

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 groundwater-quality data were obtained from the California Department of Water Resources (DWR) and supplemented with data from some producers in the Appropriative Pool and some data from the State of California Department of Public Health (now the California State Water Resources Control Board Division of Drinking Water [DDW]). 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 in 1999. The Groundwater Quality Monitoring Program relies on well owners or their consultants to sample for water quality and provide that data to Watermaster on a routine cooperative basis, and Watermaster supplements with groundwater-quality data obtained from its own sampling programs. Watermaster obtains groundwater-quality data in the Chino Basin through the following programs:

- Annual Key Well Groundwater Quality Monitoring Program.** Historically, available 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 once 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: 90 wells are sampled on a triennial basis, and 20 are sampled on an annual basis.
- Hydraulic Control Monitoring Program (HCMP).** Watermaster collects annual groundwater quality samples from the nine nested HCMP monitoring wells for the demonstration of Hydraulic Control. Each nest contains up to three wells in the borehole. In addition, Watermaster collects quarterly 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. Groundwater-quality data are also obtained from special studies and monitoring that takes place under the orders of the RWQCB (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.

All groundwater-quality data are checked by Watermaster staff and uploaded to a centralized database management system that can be accessed online through HydroDaVESM. Groundwater-quality data collected by Watermaster are used for: this biennial State of the Basin report; the triennial ambient water quality update; and the demonstration of Hydraulic Control—the latter two are Watermaster and the IEUA maximum-benefit commitments in the Basin Plan. Groundwater-quality data are also used by Watermaster to analyze nonpoint-source groundwater contamination, and plumes associated with point-source discharges, to assess the overall health of the groundwater basin, and are used in conjunction with numerical models to assist Watermaster and other parties in evaluating proposed groundwater remediation strategies.

Exhibit 29 shows all wells with groundwater-quality monitoring results for the five-year period from July 2009 to June 2014. All available groundwater-quality data for this period were analyzed synoptically and temporally at all production and monitoring wells. The analysis does not represent a programmatic investigation of potential sources of chemical constituents in the Basin nor does it represent a randomized study designed to ascertain the water quality status of the Chino Basin. These data do, however, represent the most comprehensive information available to date.

All groundwater-quality data from the Chino Basin for the five-year period of July 2009 through June 2014 were analyzed for exceedances of Primary or Secondary, Federal or State, Maximum Contaminant Levels (MCLs), or State Notification Levels (NLs). Wells with constituent concentrations greater than half the MCL represent areas that warrant concern. Understanding the spatial distribution of wells

with concentrations greater than regulatory standards is important because it indicates areas in the Basin where groundwater may be impaired from a beneficial use standpoint. Exhibits 30 through 41 show the areal distribution of constituent concentrations for constituents of potential concern (COPC) in the Chino Basin. The COPCs in the Chino Basin are defined as follows:

- Constituents associated with salt and nutrient management planning, which are primarily total dissolved solids (TDS) and nitrate.
- Other constituents where a primary MCL was exceeded in twenty or more wells from July 2009 to June 2014 and are not primarily exclusive to one particular point source (*i.e.*, the Stringfellow NPL Site, these include nitrate, perchlorate, total chromium, hexavalent chromium, arsenic, trichloroethene (TCE), tetrachloroethene (PCE), *cis*-1,2-dichloroethene (*cis*-1,2DCE), 1,1-dichloroethene (1,1-DCE), and 1,1-dichloroethane (1,1-DCA).
- Constituents for which the California DDW is in the process of developing an MCL that may impact future beneficial use of groundwater, this includes 1,2,3-trichloropropane (1,2,3-TCP).

In each exhibit, the water-quality standard is defined in the legend and each well is symbolized by the maximum concentration value measured during the study period. The following class interval convention is applied to each water quality standard:

Symbol	Class Interval
○	Not Detected
●	<0.5x WQS ³ , but detected
●	0.5x WQS to WQS
●	WQS to 2x WQS
●	2x WQS to 4x WQS
●	> 4x WQS

³ Where WQS is the appropriate water quality standard.



Exhibit 42 shows the locations of various known point-source discharges to groundwater and the 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 closely monitors information, decisions, cleanup activities, and monitoring data pertaining to point-source contamination within the Chino Basin. If-needed, Watermaster will work with the RWQCB and the potentially responsible parties (PRPs) in determining sources of groundwater-quality contamination and assist with establishing a cleanup strategy. The following is a summary of all the regulatory and voluntary groundwater-quality contamination monitoring in the Chino Basin that are tracked by Watermaster:

- **Plume:** Alumax Aluminum Recycling Facility
Constituents of Concern: TDS, sulfate, nitrate, chloride
Order: RWQCB Cleanup and Abatement Order 99-38
- **Plume:** Alger Manufacturing Co.
Constituents of Concern: volatile organic chemicals (VOCs)
Order: Voluntary Cleanup and Monitoring
- **Plume:** Chino Airport
Constituents 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)
Constituents of Concern: VOCs
Order: Voluntary Cleanup and Monitoring
- **Plume:** Former Crown Coach International Facility
Constituents of Concern: VOCs and Solvents
Order: Voluntary Cleanup and Monitoring
- **Plume:** General Electric Flatiron Facility
Constituents of Concern: VOCs and hexavalent chromium
- **Order:** Voluntary Cleanup and Monitoring
- **Plume: General Electric Test Cell Facility**
Constituents of Concern: VOCs
Order: Voluntary Cleanup and Monitoring
- **Plume:** Former Kaiser Steel Mill
Constituents of Concern: TDS, total organic carbon (TOC), VOCs
Order: RWQCB Order No. 91-40 Closed. Kaiser granted capacity in the Chino II Desalter to remediate.
- **Plume:** Former Kaiser Steel Mill – CCG Property
Constituents of Concern: chromium, hexavalent chromium, other metals, VOCs
Order: DTSC Consent Order 00/01-001
- **Plume:** Milliken Sanitary Landfill
Constituents of Concern: VOCs
Order: RWQCB Order No. 81-003
- **Plume:** Upland Sanitary Landfill
Constituents of Concern: VOCs
Order: RWQCB Order No 98-99-07
- **Plume:** South Archibald Plume
Constituents of Concern: (VOCs)
Order: This plume is currently being voluntarily investigated by a group of potentially responsible parties per seven Draft Cleanup and Abatement Orders
- **Plume:** Stringfellow NPL Site
Constituents of Concern: VOCs, perchlorate, N-nitrosodimethylamine (NDMA), trace 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 or DTSC are used by Watermaster to delineate plumes associated with VOC contamination every two years. Exhibit 42 shows the extent of contamination associated with the VOC plumes as of June 2014. The VOC plumes illustrate 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 43 and 44 show more detailed delineations of the Chino Airport plume and the South Archibald plume, respectively. Because the extensive multi-depth groundwater quality monitoring completed in the Chino Airport region, Exhibit 43 shows Chino Airport plume delineation in the shallow and deep aquifers.

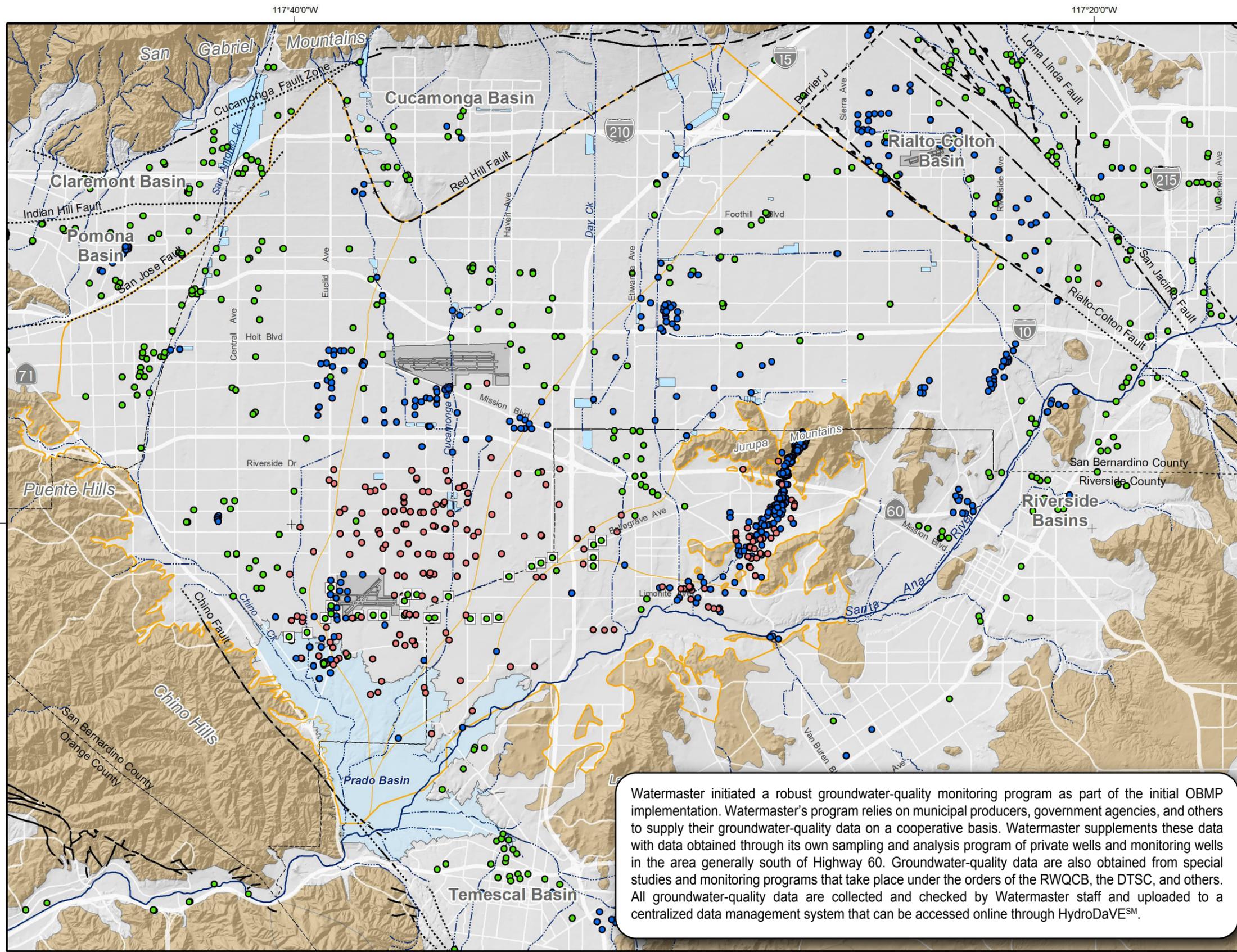
Exhibit 45 shows the VOC plumes and features pie charts that display the relative percent of TCE, PCE, and other VOCs detected at wells within the plume impacted areas. The pie charts demonstrate the chemical differentiation between the VOC plumes in the Chino Basin.

Exhibit 46 shows all GeoTracker and EnviroStor sites in the Chino Basin as of 2014. GeoTracker is the State Board's online data-management system for compliance data from contamination sites with confirmed or potential impacts to groundwater. This includes locations where there have been unauthorized discharges of waste to land, or unauthorized releases of hazardous substances from underground storage tanks. EnviroStor is the DTSC's online data-management system for permitted hazardous waste facilities. In 2014, Watermaster performed a thorough review of the GeoTracker and EnviroStor databases to identify sites in the Chino Basin that have impacted groundwater quality but have not been previously tracked by the Watermaster. There are 22 open sites and 24 closed sites with confirmed or potential impacts to groundwater quality on the GeoTracker and Envirostor databases where the groundwater data will be incorporated into the CBDC groundwater-quality program. Groundwater-quality for the open sites will be routinely collected for the CBDC program. Watermaster will continue to review the GeoTracker and Envirostor databases to track previously identified sites, identify new sites with potential or confirmed groundwater contamination, and add any new data to Watermaster's databases.

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

Exhibits 47 and 48 show trends in the ambient water quality determinations for TDS and nitrate by management zone and the associated anti-degradation and maximum-benefit water quality objectives. The maximum-benefit objectives established in the Basin Plan (RWQCB, 2004) raised the TDS and nitrate objectives for the Chino-North Management Zone (combined MZ1, MZ2, and MZ3 above Prado Basin). 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 application of the maximum-benefit objectives is contingent upon the implementation of specific projects and programs by Watermaster and the IEUA. These projects and programs, termed the “Chino Basin maximum-benefit commitments,” are described in the Maximum Benefit Implementation Plan for Salt Management in the Basin Plan. The maximum-benefit objectives have allowed for more efficient and pragmatic water supply planning and salt/nutrient management.

Exhibits 49 through Exhibit 56 show TDS and nitrate time histories for selected wells from 1970 to 2014. These time histories illustrate groundwater-quality variations and trends within each management zone and the current state of groundwater quality compared to those 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 also display the State of California MCL.



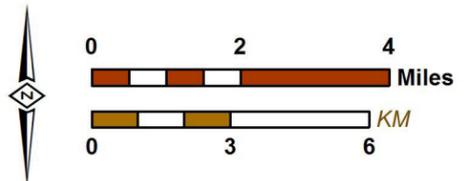
- Wells with Groundwater-Quality Monitoring Data During June 2009 to June 2014**
- Monitoring Wells
 - Municipal Wells
 - Private Wells
 - Chino Basin Desalter Wells
- OBMP Management Zones**
-
- Streams & Flood Control Channels
 - Flood Control & Conservation Basins
- Geology**
- Water-Bearing Sediments**
- Quaternary Alluvium
- Consolidated Bedrock**
- Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks
- Faults**
- Location Certain
 - Location Concealed
 - Location Approximate
 - Location Uncertain
 - Approximate Location of Groundwater Barrier

Watermaster initiated a robust groundwater-quality monitoring program as part of the initial OBMP implementation. Watermaster's program relies on municipal producers, government agencies, and others 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 and monitoring wells in the area generally south of Highway 60. Groundwater-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 data management system that can be accessed online through HydroDaVESM.



Prepared by:
WEI
 WILDERNESS ENVIRONMENTAL, INC.
 23692 Birtcher Drive
 Lake Forest, CA 92630
 949.420.3030
 www.weiwater.com

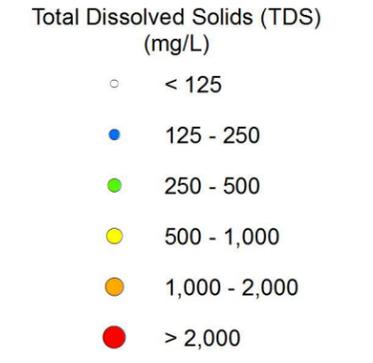
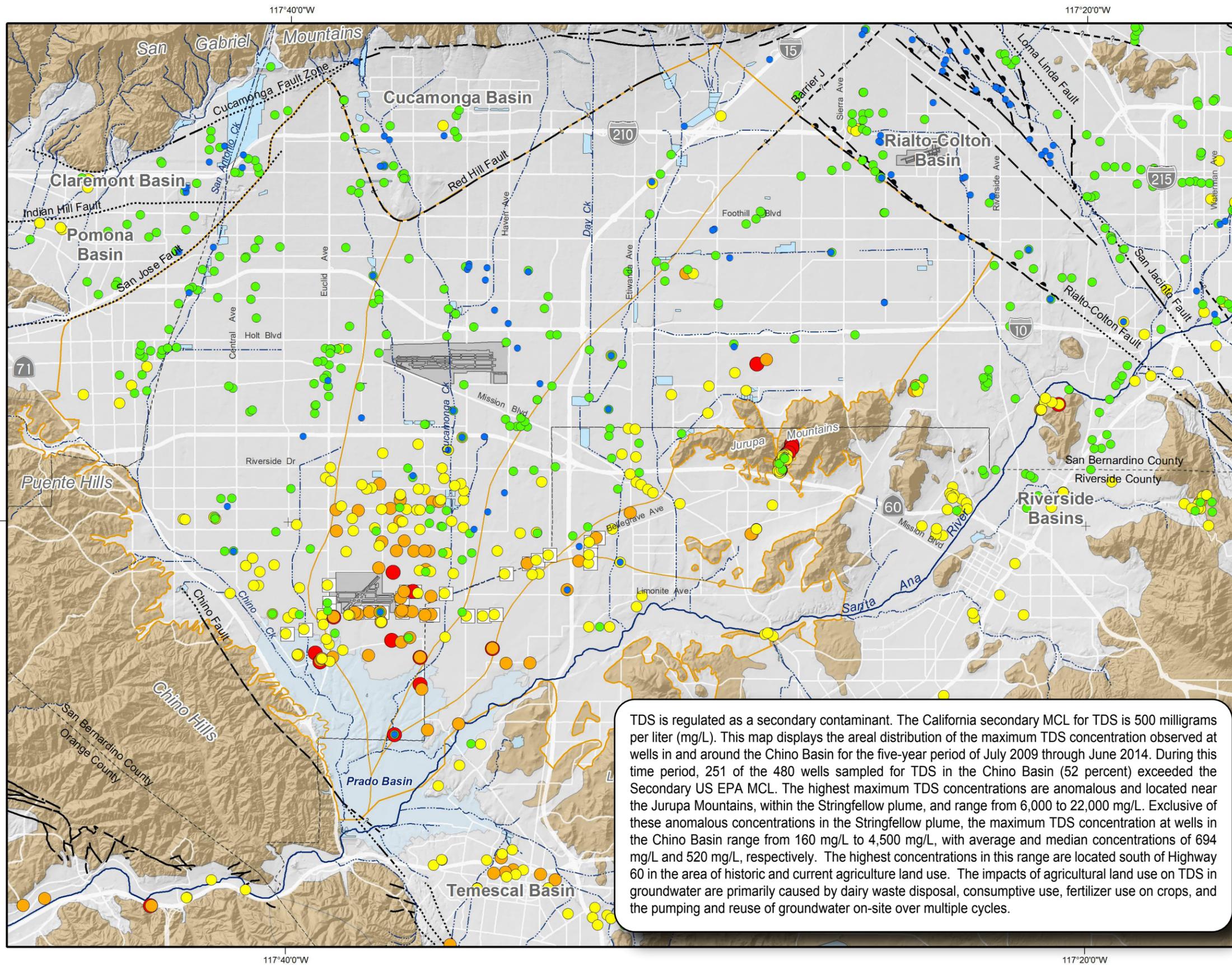
Author: MAB
 Date: 6/24/2015
 Document Name: Exhibit_29_WQ_Wells



2014 State of the Basin
 Groundwater Quality

Wells with Groundwater Quality Data

July 2009 to June 2014



Secondary US EPA MCL = 500 mg/L



OBMP Management Zones

- Chino Basin Desalter Well
- ~ Streams & Flood Control Channels
- ☪ Flood Control & Conservation Basins

Geology

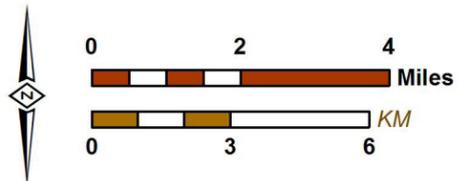
- Water-Bearing Sediments**
- Quaternary Alluvium
- Consolidated Bedrock**
- Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks
- Faults**
- Location Certain
 - Location Concealed
 - - - - Location Approximate
 - - - ? - Location Uncertain
 - ▲- Approximate Location of Groundwater Barrier

TDS is regulated as a secondary contaminant. The California secondary MCL for TDS is 500 milligrams per liter (mg/L). This map displays the areal distribution of the maximum TDS concentration observed at wells in and around the Chino Basin for the five-year period of July 2009 through June 2014. During this time period, 251 of the 480 wells sampled for TDS in the Chino Basin (52 percent) exceeded the Secondary US EPA MCL. The highest maximum TDS concentrations are anomalous and located near the Jurupa Mountains, within the Stringfellow plume, and range from 6,000 to 22,000 mg/L. Exclusive of these anomalous concentrations in the Stringfellow plume, the maximum TDS concentration at wells in the Chino Basin range from 160 mg/L to 4,500 mg/L, with average and median concentrations of 694 mg/L and 520 mg/L, respectively. The highest concentrations in this range are located south of Highway 60 in the area of historic and current 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 the pumping and reuse of groundwater on-site over multiple cycles.



Prepared by:
WEI
 WILDERNESS ENVIRONMENTAL, INC.
 23692 Birtcher Drive
 Lake Forest, CA 92630
 949.420.3030
 www.weiwater.com

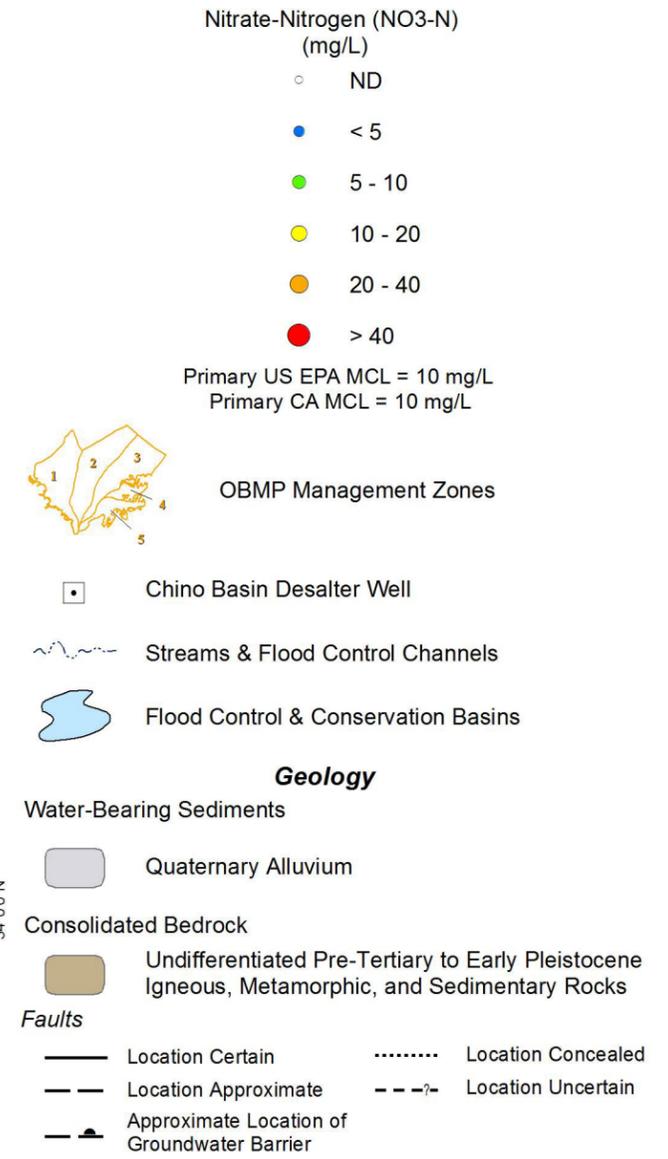
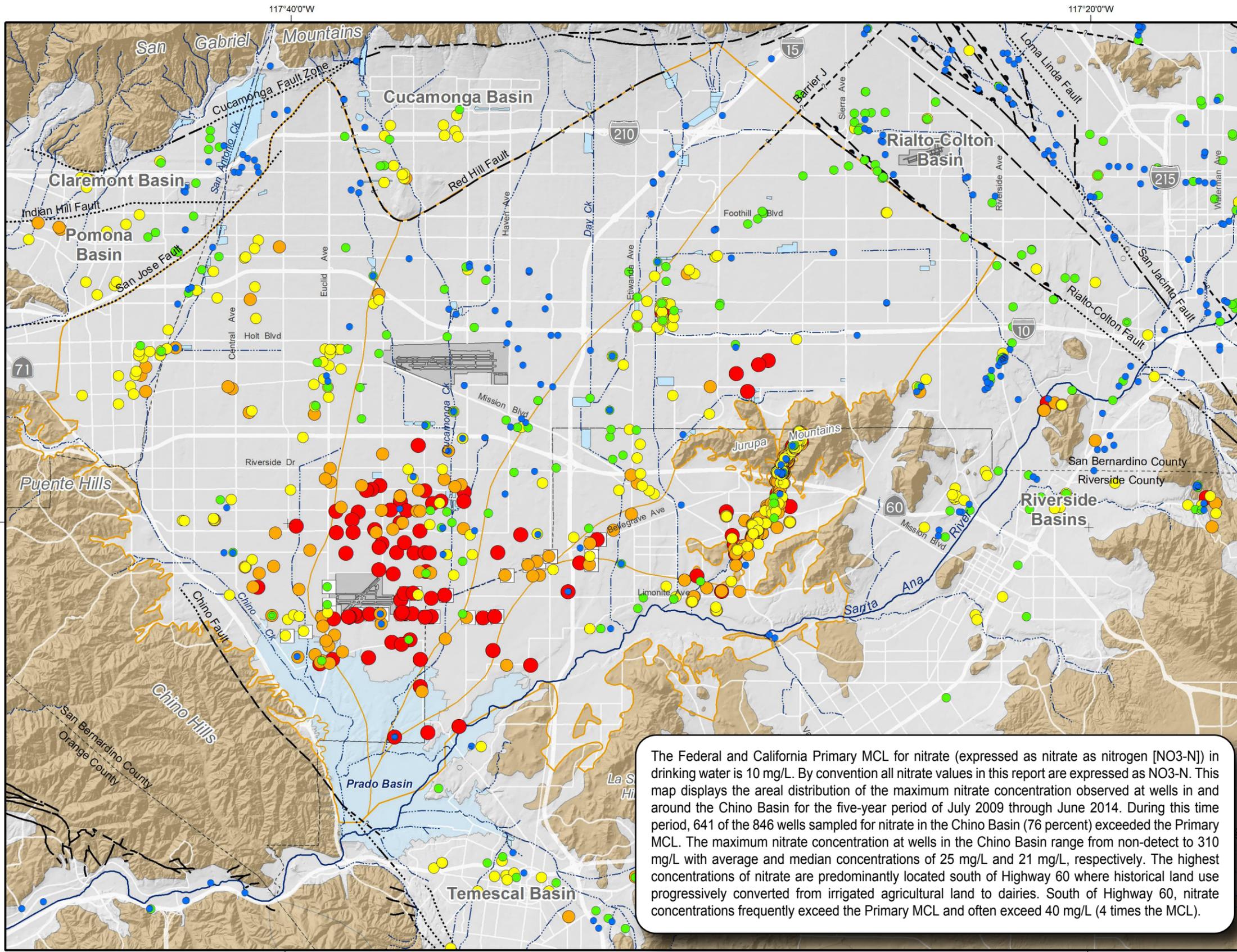
Author: JMS
 Date: 6/23/2015
 Document Name: Exhibit_30_TDS



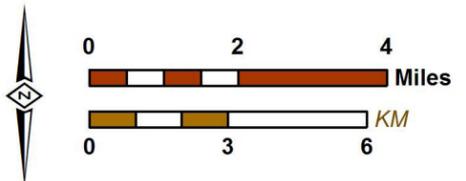
2014 State of the Basin
 Groundwater Quality

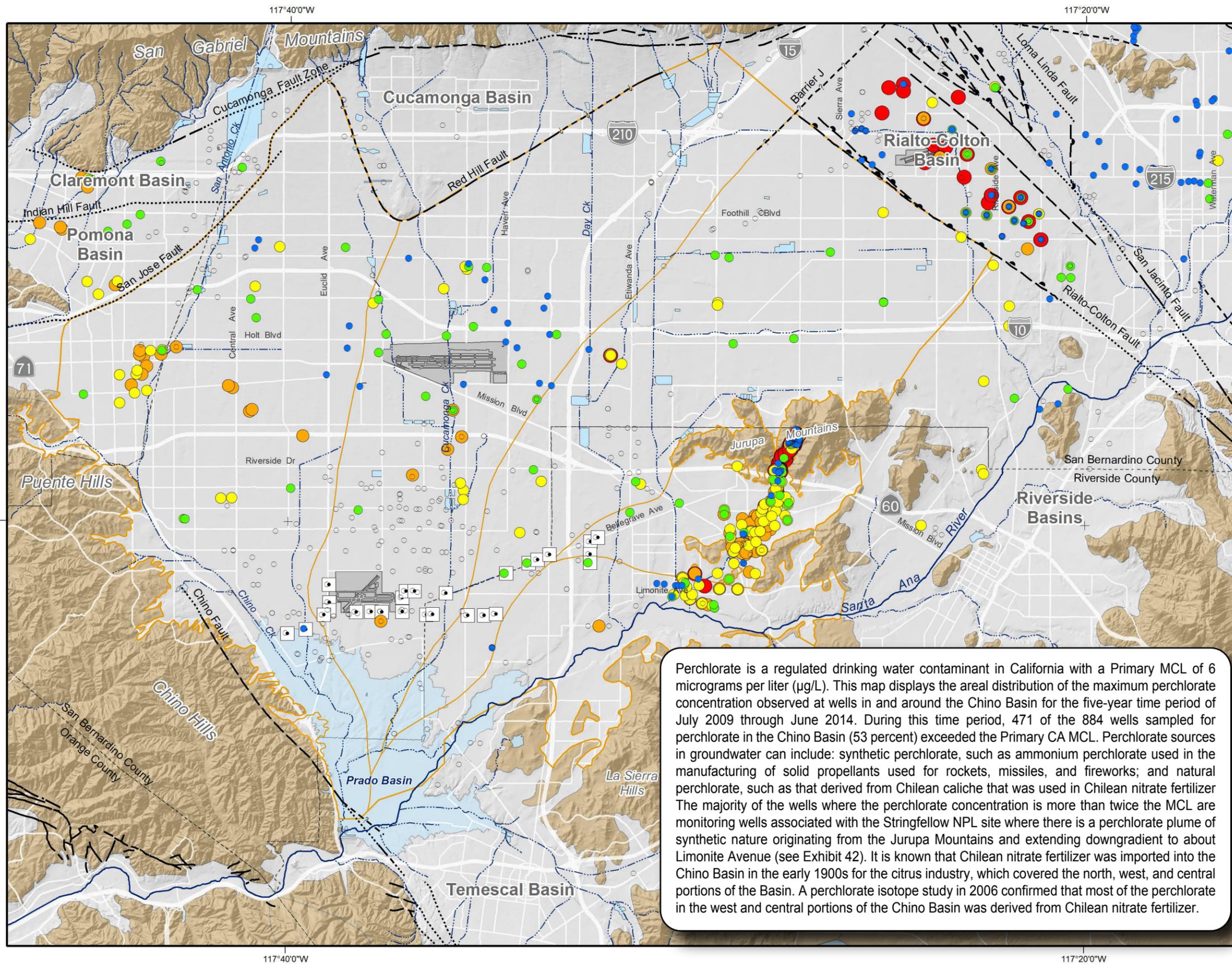
Total Dissolved Solids (TDS) in Groundwater

Maximum Concentration (July 2009 to June 2014)



The Federal and California Primary MCL for nitrate (expressed as nitrate as nitrogen [NO₃-N]) in drinking water is 10 mg/L. By convention all nitrate values in this report are expressed as NO₃-N. This map displays the areal distribution of the maximum nitrate concentration observed at wells in and around the Chino Basin for the five-year period of July 2009 through June 2014. During this time period, 641 of the 846 wells sampled for nitrate in the Chino Basin (76 percent) exceeded the Primary MCL. The maximum nitrate concentration at wells in the Chino Basin range from non-detect to 310 mg/L with average and median concentrations of 25 mg/L and 21 mg/L, respectively. The highest concentrations of nitrate are predominantly located south of Highway 60 where historical land use progressively converted from irrigated agricultural land to dairies. South of Highway 60, nitrate concentrations frequently exceed the Primary MCL and often exceed 40 mg/L (4 times the MCL).





Perchlorate (µg/L)

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

CA Primary MCL = 6 µg/L

OBMP Management Zones

Chino Basin 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

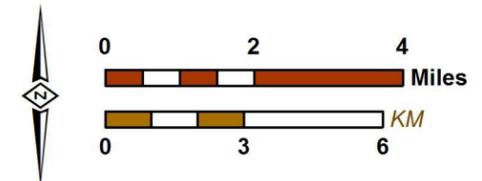
- Location Certain
- Location Approximate
- Location Concealed
- Location Uncertain
- Approximate Location of Groundwater Barrier

Perchlorate is a regulated drinking water contaminant in California with a Primary MCL of 6 micrograms per liter (µg/L). This map displays the areal distribution of the maximum perchlorate concentration observed at wells in and around the Chino Basin for the five-year time period of July 2009 through June 2014. During this time period, 471 of the 884 wells sampled for perchlorate in the Chino Basin (53 percent) exceeded the Primary CA MCL. Perchlorate sources in groundwater can include: synthetic perchlorate, such as ammonium perchlorate used in the manufacturing of solid propellants used for rockets, missiles, and fireworks; and natural perchlorate, such as that derived from Chilean caliche that was used in Chilean nitrate fertilizer. The majority of the wells where the perchlorate concentration is more than twice the MCL are monitoring wells associated with the Stringfellow NPL site where there is a perchlorate plume of synthetic nature originating from the Jurupa Mountains and extending downgradient to about Limonite Avenue (see Exhibit 42). 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.



Prepared by:
 WEI
 WILDFORTH ENVIRONMENTAL, INC.
 23692 Birtcher Drive
 Lake Forest, CA 92630
 949.420.3030
 www.weiwater.com

Author: JMS
 Date: 6/23/2015
 Document Name: Exhibit_32_CLO4

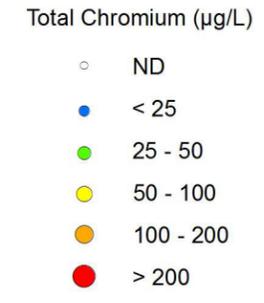
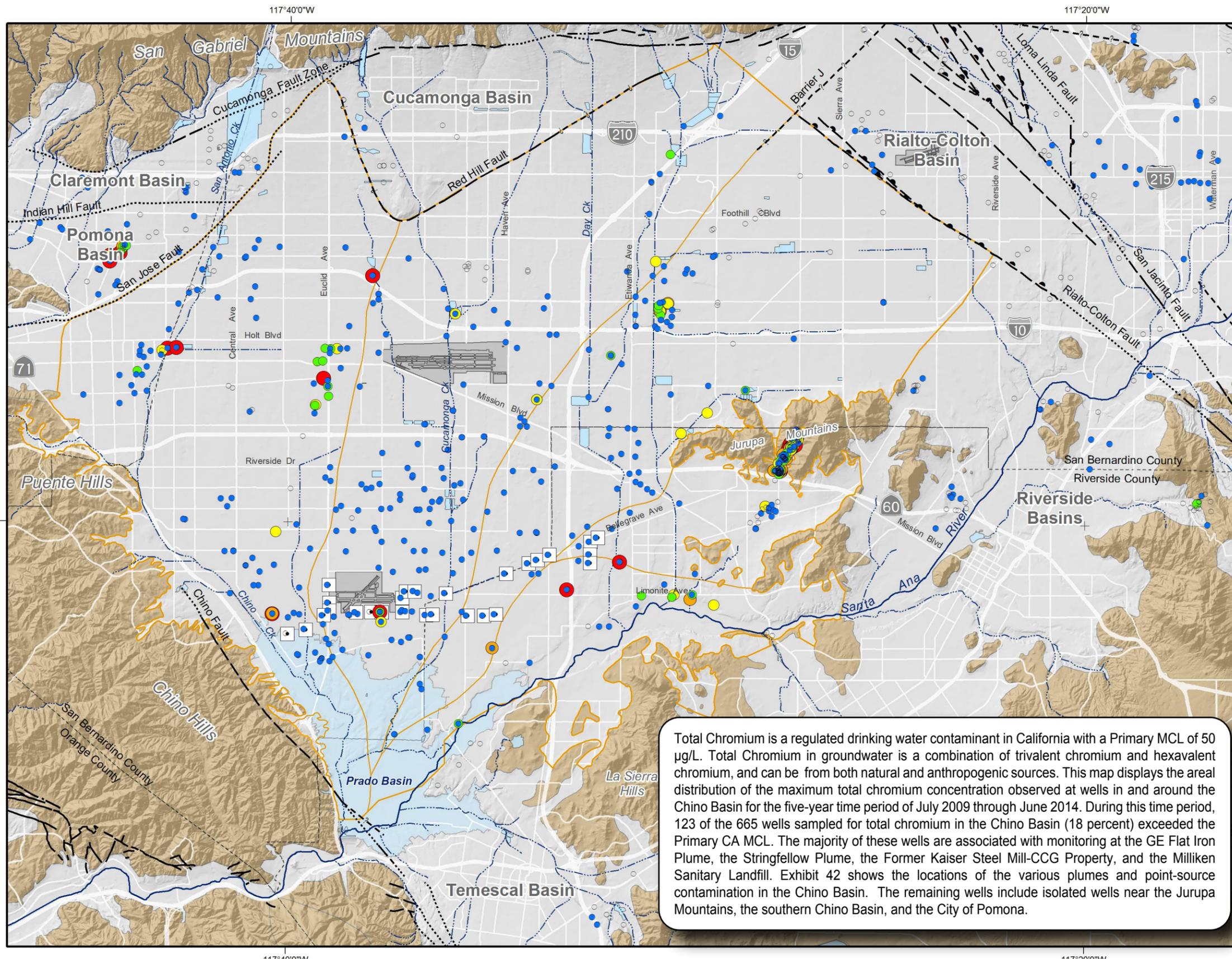


CHINO BASIN WATERMASTER
 Partners in Basin Management

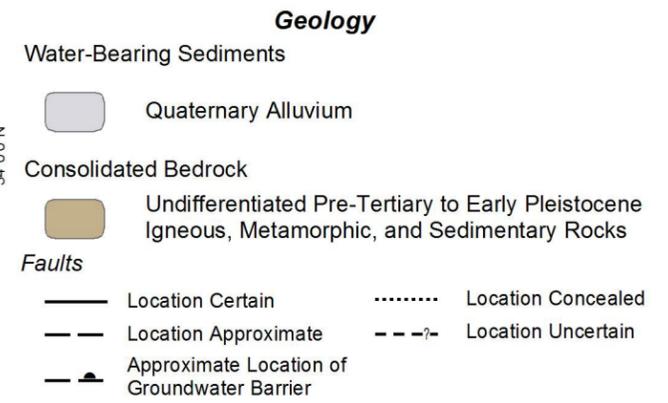
2014 State of the Basin
 Groundwater Quality

Perchlorate in Groundwater
 Maximum Concentration (July 2009 to June 2014)

Exhibit 32



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

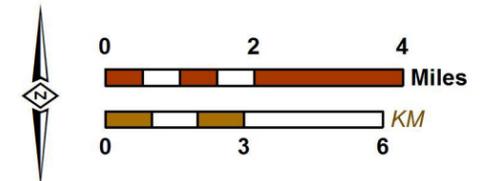


Total Chromium is a regulated drinking water contaminant in California with a Primary MCL of 50 µg/L. Total Chromium in groundwater is a combination of trivalent chromium and hexavalent chromium, and can be from both natural and anthropogenic sources. This map displays the areal distribution of the maximum total chromium concentration observed at wells in and around the Chino Basin for the five-year time period of July 2009 through June 2014. During this time period, 123 of the 665 wells sampled for total chromium in the Chino Basin (18 percent) exceeded the Primary CA MCL. The majority of these wells are associated with monitoring at the GE Flat Iron Plume, the Stringfellow Plume, the Former Kaiser Steel Mill-CCG Property, and the Milliken Sanitary Landfill. Exhibit 42 shows the locations of the various plumes and point-source contamination in the Chino Basin. The remaining wells include isolated wells near the Jurupa Mountains, the southern Chino Basin, and the City of Pomona.

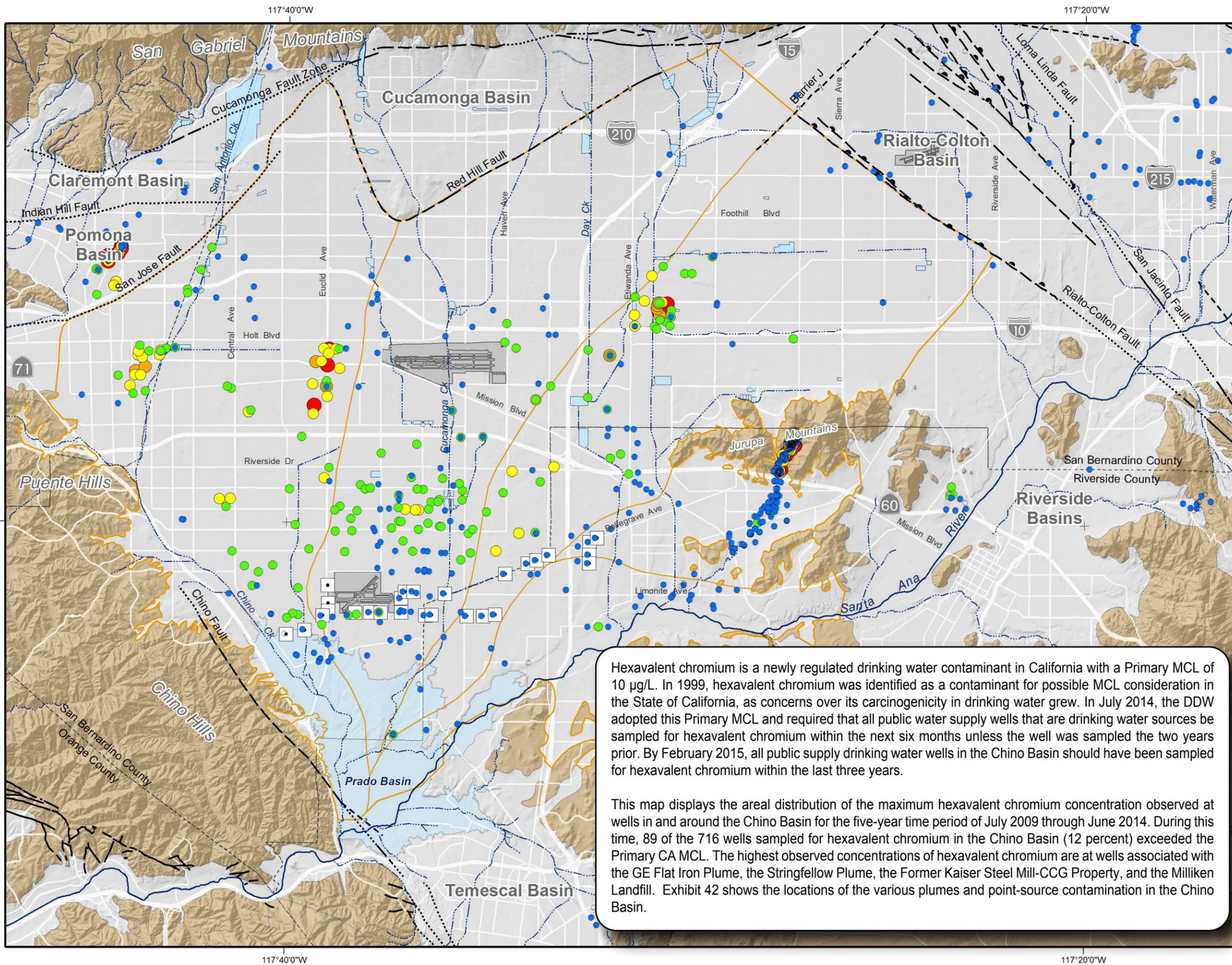


Prepared by:
WEI
 WILKINSON ENVIRONMENTAL, INC.
 23692 Birtcher Drive
 Lake Forest, CA 92630
 949.420.3030
 www.weiwater.com

Author: JMS
 Date: 6/23/2015
 Document Name: Exhibit_33_Cr



2014 State of the Basin
 Groundwater Quality



Hexavalent Chromium ($\mu\text{g/L}$)

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

Primary CA MCL = $10 \mu\text{g/L}$



OBMP Management Zones



Chino Basin 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

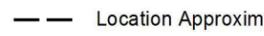
Faults



Location Certain



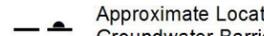
Location Concealed



Location Approximate



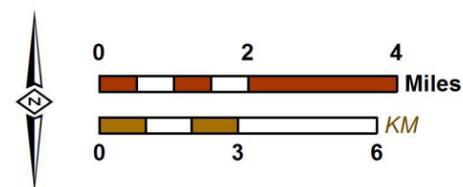
Location Uncertain

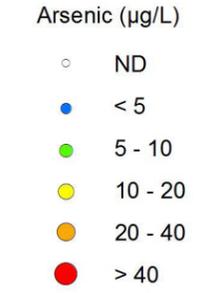
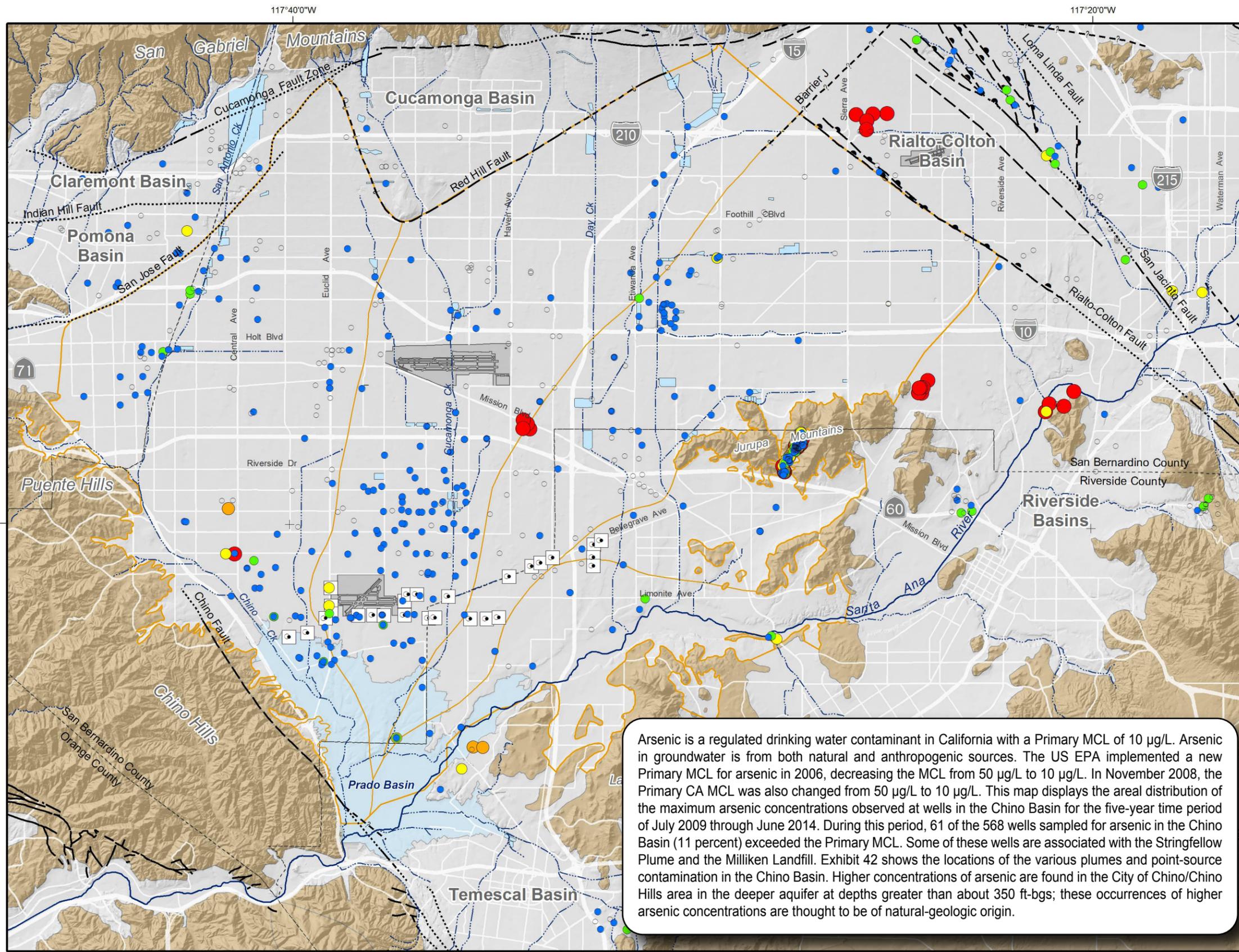


Approximate Location of Groundwater Barrier

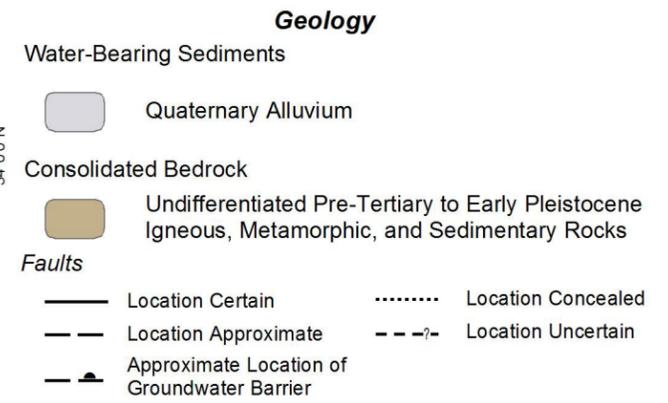
Hexavalent chromium is a newly regulated drinking water contaminant in California with a Primary MCL of $10 \mu\text{g/L}$. In 1999, hexavalent chromium was identified as a contaminant for possible MCL consideration in the State of California, as concerns over its carcinogenicity in drinking water grew. In July 2014, the DDW adopted this Primary MCL and required that all public water supply wells that are drinking water sources be sampled for hexavalent chromium within the next six months unless the well was sampled the two years prior. By February 2015, all public supply drinking water wells in the Chino Basin should have been sampled for hexavalent chromium within the last three years.

This map displays the areal distribution of the maximum hexavalent chromium concentration observed at wells in and around the Chino Basin for the five-year time period of July 2009 through June 2014. During this time, 89 of the 716 wells sampled for hexavalent chromium in the Chino Basin (12 percent) exceeded the Primary CA MCL. The highest observed concentrations of hexavalent chromium are at wells associated with the GE Flat Iron Plume, the Stringfellow Plume, the Former Kaiser Steel Mill-CCG Property, and the Milliken Landfill. Exhibit 42 shows the locations of the various plumes and point-source contamination in the Chino Basin.





Primary US EPA MCL = 10 $\mu\text{g/L}$
 Primary CA MCL = 10 $\mu\text{g/L}$

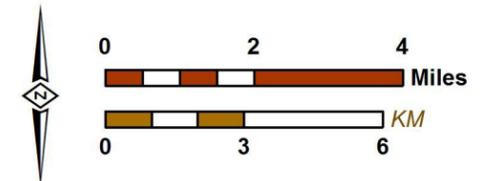


Arsenic is a regulated drinking water contaminant in California with a Primary MCL of 10 $\mu\text{g/L}$. Arsenic in groundwater is from both natural and anthropogenic sources. The US EPA implemented a new Primary MCL for arsenic in 2006, decreasing the MCL from 50 $\mu\text{g/L}$ to 10 $\mu\text{g/L}$. In November 2008, the Primary CA MCL was also changed from 50 $\mu\text{g/L}$ to 10 $\mu\text{g/L}$. This map displays the areal distribution of the maximum arsenic concentrations observed at wells in the Chino Basin for the five-year time period of July 2009 through June 2014. During this period, 61 of the 568 wells sampled for arsenic in the Chino Basin (11 percent) exceeded the Primary MCL. Some of these wells are associated with the Stringfellow Plume and the Milliken Landfill. Exhibit 42 shows the locations of the various plumes and point-source contamination in the Chino Basin. Higher concentrations of arsenic are found in the City of Chino/Chino Hills area in the deeper aquifer at depths greater than about 350 ft-bgs; these occurrences of higher arsenic concentrations are thought to be of natural-geologic origin.



Prepared by:
WEI
 WILDFORTH ENVIRONMENTAL, INC.
 23692 Birtcher Drive
 Lake Forest, CA 92630
 949.420.3030
 www.weewater.com

Author: JMS
 Date: 6/9/2015
 Document Name: Exhibit_35_Ar



2014 State of the Basin
 Groundwater Quality