMP Sampling.** Watermaster collects groundwater quality samples from the nine nested HCMP monitoring wells to demonstrate whether hydraulic control is being achieved. In addition, Watermaster collects monthly samples from four near-river wells to characterize the interaction of the Santa Ana River and groundwater. These shallow monitoring wells along the Santa Ana River consist of two former US Geological Survey (USGS) National Water Quality Assessment Program (NAWQA) wells (Archibald 1 and Archibald 2) and two Santa Ana River Water Company (SARWC) wells (well 9 and well 11).

- **Chino Basin Data Collection (CBDC)**. Watermaster routinely and proactively collects groundwater quality data from well owners, such as municipal producers and other government agencies. Water quality data are also obtained from special studies and monitoring that takes place under the orders of the Regional Board (landfills, groundwater quality investigations, etc.), the Department of Toxic Substances Control (DTSC) for the Stringfellow National Priorities List (NPL) site, the USGS, and others. These data are collected from the well owners and monitoring entities twice per year.

Groundwater quality data collected by Watermaster are used for this biennial State of the Basin report; the triennial ambient water quality update mandated by the Water Quality Control Plan for the Santa Ana River Basin (Region 8) (Basin Plan); and the demonstration of hydraulic control, a maximum benefit commitment in the Basin Plan. Data are also used for monitoring nonpoint source groundwater contamination and plumes associated with point source discharges and to assess the overall health of the groundwater basin. All groundwater quality data are checked by Watermaster staff and uploaded to a centralized database that is accessed through HydroDaVE™.

Exhibit 26 shows all wells with groundwater quality monitoring results for the five-year period of July 2005 to June 2010—the period prior to the 2010 SOB analysis date of June 30, 2010. All available groundwater quality data for this time period were analyzed synoptically and temporally at all the production and monitoring wells. Hence, the data do not represent a programmatic investigation of potential sources nor do they represent a randomized study that was designed to ascertain the water quality status of the Chino Basin. These data do, however, represent the most comprehensive information available to date.

A query was developed to analyze water quality data in the Chino Basin from July 2006 through June 2010 for any exceedances of Primary or Secondary, Federal or State Maximum Contaminant Levels (MCLs), or State Notification Levels (NLs). Wells with constituent concentrations greater than one-half of the MCL represent areas that warrant concern and inclusion in a long-term monitoring program. In addition, groundwater in the vicinity of wells with samples greater than the primary MCL may be impaired from a beneficial use standpoint. Exhibits 27 through 37 show the results of these exceedances graphically for constituents that exceeded the primary MCL in more than ten wells in the Chino Basin; the exceedances are not exclusive to one particular known-point source (*i.e.* Stringfellow Superfund Site). These constituents include total dissolved solids (TDS), nitrate as nitrogen (NO_3-N), perchlorate, total chromium, arsenic, trichloroethene (TCE), tetrachloroethene (PCE), 1,2,3-trichloropropane (1,2,3-TCP), *cis*-1,2-dichloroethene (*cis*-1,2DCE), and 1,1-dichloroethene (1,1-DCE). An exhibit showing hexavalent chromium exceedances in the Chino Basin has also been included to address the recent determination of a CDPH Public Health Goal and the current process of establishing an MCL in California. The water quality standards exceedances are noted on the exhibits, the maximum concentration value for each well is plotted. The following convention sets class intervals on a given map:

Symbol	Class Interval
○ (white)	Not Detected
● (blue)	<0.5x WQS, but detected
● (green)	0.5x WQS to WQS
● (yellow)	WQS to 2x WQS
● (orange)	2x WQS to 4x WQS
● (red)	> 4x WQS

Exhibit 38 shows the locations of various known point source discharges to groundwater and associated areas of degradation. Understanding point sources of concern in the Chino Basin is critical to the overall management of groundwater quality. To ensure that Chino Basin groundwater remains a sustainable resource, Watermaster must closely monitor point source discharges and emerging contaminates of concern. Watermaster works closely with the Regional Water Quality Control Board (RWQCB) and the potentially responsible parties (PRPs) within the Chino Basin. The following is a summary of all the regulatory and voluntary contamination monitoring in the Chino Basin:

- **Plume:** Alumax Aluminum Recycling Facility
  Constituent of Concern: TDS, sulfate, nitrate, chloride
  Order: RWQCB Cleanup and Abatement Order 99-38

- **Plume:** Archibald South Plume – South of Ontario Airport
  Constituent of Concern: volatile organic chemicals (VOCs)
  Order: This plume is currently being voluntarily investigated by a group of potentially responsible parties.

- **Plume:** Chino Airport
  Constituent of Concern: VOCs
  Order: RWQCB Cleanup and Abatement Order 90-134

- **Plume:** California Institute for Men (No Further Action status, as of 2/17/2009)
  Constituent of Concern: VOCs
  Order: Voluntary Cleanup Monitoring
- **Plume:** Crown Coach International Facility
  Constituent of Concern: VOCs and Solvents
  Order: Voluntary Cleanup Monitoring
- **Plume:** General Electric Flatiron Facility
  Constituent of Concern: VOCs
  Order: Voluntary Cleanup Monitoring
- **Plume:** General Electric Test Cell Facility
  Constituent of Concern: VOCs
  Order: Voluntary Cleanup Monitoring
- **Plume:** Kaiser Steel Fontana Site
  Constituent of Concern: TDS/total organic carbon (TOC)
  Order: RWQCB Order No. 91-40 Closed. Kaiser granted capacity in the Chino II Desalter to remediate.
- **Plume:** Milliken Sanitary Landfill
  Constituent of Concern: VOCs
  Order: RWQCB Order No. 81-003
- **Plume:** Upland Sanitary Landfill
  Constituent of Concern: VOCs
  Order RWQCB Order No 98-99-07
- **Plume:** Stringfellow National Priorities List (NPL) Site
  Constituent of Concern: VOCs, perchlorate, N-nitrosodimethylamine (NDMA), heavy metals
  Order: The Stringfellow Site is the subject of US Environmental Protection Agency (EPA) Records of Decision (RODs): EPA/ROD/R09-84/007, EPA/ROD/R09-83/005, EPA/ROD/R09-87/016, and EPA/ROD/R09-90/048.

Groundwater quality data collected from Watermaster's sampling programs, from other special studies, and from monitoring in the Basin under the orders of the RWQCB are used by Watermaster to delineate plumes associated with VOC contamination every two to three years. Exhibit 38 shows the extent of contamination associated with VOC plumes as of 2010. The VOC plumes are illustrations of the estimated spatial extent of TCE or PCE, depending on the main constituent of concern. The methods employed to create these depictions are described on each exhibit. Exhibits 39 and 40 show more detailed delineations of the Chino Airport plume and Archibald South plume, respectively. Because the extensive multi-depth groundwater quality monitoring completed over the last five years in the Chino Airport region, Exhibit 39 shows Chino Airport plume delineation in the shallow and deep aquifers.

Exhibit 41 shows the VOC plumes and features pie charts that display the relative percent of TCE, PCE, and other VOCs detected at groundwater wells within the plume impacted areas. The pie charts demonstrate the chemical differentiation between the VOC plumes in the southern portion of Chino Basin.

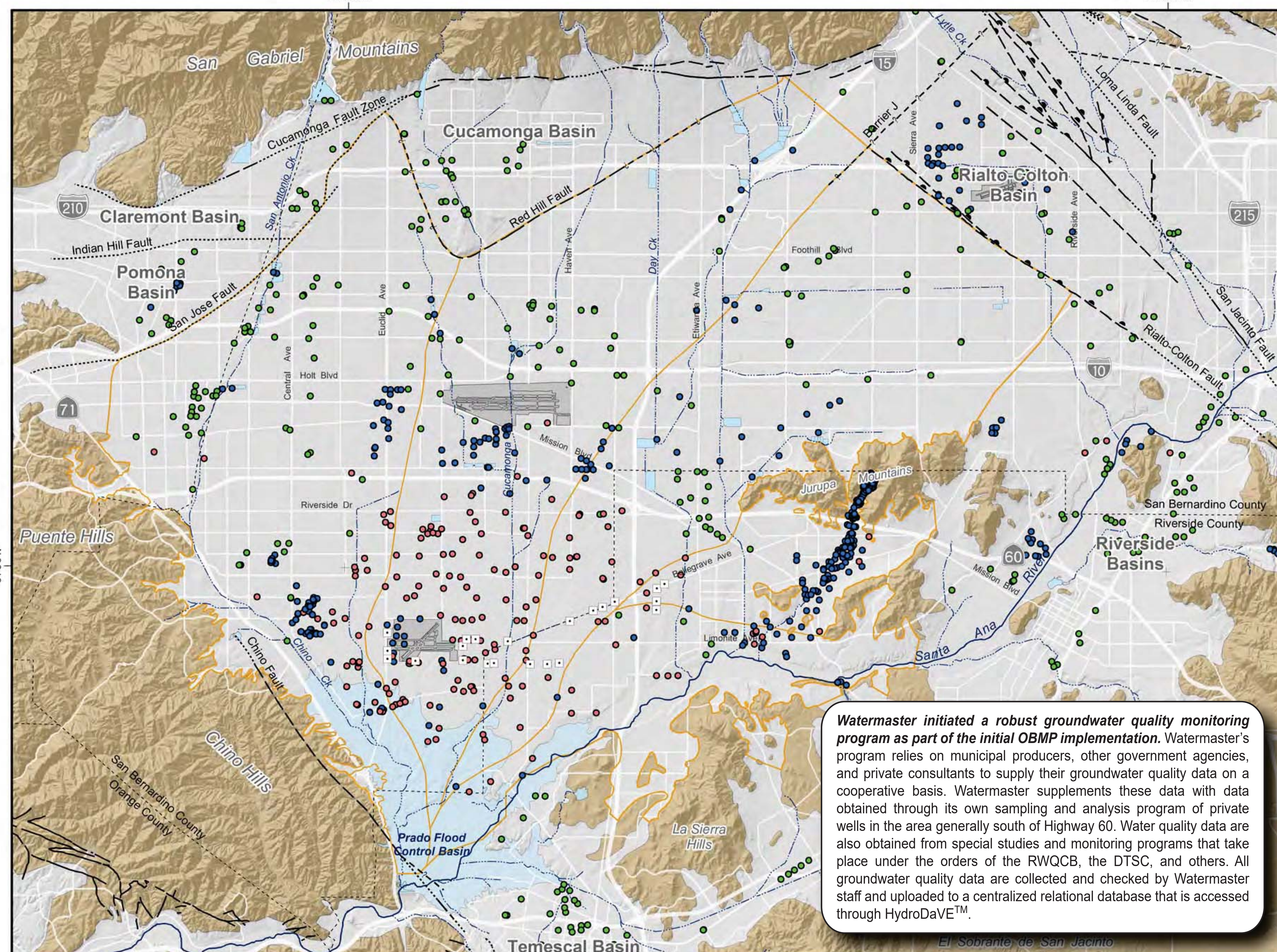
The remaining exhibits in this section display the overall state of groundwater quality in the Basin with respect to TDS and nitrate concentrations.

Exhibits 42 and 43 show trends in the ambient water quality determinations for TDS and NO_3-N by management zone and the associated anti-degradation and maximum benefit water quality objectives. The maximum benefit objectives established in the Basin Plan Amendment (RWQCB, 2004) raised the TDS and NO_3-N objectives for management zones in the Chino-North Management Zone (MZ1, MZ2, and MZ3), based on the maximum beneficial use of the waters of the state ("maximum benefit"). These "maximum benefit" water quality objectives were based on the additional consideration of factors specified in California Water Code Section 13241 and the requirements of the State's Antidegradation Policy (SWRCB Resolution No. 68-16), which requires a demonstration that the change in the objective will be "[…] consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies." The maximum benefit showings have allowed for more efficient and pragmatic water supply planning and salt/nutrient management.

For the establishment of "maximum benefit" based objectives, the RWQCB has required that Watermaster and IEUA demonstrate that raising the objectives will not impact downstream beneficial uses or significantly impact the quality of the Santa Ana River. The CBWM and IEUA must demonstrate hydraulic control to ensure that downstream beneficial uses are not impaired by management activities in the Chino-North Management Zone.

The IEUA and the CBWM are co-permittees for the recharge of recycled water in the Chino Basin. They have obligations codified in the 2004 Basin Plan Amendment that require them to manage the Chino Basin in such a way that there is no groundwater outflow to the Santa Ana River from the main part of the Chino Basin. The elimination of groundwater outflow from the main part of the Chino Basin to the Santa Ana River is referred to as hydraulic control.

Exhibits 44 through Exhibit 51 show TDS and nitrate time histories for selected wells from 1970 to 2010. These time histories illustrate water quality variations and trends within each management zone and the current state of water quality compared to historical trends. The wells were selected based on location, length of record, quality of data, geographical distribution, and screened intervals. Wells are identified by their local name (usually owner abbreviation and well number) or X Reference ID (XRef) if privately owned. The time histories include the CDPH MCL.



Monitoring/Extraction Wells
Municipal Wells
Private Wells
Chino Desalter Wells
OBMP Management Zones
Streams & Flood Control Channels
Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain
Location Approximate
Approximate Location of Groundwater Barrier
Location Concealed
Location Uncertain

Watermaster initiated a robust groundwater quality monitoring program as part of the initial OBMP implementation. Watermaster's program relies on municipal producers, other government agencies, and private consultants to supply their groundwater quality data on a cooperative basis. Watermaster supplements these data with data obtained through its own sampling and analysis program of private wells in the area generally south of Highway 60. Water quality data are also obtained from special studies and monitoring programs that take place under the orders of the RWQCB, the DTSC, and others. All groundwater quality data are collected and checked by Watermaster staff and uploaded to a centralized relational database that is accessed through HydroDaVE™.

Produced by:

WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110420
File: Exhibit_26.mxd

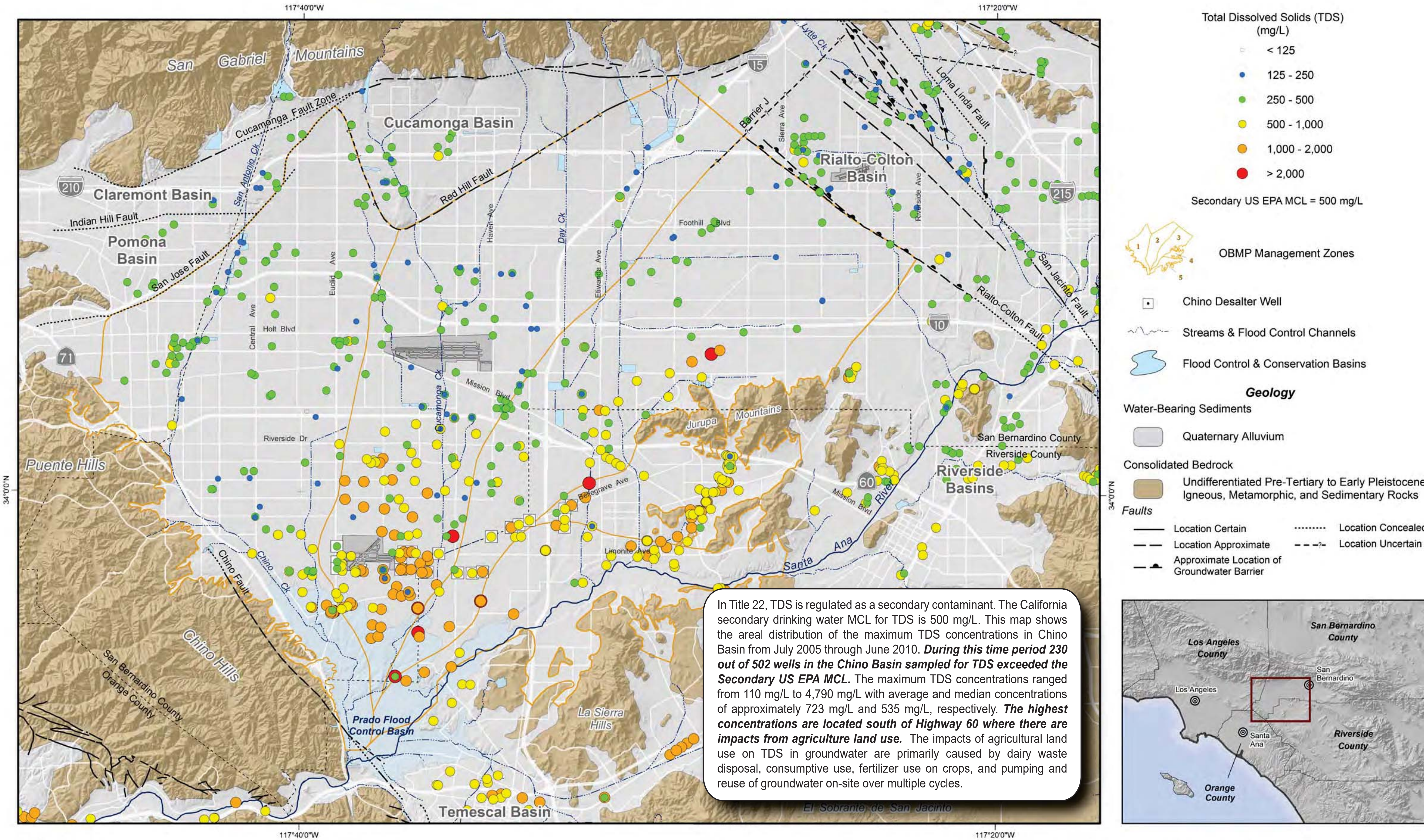
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Wells with Groundwater Quality Data

July 2005 to June 2010

Exhibit 26



In Title 22, TDS is regulated as a secondary contaminant. The California secondary drinking water MCL for TDS is 500 mg/L. This map shows the areal distribution of the maximum TDS concentrations in Chino Basin from July 2005 through June 2010. ***During this time period 230 out of 502 wells in the Chino Basin sampled for TDS exceeded the Secondary US EPA MCL.*** The maximum TDS concentrations ranged from 110 mg/L to 4,790 mg/L with average and median concentrations of approximately 723 mg/L and 535 mg/L, respectively. ***The highest concentrations are located south of Highway 60 where there are impacts from agriculture land use.*** The impacts of agricultural land use on TDS in groundwater are primarily caused by dairy waste disposal, consumptive use, fertilizer use on crops, and pumping and reuse of groundwater on-site over multiple cycles.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110421
File: Exhibit_27.mxd

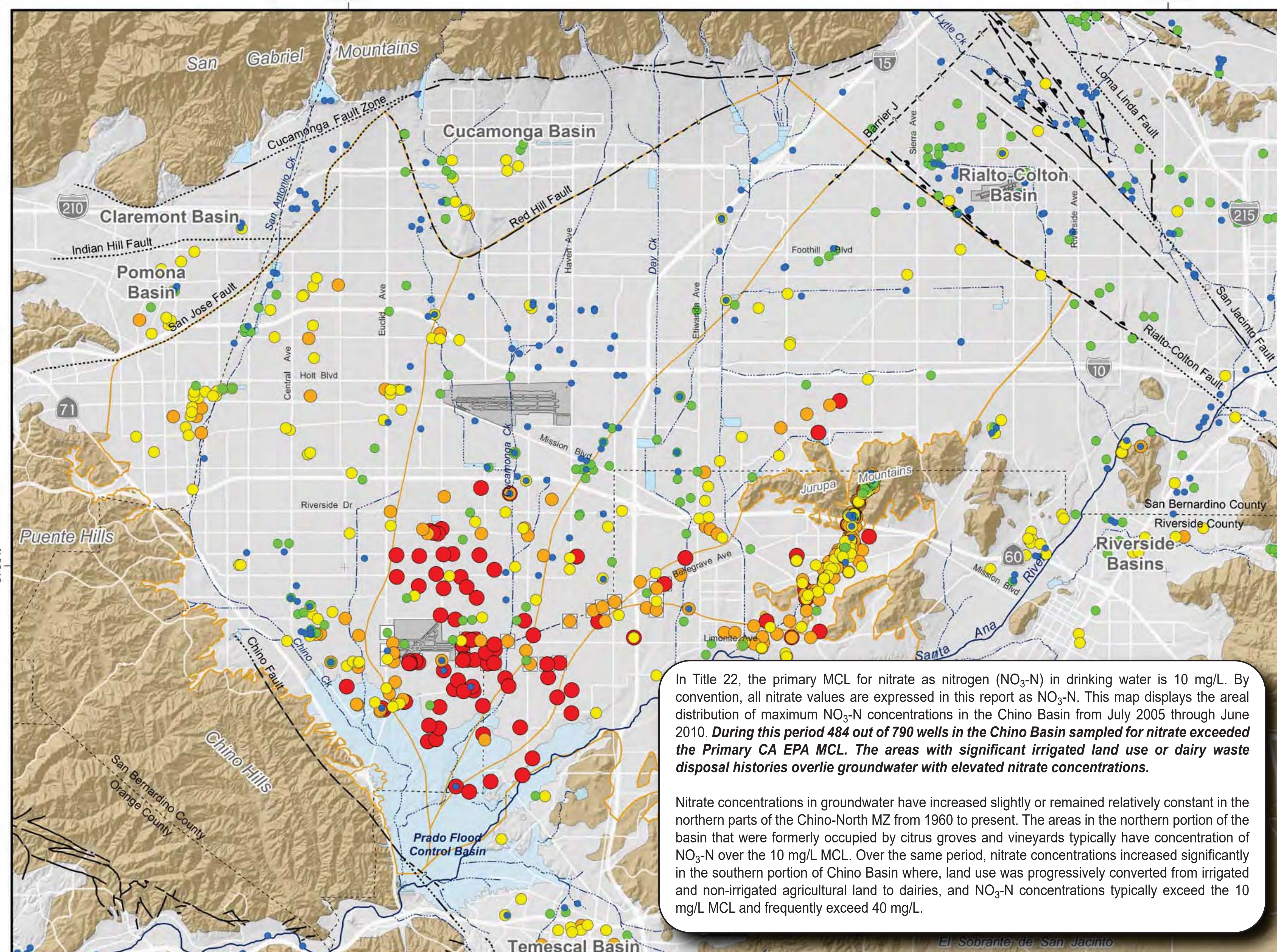
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Total Dissolved Solids in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 27



Nitrate-Nitrogen (NO3-N) (mg/L)

- ND
- < 5
- 5 - 10
- 10 - 20
- 20 - 40
- > 40

Primary US EPA MCL = 10 mg/L
Primary CA MCL = 10 mg/L

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

In Title 22, the primary MCL for nitrate as nitrogen (NO_3-N) in drinking water is 10 mg/L. By convention, all nitrate values are expressed in this report as NO_3-N. This map displays the areal distribution of maximum NO_3-N concentrations in the Chino Basin from July 2005 through June 2010. ***During this period 484 out of 790 wells in the Chino Basin sampled for nitrate exceeded the Primary CA EPA MCL. The areas with significant irrigated land use or dairy waste disposal histories overlie groundwater with elevated nitrate concentrations.***

Nitrate concentrations in groundwater have increased slightly or remained relatively constant in the northern parts of the Chino-North MZ from 1960 to present. The areas in the northern portion of the basin that were formerly occupied by citrus groves and vineyards typically have concentration of NO_3-N over the 10 mg/L MCL. Over the same period, nitrate concentrations increased significantly in the southern portion of Chino Basin where, land use was progressively converted from irrigated and non-irrigated agricultural land to dairies, and NO_3-N concentrations typically exceed the 10 mg/L MCL and frequently exceed 40 mg/L.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110421
File: Exhibit_28.mxd

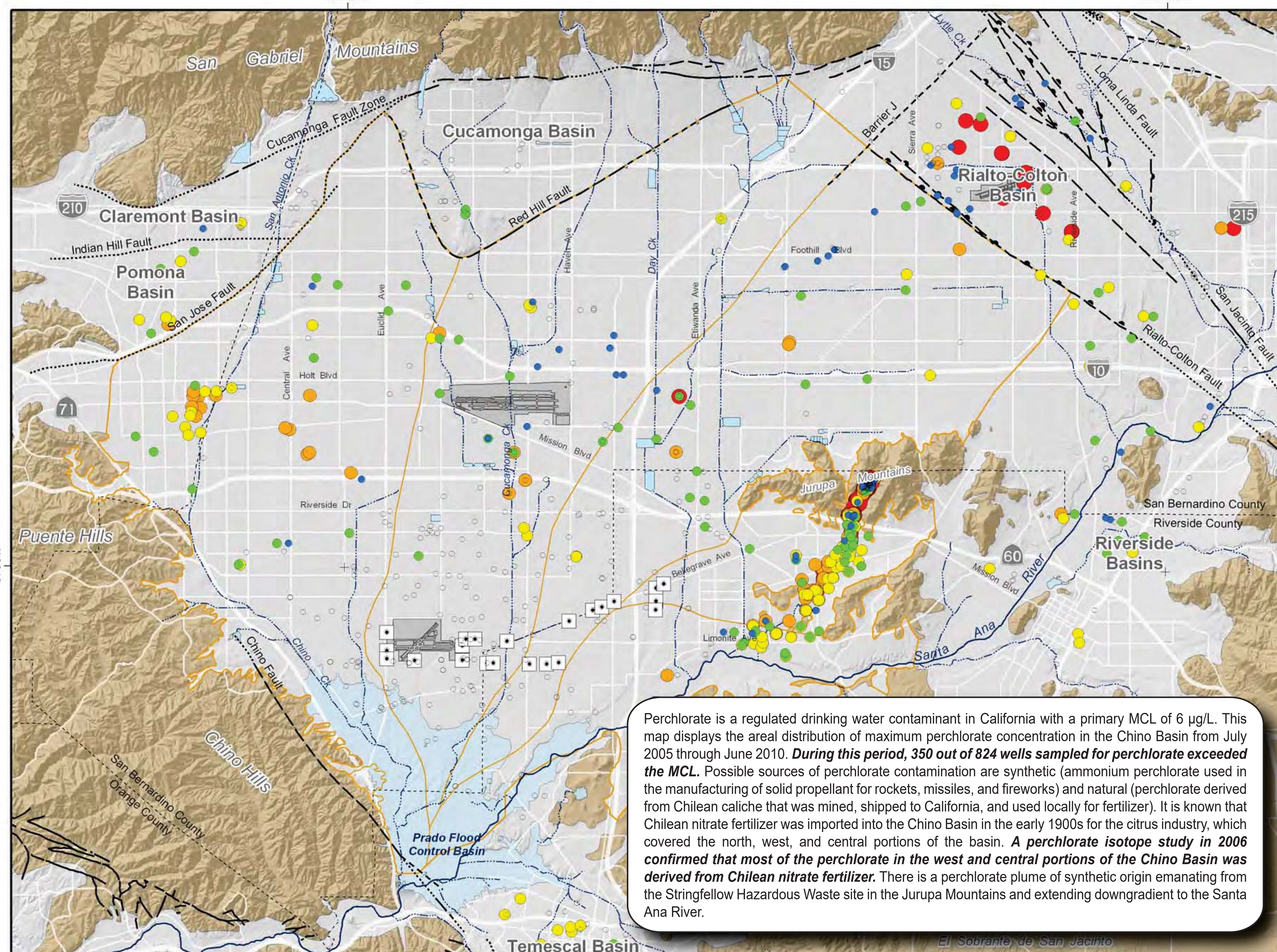
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Nitrate as Nitrogen in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 28



Perchlorate is a regulated drinking water contaminant in California with a primary MCL of 6 µg/L. This map displays the areal distribution of maximum perchlorate concentration in the Chino Basin from July 2005 through June 2010. ***During this period, 350 out of 824 wells sampled for perchlorate exceeded the MCL.*** Possible sources of perchlorate contamination are synthetic (ammonium perchlorate used in the manufacturing of solid propellant for rockets, missiles, and fireworks) and natural (perchlorate derived from Chilean caliche that was mined, shipped to California, and used locally for fertilizer). It is known that Chilean nitrate fertilizer was imported into the Chino Basin in the early 1900s for the citrus industry, which covered the north, west, and central portions of the basin. ***A perchlorate isotope study in 2006 confirmed that most of the perchlorate in the west and central portions of the Chino Basin was derived from Chilean nitrate fertilizer.*** There is a perchlorate plume of synthetic origin emanating from the Stringfellow Hazardous Waste site in the Jurupa Mountains and extending downgradient to the Santa Ana River.

Perchlorate (ug/L)
- ND
- < 3
- 3 - 6
- 6 - 12
- 12 - 24
- > 24

CA Primary MCL = 6 ug/L

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 201100520
File: Exhibit_29.mxd

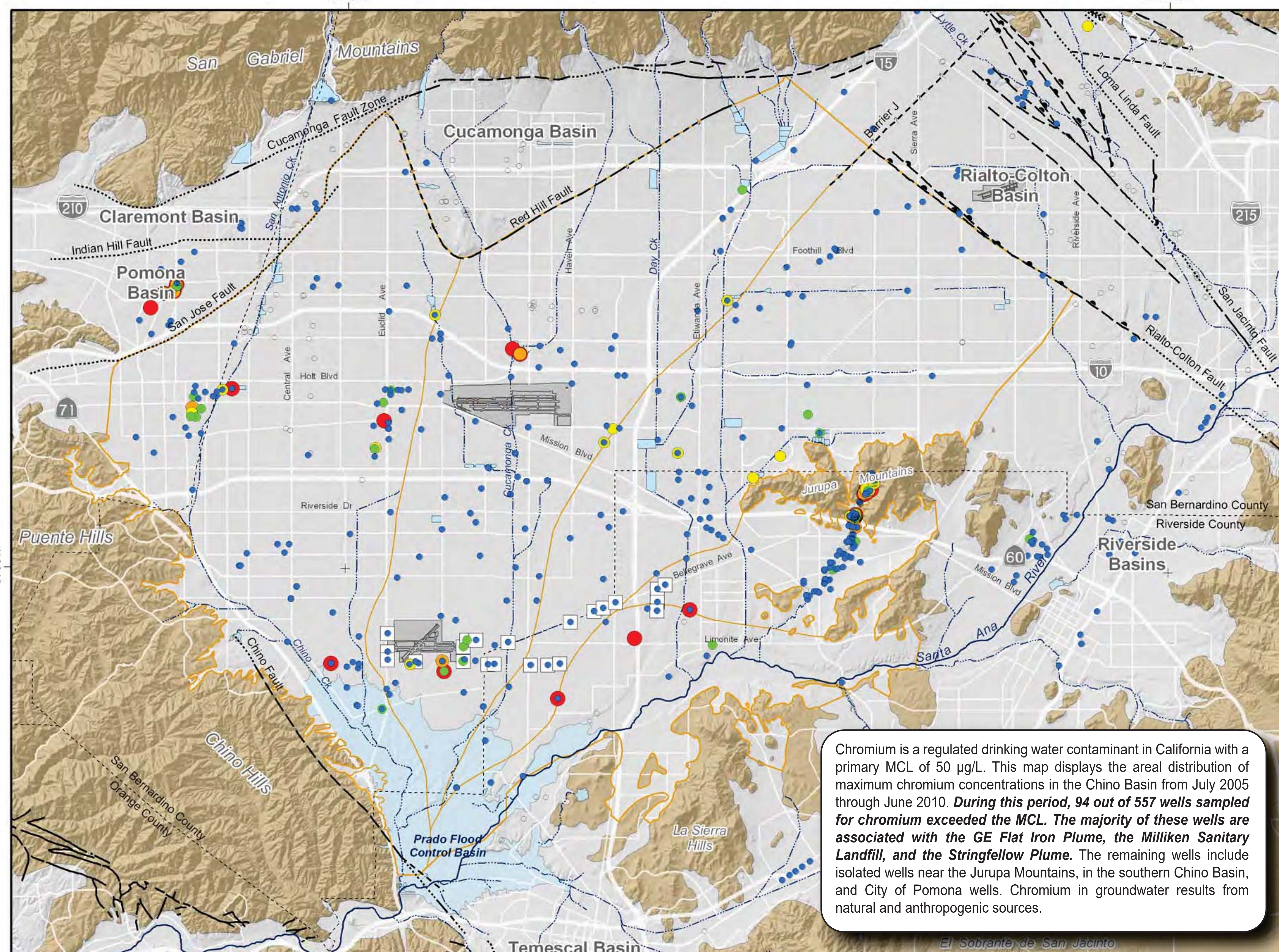
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Perchlorate in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 29



Chromium is a regulated drinking water contaminant in California with a primary MCL of 50 µg/L. This map displays the areal distribution of maximum chromium concentrations in the Chino Basin from July 2005 through June 2010. ***During this period, 94 out of 557 wells sampled for chromium exceeded the MCL. The majority of these wells are associated with the GE Flat Iron Plume, the Milliken Sanitary Landfill, and the Stringfellow Plume.*** The remaining wells include isolated wells near the Jurupa Mountains, in the southern Chino Basin, and City of Pomona wells. Chromium in groundwater results from natural and anthropogenic sources.

Total Chromium (ug/L)

- ND
- < 25
- 25 - 50
- 50 - 100
- 100 - 200
- > 200

Primary US EPA MCL = 100 ug/L
Primary CA MCL = 50 ug/L

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 201100520
File: Exhibit_30.mxd

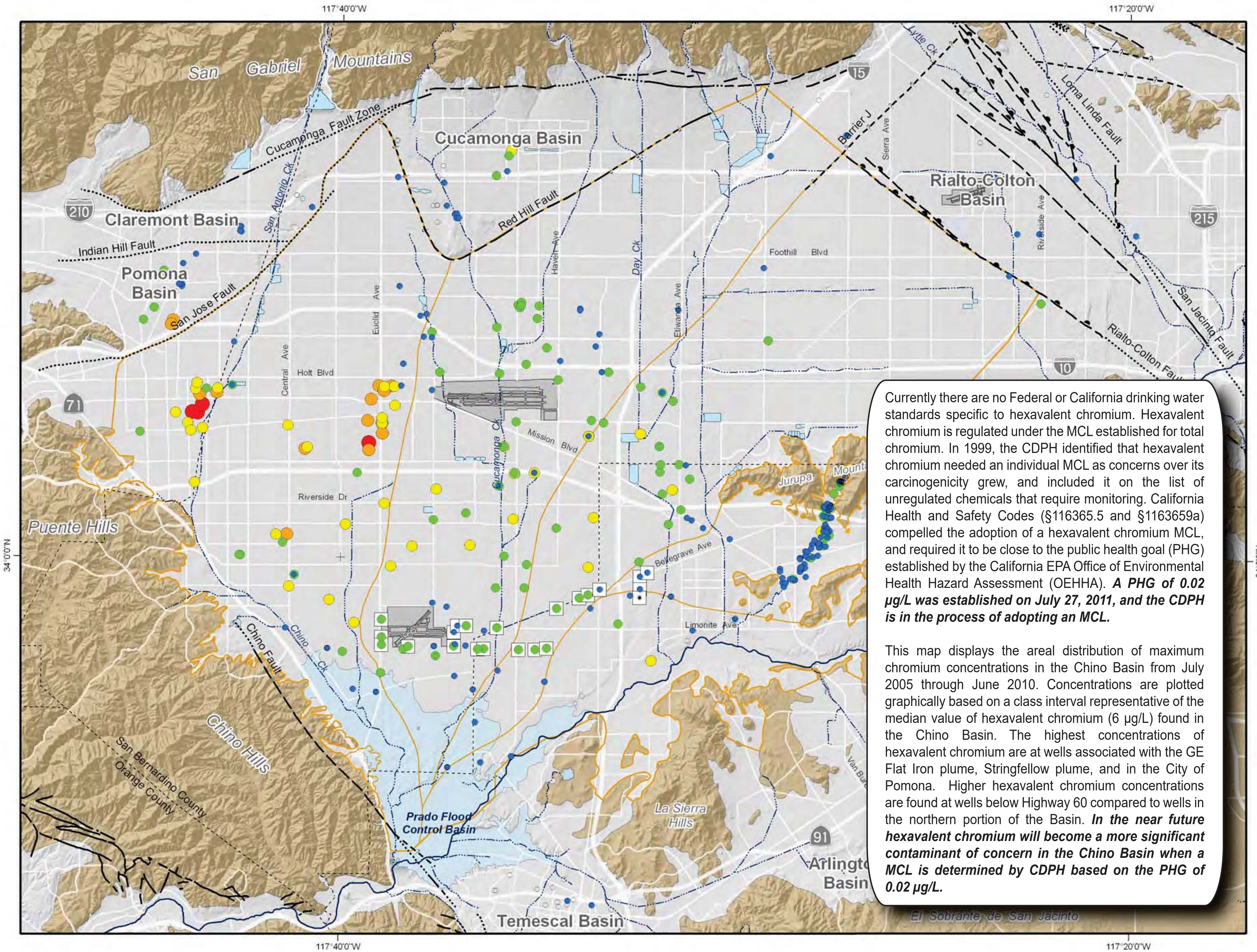
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Total Chromium in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 30



Currently there are no Federal or California drinking water standards specific to hexavalent chromium. Hexavalent chromium is regulated under the MCL established for total chromium. In 1999, the CDPH identified that hexavalent chromium needed an individual MCL as concerns over its carcinogenicity grew, and included it on the list of unregulated chemicals that require monitoring. California Health and Safety Codes (§116365.5 and §1163659a) compelled the adoption of a hexavalent chromium MCL, and required it to be close to the public health goal (PHG) established by the California EPA Office of Environmental Health Hazard Assessment (OEHHA). ***A PHG of 0.02 µg/L was established on July 27, 2011, and the CDPH is in the process of adopting an MCL.***

This map displays the areal distribution of maximum chromium concentrations in the Chino Basin from July 2005 through June 2010. Concentrations are plotted graphically based on a class interval representative of the median value of hexavalent chromium (6 µg/L) found in the Chino Basin. The highest concentrations of hexavalent chromium are at wells associated with the GE Flat Iron plume, Stringfellow plume, and in the City of Pomona. Higher hexavalent chromium concentrations are found at wells below Highway 60 compared to wells in the northern portion of the Basin. ***In the near future hexavalent chromium will become a more significant contaminant of concern in the Chino Basin when a MCL is determined by CDPH based on the PHG of 0.02 µg/L.***

Hexavalent Chromium (ug/L)

- ND
- < 3
- 3 - 6
- 6 - 12
- 12 - 24
- > 24

Currently there is no US or CA EPA MCL; hexavalent chromium is regulated as total chromium which has a CA EPA MCL of 50 ug/L.

A CA Public Health Goal of 0.02 ug/L was established in July 2011.

- OBMP Management Zones
- Chino Desalter Well
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

- Quaternary Alluvium

Consolidated Bedrock

- Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:
WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 201100520
File: Exhibit_31.mxd

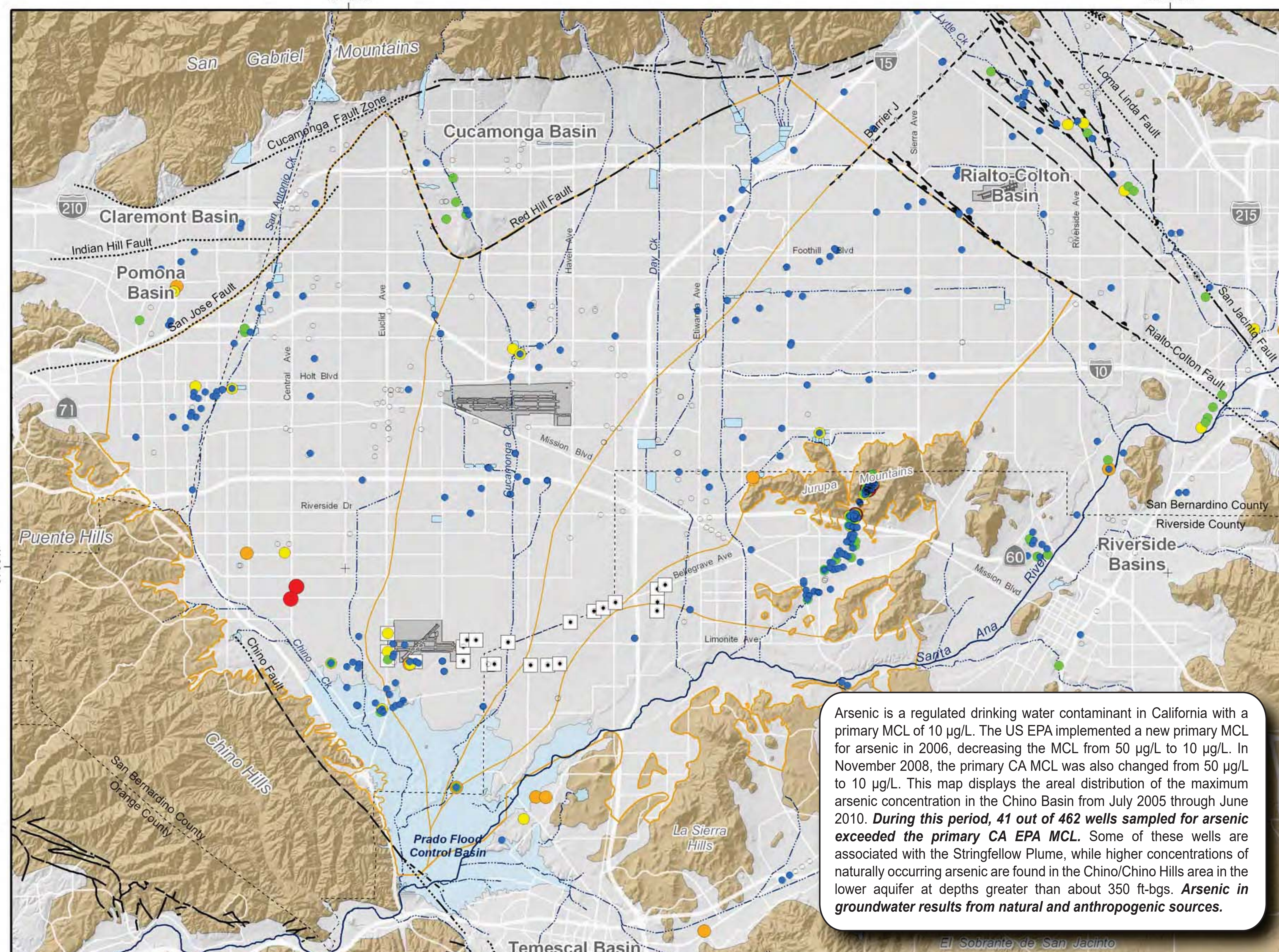
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Hexavalent Chromium in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 31



Arsenic is a regulated drinking water contaminant in California with a primary MCL of 10 μg/L. The US EPA implemented a new primary MCL for arsenic in 2006, decreasing the MCL from 50 μg/L to 10 μg/L. In November 2008, the primary CA MCL was also changed from 50 μg/L to 10 μg/L. This map displays the areal distribution of the maximum arsenic concentration in the Chino Basin from July 2005 through June 2010. ***During this period, 41 out of 462 wells sampled for arsenic exceeded the primary CA EPA MCL.*** Some of these wells are associated with the Stringfellow Plume, while higher concentrations of naturally occurring arsenic are found in the Chino/Chino Hills area in the lower aquifer at depths greater than about 350 ft-bgs. ***Arsenic in groundwater results from natural and anthropogenic sources.***

Arsenic (ug/L)

- ND
- < 5
- 5 - 10
- 10 - 20
- 20 - 40
- > 40

Primary US EPA MCL = 10 ug/L
Primary CA MCL = 10 ug/L

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 201100519
File: Exhibit_32.mxd

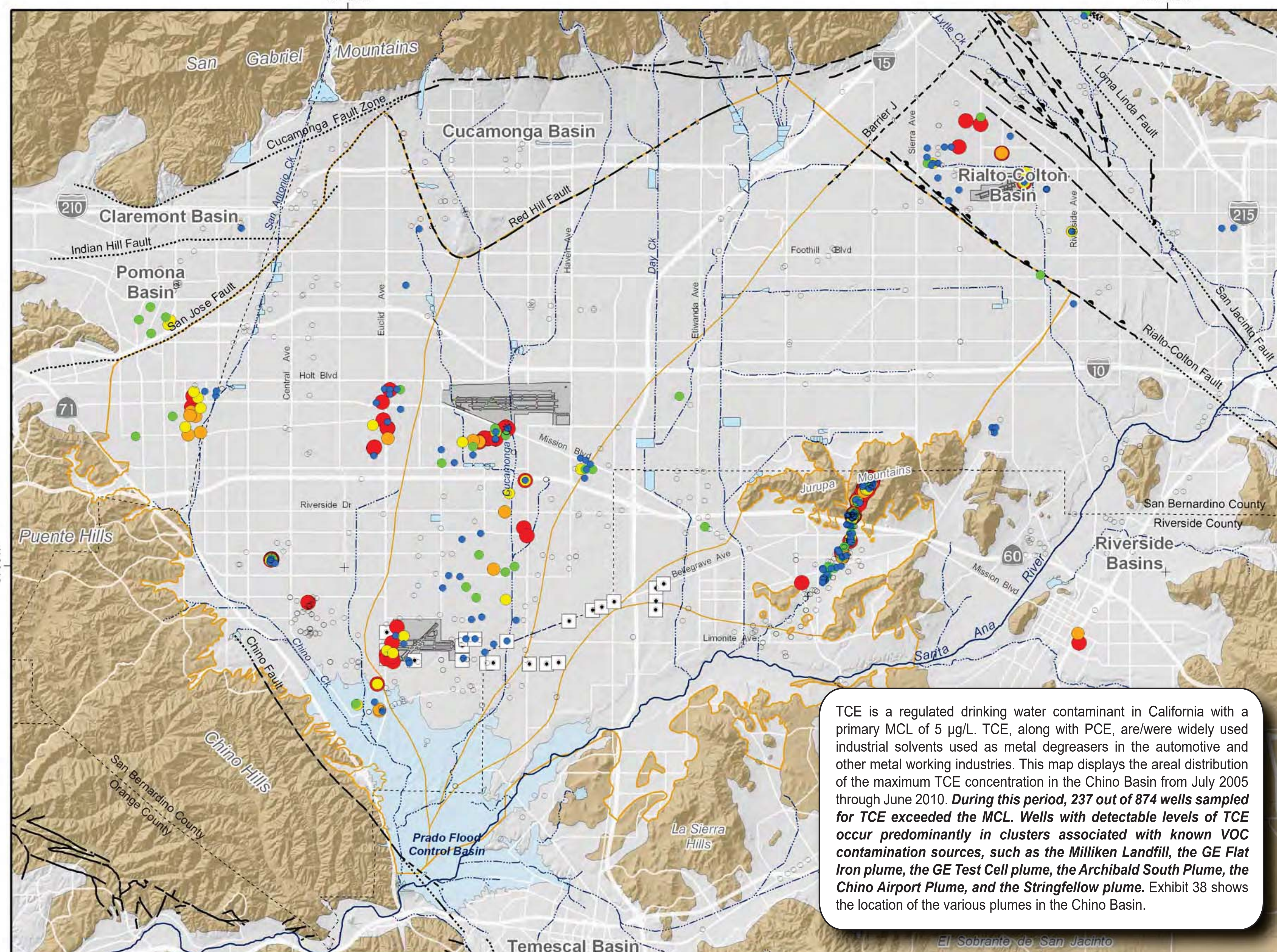
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Arsenic in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 32



TCE is a regulated drinking water contaminant in California with a primary MCL of 5 µg/L. TCE, along with PCE, are/were widely used industrial solvents used as metal degreasers in the automotive and other metal working industries. This map displays the areal distribution of the maximum TCE concentration in the Chino Basin from July 2005 through June 2010. ***During this period, 237 out of 874 wells sampled for TCE exceeded the MCL. Wells with detectable levels of TCE occur predominantly in clusters associated with known VOC contamination sources, such as the Milliken Landfill, the GE Flat Iron plume, the GE Test Cell plume, the Archibald South Plume, the Chino Airport Plume, and the Stringfellow plume.*** Exhibit 38 shows the location of the various plumes in the Chino Basin.

Trichloroethene (ug/L)

- ND
- < 2.5
- 2.5 - 5
- 5 - 10
- 10 - 20
- > 20

Primary US EPA MCL = 5 ug/L
Primary CA MCL = 5 ug/L

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110421
File: Exhibit_33.mxd

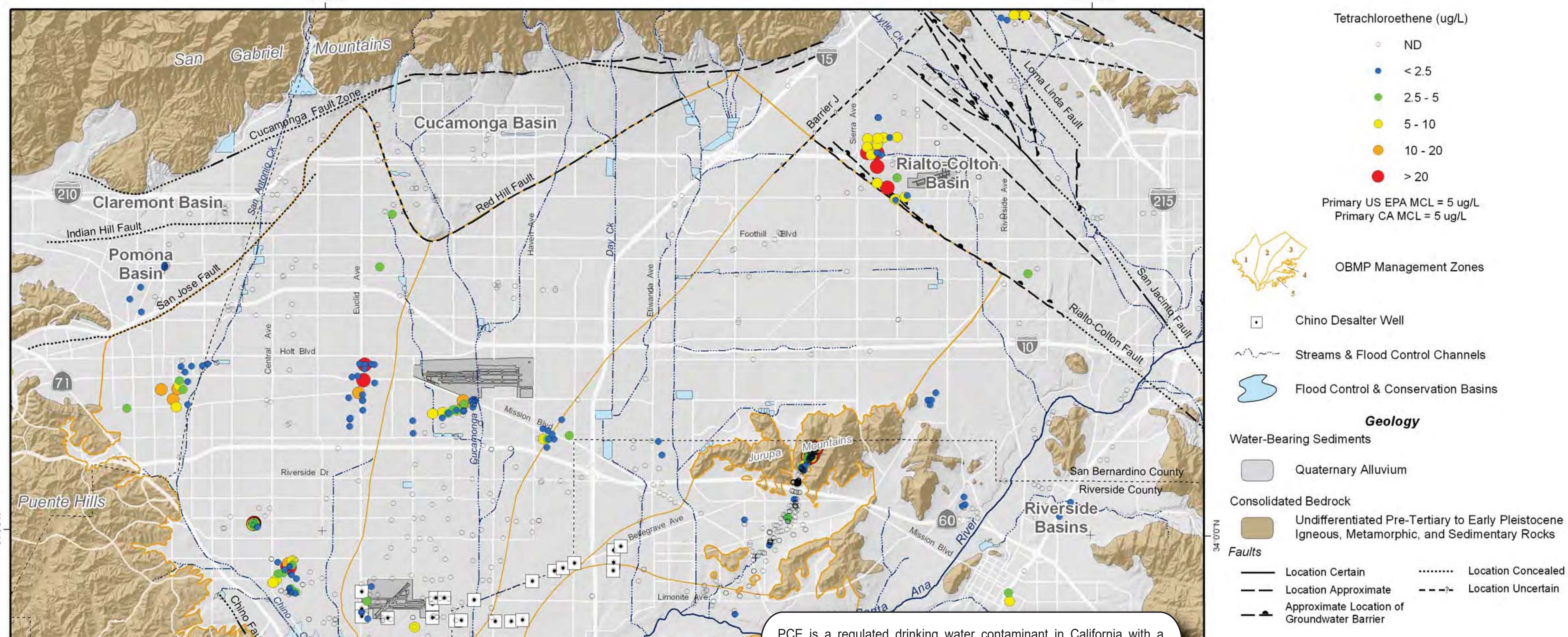
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Trichloroethene (TCE) in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 33



PCE is a regulated drinking water contaminant in California with a primary MCL of 5 µg/L. PCE along with TCE, are/were widely used industrial solvents used as metal degreasers in the automotive and other metal working industries. PCE is also a commonly used chemical in the dry-cleaning industry. This map displays the areal distribution of the maximum PCE concentrations in the Chino Basin from July 2005 through June 2010. ***During this period, 88 out of 840 wells sampled for PCE exceeded the primary CA EPA MCL.*** The spatial distribution of PCE resembles that of TCE. ***Wells with detectable levels of PCE occur predominantly in well clusters associated with known VOC contamination sources such as the Milliken Landfill, the GE Flat Iron plume, the GE Test Cell plume, the Chino Airport Plume, the CIM plume, and the Stringfellow plume.*** Exhibit 38 shows the location of the various plumes in the Chino Basin.

Produced by:
WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 201100519
File: Exhibit_34.mxd

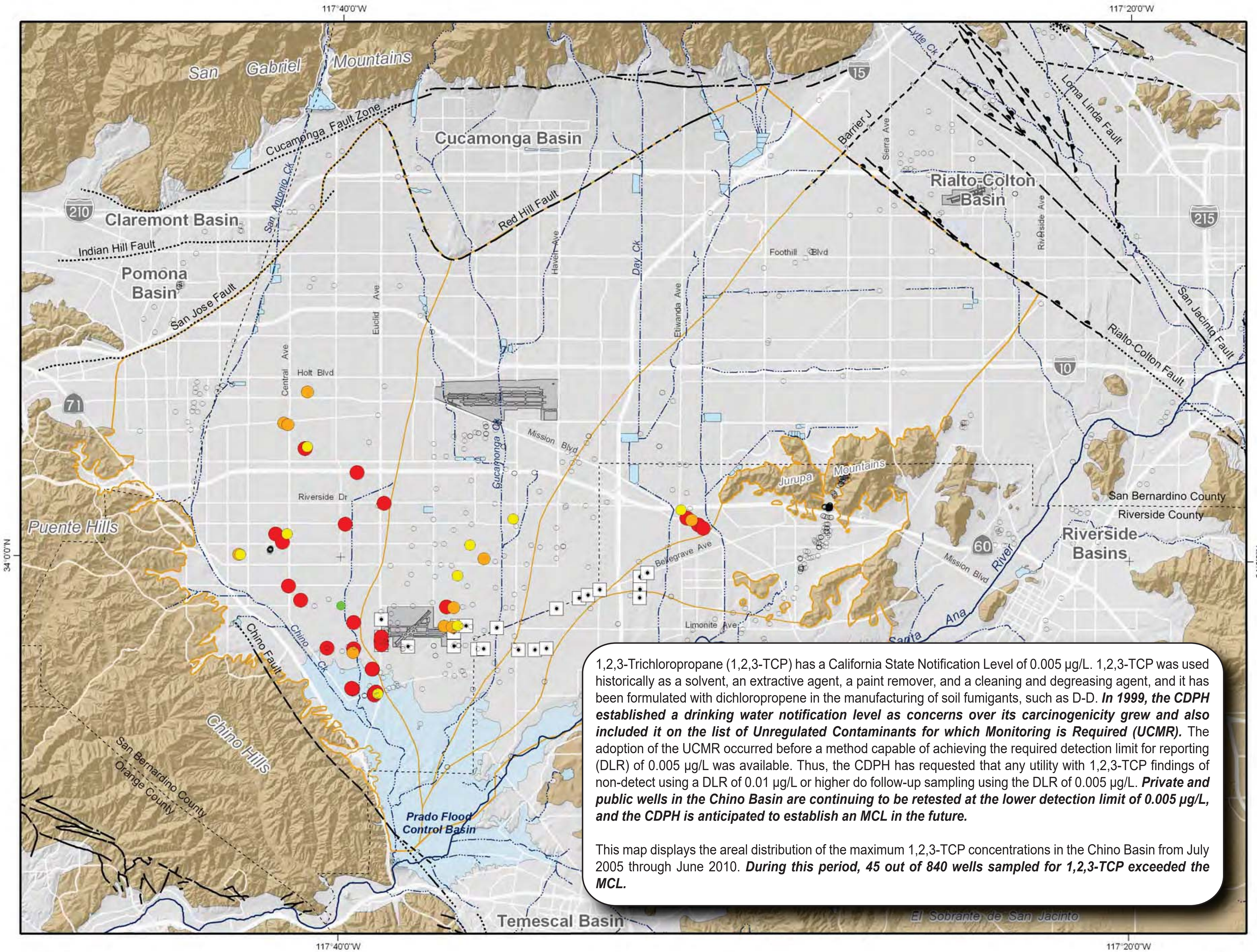
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Tetrachloroethene (PCE) in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 34



1,2,3-Trichloropropane (1,2,3-TCP) has a California State Notification Level of 0.005 µg/L. 1,2,3-TCP was used historically as a solvent, an extractive agent, a paint remover, and a cleaning and degreasing agent, and it has been formulated with dichloropropene in the manufacturing of soil fumigants, such as D-D. ***In 1999, the CDPH established a drinking water notification level as concerns over its carcinogenicity grew and also included it on the list of Unregulated Contaminants for which Monitoring is Required (UCMR).*** The adoption of the UCMR occurred before a method capable of achieving the required detection limit for reporting (DLR) of 0.005 µg/L was available. Thus, the CDPH has requested that any utility with 1,2,3-TCP findings of non-detect using a DLR of 0.01 µg/L or higher do follow-up sampling using the DLR of 0.005 µg/L. ***Private and public wells in the Chino Basin are continuing to be retested at the lower detection limit of 0.005 µg/L, and the CDPH is anticipated to establish an MCL in the future.***

This map displays the areal distribution of the maximum 1,2,3-TCP concentrations in the Chino Basin from July 2005 through June 2010. ***During this period, 45 out of 840 wells sampled for 1,2,3-TCP exceeded the MCL.***

Produced by:

WILDERMUTH ENVIRONMENTAL INC

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 201100519
File: Exhibit_35.mxd

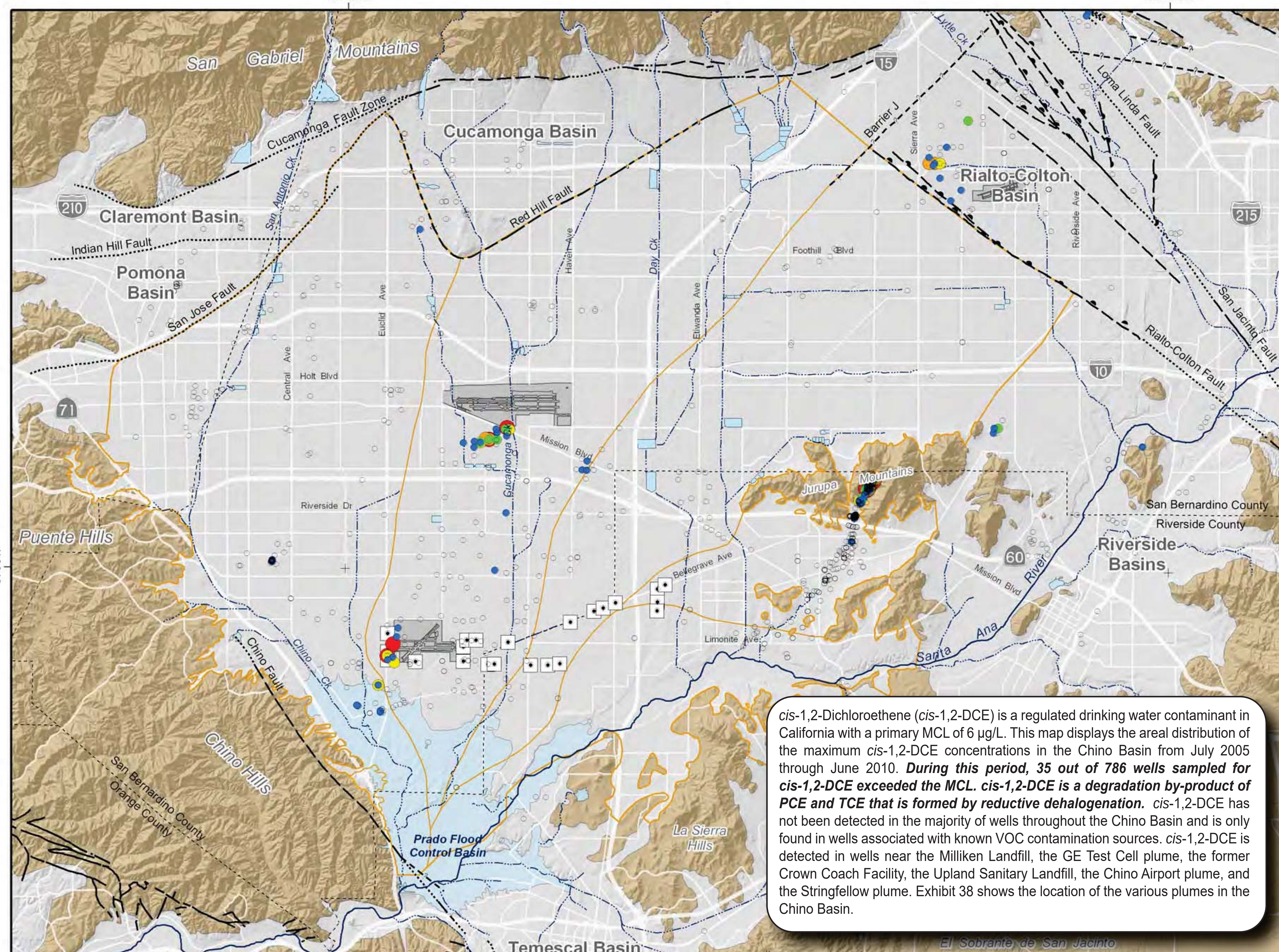
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

1,2,3-Trichloropropane in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 35



cis-1,2-Dichloroethene (ug/L)

- ND
- < 3
- 3 - 6
- 6 - 12
- 12 - 24
- > 24

Primary US EPA MCL = 70 ug/L
Primary CA MCL = 6 ug/L

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

cis-1,2-Dichloroethene (*cis*-1,2-DCE) is a regulated drinking water contaminant in California with a primary MCL of 6 μg/L. This map displays the areal distribution of the maximum *cis*-1,2-DCE concentrations in the Chino Basin from July 2005 through June 2010. ***During this period, 35 out of 786 wells sampled for cis-1,2-DCE exceeded the MCL. cis-1,2-DCE is a degradation by-product of PCE and TCE that is formed by reductive dehalogenation.*** *cis*-1,2-DCE has not been detected in the majority of wells throughout the Chino Basin and is only found in wells associated with known VOC contamination sources. *cis*-1,2-DCE is detected in wells near the Milliken Landfill, the GE Test Cell plume, the former Crown Coach Facility, the Upland Sanitary Landfill, the Chino Airport plume, and the Stringfellow plume. Exhibit 38 shows the location of the various plumes in the Chino Basin.

Produced by:

WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 201100519
File: Exhibit_36.mxd

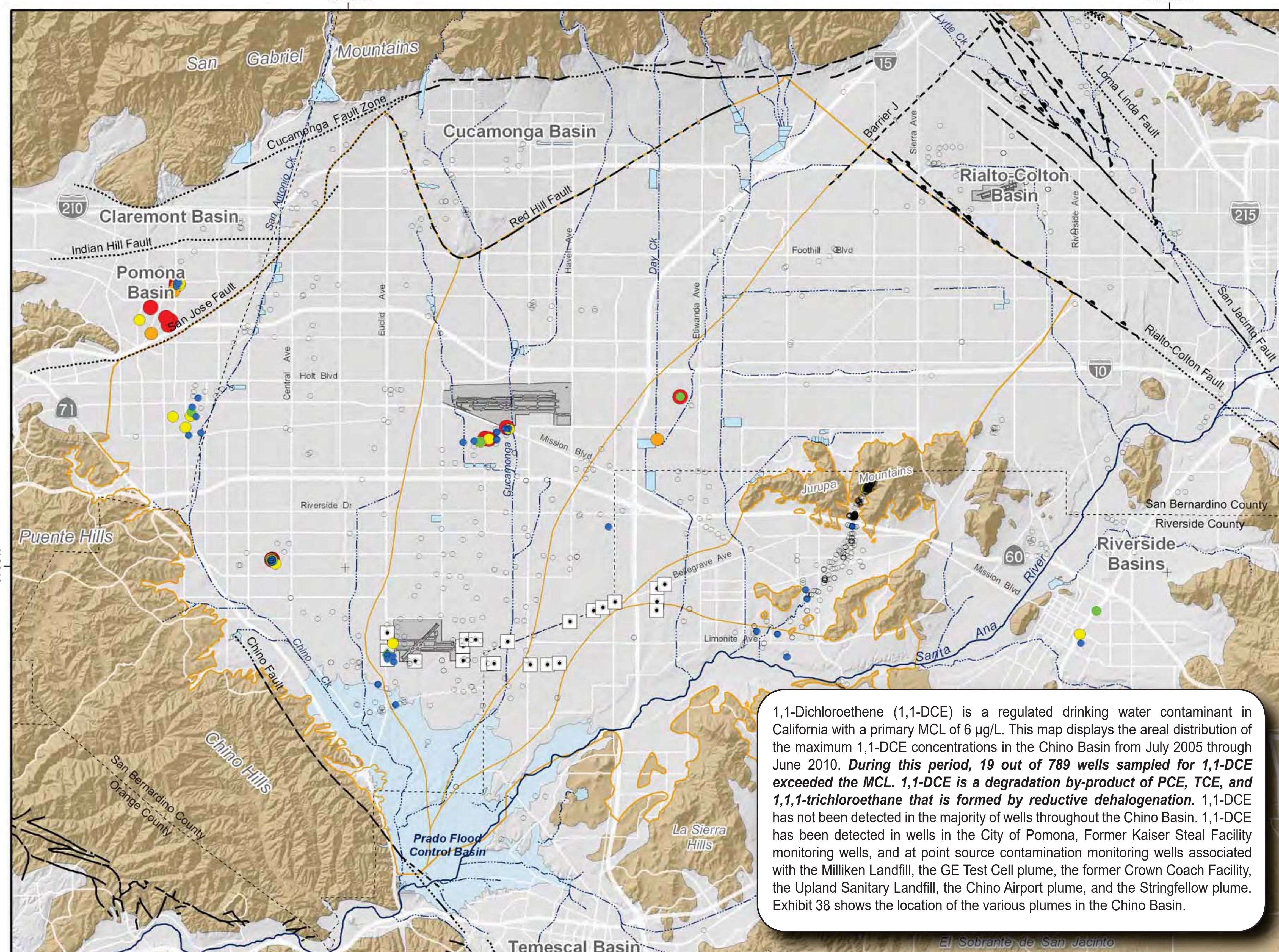
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

cis-1,2-Dichloroethene in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 36



1,1-Dichloroethene (1,1-DCE) is a regulated drinking water contaminant in California with a primary MCL of 6 µg/L. This map displays the areal distribution of the maximum 1,1-DCE concentrations in the Chino Basin from July 2005 through June 2010. ***During this period, 19 out of 789 wells sampled for 1,1-DCE exceeded the MCL. 1,1-DCE is a degradation by-product of PCE, TCE, and 1,1,1-trichloroethane that is formed by reductive dehalogenation.*** 1,1-DCE has not been detected in the majority of wells throughout the Chino Basin. 1,1-DCE has been detected in wells in the City of Pomona, Former Kaiser Steal Facility monitoring wells, and at point source contamination monitoring wells associated with the Milliken Landfill, the GE Test Cell plume, the former Crown Coach Facility, the Upland Sanitary Landfill, the Chino Airport plume, and the Stringfellow plume. Exhibit 38 shows the location of the various plumes in the Chino Basin.

1,1-Dichloroethene (ug/L)

- ND
- < 3
- 3 - 6
- 6 - 12
- 12 - 24
- > 24

Primary US EPA MCL = 7 ug/L
Primary CA MCL = 6 ug/L

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110519
File: Exhibit_37.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

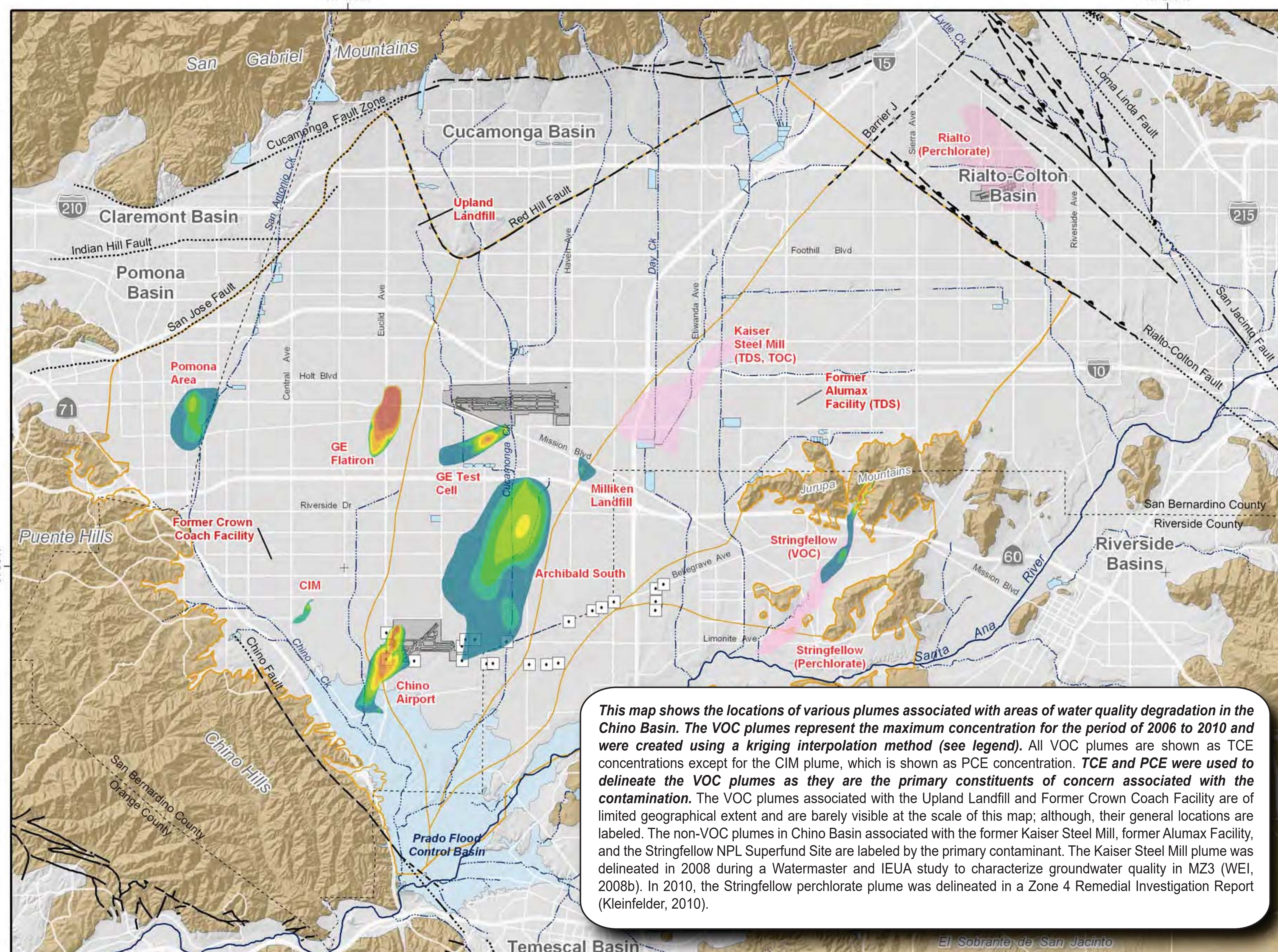
2010 State of the Basin
Groundwater Quality

1,1-Dichloroethene in Groundwater

Maximum Concentration (July 2005 to June 2010)

Exhibit 37

2010 Delineation of Groundwater Contamination Plumes



This map shows the locations of various plumes associated with areas of water quality degradation in the Chino Basin. The VOC plumes represent the maximum concentration for the period of 2006 to 2010 and were created using a kriging interpolation method (see legend). All VOC plumes are shown as TCE concentrations except for the CIM plume, which is shown as PCE concentration. ***TCE and PCE were used to delineate the VOC plumes as they are the primary constituents of concern associated with the contamination.*** The VOC plumes associated with the Upland Landfill and Former Crown Coach Facility are of limited geographical extent and are barely visible at the scale of this map; although, their general locations are labeled. The non-VOC plumes in Chino Basin associated with the former Kaiser Steel Mill, former Alumax Facility, and the Stringfellow NPL Superfund Site are labeled by the primary contaminant. The Kaiser Steel Mill plume was delineated in 2008 during a Watermaster and IEUA study to characterize groundwater quality in MZ3 (WEI, 2008b). In 2010, the Stringfellow perchlorate plume was delineated in a Zone 4 Remedial Investigation Report (Kleinfelder, 2010).

VOC Concentration (ug/L)

- > 0 and ≤ 5
- > 5 and ≤ 10
- > 10 and ≤ 20
- > 20 and ≤ 50
- > 50 and ≤ 100
- > 100 and ≤ 200
- > 200 and ≤ 500
- > 500

The VOC plumes shown on this map are illustrations of the estimated spatial extent of TCE/PCE, based on maximum concentrations measured over a five year period (2006-2010). These plume depictions are for illustrative purposes only and are not intended to be used for analytical purposes. The VOC plume illustrations were created via the Geostatistical Analyst extension in ESRI's ArcView 10, using an ordinary kriging interpolation model with model input parameter estimation and optimization performed by semivariogram analysis in Golden's Surfer 8.09. Interpretations of plume extent and boundary delineation were made based on measured concentrations and local groundwater flow patterns as predicted by the Chino Basin groundwater flow model.

Other plumes (labeled by name and dominant contaminant)

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW

Date: 201100630

File: Exhibit_38.mxd

0 1 2 3 4 5 Miles

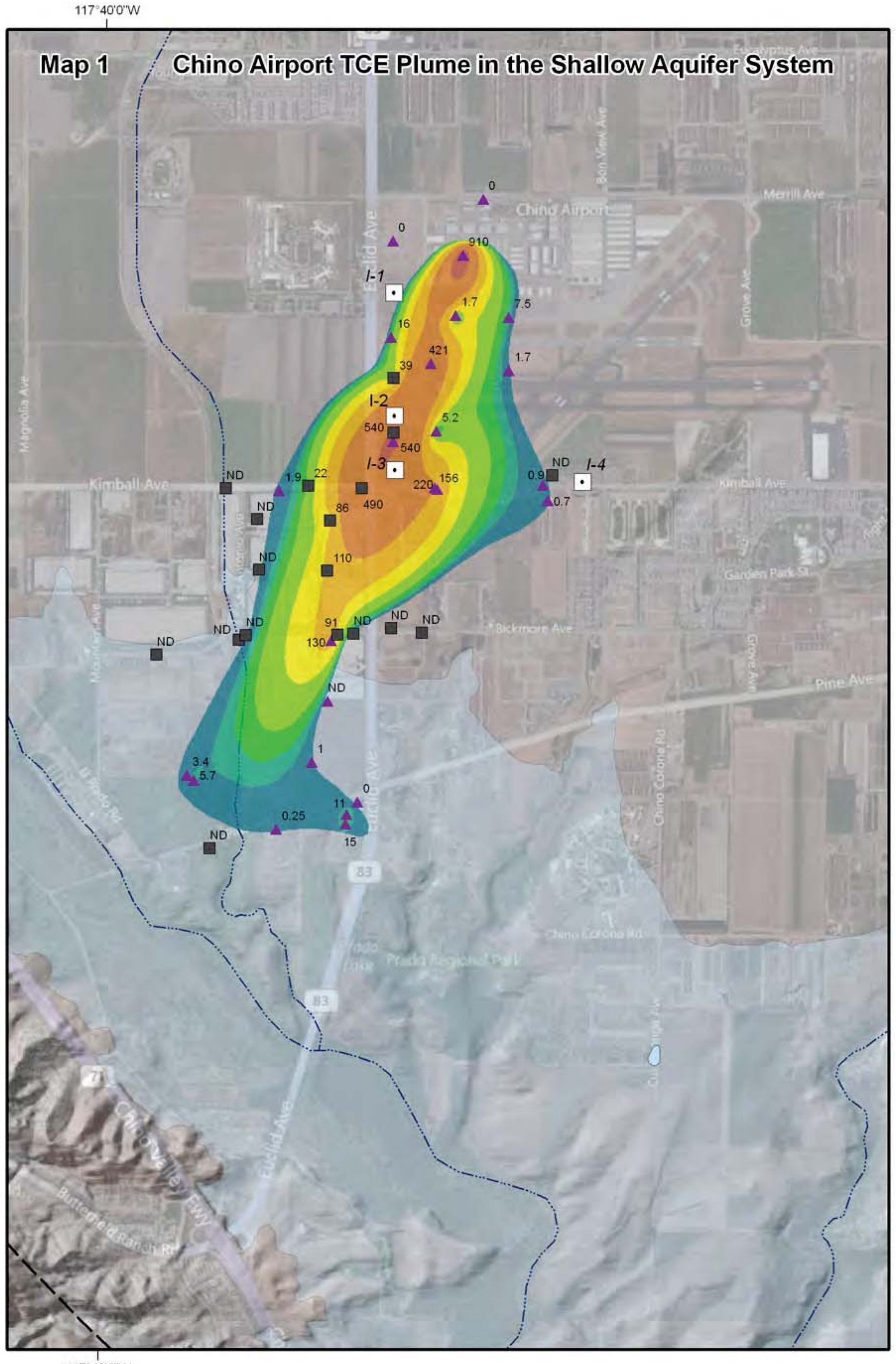
0 2 4 6 8 KM

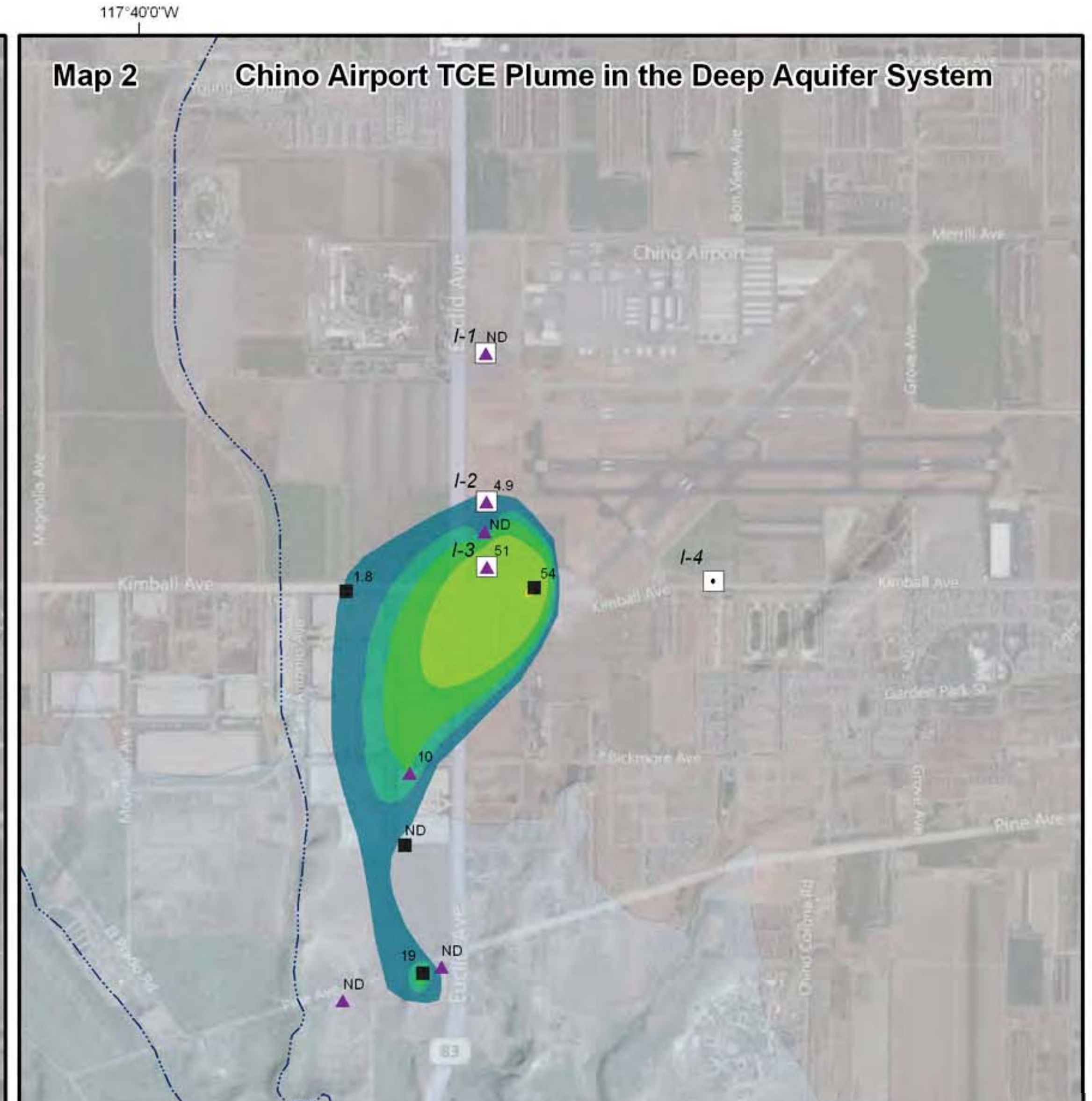
2010 State of the Basin

Groundwater Quality

2010 Delineation of Groundwater Contamination Plumes

Exhibit 38





TCE Concentration (ug/L)

- > 0 and ≤ 5
- > 5 and ≤ 10
- > 10 and ≤ 20
- > 20 and ≤ 50
- > 50 and ≤ 100
- > 100 and ≤ 200
- > 200 and ≤ 500
- > 500

The VOC plumes shown on this map are illustrations of the estimated spatial extent of TCE/PCE, based on maximum concentrations measured over a five year period (2006-2010). These plume depictions are for illustrative purposes only and are not intended to be used for analytical purposes. The VOC plume illustrations were created via the Geostatistical Analyst extension in ESRI's ArcView 10, using an ordinary kriging interpolation model with model input parameter estimation and optimization performed by semivariogram analysis in Golden's Surfer 8.09. Interpretations of plume extent and boundary delineation were made based on measured concentrations and local groundwater flow patterns as predicted by the Chino Basin groundwater flow model.

- 5 Wells & TCE concentration (ug/L)
- 10 HydroPunch Samples & TCE concentration (ug/L)
- Chino Desalter Well
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

These maps depict the TCE contamination of groundwater near the Chino Airport in the southern portion of Chino Basin. ***The County of San Bernardino, Department of Airports (County) has been identified as the primary responsible party and has been conducting investigations of soil and groundwater contamination since 2003.*** The County has constructed and sampled nine shallow monitoring wells on the airport property and 19 depth-specific monitoring wells at eight locations offsite. The County has also collected 100 depth-specific HydroPunch groundwater samples at 27 locations offsite. Groundwater samples have been collected by the Chino Basin Watermaster at private agricultural wells in this area and at one depth-specific monitoring well (HCMP-4), and by the Chino Desalter Authority at its deep production wells (CDA-I-1, -2, -3, and -4).

The multiple depth groundwater quality monitoring at wells in and south of the Chino Airport have allowed for the TCE concentration to be characterized horizontally and vertically. TCE has been detected in both the shallow unconfined aquifer system (see Map 1) and the deeper confined aquifer system (see Map 2). The TCE contamination is more thoroughly characterized in the shallow aquifer system than in the deep aquifer system.

Produced by:
WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

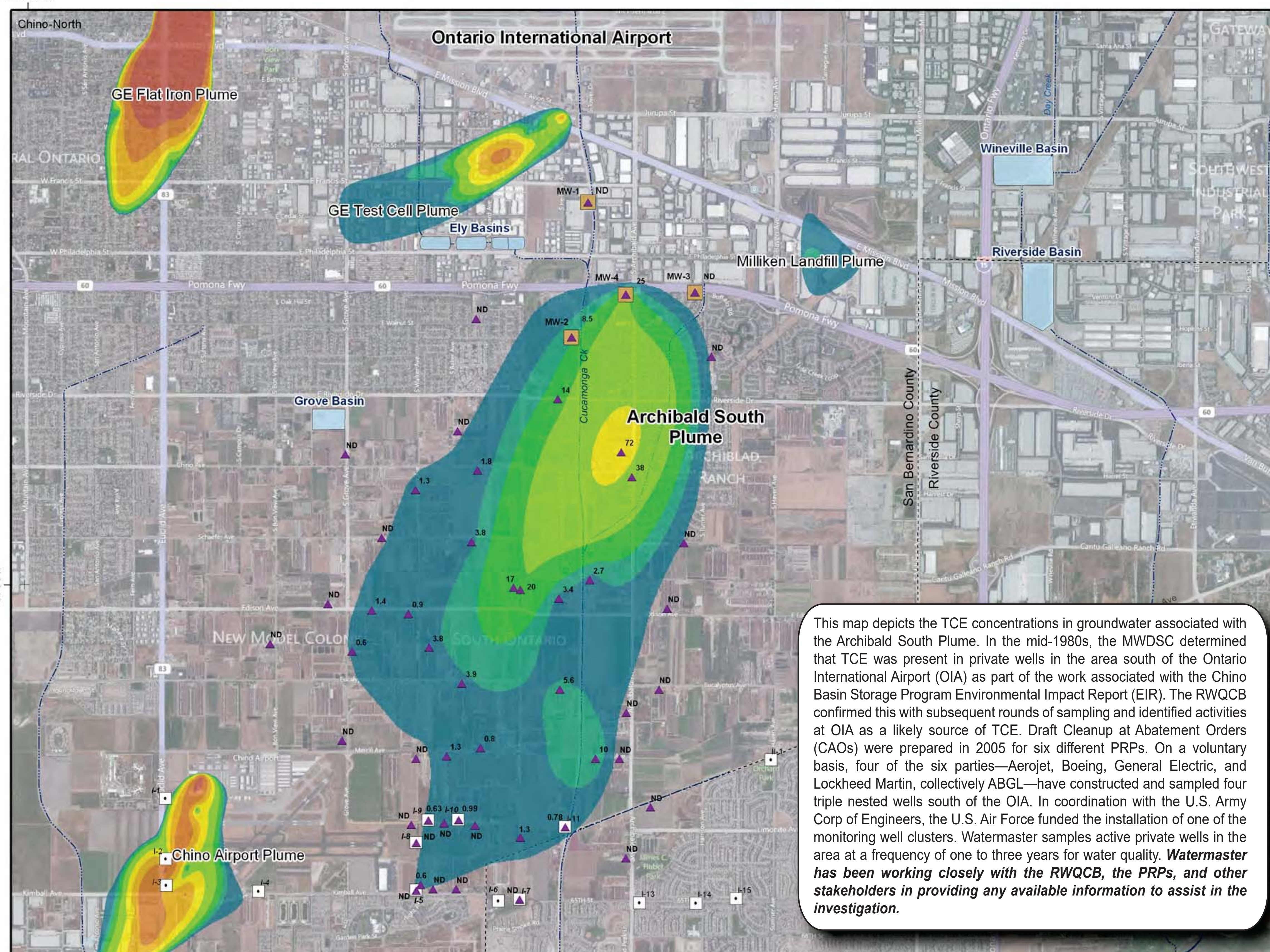
Author: VMW
Date: 201100630
File: Exhibit_39.mxd

0 0.5 1 1.5 Miles
0 0.25 0.5 1 1.5 2 KM

2010 State of the Basin
Groundwater Quality

Chino Airport TCE Plume
Shallow and Deep Aquifers

Exhibit 39



This map depicts the TCE concentrations in groundwater associated with the Archibald South Plume. In the mid-1980s, the MWDSC determined that TCE was present in private wells in the area south of the Ontario International Airport (OIA) as part of the work associated with the Chino Basin Storage Program Environmental Impact Report (EIR). The RWQCB confirmed this with subsequent rounds of sampling and identified activities at OIA as a likely source of TCE. Draft Cleanup at Abatement Orders (CAOs) were prepared in 2005 for six different PRPs. On a voluntary basis, four of the six parties—Aerojet, Boeing, General Electric, and Lockheed Martin, collectively ABGL—have constructed and sampled four triple nested wells south of the OIA. In coordination with the U.S. Army Corp of Engineers, the U.S. Air Force funded the installation of one of the monitoring well clusters. Watermaster samples active private wells in the area at a frequency of one to three years for water quality. ***Watermaster has been working closely with the RWQCB, the PRPs, and other stakeholders in providing any available information to assist in the investigation.***

TCE Concentration (ug/L)

- > 0 and ≤ 5
- > 5 and ≤ 10
- > 10 and ≤ 20
- > 20 and ≤ 50
- > 50 and ≤ 100
- > 100 and ≤ 200
- > 200 and ≤ 500
- > 500

The VOC plumes shown on this map are illustrations of the estimated spatial extent of TCE/PCE, based on maximum concentrations measured over a five year period (2006-2010). These plume depictions are for illustrative purposes only and are not intended to be used for analytical purposes. The VOC plume illustrations were created via the Geostatistical Analyst extension in ESRI's ArcView 10, using an ordinary kriging interpolation model with model input parameter estimation and optimization performed by semivariogram analysis in Golden's Surfer 8.09. Interpretations of plume extent and boundary delineation were made based on measured concentrations and local groundwater flow patterns as predicted by the Chino Basin groundwater flow model.

- ABGL Monitoring Wells
- Wells & TCE concentration (ug/L)
- Chino Desalter Well
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

Produced by:
WILDERMUTH ENVIRONMENTAL INC
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

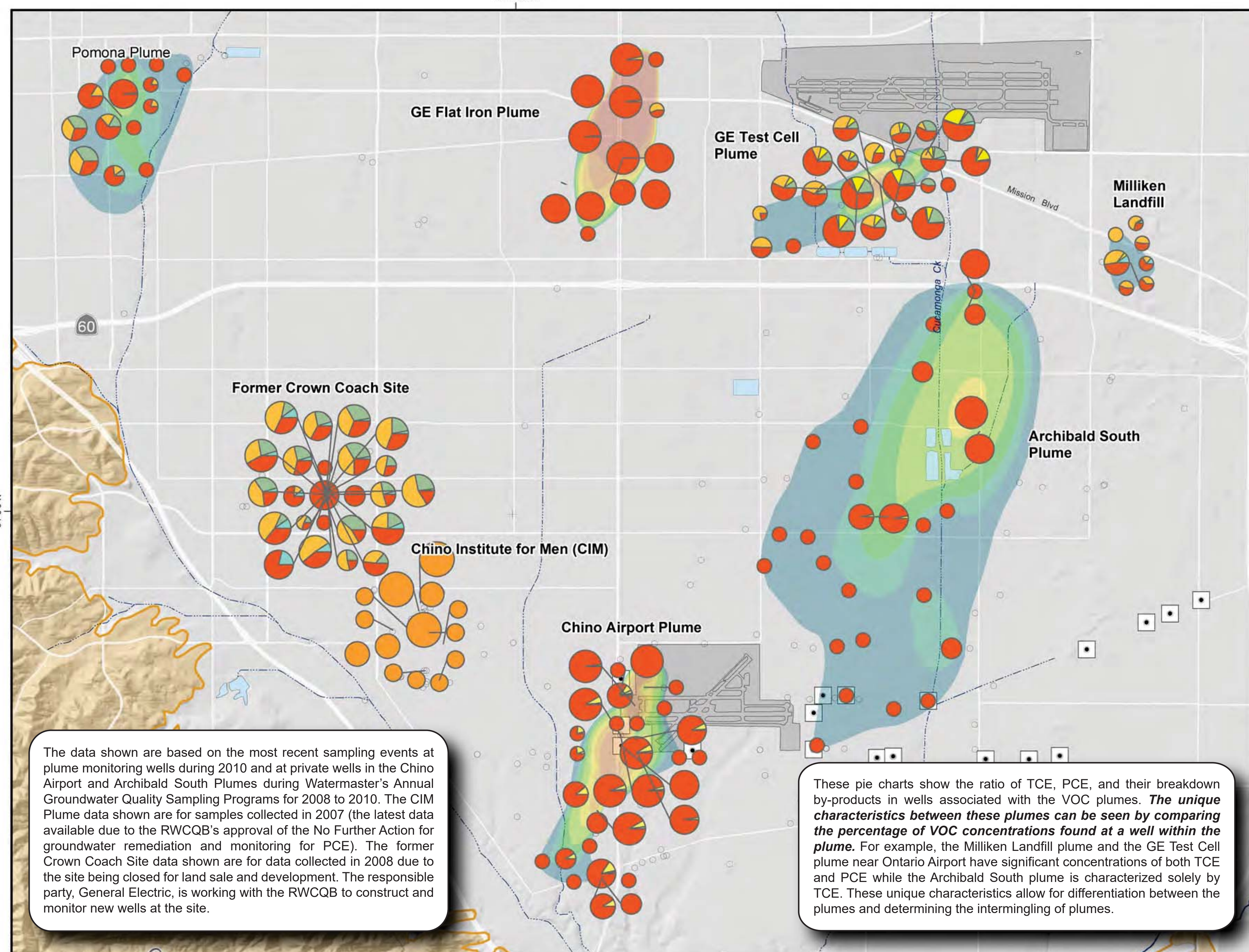
Author: VMW
Date: 201100630
File: Exhibit_40.mxd

0 0.5 1 1.5 Miles
0 0.25 0.5 1 1.5 2 KM

2010 State of the Basin
Groundwater Quality

Archibald South TCE Plume

Exhibit 40



The data shown are based on the most recent sampling events at plume monitoring wells during 2010 and at private wells in the Chino Airport and Archibald South Plumes during Watermaster's Annual Groundwater Quality Sampling Programs for 2008 to 2010. The CIM Plume data shown are for samples collected in 2007 (the latest data available due to the RWCQB's approval of the No Further Action for groundwater remediation and monitoring for PCE). The former Crown Coach Site data shown are for data collected in 2008 due to the site being closed for land sale and development. The responsible party, General Electric, is working with the RWCQB to construct and monitor new wells at the site.

These pie charts show the ratio of TCE, PCE, and their breakdown by-products in wells associated with the VOC plumes. ***The unique characteristics between these plumes can be seen by comparing the percentage of VOC concentrations found at a well within the plume.*** For example, the Milliken Landfill plume and the GE Test Cell plume near Ontario Airport have significant concentrations of both TCE and PCE while the Archibald South plume is characterized solely by TCE. These unique characteristics allow for differentiation between the plumes and determining the intermingling of plumes.

Percent of Detectable TCE, PCE, and Their Degradation By-Products During the Last Sample

- 1,1,1-Trichloroethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- 1,2-Dichloroethane
- cis-1,2-Dichloroethene
- Tetrachloroethene (PCE)
- trans-1,2-Dichloroethene
- Trichloroethene (TCE)
- Vinyl Chloride

Sample Size
Based on the Sum of TCE, PCE, and Their Degradation By-Products (ug/L)

- 0.01 - 5
- 5 - 10
- 10 - 20
- 20 - 50
- > 50

- Wells with Non-Detect Results for VOCs During Last Sample Event (2006- 2010).
- Chino Desalter Well
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

- Quaternary Alluvium

Consolidated Bedrock

- Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20090608
File: Exhibit_41.mxd

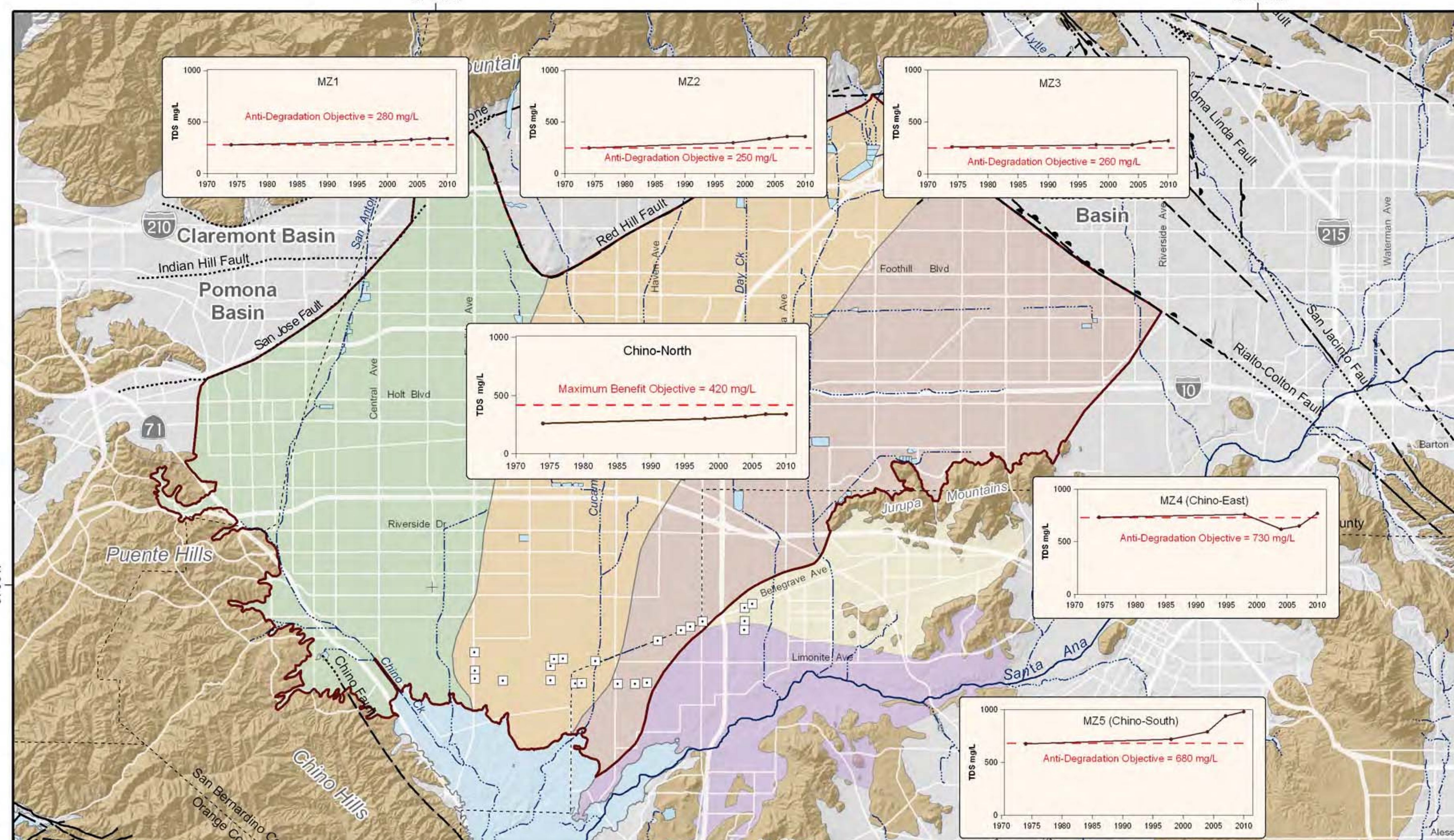
0 0.5 1 1.5 2 Miles
0 0.5 1 1.5 2 2.5 Kilometers

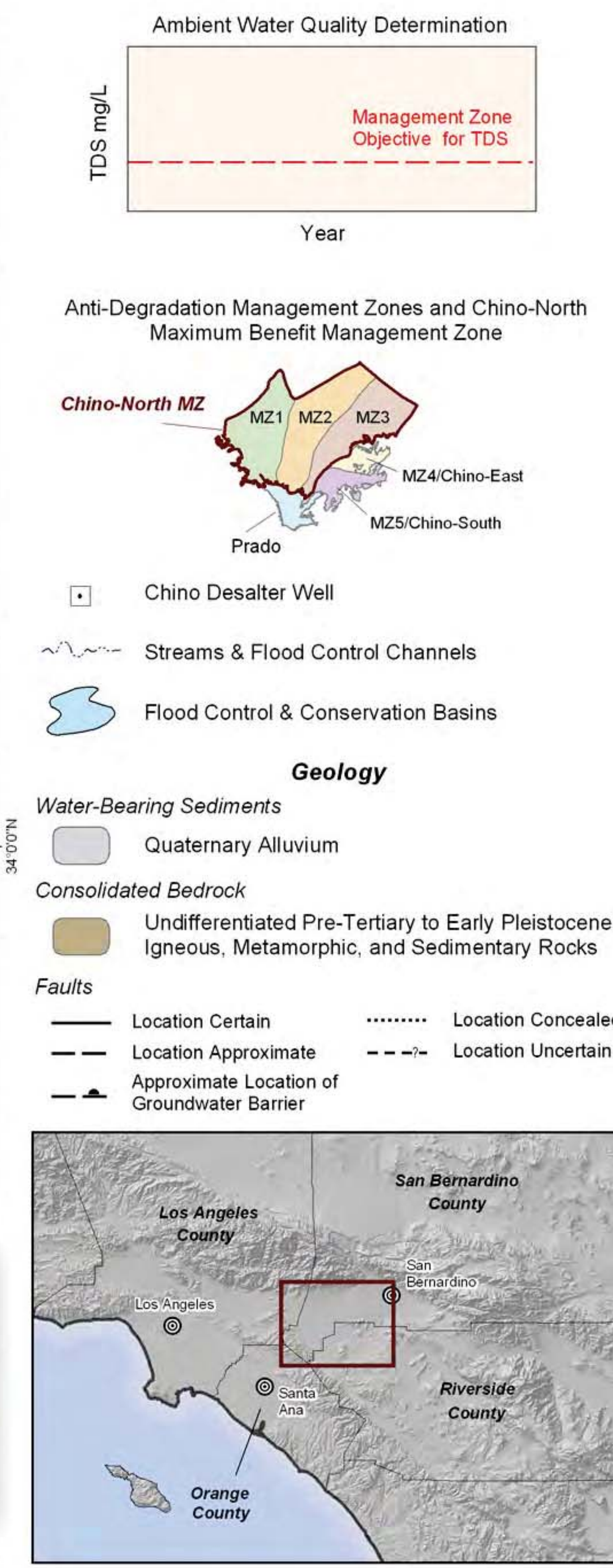
2010 State of the Basin
Groundwater Quality

VOC Pie Chart Comparisons

Wells Within and Adjacent to VOC Plumes

Exhibit 41





The ambient water quality (AWQ) of management zones in the Santa Ana Region is computed on a triennial basis to determine whether each management zone has assimilative capacity for TDS and nitrate concentrations. The AWQ determinations for the historical period from 1954-1973 were used as the basis for the water quality objectives in the 2004 Basin Plan Amendment (RWQCB, 2004). To create assimilative capacity in MZ1, MZ2, and MZ3 within the Chino Basin, less stringent "maximum benefit" objectives for TDS and nitrate were accepted by the Regional Board for a combined Chino-North Management Zone (Chino-North).

Shown here are time histories of ambient TDS concentration for the individual management zones and for the Chino-North management zone. TDS AWQ determinations were made for 1973, 1997, 2003, 2006, and 2009 (WEI, 2000, 2005b, 2008a, and 2011b). The AWQ determination for Chino-North is used for compliance purposes. If the current TDS AWQ were to exceed the maximum benefit objective there would be a mitigation requirement for the recharge and direct use of recycled water equivalent to using recycled water with a TDS concentration less than or equal to the TDS objective. ***The current (2009) AWQ determination for TDS in Chino-North is 340 mg/L. The TDS objective is 420 mg/L. Therefore there is 80 mg/L of assimilative capacity (WEI, 2011b).*** The more recent increases in TDS AWQ determinations are due to the expansion of monitoring programs in the Chino Basin and are not due to an increase in TDS concentrations in the Basin.

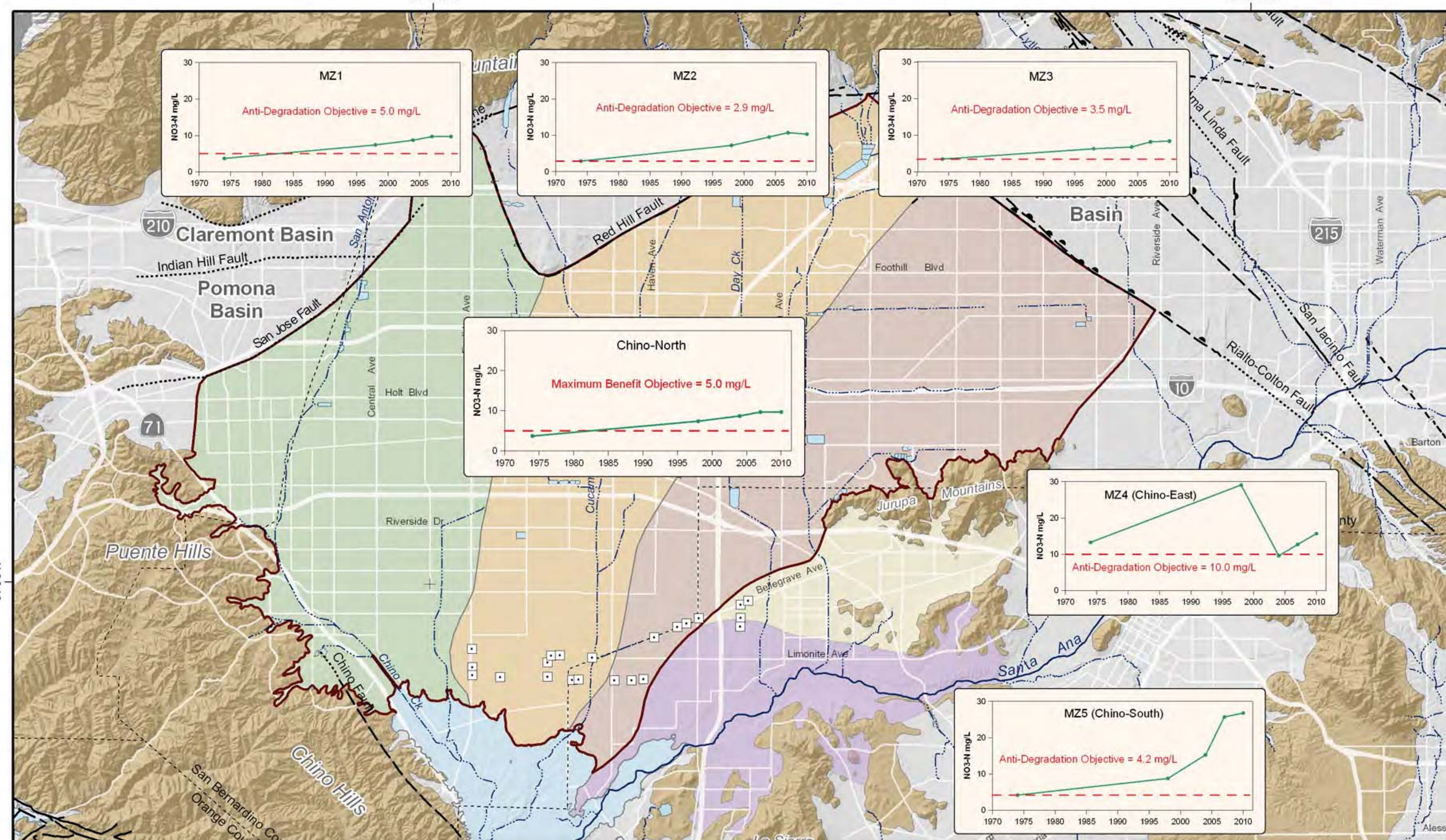
Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

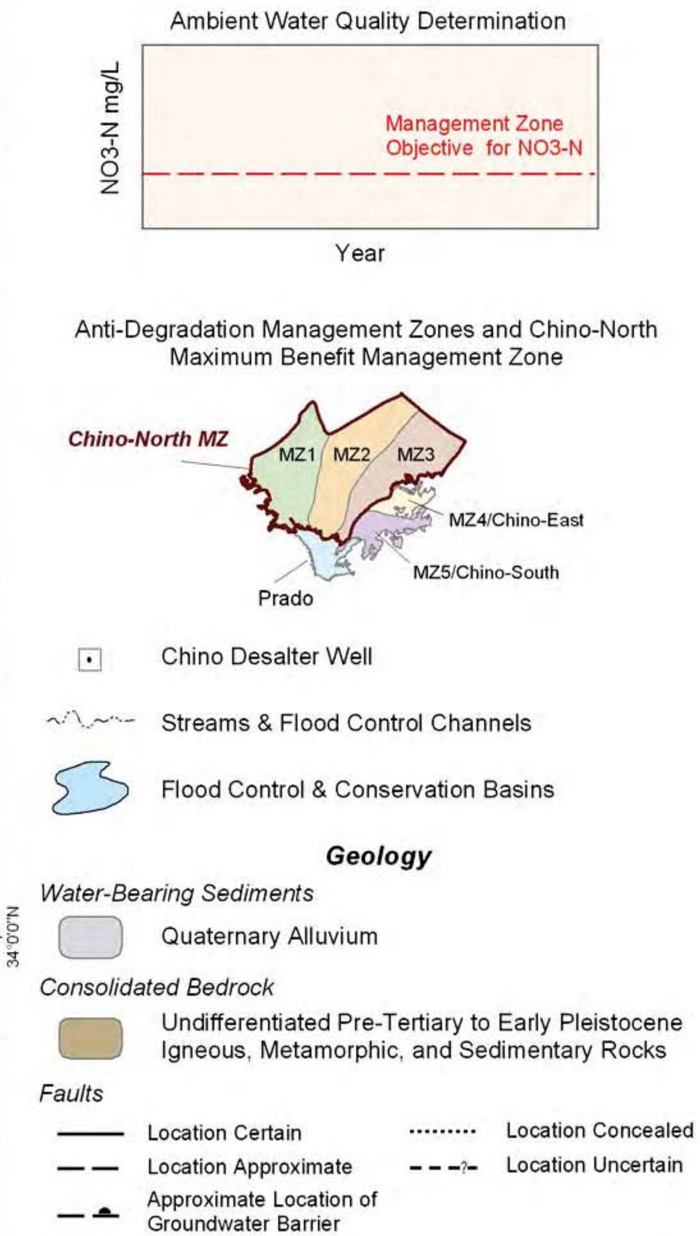
Author: VMW
Date: 20110630
File: Exhibit_42.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

Trends in Ambient Water Quality Determinations for Total Dissolved Solids By Management Zone

Exhibit 42





The ambient water quality (AWQ) of management zones in the Santa Ana Region is computed on a triennial basis to determine whether each management zone has assimilative capacity for TDS and nitrate concentrations. The AWQ determinations for the historical period from 1954-1973 were used as the basis for the water quality objectives in the 2004 Basin Plan Amendment (RWQCB, 2004). To create assimilative capacity in MZ1, MZ2, and MZ3 within the Chino Basin, less stringent "maximum benefit" objectives for TDS and nitrate were accepted by the Regional Board for a combined Chino-North Management Zone (Chino-North).

Shown here are time histories of ambient NO_3-N concentrations for the individual management zones and for the Chino-North management zone. NO_3-N AWQ determinations were made for 1973, 1997, 2003, 2006, and 2009 (WEI, 2000, 2005b, 2008a, and 2011b). The AWQ determination for Chino-North is used for compliance purposes. If the current NO_3-N AWQ were to exceed the maximum benefit objective there would be a mitigation requirement for the recharge and direct use of recycled water equivalent to using recycled water with a NO_3-N concentration less than or equal to the NO3-N objective. ***The current (2009) AWQ determination for NO_3-N in Chino-North is 9.5 mg/L. The NO_3-N objective is 5.0 mg/L. Therefore there is no assimilative capacity (WEI, 2011b)***. The more recent increases in NO_3-N AWQ are due to the expansion of monitoring programs in the Chino Basin, and are not due to an increase in NO_3-N concentrations in the Basin.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

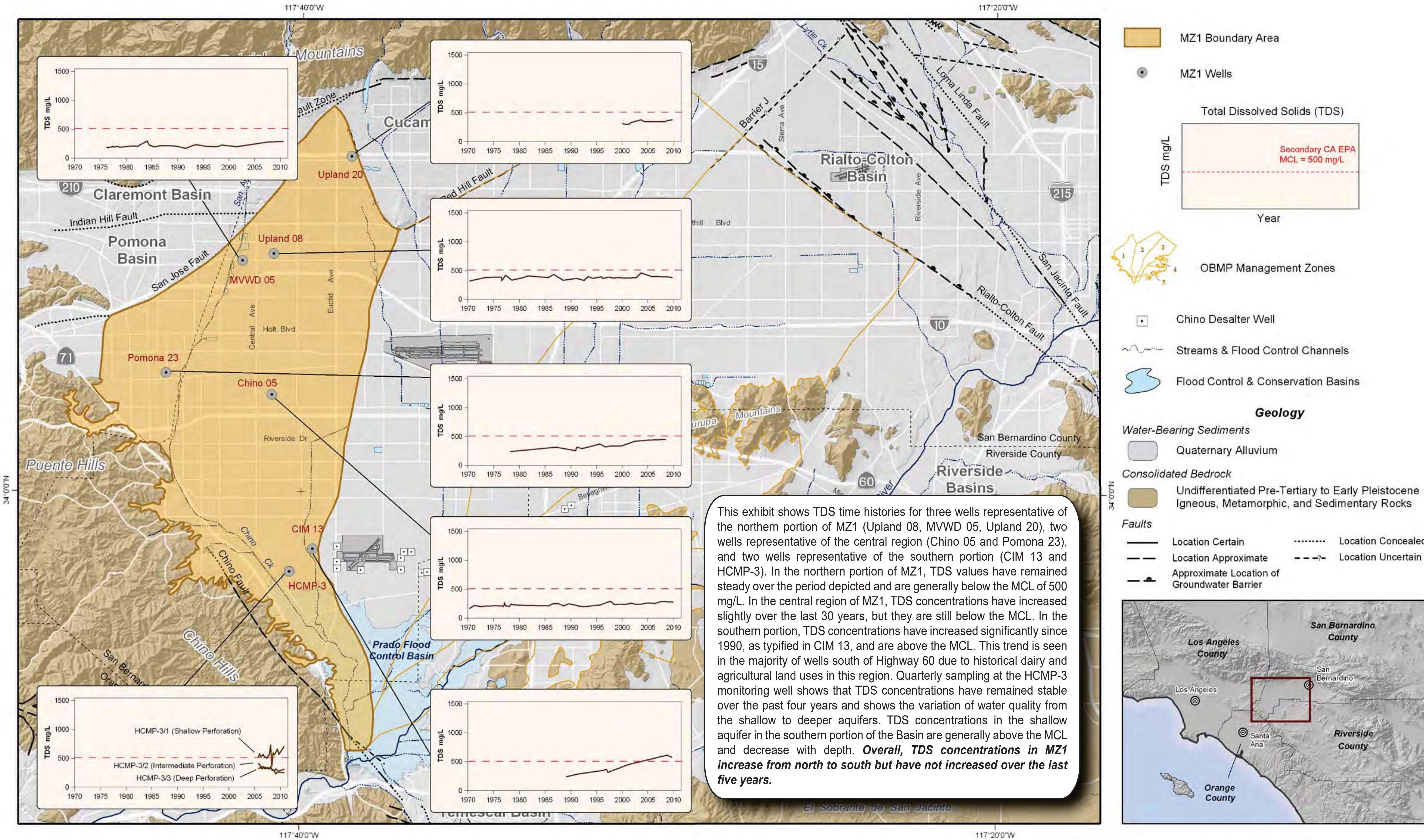
Author: VMW
Date: 20110630
File: Exhibit_43.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Trends in Ambient Water Quality Determinations for Nitrate as Nitrogen By Management Zone

Exhibit 43



This exhibit shows TDS time histories for three wells representative of the northern portion of MZ1 (Upland 08, MVWD 05, Upland 20), two wells representative of the central region (Chino 05 and Pomona 23), and two wells representative of the southern portion (CIM 13 and HCMP-3). In the northern portion of MZ1, TDS values have remained steady over the period depicted and are generally below the MCL of 500 mg/L. In the central region of MZ1, TDS concentrations have increased slightly over the last 30 years, but they are still below the MCL. In the southern portion, TDS concentrations have increased significantly since 1990, as typified in CIM 13, and are above the MCL. This trend is seen in the majority of wells south of Highway 60 due to historical dairy and agricultural land uses in this region. Quarterly sampling at the HCMP-3 monitoring well shows that TDS concentrations have remained stable over the past four years and shows the variation of water quality from the shallow to deeper aquifers. TDS concentrations in the shallow aquifer in the southern portion of the Basin are generally above the MCL and decrease with depth. ***Overall, TDS concentrations in MZ1 increase from north to south but have not increased over the last five years.***

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110524
File: Exhibit_44.mxd

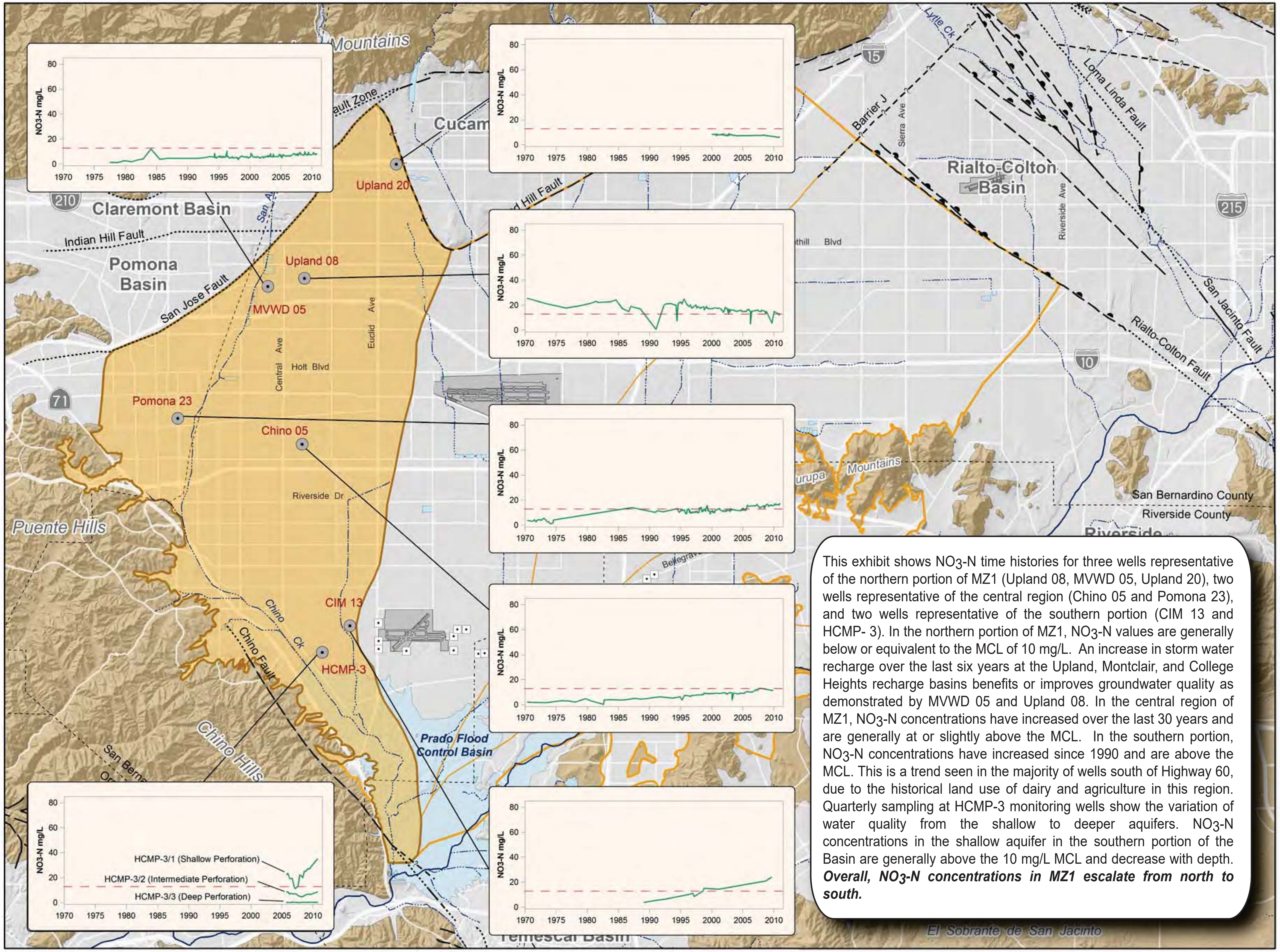
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Chino Basin Management Zone 1

Trends in Total Dissolved Solids Concentrations

Exhibit 44



This exhibit shows NO_3-N time histories for three wells representative of the northern portion of MZ1 (Upland 08, MVWD 05, Upland 20), two wells representative of the central region (Chino 05 and Pomona 23), and two wells representative of the southern portion (CIM 13 and HCMP- 3). In the northern portion of MZ1, NO_3-N values are generally below or equivalent to the MCL of 10 mg/L. An increase in storm water recharge over the last six years at the Upland, Montclair, and College Heights recharge basins benefits or improves groundwater quality as demonstrated by MVWD 05 and Upland 08. In the central region of MZ1, NO_3-N concentrations have increased over the last 30 years and are generally at or slightly above the MCL. In the southern portion, NO_3-N concentrations have increased since 1990 and are above the MCL. This is a trend seen in the majority of wells south of Highway 60, due to the historical land use of dairy and agriculture in this region. Quarterly sampling at HCMP-3 monitoring wells show the variation of water quality from the shallow to deeper aquifers. NO_3-N concentrations in the shallow aquifer in the southern portion of the Basin are generally above the 10 mg/L MCL and decrease with depth. ***Overall, NO_3-N concentrations in MZ1 escalate from north to south.***

MZ1 Boundary Area

MZ1 Wells

Nitrate as Nitrogen (NO3-N)

NO3-N mg/L — Year — Primary US EPA MCL = 10 mg/L

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain — Location Concealed

Location Approximate — Location Uncertain

Approximate Location of Groundwater Barrier

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

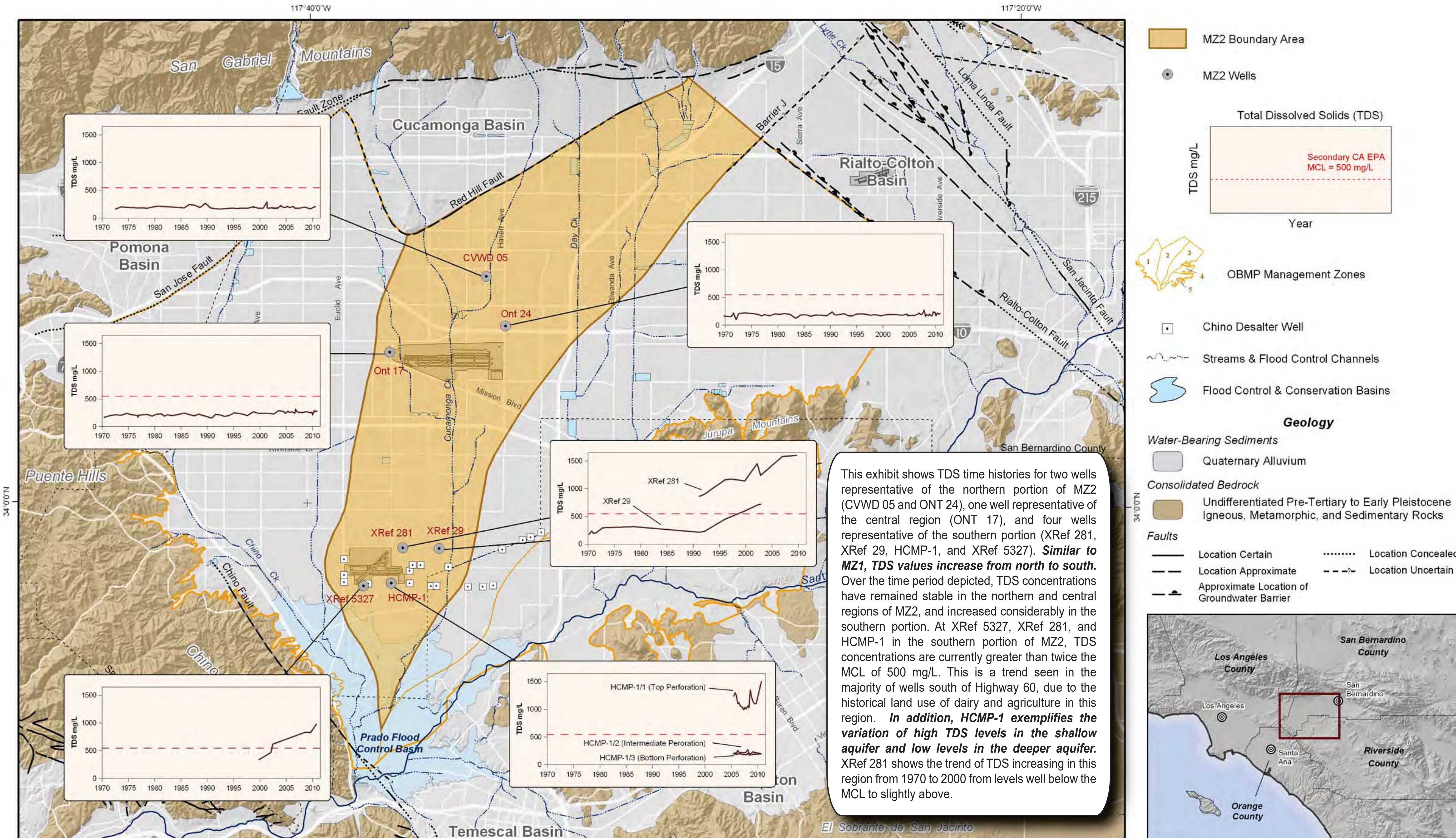
Author: VMW
Date: 20110608
File: Exhibit_45.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Chino Basin Management Zone 1
Trends in Nitrate as Nitrogen Concentrations

Exhibit 45



This exhibit shows TDS time histories for two wells representative of the northern portion of MZ2 (CVWD 05 and ONT 24), one well representative of the central region (ONT 17), and four wells representative of the southern portion (XRef 281, XRef 29, HCMP-1, and XRef 5327). ***Similar to MZ1, TDS values increase from north to south.*** Over the time period depicted, TDS concentrations have remained stable in the northern and central regions of MZ2, and increased considerably in the southern portion. At XRef 5327, XRef 281, and HCMP-1 in the southern portion of MZ2, TDS concentrations are currently greater than twice the MCL of 500 mg/L. This is a trend seen in the majority of wells south of Highway 60, due to the historical land use of dairy and agriculture in this region. ***In addition, HCMP-1 exemplifies the variation of high TDS levels in the shallow aquifer and low levels in the deeper aquifer.*** XRef 281 shows the trend of TDS increasing in this region from 1970 to 2000 from levels well below the MCL to slightly above.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110608
File: Exhibit_46.mxd

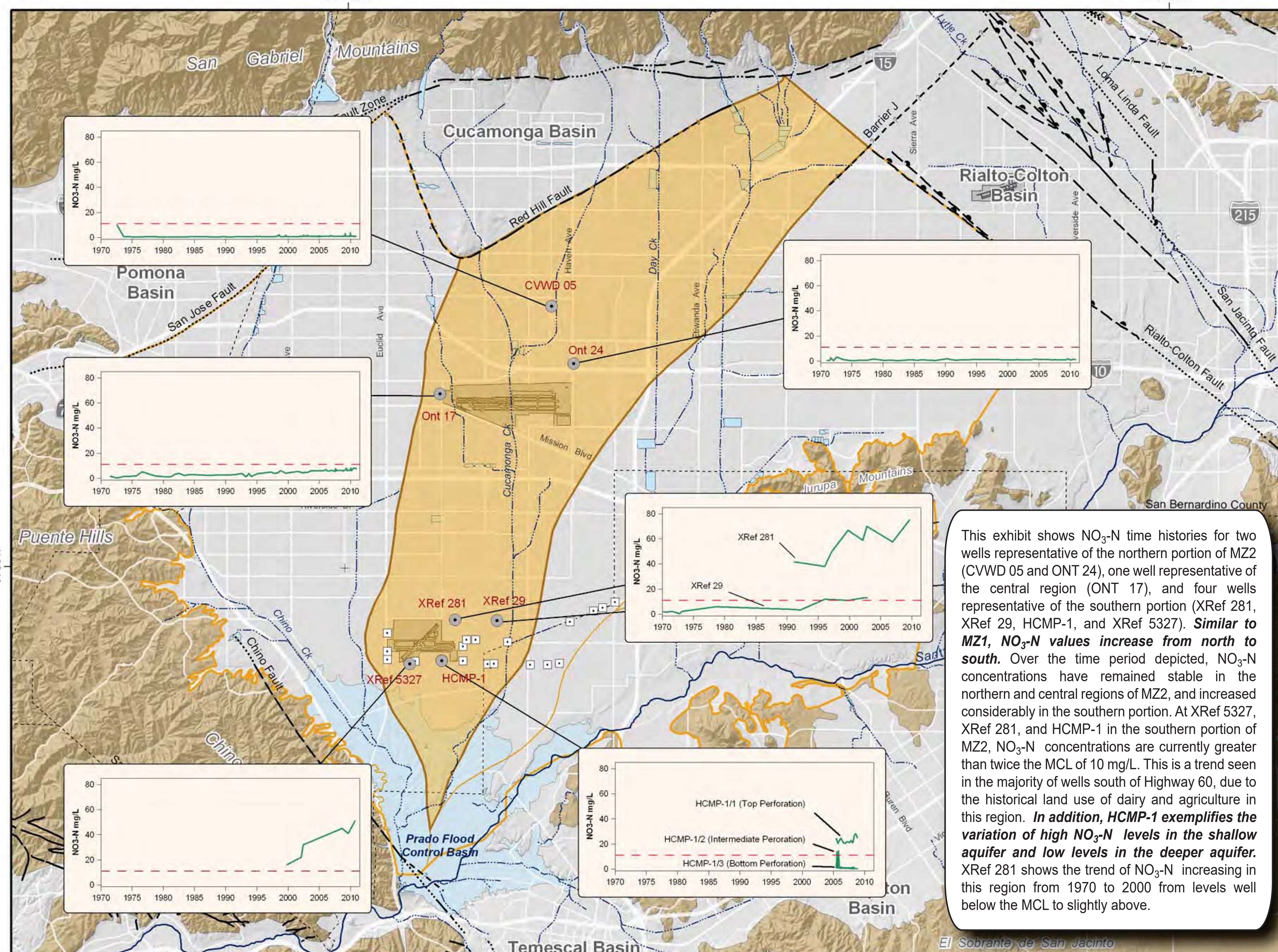
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Chino Basin Management Zone 2

Trends in Total Dissolved Solids Concentrations

Exhibit 46



This exhibit shows NO_3-N time histories for two wells representative of the northern portion of MZ2 (CVWD 05 and ONT 24), one well representative of the central region (ONT 17), and four wells representative of the southern portion (XRef 281, XRef 29, HCMP-1, and XRef 5327). ***Similar to MZ1, NO_3-N values increase from north to south.*** Over the time period depicted, NO_3-N concentrations have remained stable in the northern and central regions of MZ2, and increased considerably in the southern portion. At XRef 5327, XRef 281, and HCMP-1 in the southern portion of MZ2, NO_3-N concentrations are currently greater than twice the MCL of 10 mg/L. This is a trend seen in the majority of wells south of Highway 60, due to the historical land use of dairy and agriculture in this region. ***In addition, HCMP-1 exemplifies the variation of high NO_3-N levels in the shallow aquifer and low levels in the deeper aquifer.*** XRef 281 shows the trend of NO_3-N increasing in this region from 1970 to 2000 from levels well below the MCL to slightly above.

MZ2 Boundary Area

MZ2 Wells

Nitrate as Nitrogen (NO3-N)

NO3-N mg/L

Primary US EPA MCL = 10 mg/L

Year

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Approximate Location of Groundwater Barrier

Location Concealed

Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110609
File: Exhibit_47.mxd

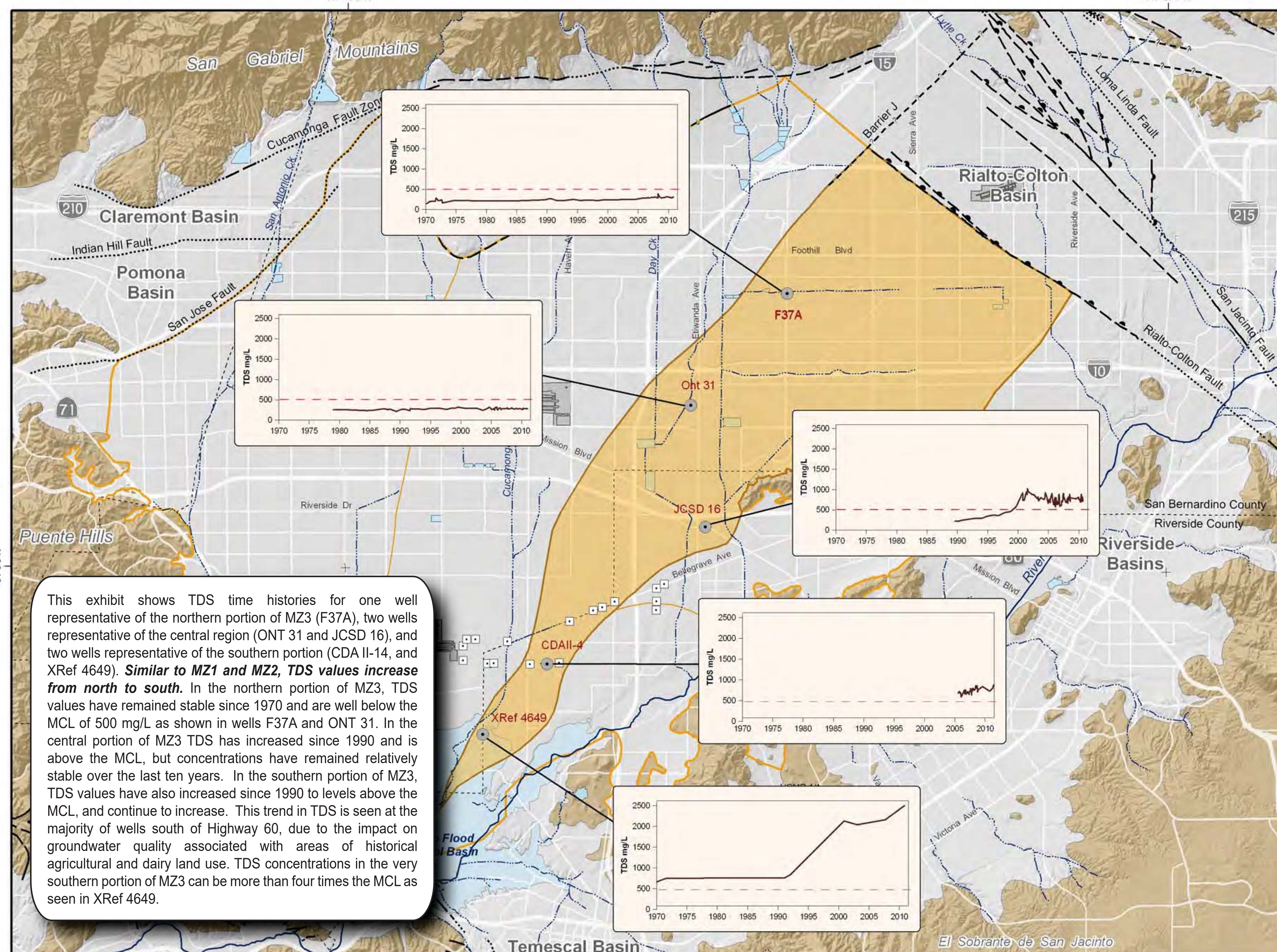
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Chino Basin Management Zone 2

Trends in Nitrate as Nitrogen Concentrations

Exhibit 47



This exhibit shows TDS time histories for one well representative of the northern portion of MZ3 (F37A), two wells representative of the central region (ONT 31 and JCSD 16), and two wells representative of the southern portion (CDA II-14, and XRef 4649). ***Similar to MZ1 and MZ2, TDS values increase from north to south.*** In the northern portion of MZ3, TDS values have remained stable since 1970 and are well below the MCL of 500 mg/L as shown in wells F37A and ONT 31. In the central portion of MZ3 TDS has increased since 1990 and is above the MCL, but concentrations have remained relatively stable over the last ten years. In the southern portion of MZ3, TDS values have also increased since 1990 to levels above the MCL, and continue to increase. This trend in TDS is seen at the majority of wells south of Highway 60, due to the impact on groundwater quality associated with areas of historical agricultural and dairy land use. TDS concentrations in the very southern portion of MZ3 can be more than four times the MCL as seen in XRef 4649.

MZ3 Boundary Area

MZ3 Wells

Total Dissolved Solids (TDS)

TDS mg/L — Secondary CA EPA MCL = 500 mg/L — Year

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Approximate Location of Groundwater Barrier

Location Concealed

Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110609
File: Exhibit_48.mxd

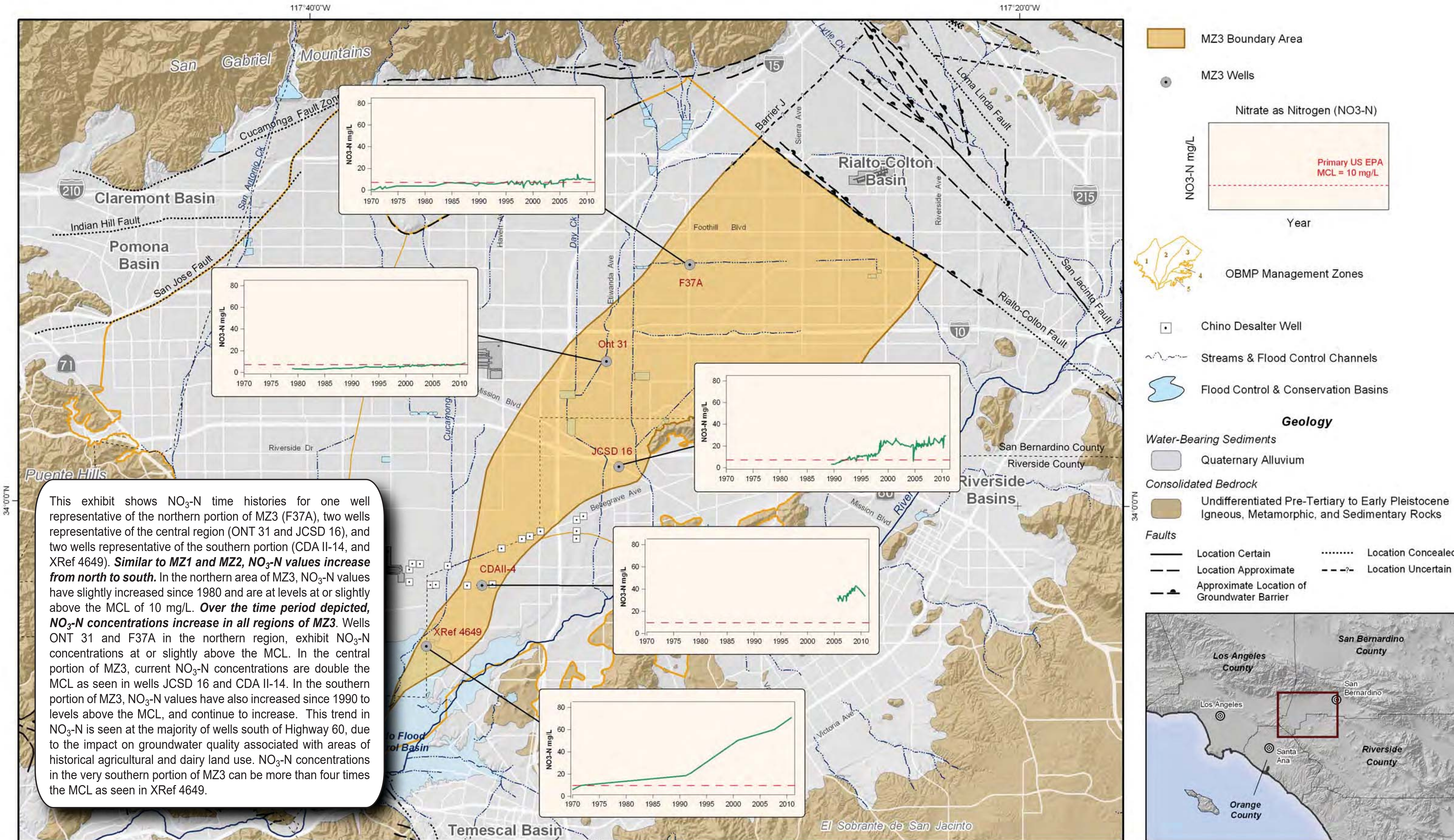
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Chino Basin Management Zone 3

Trends inTotal Dissolved Solids Concentrations

Exhibit 48



This exhibit shows NO_3-N time histories for one well representative of the northern portion of MZ3 (F37A), two wells representative of the central region (ONT 31 and JCSD 16), and two wells representative of the southern portion (CDA II-14, and XRef 4649). ***Similar to MZ1 and MZ2, NO_3-N values increase from north to south.*** In the northern area of MZ3, NO_3-N values have slightly increased since 1980 and are at levels at or slightly above the MCL of 10 mg/L. ***Over the time period depicted, NO_3-N concentrations increase in all regions of MZ3***. Wells ONT 31 and F37A in the northern region, exhibit NO_3-N concentrations at or slightly above the MCL. In the central portion of MZ3, current NO_3-N concentrations are double the MCL as seen in wells JCSD 16 and CDA II-14. In the southern portion of MZ3, NO_3-N values have also increased since 1990 to levels above the MCL, and continue to increase. This trend in NO_3-N is seen at the majority of wells south of Highway 60, due to the impact on groundwater quality associated with areas of historical agricultural and dairy land use. NO_3-N concentrations in the very southern portion of MZ3 can be more than four times the MCL as seen in XRef 4649.

Produced by:

WILDERMUTH ENVIRONMENTAL INC

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110609
File: Exhibit_49.mxd

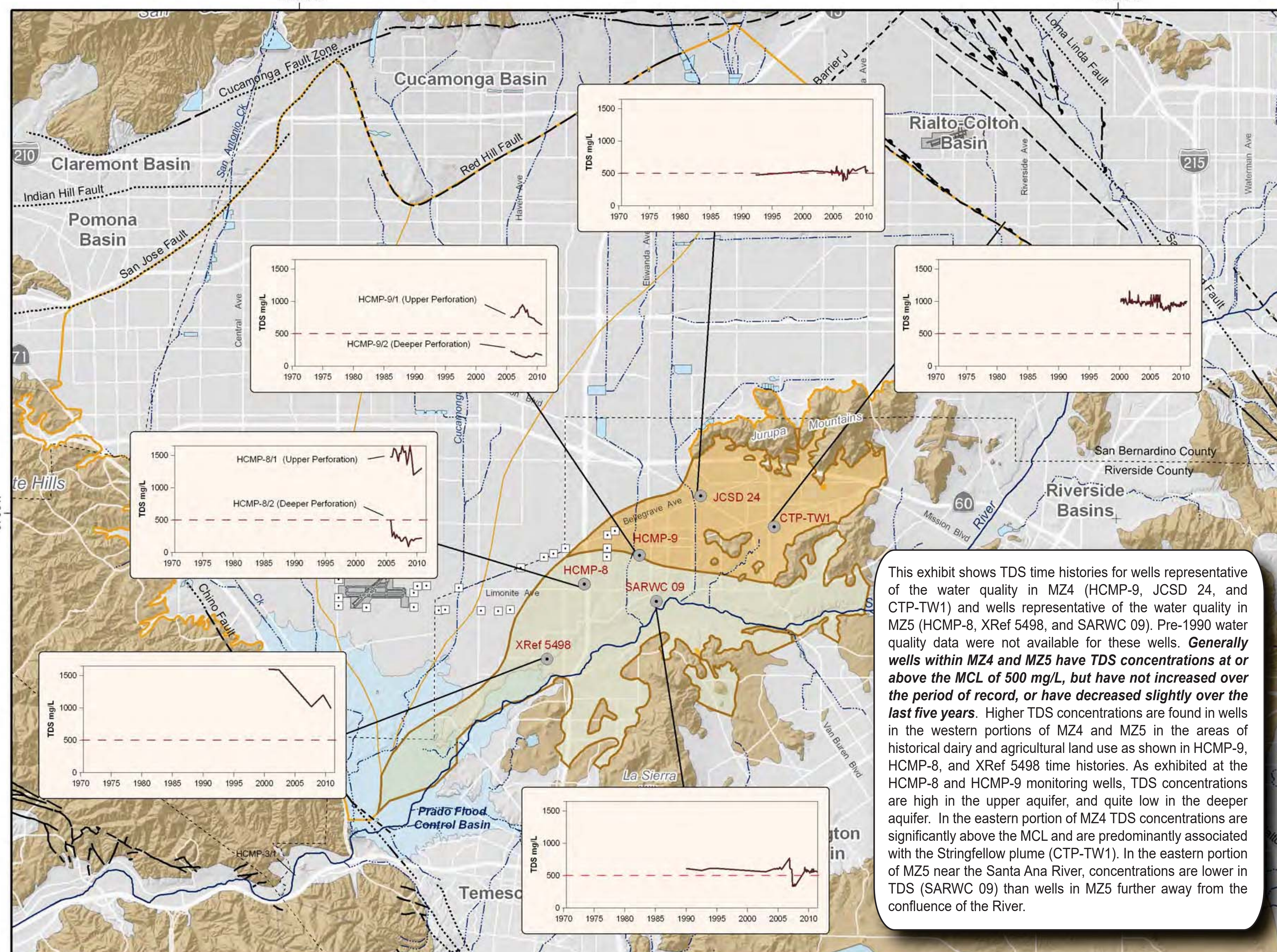
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Chino Basin Management Zone 3

Trends in Nitrate as Nitrogen Concentrations

Exhibit 49



This exhibit shows TDS time histories for wells representative of the water quality in MZ4 (HCMP-9, JCSD 24, and CTP-TW1) and wells representative of the water quality in MZ5 (HCMP-8, XRef 5498, and SARWC 09). Pre-1990 water quality data were not available for these wells. ***Generally wells within MZ4 and MZ5 have TDS concentrations at or above the MCL of 500 mg/L, but have not increased over the period of record, or have decreased slightly over the last five years***. Higher TDS concentrations are found in wells in the western portions of MZ4 and MZ5 in the areas of historical dairy and agricultural land use as shown in HCMP-9, HCMP-8, and XRef 5498 time histories. As exhibited at the HCMP-8 and HCMP-9 monitoring wells, TDS concentrations are high in the upper aquifer, and quite low in the deeper aquifer. In the eastern portion of MZ4 TDS concentrations are significantly above the MCL and are predominantly associated with the Stringfellow plume (CTP-TW1). In the eastern portion of MZ5 near the Santa Ana River, concentrations are lower in TDS (SARWC 09) than wells in MZ5 further away from the confluence of the River.

MZ4 Boundary Area

MZ5 Boundary Area

MZ4 and MZ5 Wells

Total Dissolved Solids (TDS)

TDS mg/L — Secondary CA EPA MCL = 500 mg/L — Year

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain — Location Concealed

Location Approximate — Location Uncertain

Approximate Location of Groundwater Barrier

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 20110609
File: Exhibit_50.mxd

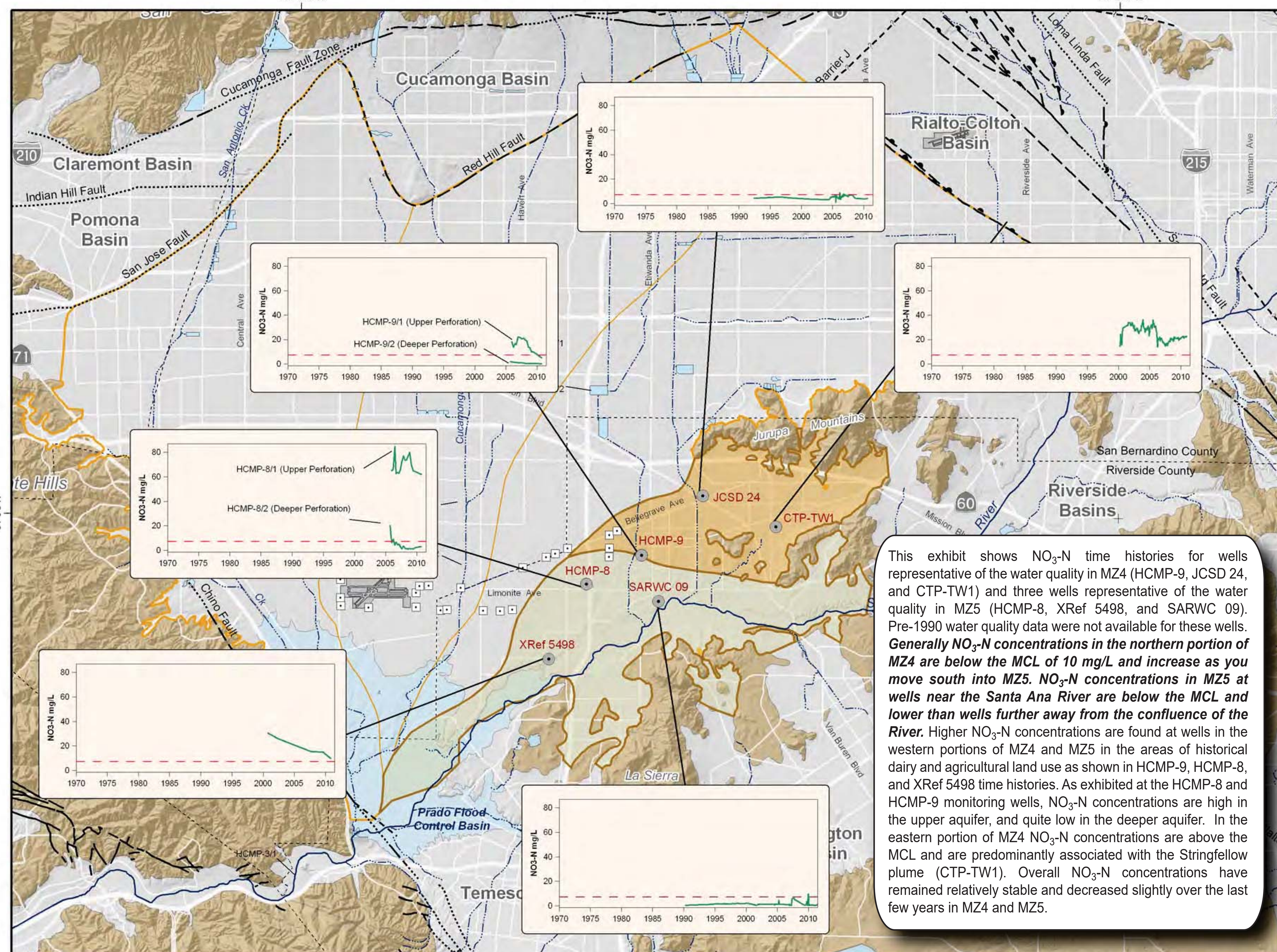
0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Chino Basin Management Zone 4 and Zone 5

Trends in Total Dissolved Solids Concentrations

Exhibit 50



This exhibit shows NO_3-N time histories for wells representative of the water quality in MZ4 (HCMP-9, JCSD 24, and CTP-TW1) and three wells representative of the water quality in MZ5 (HCMP-8, XRef 5498, and SARWC 09). Pre-1990 water quality data were not available for these wells. ***Generally NO_3-N concentrations in the northern portion of MZ4 are below the MCL of 10 mg/L and increase as you move south into MZ5. NO_3-N concentrations in MZ5 at wells near the Santa Ana River are below the MCL and lower than wells further away from the confluence of the River.*** Higher NO_3-N concentrations are found at wells in the western portions of MZ4 and MZ5 in the areas of historical dairy and agricultural land use as shown in HCMP-9, HCMP-8, and XRef 5498 time histories. As exhibited at the HCMP-8 and HCMP-9 monitoring wells, NO_3-N concentrations are high in the upper aquifer, and quite low in the deeper aquifer. In the eastern portion of MZ4 NO_3-N concentrations are above the MCL and are predominantly associated with the Stringfellow plume (CTP-TW1). Overall NO_3-N concentrations have remained relatively stable and decreased slightly over the last few years in MZ4 and MZ5.

MZ4 Boundary Area

MZ5 Boundary Area

MZ4 and MZ5 Wells

Nitrate as Nitrogen (NO3-N)

NO3-N mg/L — Primary US EPA MCL = 10 mg/L — Year

OBMP Management Zones

Chino Desalter Well

Streams & Flood Control Channels

Flood Control & Conservation Basins

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Approximate Location of Groundwater Barrier

Location Concealed

Location Uncertain

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: VMW
Date: 201100616
File: Exhibit_51.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 KM

2010 State of the Basin
Groundwater Quality

Chino Basin Management Zone 4 and Zone 5

Trends in Nitrate as Nitrogen Concentrations

Exhibit 51

The exhibits in this section show the state of ground-level subsidence in the Chino Basin, using data from the Chino Basin ground-level monitoring program that was designed to minimize and/or abate land subsidence.

One of the earliest indications of land subsidence in Chino Basin was the appearance of ground fissures in the City of Chino. These fissures appeared as early as 1973, but an accelerated occurrence of ground fissuring ensued after 1991 and resulted in damage to existing infrastructure.

In 1999, the OBMP Phase I Report (WEI, 1999) identified pumping-induced drawdown and subsequent aquifer-system compaction as the most likely cause of land subsidence and ground fissuring observed in MZ1. Program Element 1 – *Develop and Implement a Comprehensive Monitoring Program*, called for basin-wide analysis of land subsidence via ground-level surveys and remote sensing (InSAR), and ongoing monitoring based on the analysis of the subsidence data. Program Element 4 of the OBMP, *Develop and Implement a Comprehensive Groundwater Management Plan for Management Zone 1*, called for the development and implementation of an interim management plan for MZ1 that would:

- Minimize subsidence and fissuring in the short-term.
- Collect the information necessary to understand the extent, rate, and mechanisms of subsidence and fissuring.
- Formulate a management plan to abate future subsidence and fissuring or reduce it to tolerable levels.

In 2000, the Implementation Plan in the Peace Agreement called for an aquifer system and land subsidence investigation in the southwestern region of MZ1 to support the development of a management plan for MZ1 (second and third bullets above). This investigation was titled the MZ1 Interim Monitoring Program (IMP). From 2001-2005, Watermaster developed, coordinated, and conducted the IMP under the guidance of the MZ1 Technical Committee, which was composed of representatives from all major producers in MZ1 and their technical consultants. The investigation methods, results, and conclusions are described in detail in the MZ1 Summary Report (WEI, 2006). The investigation provided enough information for Watermaster to develop Guidance Criteria for MZ1 producers in the investigation area that, if followed, would minimize the potential for subsidence and fissuring. The Guidance Criteria also formed the basis for the MZ1 Subsidence Management Plan (WEI, 2007b).

The Subsidence Management Plan was developed by the MZ1 Technical Committee and approved by Watermaster in October 2007. In November 2007, the California Superior Court, which retains continuing jurisdiction over the Chino Basin Adjudication, approved the Subsidence Management Plan and ordered its implementation. The Subsidence Management Plan calls for (1) the continued scope and frequency of monitoring implemented during the IMP within the MZ1 Managed Area (see Exhibit 52) and (2) expanded monitoring of the aquifer system and land subsidence in other areas of the Chino Basin where the IMP indicated concern for future subsidence and ground fissuring.

Watermaster's current ground-level monitoring program includes:

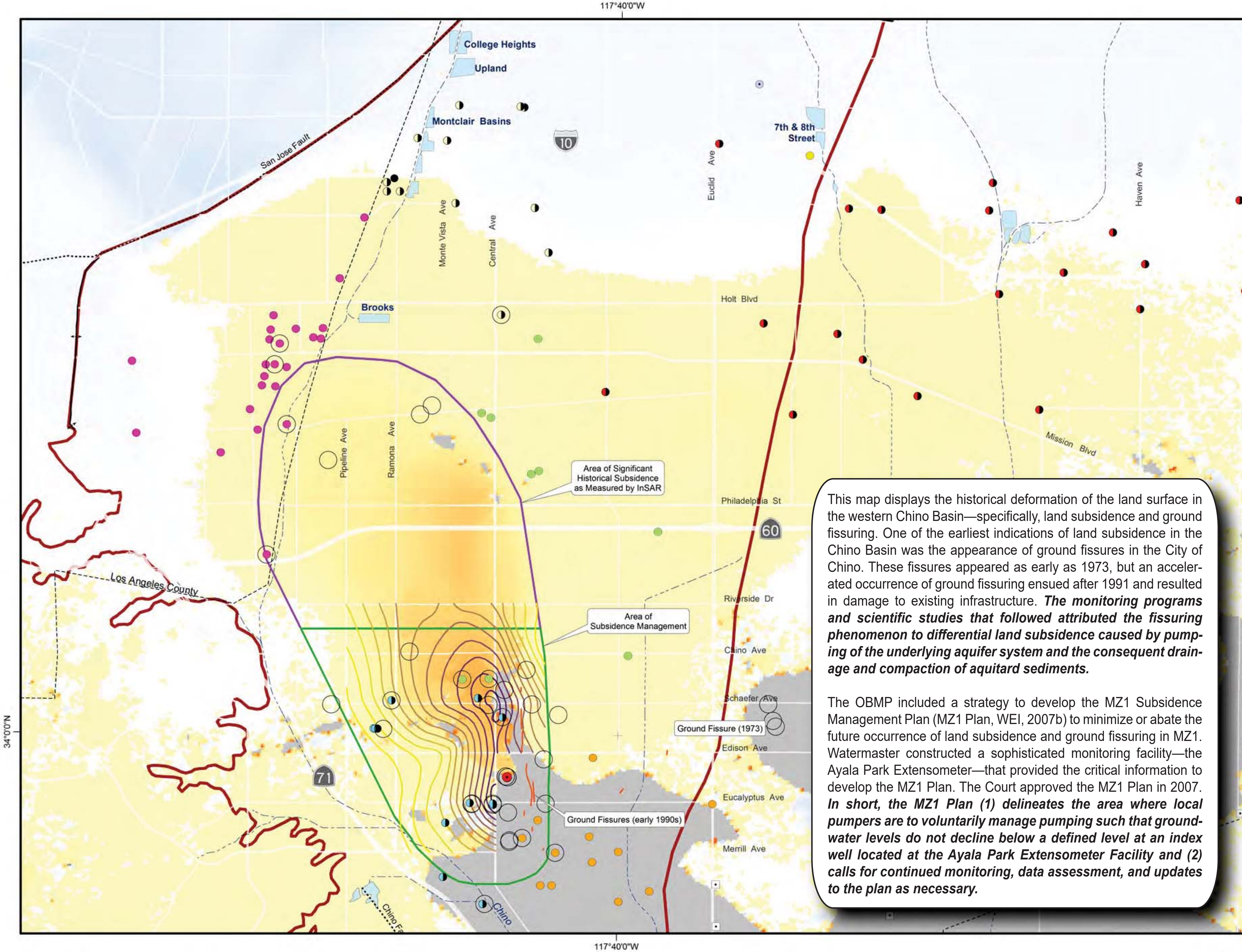
- *Piezometric Levels*. Piezometric levels are an important part of the ground-level monitoring program because piezometric changes are the mechanism for aquifer-system deformation and land subsidence. Watermaster monitors piezometric levels at about 33 wells in MZ1. Currently, a pressure-transducer/data-logger is installed at each of these wells and records one water-level reading every 15 minutes. Watermaster also records depth-specific water levels at the piezometers located at the Ayala Park Extensometer Facility every 15 minutes.
- *Aquifer-System Deformation*. Watermaster records aquifer-system deformation at the Ayala Park Extensometer Facility (see Exhibit 52). At this facility, two extensometers, completed at 550 ft-bgs (Shallow Extensometer) and 1,400 ft-bgs (Deep Extensometer), record the vertical component of aquifer-system compression and/or expansion once every 15 minutes (synchronized with the piezometric measurements).
- *Vertical Ground-Surface Deformation*. Watermaster monitors vertical ground-surface deformation via the ground-level surveying and InSAR techniques established during the IMP. Currently, ground-level surveys are being conducted in the MZ1 Managed Area once per year. InSAR is the only monitoring technique being employed outside the MZ1 Managed Area, and InSAR data is analyzed once per year.
- *Horizontal Ground-Surface Deformation*. Watermaster monitors horizontal ground-surface displacement across the eastern side of the subsidence trough and the adjacent area east of the barrier/fissure zone. These data, obtained by electronic distance measurements (EDMs), are used to characterize the horizontal component of land surface displacement caused by groundwater production on either side of the fissure zone. Currently, Watermaster is collecting EDMs between east/west aligned benchmarks on Eucalyptus, Edison, Schaefer, and Philadelphia Avenues at a semiannual frequency (Spring/Fall).

Exhibits 52 through 54 show historical and recent ground surface motion information collected from InSAR and ground-level surveys in MZ1 and across the Chino Basin.

Historical ground motion data (shown in Exhibit 52) and recent ground motion data (shown in Exhibits 53 and 54) indicate that land subsidence concerns in the Chino Basin are confined to certain portions of MZ1 and MZ2. These "areas of subsidence concern" are delineated and labeled in Exhibits 53 and 54. Besides the MZ1 Managed Area, Watermaster has designated four additional areas of subsidence concern: the Central MZ1 Area, the Pomona Area, the Ontario Area, and the Southeast Area.

The recent land subsidence that has occurred in each of these areas is mainly controlled by recent and/or historical changes in groundwater levels, which, in turn, are mainly controlled by pumping and recharge. Exhibits 55 through 62 show the relationships between groundwater pumping, aquifer recharge, groundwater levels, and ground motion. These graphics reveal cause and effect relationships, the current state of ground motion, and the nature of current land subsidence (i.e. elastic and/or inelastic, differential, etc.). For each area of concern, if applicable, two time history charts are included to display 1) the long-term history of the data beginning in 1930, and 2) the recent, higher resolution data beginning in 1990. Discussions of these data are included on the first exhibit for each area of subsidence concern. Only one time history chart combining the historical and recent data is shown for the MZ1 Managed Area (Exhibit 55), and the Southeast Area (Exhibit 62), because the historical data only goes back to 1974, and 1987, respectively.

Watermaster convenes a Land Subsidence Committee to review the data from the ground-level monitoring program. This committee evaluates the appropriateness of the guidance criteria in the MZ1 Plan annually and recommends changes if necessary. The committee also recommends changes to the ground-level monitoring program if needed. Watermaster's Subsidence Management Plan is a prime example of adaptive management based on current technical information.



This map displays the historical deformation of the land surface in the western Chino Basin—specifically, land subsidence and ground fissuring. One of the earliest indications of land subsidence in the Chino Basin was the appearance of ground fissures in the City of Chino. These fissures appeared as early as 1973, but an accelerated occurrence of ground fissuring ensued after 1991 and resulted in damage to existing infrastructure. ***The monitoring programs and scientific studies that followed attributed the fissuring phenomenon to differential land subsidence caused by pumping of the underlying aquifer system and the consequent drainage and compaction of aquitard sediments.***

The OBMP included a strategy to develop the MZ1 Subsidence Management Plan (MZ1 Plan, WEI, 2007b) to minimize or abate the future occurrence of land subsidence and ground fissuring in MZ1. Watermaster constructed a sophisticated monitoring facility—the Ayala Park Extensometer—that provided the critical information to develop the MZ1 Plan. The Court approved the MZ1 Plan in 2007. ***In short, the MZ1 Plan (1) delineates the area where local pumpers are to voluntarily manage pumping such that groundwater levels do not decline below a defined level at an index well located at the Ayala Park Extensometer Facility and (2) calls for continued monitoring, data assessment, and updates to the plan as necessary.***

Subsidence Features

Contours of Relative Change in Land Surface Altitude as Measured by Leveling Surveys 1987 to 1999 (feet)

0.0

-2.2

Relative Change in Land Surface Altitude as Measured by InSAR Oct 1993 to Dec 1995 (feet)

+ 1.0

0.0

- 1.0

InSAR data absent (incoherent)

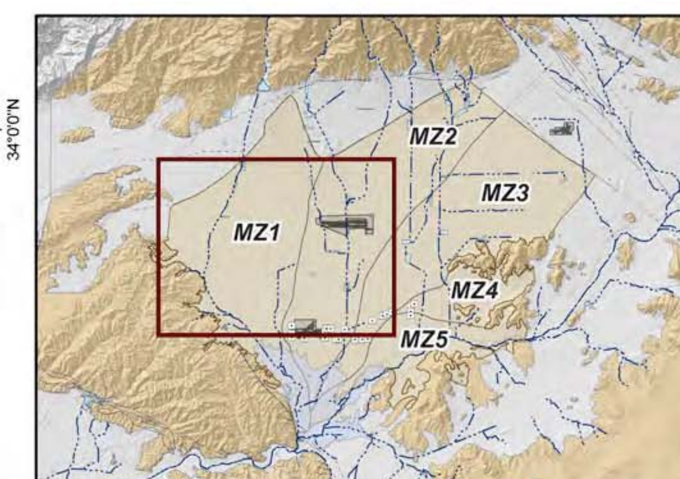
Active Production Wells in MZ-1 by Owner

- Ontario
- Pomona
- SAWC
- Upland
- GSWC
- CIM
- Chino Hills
- Chino
- MVWD

- Well Used in MZ1 Monitoring Program
- Ground Fissures
- Ayala Park Extensometer Facility
- Chino Basin Desalter Well
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain



Produced by:

WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: AEM\MJC\TCR
Date: 20110906
File: Exhibit_52.mxd

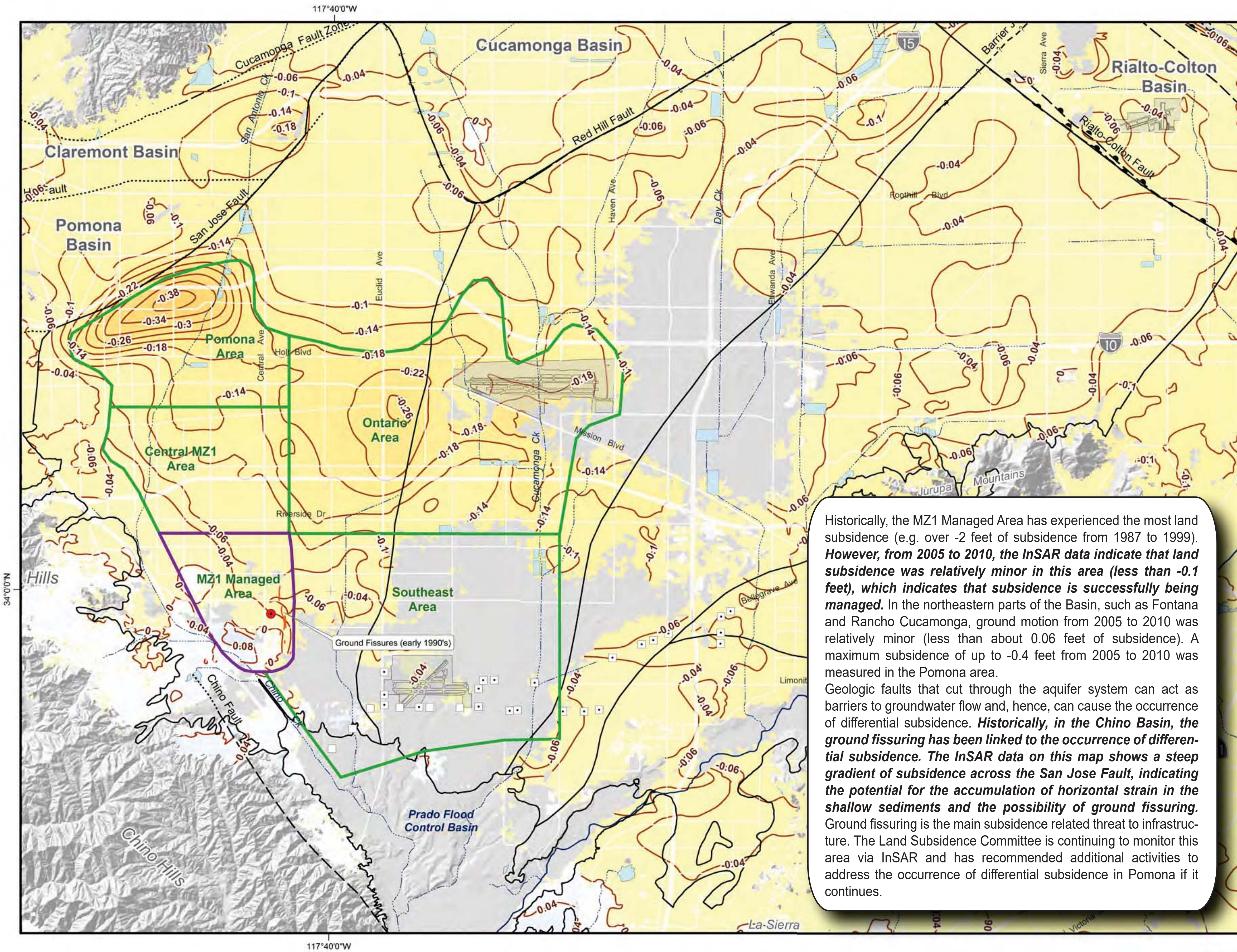
0 1 2 3 Miles
0 1 2 3 4 KM

2010 State of the Basin
Ground-Level Monitoring

Historical Land Surface Deformation in Management Zone 1

Leveling Surveys (1987 to 1999) and InSAR (1993 to 1995)

Exhibit 52



Historically, the MZ1 Managed Area has experienced the most land subsidence (e.g. over -2 feet of subsidence from 1987 to 1999). ***However, from 2005 to 2010, the InSAR data indicate that land subsidence was relatively minor in this area (less than -0.1 feet), which indicates that subsidence is successfully being managed.*** In the northeastern parts of the Basin, such as Fontana and Rancho Cucamonga, ground motion from 2005 to 2010 was relatively minor (less than about 0.06 feet of subsidence). A maximum subsidence of up to -0.4 feet from 2005 to 2010 was measured in the Pomona area.

Geologic faults that cut through the aquifer system can act as barriers to groundwater flow and, hence, can cause the occurrence of differential subsidence. ***Historically, in the Chino Basin, the ground fissuring has been linked to the occurrence of differential subsidence. The InSAR data on this map shows a steep gradient of subsidence across the San Jose Fault, indicating the potential for the accumulation of horizontal strain in the shallow sediments and the possibility of ground fissuring.*** Ground fissuring is the main subsidence related threat to infrastructure. The Land Subsidence Committee is continuing to monitor this area via InSAR and has recommended additional activities to address the occurrence of differential subsidence in Pomona if it continues.

Relative Change in Land Surface Altitude as Measured by InSAR June 2005 to September 2010 (feet)

+1 / 0 / -0.50 / -1

InSAR data absent (incoherent)

- Ayala Park Extensometer
- Ground Fissures (early 1990's)
- Proposed Chino Creek Desalter Well
- Existing Chino Desalter Well
- Chino Basin OBMP Management Zones
- MZ1 Managed Area
- Other Areas of Subsidence Concern
- Streams & Flood Control Channels
- Flood Control & Conservation Basins

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: AEM\TCR
Date: 20111031
File: Exhibit_53.mxd

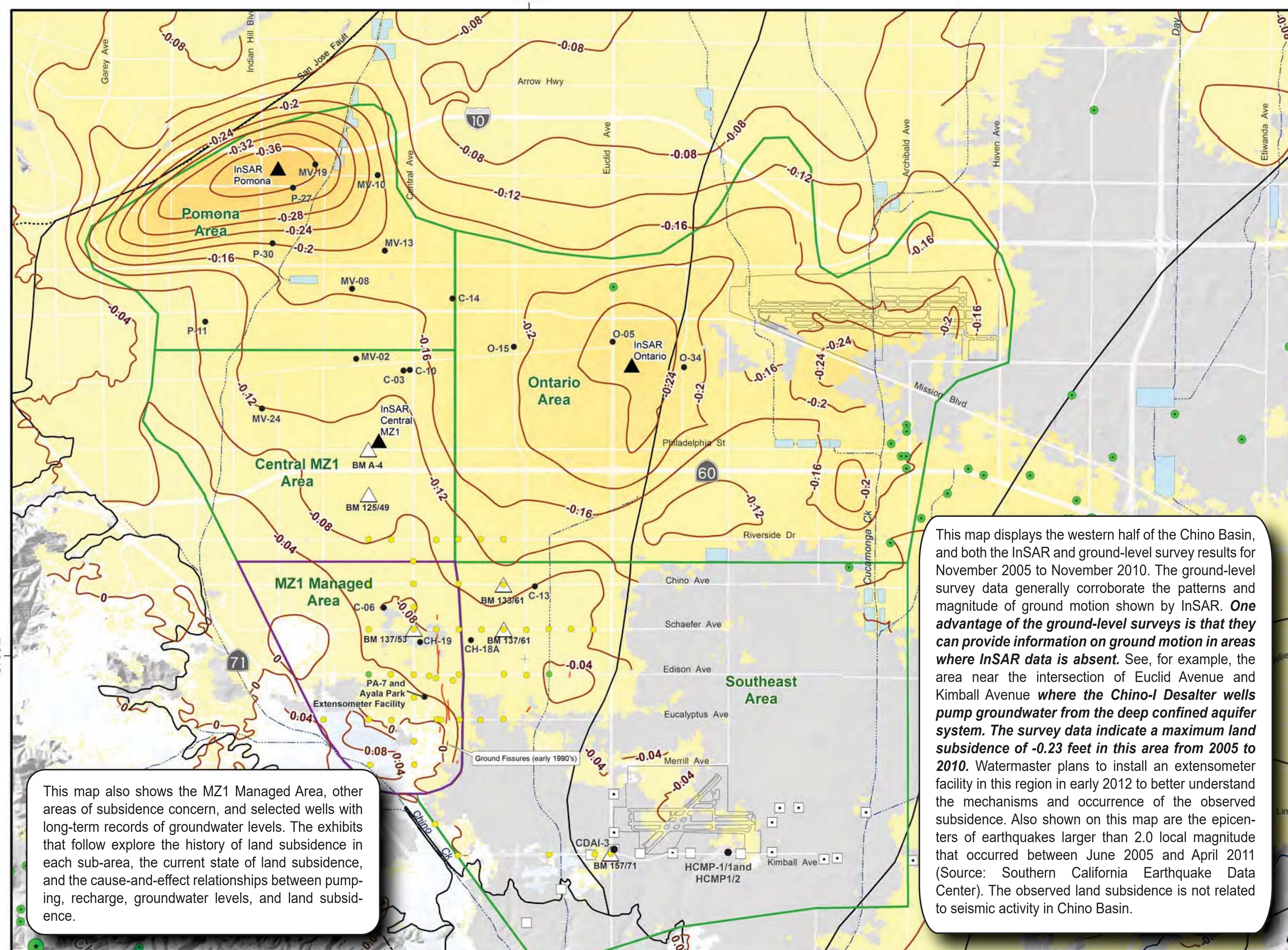
0 1 2 3 4 Miles
0 1 2 3 4 5 6 KM

2010 State of the Basin
Ground-Level Monitoring

Vertical Ground Motion (2005 to 2010)

as Measured by InSAR in the Chino Basin Area

Exhibit 53



This map also shows the MZ1 Managed Area, other areas of subsidence concern, and selected wells with long-term records of groundwater levels. The exhibits that follow explore the history of land subsidence in each sub-area, the current state of land subsidence, and the cause-and-effect relationships between pumping, recharge, groundwater levels, and land subsidence.

This map displays the western half of the Chino Basin, and both the InSAR and ground-level survey results for November 2005 to November 2010. The ground-level survey data generally corroborate the patterns and magnitude of ground motion shown by InSAR. ***One advantage of the ground-level surveys is that they can provide information on ground motion in areas where InSAR data is absent.*** See, for example, the area near the intersection of Euclid Avenue and Kimball Avenue ***where the Chino-I Desalter wells pump groundwater from the deep confined aquifer system. The survey data indicate a maximum land subsidence of -0.23 feet in this area from 2005 to 2010.*** Watermaster plans to install an extensometer facility in this region in early 2012 to better understand the mechanisms and occurrence of the observed subsidence. Also shown on this map are the epicenters of earthquakes larger than 2.0 local magnitude that occurred between June 2005 and April 2011 (Source: Southern California Earthquake Data Center). The observed land subsidence is not related to seismic activity in Chino Basin.

Relative Change in Land Surface Altitudes Measured by Leveling Surveys November 2005 to November 2010 (feet)

- Insufficient Data
- 0.75 - 1
- 0.50 - 0.75
- 0.25 - 0.50
- 0.01 - 0.25
- 0.00
- -0.01 - -0.25
- -0.25 - -0.50
- -0.50 - -0.75
- -0.75 - -1

Relative Change in Land Surface Altitude as Measured by InSAR June 2005 to September 2010 (feet)

+1, 0, -0.50, -1

InSAR data absent (incoherent)

- Water Level Wells (Exhibits 55 to 62)
- Chino Basin Desalter Well
- Proposed Chino Creek Desalter Well
- Survey Measurement Stations (Exhibits 55 to 62)
- Selected InSAR Measurement Point (Exhibits 56 to 62)
- Chino Basin OBMP Management Zones
- MZ1 Managed Area
- Other Areas of Subsidence Concern
- Ground Fissures (early 1990's)

Earthquake Epicenters June 2005 to April 2011 (Local Magnitude)

- 2
- 2 - 3
- 3 - 4
- 4 - 5
- < 5

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20111101
File: Exhibit_54.mxd

0 1 2 3 Miles
0 1 2 3 4 KM

2010 State of the Basin
Ground-Level Monitoring

Vertical Ground Motion (2005 to 2010)

Leveling Surveys and InSAR in Western Chino

Exhibit 54

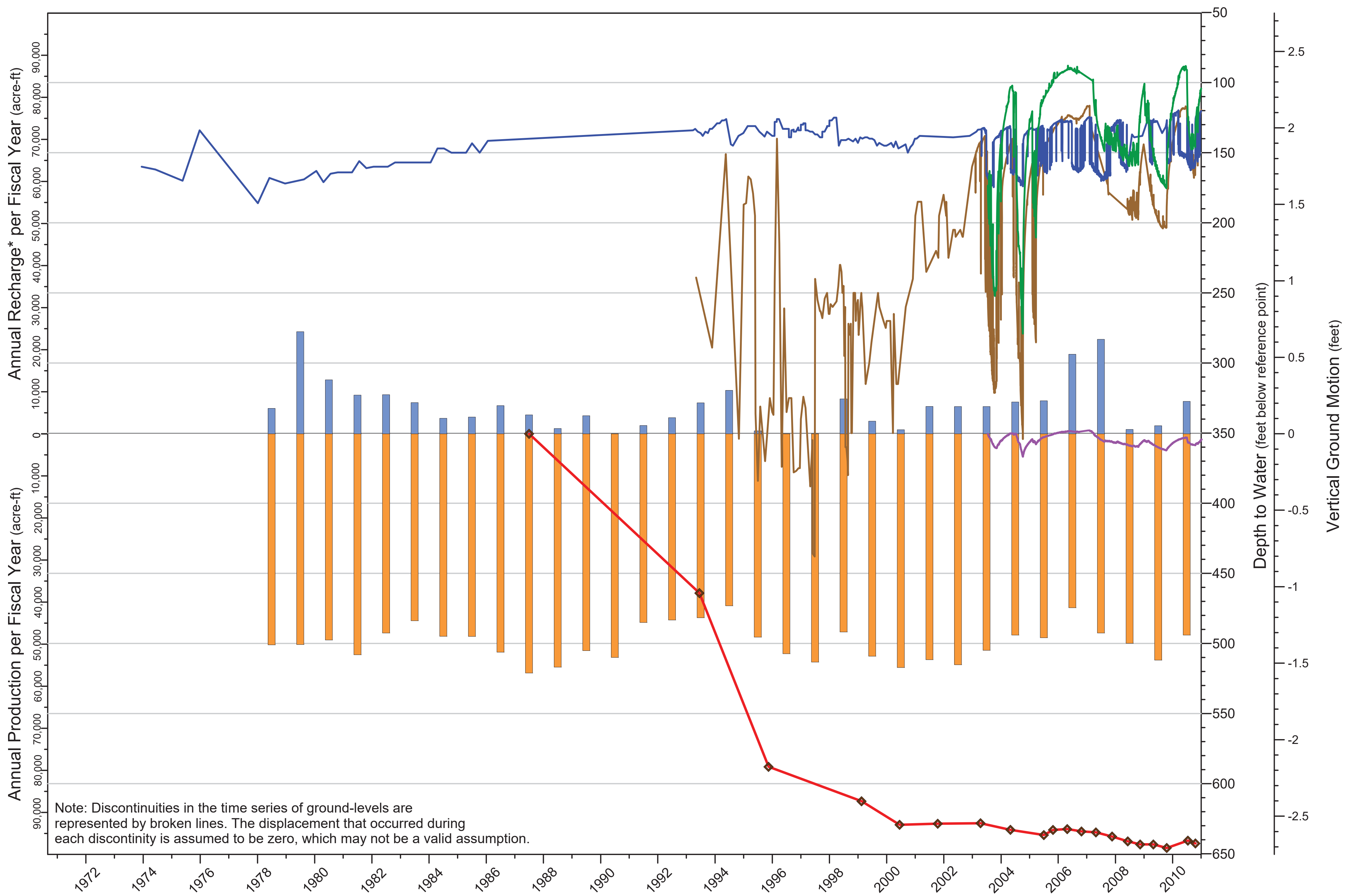


Exhibit 55 is a time series chart that displays annual pumping and recharge in MZ1, along with groundwater levels at wells and ground-level survey data at measurement stations within the MZ1 Managed Area (see Exhibit 54). The observations and conclusions described below were largely derived during the testing and monitoring that was performed by Watermaster during the development of the MZ1 Plan during 2000 to 2006.

Artificial recharge in the northern portions of MZ1 has no immediate impact on groundwater levels in the deep aquifer system. ***Pumping of the deep aquifer system is the main cause of groundwater-level changes and ground motion in the MZ1 Managed Area.***

Wells CH-19 and PA-7 are perforated within the deep aquifer system. Well C-06 is perforated in the shallow aquifer system. Pumping of the deep confined aquifer system causes groundwater- level drawdowns that are much greater in magnitude and lateral extent than drawdowns caused by pumping of the shallow aquifer system. Groundwater-level drawdowns due to pumping of the deep aquifer system can cause inelastic (permanent) compaction of the aquifer-system sediments, which results in permanent land subsidence. During controlled pumping tests in 2004 and 2005, the initiation of inelastic compaction within the aquifer system began to happen when groundwater-levels were drawdown about 250 feet below reference point (ft-brp) in the PA-7 piezometer at Ayala Park. I***n order to avoid inelastic compaction a guidance level of 245 feet in the PA-7 piezometer was established and is the primary criteria for the management of subsidence in the MZ1 Plan.***

This exhibit also shows the history of vertical ground motion measured at the Deep Extensometer at Ayala Park and at a benchmark monument (137/53) at the corner of Schaefer Avenue and Central Avenue. About -2.5 ft of subsidence occurred in portions of the ***MZ1 Managed Area from 1987 to 2000, but very little inelastic subsidence has occurred since 2000, and no additional ground fissuring has been observed.*** From 2006 to 2010, groundwater levels at PA-7 did not decline below 250 ft-brp, and very little, if any, inelastic compaction was recorded in the MZ1 Managed Area.

* Recharge includes imported water and recycled water delivered to recharge basins, and does not include in-lieu replenishment water.

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20110906
File: Exhibit_55_new.grf

Groundwater Levels at Wells (top-bottom of well screen)
- PA-7 (438-448 ft-bgs)
- CH-19 (340-1000 ft-bgs)
- C-06 (200-375 ft-bgs)

Production & Recharge in MZ1
- Recharge*
- Groundwater Production

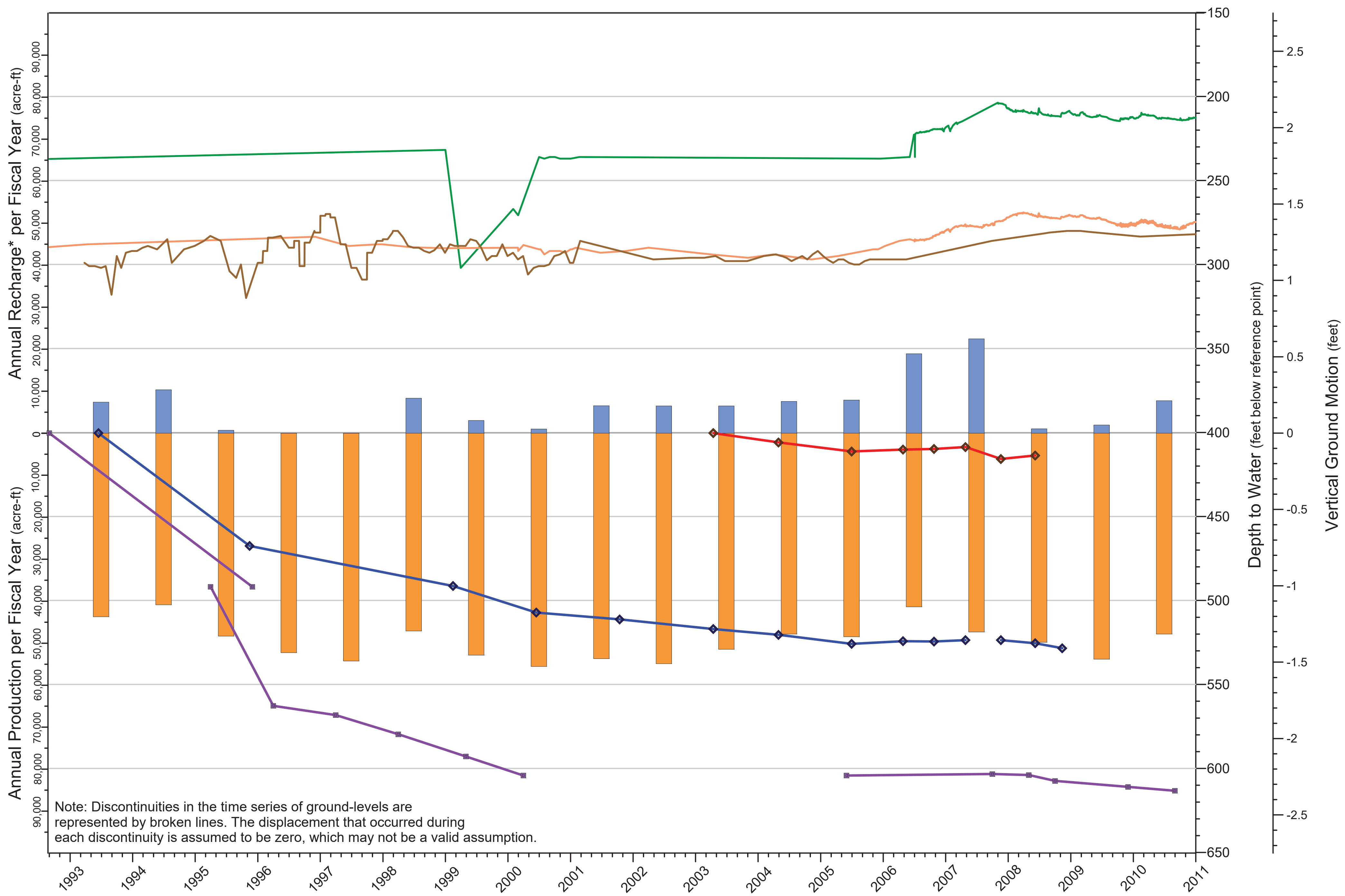
Ground-Levels
- BM 137/53 Survey Measurements
- Deep Extensometer at Ayala Park (1,400 ft-bgs)

2010 State of the Basin
Ground-Level Monitoring

Groundwater Levels versus Ground-Levels in the MZ1 Managed Area

1970 to 2010

Exhibit 55



The Central MZ1 subsidence area is located directly north of the MZ1 Managed Area. Exhibits 56 and 57 are time series charts that display annual production and recharge in MZ1, along with groundwater levels at wells and ground-level survey data at measurement stations within the Central MZ1 Area (see Exhibit 54).

The vertical ground motion time histories for Central MZ1 subsidence area are similar to those of the MZ1 Managed Area: ***as much as -2.2 feet of inelastic subsidence occurred at the corner of Philadelphia and Monte Vista Avenue from 1993-2000, but very little inelastic subsidence has occurred since 2000.*** This similarity suggests a relationship to the causes of land subsidence in the MZ1 Managed Area; however, there is very little historical groundwater-level data in this area to confirm this relationship.

Most of the wells with historical groundwater level records are in the northern part of the Central MZ1 subsidence area (see Exhibit 54), where historical subsidence was not as pronounced. From about 1935 to 1978, groundwater levels in these wells declined by about 150 feet. Groundwater levels increase by about 50 feet during the 1980s and remained relatively stable until 2005. From 2005 to 2008, groundwater levels increased by about 25 feet, which was likely due to decreased pumping and increased recharge in MZ1. Since 2008, recharge in MZ1 has decreased, production has increased, and water levels have remained relatively stable

* Recharge includes imported water and recycled water delivered to recharge basins, and does not include in-lieu replenishment water.

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20110906
File: Exhibit_56_new.grf

Groundwater Levels at Wells (top-bottom of well screen)
- C-10 (355-1090 ft-bgs)
- MVWD-24 (244-420 ft-bgs)
- MVWD-02 (397-962 ft-bgs)

Production & Recharge in MZ1
- Recharge*
- Groundwater Production

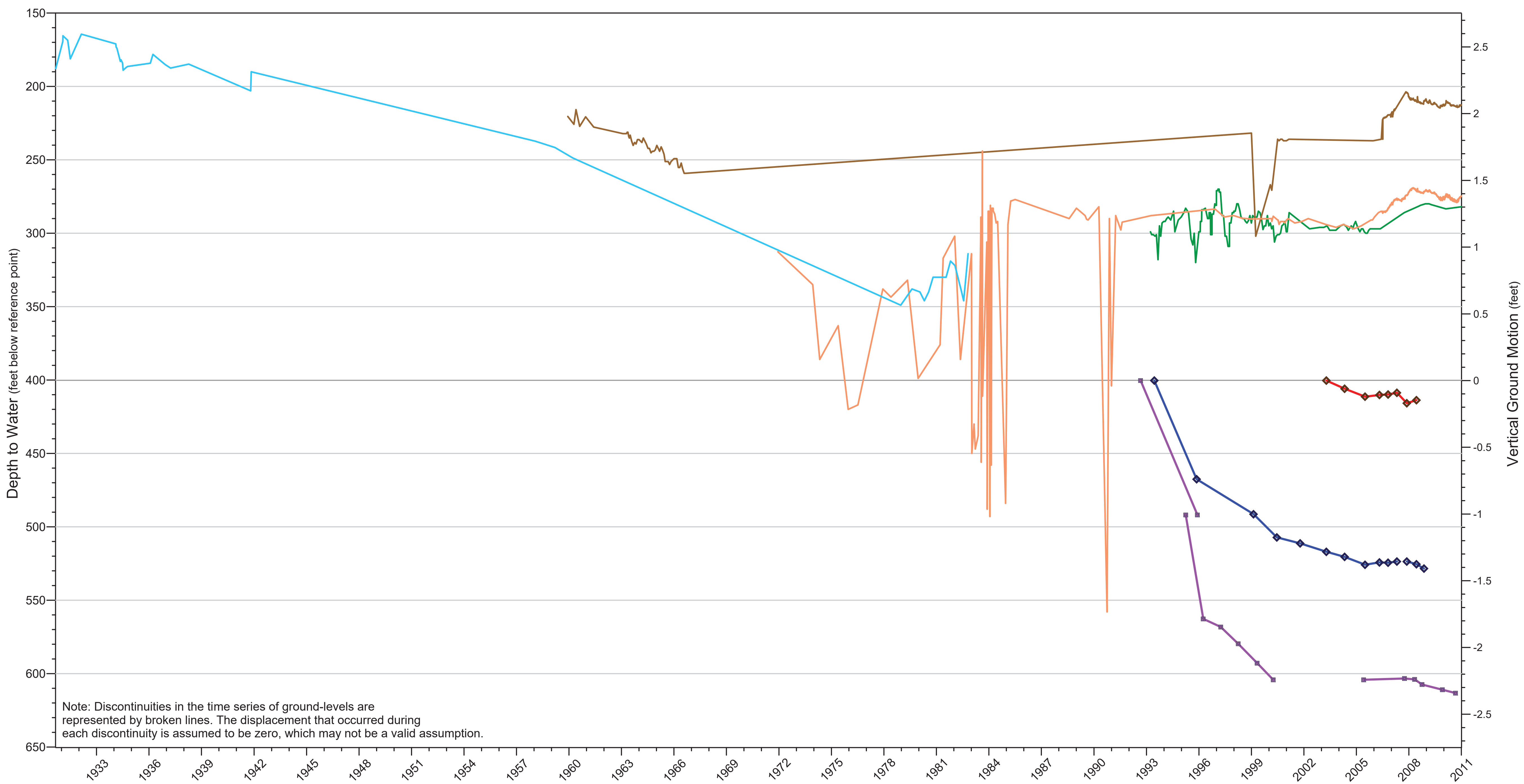
Ground-Levels
- BM 125/49 Survey Measurements
- BM A-4 Survey Measurements
- Central-MZ1 InSAR Measurements

2010 State of the Basin
Ground-Level Monitoring

Groundwater Levels versus Ground-Levels in the Central MZ1 Area

1993 to 2010

Exhibit 56



Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20110906
File: Exhibit_57_new.grf

Groundwater Levels at Wells
(top-bottom of well screen)

- C-03 (230-450 ft-bgs)
- C-10 (355-1090 ft-bgs)
- MVWD-02 (397-962 ft-bgs)
- MVWD-24 (244-420 ft-bgs)

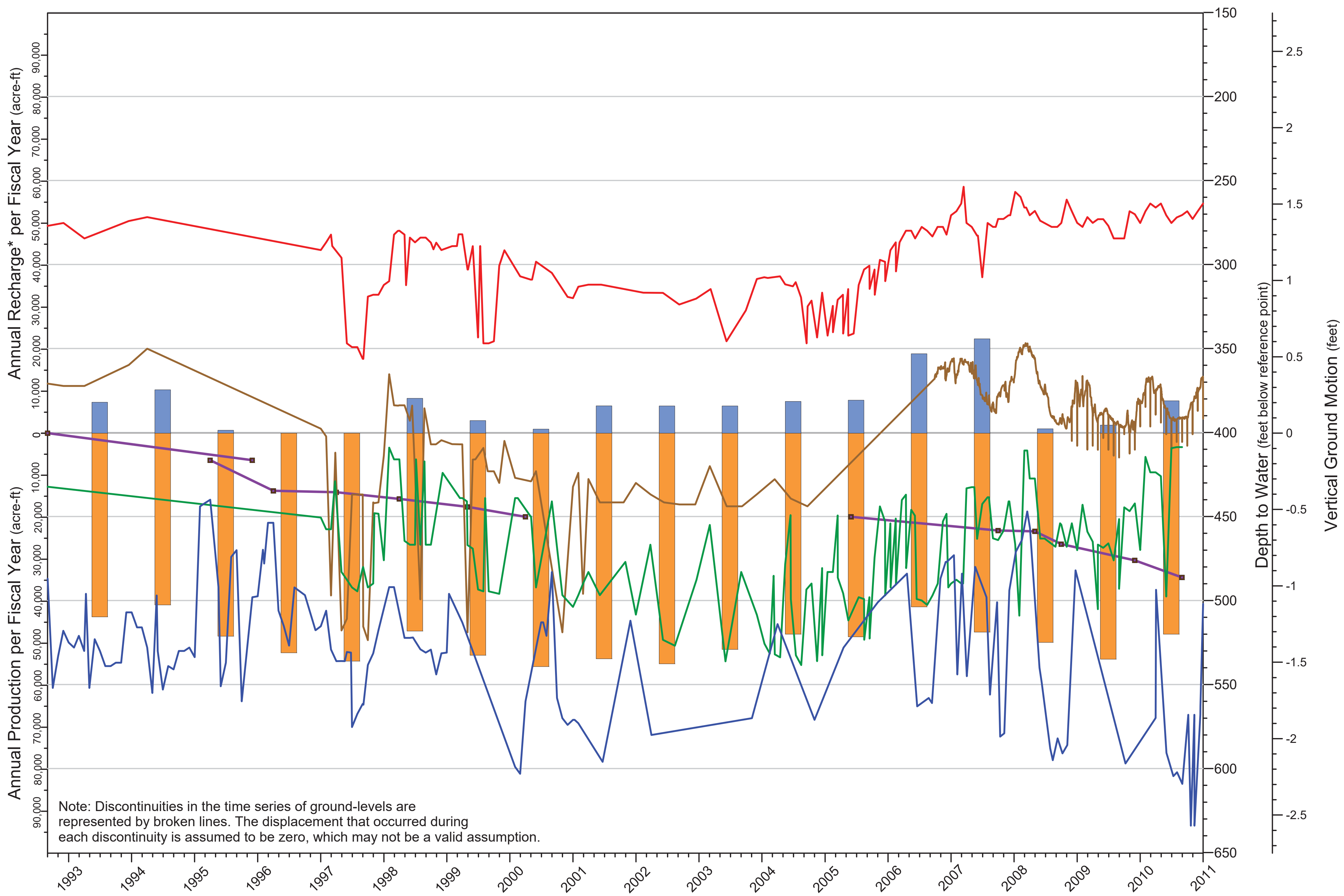
Ground-Levels

- Central-MZ1 InSAR Measurements
- BM A-4 Survey Measurements
- City BM 125/49 Survey Measurements

2010 State of the Basin
Ground-Level Monitoring

Groundwater Levels versus Ground-Levels in the Central MZ1 Area
1930 to 2010

Exhibit 57



The Pomona subsidence area is located directly north of the Central MZ1 subsidence area. Exhibits 58 and 59 are time series charts that display annual production and recharge within MZ1, along with groundwater levels at wells and ground-level survey data at measurement stations within the Pomona Area (see Exhibit 54).

The history of vertical ground motion in the Pomona subsidence area is based solely on InSAR data from 1992 to 1995, 1995 to 2000, and 2005 to 2010. ***These data indicate that land subsidence has occurred continuously in this area, generally at a rate of about 0.07 feet per year (ft/yr).***

From about 1935 to 1978, groundwater levels in the Pomona Area declined by about 175 feet or more. Groundwater levels increased by about 50 to 100 feet during the 1980s. From about 1990 to 2004, groundwater levels declined again by about 25 to 50 feet. From 2004 to 2008, groundwater levels increased by about 50 to over 100 feet. And, from 2008 to 2010, groundwater levels remained stable or declined slightly. ***The groundwater level changes from 1990 to 2010 appear to be closely related to pumping and recharge in MZ1.***

The observed, continuous land subsidence cannot be explained entirely by the corresponding changes in groundwater levels. A plausible explanation for the subsidence is that thick, slowly-draining aquitards are compacting in response to the historical drawdowns that occurred from 1935 to 1978 (see Exhibit 59).

* Recharge includes imported water and recycled water delivered to recharge basins, and does not include in-lieu replenishment water.

Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20110906
File: Exhibit_58_new.grf

Groundwater Levels at Wells (top-bottom of well screen)

- MVWD-19 (620-1230 ft-bgs)
- P-11 (168-550 ft-bgs)
- P-27 (472-849 ft-bgs)
- P-30 (565-875 ft-bgs)

Production & Recharge in MZ1

- Recharge*
- Groundwater Production

Ground-Levels

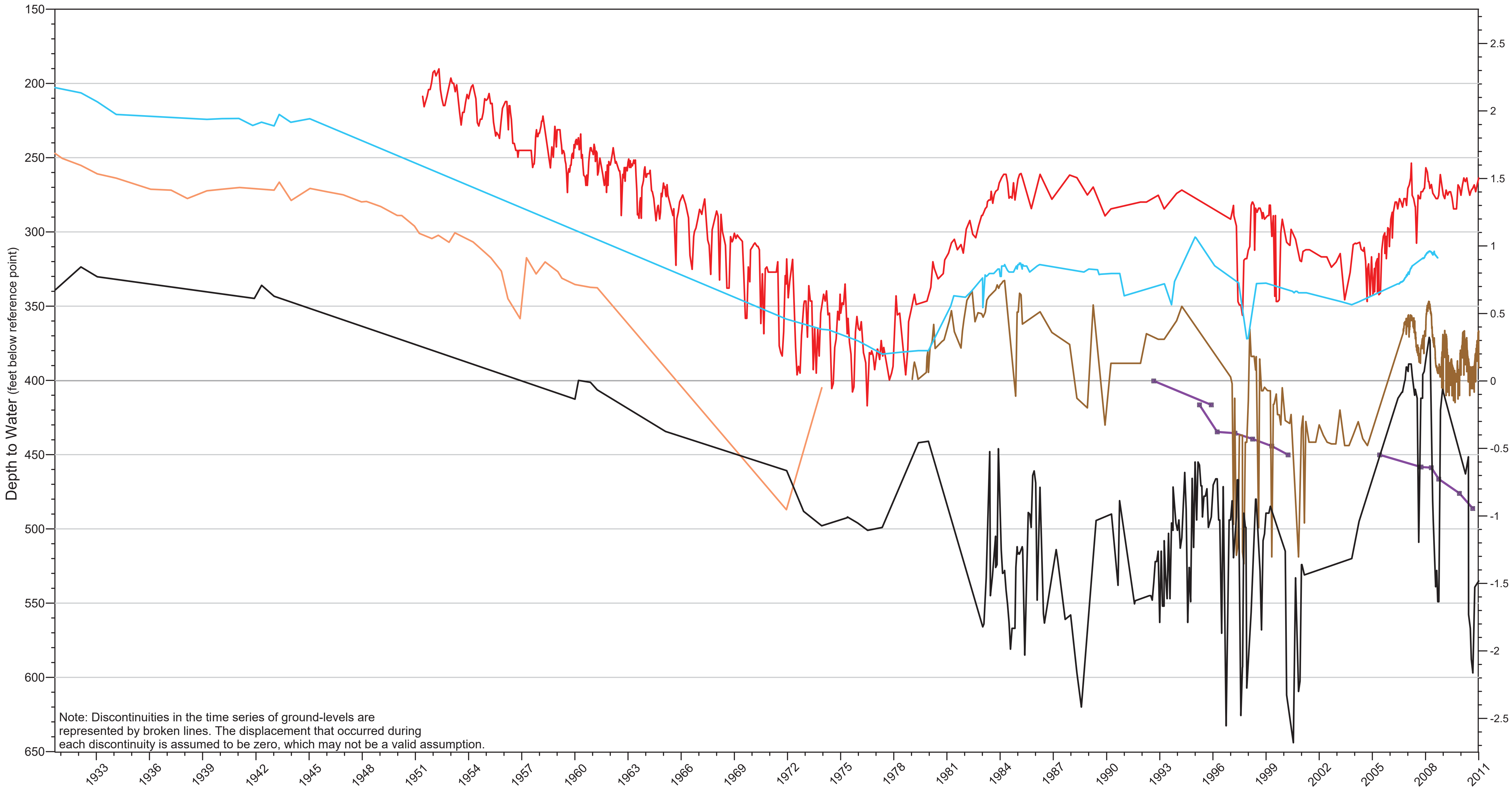
- Pomona InSAR Measurements

2010 State of the Basin
Ground-Level Monitoring

Groundwater Levels versus Ground-Levels in the Pomona Area

1993 to 2010

Exhibit 58



Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20110906
File: Exhibit_59_new.grf

Groundwater Levels at Wells (top-bottom of well screen)

- MVWD-08 (225-447 ft-bgs)
- MVWD-10 (520-1084 ft-bgs)
- MVWD-13 (203-475 ft-bgs)
- P-11 (168-550 ft-bgs)
- P-30 (565-875 ft-bgs)

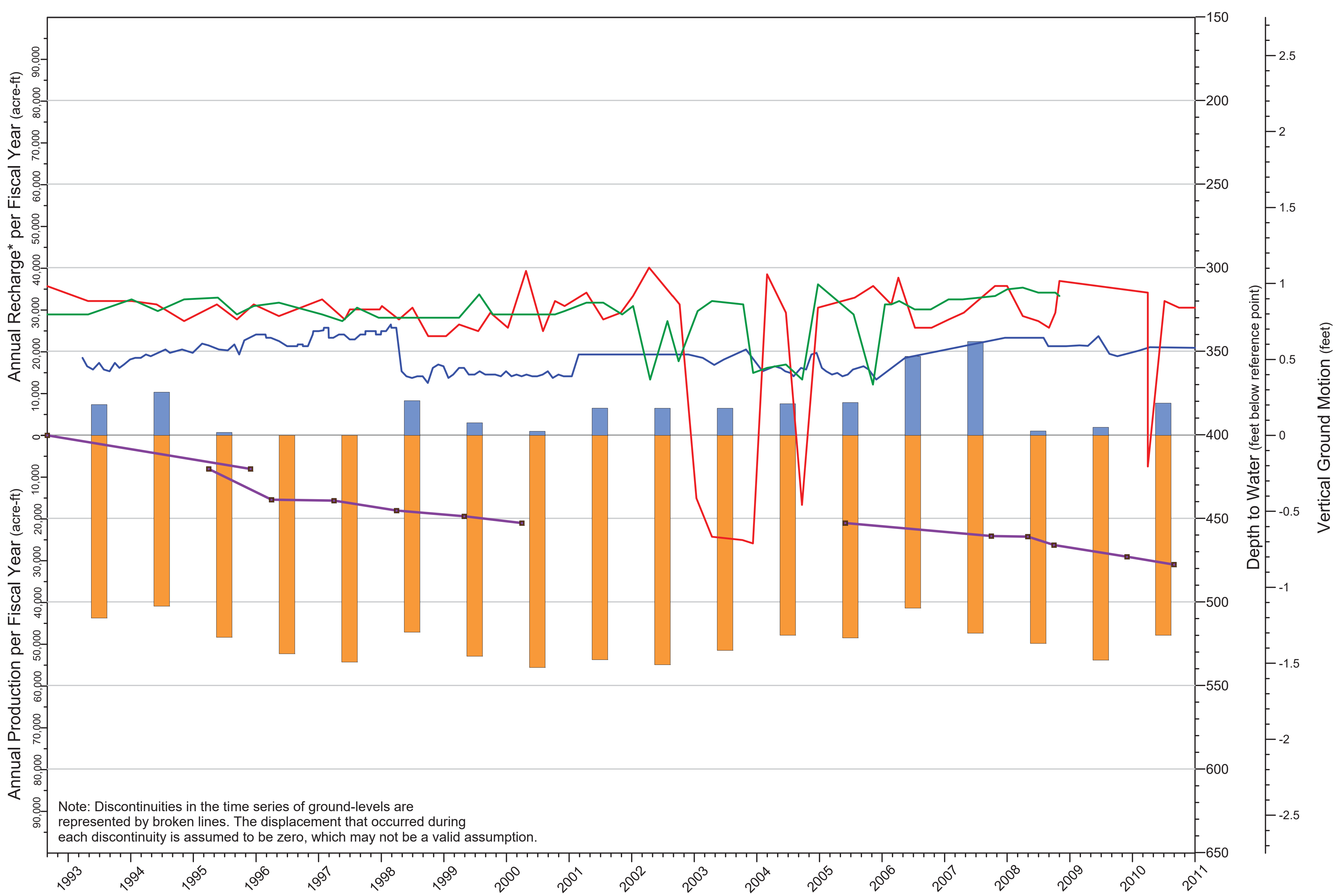
Ground-Levels

- Pomona InSAR Measurements

2010 State of the Basin
Ground-Level Monitoring

Groundwater Levels versus Ground-Levels in the Pomona Area
1930 to 2010

Exhibit 59



The Ontario subsidence area is located east of the Central MZ1 and the Pomona subsidence areas. Exhibits 60 and 61 are time series charts that display MZ1 annual production and recharge, along with groundwater levels at wells and ground-level survey data at measurement stations within the Ontario Area (see Exhibit 54).

The history of vertical ground motion in the Ontario Area is based solely on InSAR data from 1992 to 1995, 1995 to 2000, and 2005 to 2010. ***These data indicate that land subsidence has occurred continuously in this area, generally at a rate of about 0.07 ft/yr.***

From about 1935 to 1978, groundwater levels in the Ontario Area declined by about 125 feet. Groundwater levels increased by about 10 to 20 feet during the early 1980s and have remained relatively stable since then.

The observed, continuous land subsidence from 1992 to 2010 is not explained by the relatively stable groundwater levels. A plausible explanation for the subsidence is that thick, slowly draining aquitards are compacting in response to the historical draw-downs that occurred from 1935 to 1978 (see Exhibit 61).

* Recharge includes imported water and recycled water delivered to recharge basins, and does not include in-lieu replenishment water.

Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com
Author: TCR
Date: 20110906
File: Exhibit_60_new.grf

Groundwater Levels at Wells (top-bottom of well screen)
- C-14 (480-1200 ft-bgs)
- O-15 (474-966 ft-bgs)
- O-34 (522-1092 ft-bgs)

Production & Recharge in MZ1
- Recharge*
- Groundwater Production

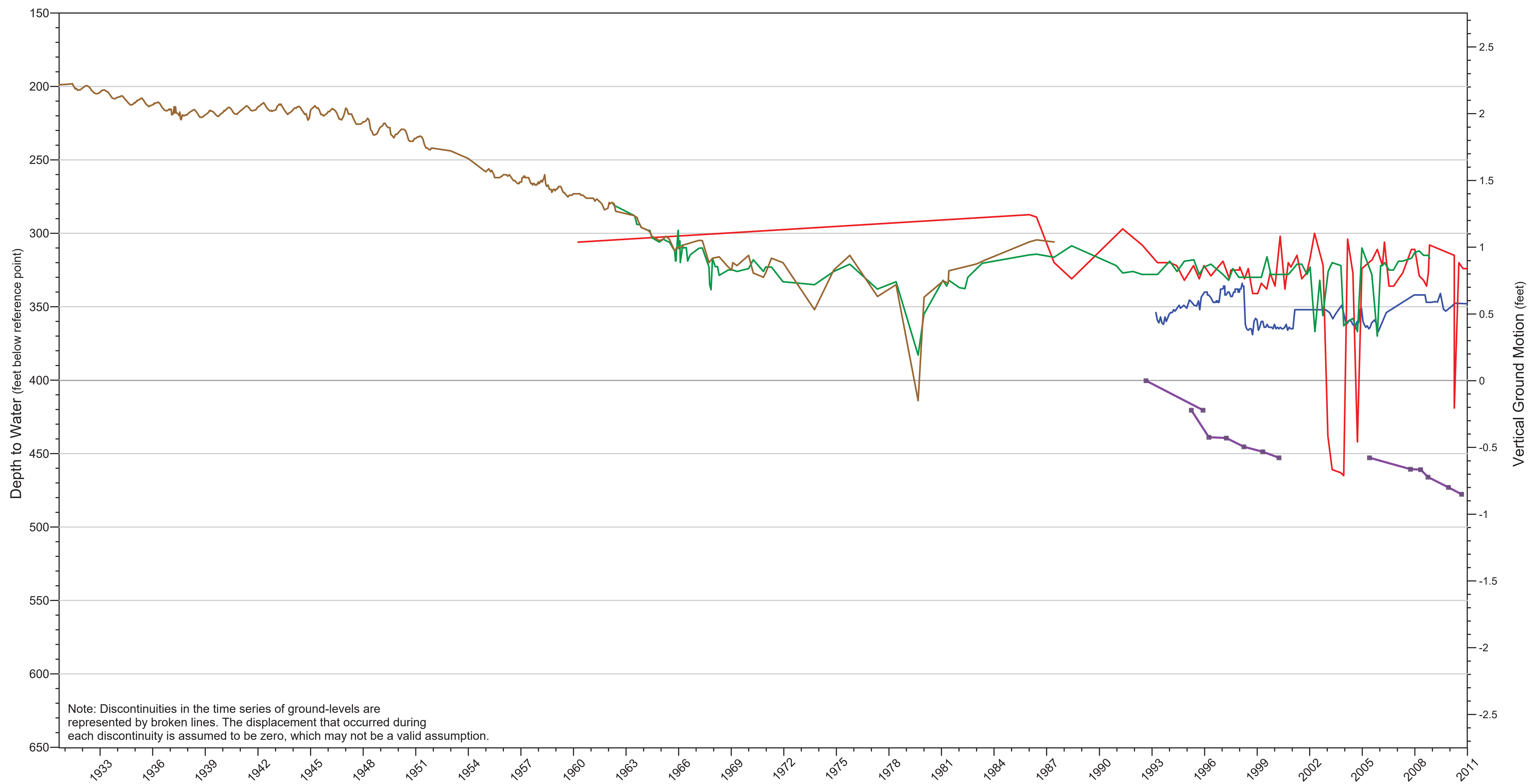
Ground-Levels
- Ontario InSAR Measurements

2010 State of the Basin
Ground-Level Monitoring

Groundwater Levels versus Ground-Levels in the Ontario Area

1993 to 2010

Exhibit 60



Produced by:

WILDERMUTH ENVIRONMENTAL INC.

23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: TCR
Date: 20110906
File: Exhibit_61_new.grf

Groundwater Levels at Wells
(top-bottom of well screen)

O-05 (360-470 ft-bgs)
O-34 (522-1092 ft-bgs)
O-15 (474-966 ft-bgs)
C-14 (480-1200 ft-bgs)

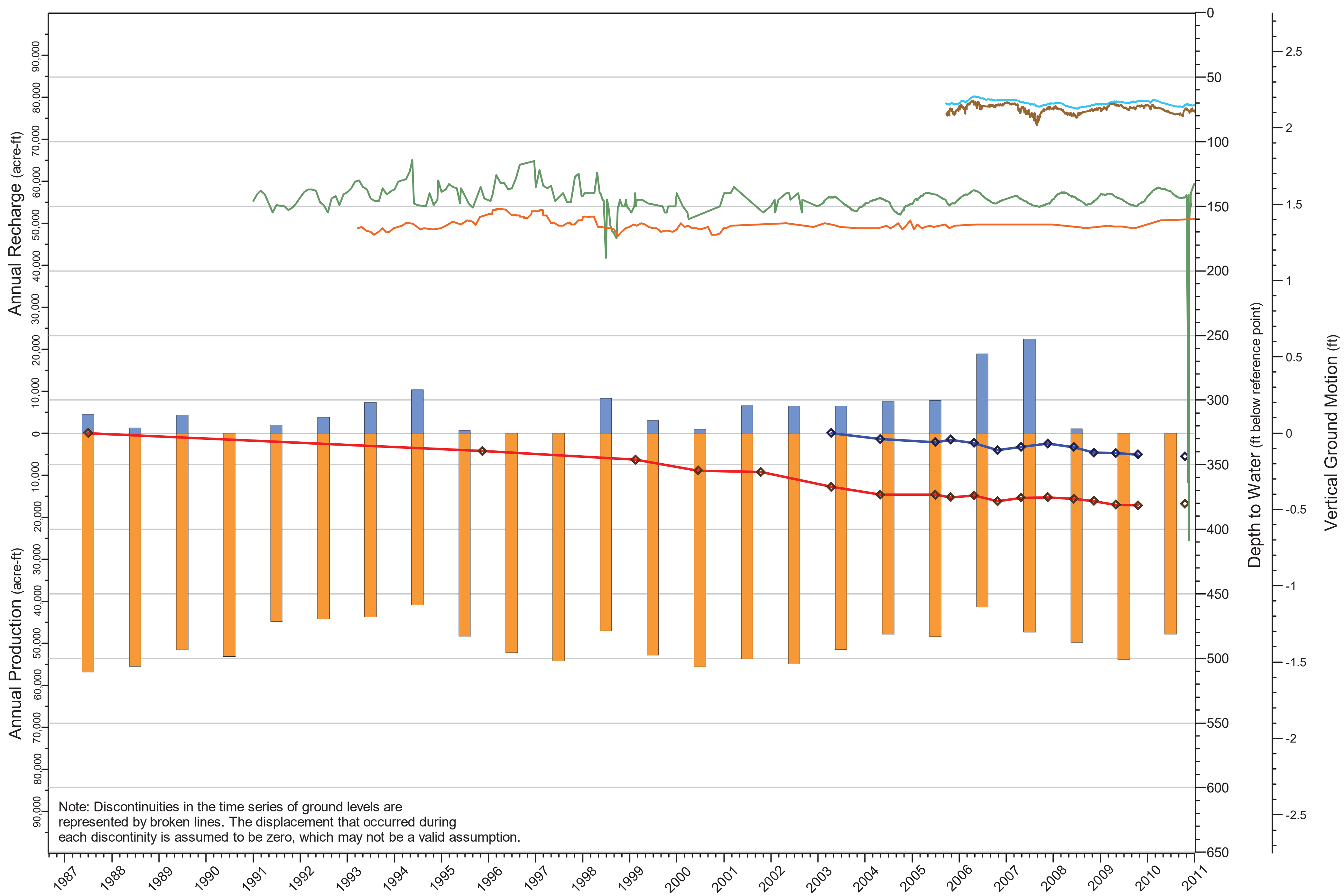
Ground-Levels

Ontario InSAR Measurements

2010 State of the Basin
Ground-Level Monitoring

Groundwater Levels versus Ground-Levels in the Ontario Area
1930 to 2010

Exhibit 61



The Southeast subsidence area is located east of the MZ1 Managed Area. This exhibit is a time series chart that displays annual production and recharge within MZ1, along with groundwater levels at wells and ground-level survey data at measurement stations within the Southeast Area. The history of vertical ground motion in the Southeast Area is based solely on ground-level surveys performed from 1987 to 2010.

In the northern portion of the Southeast Area, the ground-level survey data indicate that land subsidence has occurred continuously and slowly in this area, generally at a rate of about 0.02 ft/yr. There is very little historical groundwater-level data for this area prior to about 1990. ***The data since 1990 indicate relatively stable groundwater levels. The observed slow but continuous land subsidence from 1987 to 2010 is not explained by the relatively stable groundwater levels. A plausible explanation for the subsidence in this area is that thick, slowly-draining aquitards are compacting in response to the historical drawdowns that occurred prior to 1990.***

In the area near the intersection of Euclid Avenue and Kimball Avenue, where the Chino-I Desalter wells pump groundwater from the deep confined aquifer system, the ground-level survey data indicate land subsidence of about -0.23 feet in this area from 2005 to 2010. ***The desalter wells have been pumping since 2000, and have been causing drawdown within the deep aquifer system that is likely the cause of the observed land subsidence.*** Watermaster plans to install an extensometer facility in this region in early 2012 to better understand the mechanisms and occurrence of the subsidence in the vicinity of the Chino I-Desalter well field.

The first ground fissures documented in the Chino Basin occurred in the Southeast Area in the early 1970s, but ground fissuring has not been observed in the area since.

* Recharge includes imported water and recycled water delivered to basins, and does not include in-lieu replenishment water.

Produced by:
WILDERMUTH ENVIRONMENTAL, INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com
Author: TCR
Date: 20111215
File: Figure_62_new.grf

Groundwater Levels at Wells (top-bottom of well screen)
- CH-18A (420-980 ft-bgs)
- C-13 (290-720 ft-bgs)
- HCMP-1/1 (135-175 ft-bgs)
- HCMP-1/2 (300-320 ft-bgs)

Production & Recharge in MZ1
- Recharge*
- Groundwater Production

Ground Levels
- BM 137/61 Survey Measurements
- BM 133/61 Survey Measurements

2010 State of the Basin
Ground-Level Monitoring

Groundwater Levels versus Ground-Levels in the Southeast Area
1987 to 2010

Figure 62

California Regional Water Quality Control Board, Santa Ana Region. (2004). *Resolution No. R8-2004-0001 Resolution Amending the Water Quality Control Plan for the Santa Ana River Basin to Incorporate an Updated Total Dissolved Solids (TDS) and Nitrogen Management Plan for the Santa Ana Region*.

Chino Basin Municipal Water District v. City of Chino, et al., San Bernardino Superior Court, No. 164327. (1978).

Kleinfelder West, Inc. (2010). *Final Zone 4 Remedial Investigation Report Stringfellow Superfund Site*. Prepared for State of California, California Environmental Protection Agency, Department of Toxic Substances Control, and Legacy Landfill and Corrective Action Office. February 5, 2010.

Wildermuth Environmental, Inc. (1999). *Optimum Basin Management Program. Phase I Report*. Prepared for the Chino Basin Watermaster. August 19, 1999.

Wildermuth Environmental, Inc. (2000). TIN/TDS Phase 2A: Tasks 1 through 5. TIN/TDS Study of the Santa Ana Watershed. Technical Memorandum. July 2000.

Wildermuth Environmental, Inc. and Black & Veatch (2001). *Optimum Basin Management Program. Recharge Master Plan Phase II Report*. Prepared for the Chino Basin Watermaster. August 2001.

Wildermuth Environmental, Inc. (2002). *Optimum Basin Management Program, Final Initial State of the Basin Report*. Prepared for the Chino Basin Watermaster. October 2002.

Wildermuth Environmental, Inc. (2005a). *Optimum Basin Management Program, State of the Basin Report – 2004*. Prepared for the Chino Basin Watermaster. July 2005.

Wildermuth Environmental, Inc. (2005b). TIN/TDS Phase 4: Recomputation of Ambient Water Quality in the Santa Ana Watershed for the Period 1984 to 2003. Technical Memorandum. November 2005.

Wildermuth Environmental, Inc. (2006). *Management Zone 1 Interim Monitoring Program: MZ-1 Summary Report. Prepared for the MZ-1 Technical Committee*. Feb 2006.

Wildermuth Environmental, Inc. (2007a). *Optimum Basin Management Program, State of the Basin Report – 2006*. Prepared for the Chino Basin Watermaster. July 2007.

Wildermuth Environmental, Inc. (2007b). *Optimum Basin Management Program, Management Zone 1 Subsidence Management Plan*. Prepared for the Chino Basin Watermaster. October 2007.

Wildermuth Environmental, Inc. (2008a). *TIN/TDS Phase 6: Recomputation of Ambient Water Quality in the Santa Ana Watershed for the Period 1987 to 2006. Technical Memorandum*. August 2008.

Wildermuth Environmental, Inc. (2008b). *Chino Basin Management Zone 3 Monitoring Program, DWR Agreement No. 4600004086, Final Report. Prepared for Chino Basin Watermaster and Inland Empire Utilities Agency*. December, 2008.

Wildermuth Environmental, Inc. (2009). *Optimum Basin Management Program, State of the Basin Report – 2008*. Prepared for the Chino Basin Watermaster. November, 2009.

Wildermuth Environmental, Inc. (2010). *2010 Recharge Master Plan Update. Volume I – Final Report*. Prepared for the Chino Basin Watermaster. June, 2010.

Wildermuth Environmental, Inc. (2011a). *Chino Basin Maximum Benefit Monitoring Program 2010 Annual Report*. Prepared for the Chino Basin Watermaster and Inland Empire Utilities Agency. April 2011

Wildermuth Environmental, Inc. (2011b). *TIN/TDS*: Recomputation of Ambient Water Quality in the Santa Ana Watershed for the Period 1990 to 2009. Technical Memorandum. August 2011