



California Regional Water Quality Control Board

Los Angeles Region

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Gray Davis
Governor

Winston H. Hickox
Secretary for
Environmental
Protection

MEMORANDUM

TO: Regional Board Members

FROM: Dennis Dickerson, Executive Officer

DATE: April 28, 2003

SUBJECT: UPDATE ON PERCHLORATE GROUNDWATER POLLUTION WITHIN THE LOS ANGELES REGION

A. RECENT PERCHLORATE DETECTIONS

Regional Board staff last reported on perchlorate contamination on January 24, 2003. This report is intended to provide the Regional Board with an update on the current status of perchlorate groundwater contamination in the Region. The perchlorate update includes: 1) background information on perchlorate; 2) a summary of recent developments and the occurrences of perchlorate throughout the region; 3) information on perchlorate removal technologies, 4) recent Regional Board actions; finally 5) conclusions and recommendations. This update indicates a decline in the overall number of production wells listed by the State Department of Health Services (SDHS) that are impacted by perchlorate. There has been a reduction from 138 impacted wells to a total of 128 impacted wells. The SDHS periodically updates and removes production wells from the listing that do not have more than one perchlorate detection above the action level. Although this is good news, we still need to report that there is no significant change in the nature and extent of Groundwater polluted by perchlorate still affecting 38 active water supply systems within the Los Angeles Region. Based on current impact trends, additional systems may be impacted in the future. Widening perchlorate pollution coupled with 20 to 30 feet drops in the regional groundwater tables due to ongoing drought conditions has the potential to increase the severity of this impact.

The economic impact of perchlorate contamination is significant because conventional water treatment systems are unable to remove the chemical. Furthermore, the presence of perchlorate in groundwater could delay and increase the cost of many ongoing regional and site specific cleanup efforts. To resolve the problem, drinking water treatment plants may now need to be re-designed or augmented to remove perchlorate and other emergent chemicals such as; 1,4-dioxane, n-nitrosodimethylamine (NDMA) and in a few areas, hexavalent chromium with attendant higher costs.

Federal, State and local regulatory agencies, in addition to water supply companies, are relying on the Regional Board for assistance with identifying perchlorate contaminant source areas since most are unknown. This critical task of source identification needs to be conducted so that Regional Board staff can begin directing assessment.

B. LOCAL PERCHLORATE OCCURENCES

Perchlorate is used as an oxygen-adding component in solid propellant fuels for rockets, missiles, explosives, munitions, pyrotechnics, military countermeasures, highway safety flares, fireworks, matches and in electroplating. Ammonium perchlorate is also used in certain fertilizers (up to 1%), the manufacture of

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matches, and in analytical chemistry. Commercially, local rocket research companies and manufacturers of fireworks/pyrotecnics have primarily used perchlorate. Groundwater monitoring wells in and around these facilities have detected perchlorate. Drinking water wells in the cities of Alhambra, Arcadia, Azusa, Duarte, San Marino, Commerce, Covina, El Monte, Glendora, City of Industry, La Puente, Pasadena, Pomona, La Verne, Santa Clarita, Los Angeles (Tujunga Well Field), Norwalk, Bellflower, Baldwin Park, Monrovia, Monterey Park, San Gabriel, South Pasadena, San Dimas, Vernon and Whittier have detected perchlorate in recent years (1997 to present). Prior to 1997, there were no requirements from SDHS to test water systems.

Regional Board staff are working to locate former US Department of Defense contractors and sub-contractors engaged in manufacturing, storing, transporting and disposing of perchlorate within our Region. There are also some fireworks manufacturers under scrutiny. To date, and with the cooperation from the USEPA and DTSC, we have identified six known perchlorate source sites and 15 suspected source sites. These known source sites are listed below. We will be following up with the 15-suspected source site by sending information requests and assessment requirements where necessary.

Known Source Sites:

1. Whittaker Bermite Ordnance (DTSC Lead Agency)
2. Boeing's Rocketdyne Santa Susanna Field Laboratory (DTSC Lead Agency)
3. Former BKK (Class I) Landfill (USEPA/DTSC Lead Agency)
4. Aerojet General (RWQCB Lead Agency)
5. National Aeronautical Space Administration /Jet Propulsion Laboratory (RWQCB Lead Agency)
6. United States Naval Facility, (San Nicholas Island (RWQCB Lead Agency)

C. AREA SUMMARIES

RECENT DETECTIONS IN THE LOS ANGELES REGION

As of April 2003, according to the California Department of Health Services, over 173 surface water (springs/reservoirs) and groundwater sampling points within the Los Angeles Region (see attached Tables I) have detected perchlorate [ranging from 4 micrograms per liter ($\mu\text{g/L}$) to 159 $\mu\text{g/L}$]. This figure is up from the 150 reported in mid December 2002. The groundwater sampling points involve supply wells, water treatment influent/effluent, irrigation and monitoring wells. Site specific groundwater monitoring has verified a wider impact throughout the Los Angeles Region.

1. VENTURA COUNTY (Figures 1 and 2)

Subsurface investigations required by the California Department of Toxic Substances Control (DTSC) under a stipulated enforcement order has identified a perchlorate plume beneath Boeing's Santa Susana Field Laboratory (SSFL) near Simi Valley. This site is located just west of the Los Angeles County/Ventura County borderline and 2 miles east of the Ahmanson Ranch well that recently detected perchlorate (one sample, not repeated). At the SSFL, the highest perchlorate concentration of 1,600 $\mu\text{g/L}$ was detected along the eastern part of the facility in the fractured Chatsworth Formation. Investigations continue in an effort to understand the relationship, if any, to the Ahmanson Ranch Well No. 1 that detected perchlorate up to 28 $\mu\text{g/L}$ in August 2002. A workplan to resample Ahmanson Well

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No. 1 was approved by the Regional Board staff on April 23, 2003. This supplemental sampling is intended to validate the presence or absence of perchlorate in the Ahmanson Well.

Perchlorate has also been detected in two supply wells at the United States Naval facility on San Nicholas Island. It is believed the perchlorate contained in explosive ordinances is the source. There have been no other detections of perchlorate in any other municipal supply wells throughout Ventura County.

2. LOS ANGELES COUNTY

(i) Central Groundwater Basin (Figure 3)

There have been only five sporadic perchlorate detection's reported in the Central Groundwater Basin. Perchlorate impact on drinking water supply systems has been reported in Vernon, Commerce, Norwalk and Bellflower. Perchlorate concentrations range from 4 to 13- $\mu\text{g/L}$ (Table I). The source sites are currently unknown.

(ii) Raymond Groundwater Basin (Figure 4)

The latest water quality information on perchlorate from the City of Pasadena for December 2002 indicates that they have decided to shut down 9 of their 13 drinking water supply wells due to perchlorate pollution. Twelve other nearby wells are also impacted by perchlorate, bringing the total to 25. The source of the Pasadena perchlorate pollution is attributed to the National Aeronautics and Space Administration (NASA)/Jet Propulsion Laboratories (JPL) Complex. This facility engages in, among other things rocket research, testing and production where by solid rocket propellant fuel containing perchlorate is used. NASA/JPL is proceeding in a timely manner with implementing an approved *Remedial Action Plan* (RAP) to remove perchlorate and VOCs from groundwater onsite and offsite. This is being done under Regional Board and USEPA regulatory oversight.

(iv) San Gabriel and Pomona Valley (Figure 5)

San Gabriel Valley

Based on the information provided by SDHS for April 2003 (Table I), 69 water supply wells have become contaminated by perchlorate. Approximately 10 of these wells have been shut down due to VOC and perchlorate contamination. Wells taken off-line are located in different areas, such as, Pasadena, Azusa/Irwindale, West Covina, City of Industry and South El Monte. Federal and State regulatory agencies, municipalities, as well as water supply companies are tracking these events. In August 2002, six of these drinking water wells were taken out of service in South El Monte due to elevated concentrations of perchlorate and VOCs beyond the already identified City of Monterey Park Wells No. 5 and No. 12. Over 11,500 gallons per minute (gpm) of drinkable water has been temporarily lost due to well shutdowns. All of these wells lie within the South El Monte Operable Unit (SEMOU).

The Main San Gabriel Basin Watermaster indicates that the list of perchlorate-impacted municipal wells continues to grow. In the City of Industry, Waterworks Wells Nos. 3 and 4 remain shut down due

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to elevated perchlorate concentrations. In West Covina, Valencia Heights Well Nos. 1, 2 and 4 have also been shut down.

Pomona Valley

The City of Pomona reports that as many as 23 drinking water wells have detected perchlorate at various times during 2002. Some wells located in the City of Pomona have been taken off-line. These detections, in addition to increasing VOC concentrations, have caused the shut down of 2 of these 23 drinking water wells. Perchlorate concentrations range from 4 µg/L to as high as 19 µg/L. To reduce the impact of increasing perchlorate concentrations, the City of Pomona blends impacted groundwater with non-impacted water prior to sending it through their 15 million gallon per day treatment plant.

(v) **Santa Clarita and San Fernando Valleys (Figure 6)**

In the Santa Clarita area, perchlorate has impacted a total of 5 wells affecting three water systems (Newhall Community Water District, Valencia Water District, and Santa Clarita Water Company). Perchlorate detected in these wells ranged from 4.2 µg/L to 47 µg/L. In the San Fernando Valley perchlorate has been detected in a total of 12 wells affecting two water systems (Los Angeles Department of Water & Power and Glendale City Water Department). Perchlorate detected in these wells ranged from 4 µg/l to 21 µg/L.

D. PERCHLORATE REMOVAL TECHNOLOGIES

There are several effective treatment technologies available that will reduce perchlorate concentrations in groundwater. The most widely used removal technology is an ion exchange system, which removes the perchlorate (ClO₄⁻) anion from groundwater down to levels of 4 µg/L. Hence, this treatment process is relatively expensive, starting at approximately \$100 per acre-foot of treated water. Furthermore, during the ion exchange process, a brine solution is produced which requires special handling and disposal. Ion exchange systems for perchlorate removal and destruction can allow the recycling of brine solution, but are available at much greater cost for treatment, starting at approximately \$500 per acre-foot of treated water.

An ion exchange system would utilize multiple ion exchange beds (made of resin) that are mounted to slowly rotate. Beds move in a continuous sequence of operations that include perchlorate adsorption, backwash, regeneration, rinse, and displacement. This treatment will remove nitrate and sulfate from the water along with perchlorate. DHS has approved this technology for treatment to drinking water standards. Calgon Carbon Corporation's Engineered Solutions Division has been hired by the Baldwin Park Operable Unit (BPOU) Cooperating Respondents (CRs, aka PRPs) and the Main San Gabriel Watermaster to design, construct and operate drinking water treatment plants that remove and destroy perchlorate using their patented ISEP® Ion Exchange Separations technology. The perchlorate treatment project located in La Puente has a flow rate of 2,500 gpm and the project in San Gabriel has a flow rate of 7,800 gpm. Contaminated water being treated may have perchlorate concentrations of up to 200 µg/L.

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Another promising remedial technology uses biological treatment to remove perchlorate to non-detect levels. This technology utilizes a fluidized bed bioreactor for perchlorate removal. The VOCs are removed first, followed by perchlorate removal. However, the biological process may produce unwanted VOC byproducts. This treatment process is very expensive, with a typical low-flow system costing \$2 to \$3 million to operate. DHS is evaluating this technology and will soon issue its opinion. The Ground-Water Remediation Technologies Analysis Center (GWRTAC) has listed 65 perchlorate treatment studies on its website: <http://www.frtr.gov> under "Treatment Technology." Also, the results of a federally funded perchlorate treatment research program, managed by the American Water Works Research Foundation (AWWARF) are now available for reference on the following website: <http://www.awwarf.com/research/spperch.asp>.

E. RECENT REGIONAL BOARD STAFF ACTIONS

(i) Source Identification Efforts:

2003 - 433 13267 letters were sent out to intermittent dischargers of treated water throughout the region.

Compliance to date is about 50%. Some additional perchlorate detections have been noted. Well Investigation Program staff has discovered as many as 14 suspected perchlorate source sites to date. These sites will be thoroughly investigated shortly.

2003 – We are currently working with the San Gabriel Basin Water Quality Authority to obtain additional resources for perchlorate and VOC source site identification and cleanup.

(ii) Groundwater Remediation:

Regional Board staff has been working in conjunction with the United States Environmental Protection Agency (USEPA) and the Department of Toxic Substances Control (DTSC) staff to coordinate the soil and groundwater cleanup activities at the NASA/JPL site in Pasadena. This site has been divided into three Superfund Operable Units. Operable Unit I, II and III include the groundwater beneath the site, the soil beneath the site, and the groundwater off-site, respectively (Figure 8). In September 2002, the Record of Decision (ROD) for Operable Unit II was finalized. A pilot study to start remediation of groundwater beneath the site (Operable Unit I) using and in-situ reactive zone technology for perchlorate treatment was submitted to this Regional Board in October 2002. The final Engineering Evaluation Cost Analysis (EECA) for operable Unit III has been submitted. The projected activities covered under this EECA include the treatment of off-site groundwater in the down-gradient end of the plume and its subsequent up-gradient recharge. This will prevent the further migration of the plume off-site.

In the San Gabriel Valley, another Superfund area, the 1994-ROD for the BPOU that included groundwater treatment water for VOCs had to be reevaluated and the remedy redesigned due to the emergent chemicals; perchlorate, 1,4-dioxane and NDMA (see Appendix B). The groundwater treatment systems make use of a variety of processes to remove the contaminants from the groundwater: ion exchange (to remove perchlorate and nitrate); ultraviolet light and hydrogen peroxide (to remove NDMA, 1,4-dioxane, and VOCs); and air stripping and off-gas treatment (to remove VOCs). An initial pilot-scale test of a biological treatment system for perchlorate removal was completed between November 1997 and May 1998. The testing demonstrated that the treatment system, which converts the perchlorate to chloride, a non-toxic form of chlorine, could reduce the concentration of perchlorate in the groundwater to non-detectable levels. The CRs completed a second phase of testing in 2000 to determine whether the treatment system could reliably produce water of drinking water quality. Although the results of the phase 2 testing were positive, a decision was made to use an ion exchange

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system, rather than the biological treatment system, for perchlorate removal. In March 2002, USEPA published a *Perchlorate Update* fact sheet to provide information on environmental occurrence, toxicity assessment and the health hazard threat posed by perchlorate to the public (see Appendix A). The California Environmental Protection Agency has also released a *Perchlorate Fact Sheet* (Appendix D).

F. CONCLUSIONS

1. From Table I it is apparent that many of the localized perchlorate sources are unknown at this time. A sustained source identification effort is necessary to ensure that perchlorate pollution assessment, monitoring and cleanup continues throughout the Los Angeles Region, in particular in the San Gabriel Basin, Pomona Valley, Santa Clarita Valley and in Simi Valley. Regional Board staff has requested the assistance of USEPA for the San Gabriel Basin investigation.
2. The State's Fire Marshal's Office has been assisting the Regional Board with identifying the manufacturers of perchlorate end-products such as pyrotechnics, explosives, highway safety flares, munitions, military countermeasures, rocket propellant fuel, fertilizer, circuit boards and related chemical oxidizers in the Los Angeles Region. Some identified firework companies are being investigated as a result of information provided.
3. More intra- and inter-departmental coordination amongst Regional Board staff, State Board, DTSC, DHS and County agencies is necessary to ensure accelerated source identification, assessment, expanded groundwater monitoring, information exchange, and conformity in regulatory action.
4. The effects on groundwater supply and recharge needs to be coordinated and studied with MWD, the San Gabriel Basin Water Quality Authority (WQA), the respective Watermasters and local regulatory agencies in order to access the present and future threat to water resources.
5. Information obtained from dischargers subject to WDRs will be used to better understand the overall distribution of perchlorate in groundwater within the Region. We will be making recommendations to dischargers, regulatory agencies and water supply companies based partially on these findings.
6. In the event that the DHS or USEPA establish a lower MCL of perchlorate in the future, there may be a significant increase in the number of impacted wells and, possibly, surface water bodies due to perchlorate pollution.

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TABLES

Municipal Wells Containing Perchlorate in the Los Angeles Region

County Name	Drinking Water Supply System	Well/ Source name	Number of Samples Collected	Perchlorate Concentration Range (µg/l)	Dates of Detections
LOS ANGELES	ARCADIA-CITY, WATER DIVISION	ST. JOSEPH WELL 02	2	4.2-8.6	2002-2002
LOS ANGELES	AZUSA LIGHT AND WATER	WELL 10 (AVWC8)	16	5-12	1997-2002
LOS ANGELES	BELLFLOWER - SOMERSET MWC	WELL 833	2	6.1-6.7	1999-1999
LOS ANGELES	CAL/AM WATER COOMPANY - SAN MARINO	1921 A - OAK KNOLL CIRCLE - INACTIVE	4	4.4-5.7	1997-2001
LOS ANGELES	CAL/AM WATER COOMPANY - SAN MARINO	1921 B - OSWEGO	2	4.5-20	1997-1997
LOS ANGELES	CAL/AM WATER COOMPANY - SAN MARINO	1923 - PATTON - INACTIVE	4	4.3-5.2	1997-2001
LOS ANGELES	CAL/AM WATER COOMPANY - SAN MARINO	1928 - LAMANDA PARK	4	4-4.3	1997-2001
LOS ANGELES	CAL/AM WATER COOMPANY - SAN MARINO	1947 - ROANOKE - INACTIVE	2	4.2-5.6	1997-1997
LOS ANGELES	CALIFORNIA DOMESTIC WATER COMPANY	WELL 02	11	4.1-5.6	1999-2002
LOS ANGELES	CALIFORNIA DOMESTIC WATER COMPANY	WELL 03	7	4-6.1	2002-2003
LOS ANGELES	CALIFORNIA DOMESTIC WATER COMPANY	WELL 08	9	4-5.9	2002-2003
LOS ANGELES	CALIFORNIA DOMESTIC WATER COMPANY	WELL 14	24	4.6-14	2001-2003
LOS ANGELES	CALIFORNIA WATER SERVICE CO. - ELA	WELL 10-03	9	6.2-8.5	2000-2001
LOS ANGELES	CITY OF INDUSTRY WATERWORKS SYSTEMS	WELL 03 - STANDBY	7	5.3-14	1997-2001
LOS ANGELES	CITY OF INDUSTRY WATERWORKS SYSTEMS	WELL 4 - STANDBY (12-27-01)	14	5-14.8	1998-2002
LOS ANGELES	CITY OF INDUSTRY WATERWORKS SYSTEMS	WELL 5 - STANDBY (12-27-01)	12	5-10	1997-2002
LOS ANGELES	COVINA-CITY, WATER DEPT.	GRAND AVE. WELL - INACTIVE	5	20-23	1997-1999
LOS ANGELES	GLENDALE-CITY, WATER DEPT.	CS-VPB-04 - MONITORING SITE	2	4.7-5.3	2001-2002
LOS ANGELES	GLENDALE-CITY, WATER DEPT.	GOU GN-3 DISCHARGE	4	5.2-6.9	2000-2001
LOS ANGELES	LA CANADA IRRIGATION DIST.	WELL 01	2	4.8-6	1997-1998
LOS ANGELES	LA PUENTE VALLEY CWD	WELL 02 - STANDBY	10	50-129	1997-2003
LOS ANGELES	LA PUENTE VALLEY CWD	WELL 03	99	41-110	1997-2003
LOS ANGELES	LA PUENTE VALLEY CWD	WELL 04 - STANDBY	6	60-159	1997-2001
LOS ANGELES	LA VERNE, CITY WD	AMHERST WELL	4	10-15	2002-2002
LOS ANGELES	LA VERNE, CITY WD	CARTWRIGHT	4	12-20.4	1998-2001
LOS ANGELES	LA VERNE, CITY WD	LA VERNE HEIGHTS WELL 02	2	5.08-5.3	1998-1998
LOS ANGELES	LA VERNE, CITY WD	LA VERNE HEIGHTS WELL 03	9	9.6-19	1998-2002
LOS ANGELES	LA VERNE, CITY WD	LINCOLN	13	11.1-22	1998-2002
LOS ANGELES	LA VERNE, CITY WD	MILLS TRACT	8	15-20	1998-2002
LOS ANGELES	LA VERNE, CITY WD	OLD BALDY	14	7.9-26	1998-2002
LOS ANGELES	LAS FLORES WATER CO.	WELL 02	43	4-9	1997-2002
LOS ANGELES	LINCOLN AVENUE WATER CO.	WELL 03	31	2.49-16	1997-1999
LOS ANGELES	LINCOLN AVENUE WATER CO.	WELL 05	16	2-6	1997-2002
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	MISSION WELL 05	16	4-6	2000-2003
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	RINALDI TOLUCA WELL 03	7	4.2-5.4	2000-2002
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	RINALDI TOLUCA WELL 06	5	5.8-9.2	2000-2002
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	RINALDI TOLUCA WELL 07	8	4.2-7.9	2000-2002

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County Name	Drinking Water Supply System	Well/ Source name	Number of Samples Collected	Perchlorate Concentration Range (µg/l)	Dates of Detections
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	RINALDI TOLUCA WELL 08	2	6.1-6.6	2002-2002
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 05	2	4.1-4.7	2001-2002
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 07	4	4.2-5.4	2001-2002
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 08	4	4.1-4.9	2001-2002
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 10	19	4-11	2000-2003
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 11	11	9.9-21	2000-2002
LOS ANGELES	LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 12	5	4-8.1	2002-2003
LOS ANGELES	MONROVIA-CITY, WATER DEPT.	MONROVIA WELL 01 - ABANDONED	6	6-8.4	1999-2002
LOS ANGELES	MONTEREY PARK-CITY, WATER DEPT.	FERN WELL - STANDBY	2	2-5.3	1997-2002
LOS ANGELES	MONTEREY PARK-CITY, WATER DEPT.	WELL 05	7	4.7-6.5	1999-2002
LOS ANGELES	MONTEREY PARK-CITY, WATER DEPT.	WELL 06 - STANDBY	2	4.6-5.9	2002-2002
LOS ANGELES	MONTEREY PARK-CITY, WATER DEPT.	WELL 12 - INACTIVE (PCE > 10X MCL)	6	8-14	1997-2002
LOS ANGELES	Newhall CWD-Newhall	WELL 11 - INACTIVE	10	12-20	1997-2001
LOS ANGELES	PARK WC - BELLFLOWER-NORWALK	WELL 29-K	14	4-7.05	1998-2001
LOS ANGELES	PASADENA-CITY, WATER DEPT.	ARROYO - INACTIVE	5	2.97-54	1997-1999
LOS ANGELES	PASADENA-CITY, WATER DEPT.	BANGHAM	58	2.92-9.03	1997-2002
LOS ANGELES	PASADENA-CITY, WATER DEPT.	CHAPMAN	3	3.98-9	1999-2001
LOS ANGELES	PASADENA-CITY, WATER DEPT.	COPELIN	70	3.93-17.43	1997-2003
LOS ANGELES	PASADENA-CITY, WATER DEPT.	CRAIG	16	2.5-5.84	1999-2002
LOS ANGELES	PASADENA-CITY, WATER DEPT.	GARFIELD	28	3.09-27.7	1999-2002
LOS ANGELES	PASADENA-CITY, WATER DEPT.	MONTE VISTA	17	1.49-4.59	1999-2002
LOS ANGELES	PASADENA-CITY, WATER DEPT.	SUNSET	59	2.49-12.8	1999-2003
LOS ANGELES	PASADENA-CITY, WATER DEPT.	VENTURA	87	2.72-9	1997-2002
LOS ANGELES	PASADENA-CITY, WATER DEPT.	VILLA	26	2.97-7.24	1999-2001
LOS ANGELES	PASADENA-CITY, WATER DEPT.	WELL 52	115	6-34.88	1997-2002
LOS ANGELES	PASADENA-CITY, WATER DEPT.	WINDSOR	84	1.87-13.59	1999-2002
LOS ANGELES	PASADENA-CITY, WATER DEPT.	WOODBURY	2	2.42-3.41	2001-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 01B - INACTIVE	4	4.58-7	1998-1998
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 02	9	4.2-8.1	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 03	3	5.94-6.06	1998-1998
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 04	17	6.93-13.5	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 05B	10	5-7.24	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 06	24	9.8-16.3	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 07 - INACTIVE	6	8.28-11.9	1998-1999
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 08B - INACTIVE	6	6.9-12	1998-1999
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 09B	3	4.4-12	2002-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 10	9	5.9-9.5	1998-2002

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LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 12	47	9.5-19	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 14	22	6.2-13.2	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 15	23	7.3-13	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 16	41	10-19	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 17	23	8.8-17	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 18	22	8.9-16	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 23	11	5.5-10	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 25	4	3.2-6.5	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 26	9	4.7-8	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 28	2	3.1-4.68	1998-2002
LOS ANGELES	POMONA- CITY, WATER DEPT.	WELL 34	26	9.91-16.1	1998-2002
LOS ANGELES	RUBIO CANON LAND & WATER ASSOCIATION	WELL 04	7	4-6	1997-2002
LOS ANGELES	SAN GABRIEL CWD	WELL 07 - ACTIVE	5	4.3-5	2002-2002
LOS ANGELES	SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B11A	7	4.4-8	1997-2002
LOS ANGELES	SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B5A LACFCD 2994V	5	5.9-14	1997-2001
LOS ANGELES	SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B5B LACFCD 2994Q	2	9-12	1997-1997
LOS ANGELES	SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B6C - INACTIVE	2	71-74	1997-1997
LOS ANGELES	SANTA CLARITA WATER CO.	SAUGUS WELL 01 - INACTIVE	4	21-34	1997-1998
LOS ANGELES	SANTA CLARITA WATER CO.	SAUGUS WELL 02 - INACTIVE	4	12-47	1997-1998
LOS ANGELES	SANTA CLARITA WATER CO.	STADIUM WELL 13	2	4.2-5.9	2002-2002
LOS ANGELES	SCWC - CLAREMONT	CAMPBELL WELL 01 - INACTIVE	3	6-7.4	1998-1999
LOS ANGELES	SCWC-SAN DIMAS	BASELINE WELL 03	3	13-13	2003-2003
LOS ANGELES	SCWC-SAN DIMAS	BASELINE WELL 04	20	5-20	1997-2002
LOS ANGELES	SCWC-SAN DIMAS	COLUMBIA WELL 07	3	3.9-5.2	1997-2002
LOS ANGELES	SCWC-SAN DIMAS	DURWARD	9	8.5-17.9	1999-2002
LOS ANGELES	SCWC-SOUTH SAN GABRIEL	SAN GABRIEL WELL 01 - ACTIVE	2	4.1-5.5	2002-2002
LOS ANGELES	SOUTH PASADENA-CITY, WATER DEPT.	GRAVES WELL 02	9	4-6.8	1997-2002
LOS ANGELES	SUBURBAN WATER SYSTEMS-SAN JOSE	126-W2	5	5.2-6.5	1998-2001
LOS ANGELES	SUBURBAN WATER SYSTEMS-SAN JOSE	139-W2	25	8-16	1997-2001
LOS ANGELES	SUBURBAN WATER SYSTEMS-SAN JOSE	139-W4	16	4-11.3	1997-2001
LOS ANGELES	SUBURBAN WATER SYSTEMS-SAN JOSE	139-W5	8	2-9.7	1997-2001
LOS ANGELES	SUBURBAN WATER SYSTEMS-SAN JOSE	139-W6 - INACTIVE	20	7-35.4	1998-2001
LOS ANGELES	SUBURBAN WATER SYSTEMS-SAN JOSE	140-W3	28	5-14.6	1997-2002
LOS ANGELES	SUBURBAN WATER SYSTEMS-SAN JOSE	140-W4	10	4.8-10	1997-2002
LOS ANGELES	SUBURBAN WATER SYSTEMS-SAN JOSE	140-W4 - CHLORINATION	1	6.6-6.6	2002-2002
LOS ANGELES	SUBURBAN WATER SYSTEMS-SAN JOSE	140-W5	6	4.3-7.2	1999-2002

Municipal Wells Containing Perchlorate in the Los Angeles Region

County Name	Drinking Water Supply System	Well/ Source name	Number of Samples Collected	Perchlorate Concentration Range (µg/l)	Dates of Detections
LOS ANGELES	VALENCIA HEIGHTS WATER CO.	WELL 01 LACFCD 3113A	12	4-8.5	1997-2002
LOS ANGELES	VALENCIA HEIGHTS WATER CO.	WELL 02 LACFCD 3113	15	4.5-8	1997-2002
LOS ANGELES	VALENCIA HEIGHTS WATER CO.	WELL 04 LACFCD 3102B - INACTIVE	22	18-33	1997-2002
LOS ANGELES	VALENCIA HEIGHTS WATER CO.	WELL 05	5	5-7.2	1997-2000
LOS ANGELES	VALENCIA HEIGHTS WATER CO.	WELL 06	2	4.9-6.4	2002-2002
LOS ANGELES	VALENCIA WATER CO.	WELL 157 - INACTIVE	3	7-14	1997-1998
LOS ANGELES	VALLEY COUNTY WATER DIST.	WELL 03 MORADA ST. - INACTIVE	2	12-13	1997-1997
LOS ANGELES	VALLEY COUNTY WATER DIST.	WELL 07 LANTE STREET - INACTIVE	5	61-94	1997-1998
LOS ANGELES	VALLEY COUNTY WATER DIST.	WELL 09 BIG DALTON - INACTIVE	8	21-48	1997-1998
LOS ANGELES	VALLEY WATER CO.	WELL 01	7	4.2-6.4	1997-2002
LOS ANGELES	VALLEY WATER CO.	WELL 02	6	4-7.4	1997-2001
LOS ANGELES	VALLEY WATER CO.	WELL 03	9	4.1-7.3	1999-2001
LOS ANGELES	VALLEY WATER CO.	WELL 04	6	4.6-8	1997-2001
LOS ANGELES	VERNON-CITY, WATER DEPT.	WELL 18	4	4.4-13	2000-2002
LOS ANGELES	WHITTIER-CITY, WATER DEPT.	WELL 16	2	4-4	1997-1998
VENTURA	U.S.N., San Nicolas Island	WINDMILL SPRINGS	15	6.8-16	1999-2002
VENTURA	U.S.N., San Nicolas Island	ZITNIC SPRINGS	13	7-20	1998-2002

APPENDIX A



Perchlorate Update

march 2002

The United States Environmental Protection Agency (EPA) has released its revised draft toxicity assessment, "Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization." When finalized, this assessment will be an important update of EPA's health assessment that reflects the state of the science regarding the health effects of the chemical perchlorate. The preliminary revised human health risk estimates found in the document are still undergoing review and deliberations both by the external scientific community and within EPA, and do not represent EPA policy at this stage.

How To Review and Comment on EPA's Draft Perchlorate Toxicity Assessment

The draft perchlorate toxicity assessment is available at EPA's National Center for Environmental Assessment (NCEA) Web site www.epa.gov/ncea under "what's new." Written public comments on the scientific literature and on EPA's characterization of the science in the draft perchlorate assessment will be accepted by EPA's contractor, Eastern Research Group, for consideration during the Agency's document revision process. These comments will be made available to the peer reviewers. Public comments must be received by April 5, 2002. Send your comments to: Eastern Research Group ERG, Attn: Meetings, 100 Hartwell Avenue, Lexington, MA 02421. If your comments are under 50 pages in length, you can send them via email attachment (in Word, WordPerfect or PDF) to meetings@erg.com.

What is Perchlorate?

Perchlorate is both a naturally occurring and man-made chemical. Most of the perchlorate manufactured in the United States is used as the primary ingredient of solid rocket propellant. Wastes from the manufacture and improper disposal of perchlorate-containing chemicals are increasingly being discovered in soil and water.

How Can Perchlorate Affect Human Health?

Perchlorate interferes with iodide uptake into the thyroid gland. Because iodide is an essential component of thyroid hormones, perchlorate disrupts how the thyroid functions. In adults, the thyroid helps to regulate metabolism. In children, the thyroid plays a major role in proper development in addition to metabolism. Impairment of thyroid function in expectant mothers may impact the fetus and newborn and result in effects including changes in behavior, delayed development and decreased learning capability. Changes in thyroid hormone levels may also result in thyroid gland tumors. EPA's draft analysis of perchlorate toxicity is that perchlorate's disruption of iodide uptake is the key event leading to changes in development or tumor formation.

What are the Preliminary Conclusions of the Draft Toxicity Assessment?

The EPA draft assessment concludes that the potential human health risks of perchlorate exposures include effects on the developing nervous system and thyroid tumors. The draft assessment includes a draft reference dose (RfD) that is intended to be protective for both types of effects. It is based on early events that could potentially result in these effects, and factors to account for sensitive populations, the nature of the effects, and data gaps were used. The draft RfD is 0.00003 milligrams per kilogram per day (mg/kg/day). The RfD is defined as an estimate, with uncertainty spanning perhaps an order of magnitude, of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of adverse effects over a lifetime. As with any EPA draft assessment document containing a quantitative risk value, that risk value is also draft and should not at that stage be construed to represent EPA policy. Thus, the draft RfD for perchlorate is still undergoing science review and deliberations both by the external scientific community and within the Agency.

The assessment provides a hypothetical conversion of the draft RfD to a drinking water equivalent level, assuming factors of 70 kilograms (kg) body weight and 2 liters (L) of water consumption per day. The converted draft estimate would be 1 microgram per liter (ug/L) or 1 part per billion (ppb). If the Agency were to make a determination to regulate perchlorate, the RfD, along with other considerations would factor into the final value.

Does Perchlorate Cause Cancer?

Perchlorate is associated with disruption of thyroid function which can potentially lead to thyroid tumor formation. This draft toxicity assessment accounts for both developmental and tumor formation effects.

Does My Water Contain Perchlorate?

Confirmed perchlorate releases have occurred in at least 20 states throughout the United States (see Figure 2). In EPA Region 9, perchlorate releases have occurred in California, Arizona, and Nevada. Perchlorate has also been released into the Colorado River, which is a drinking water source for some areas of the region. Additional information and maps detailing those sites are available in Chapter 1 of the draft of the "Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization." EPA, other federal agencies, states, water suppliers and industry are already actively addressing perchlorate contamination through monitoring for perchlorate in drinking water and surface water. The full extent of perchlorate contamination is not known at this time.

What is Being Done about Perchlorate?

A peer review of the draft perchlorate

toxicity assessment will be held March 5 and 6, 2002 in Sacramento, CA. The purpose of the peer review is to provide an independent review of the scientific information and interpretation used in the document. Once the assessment is finalized, the reference dose will be used in EPA's ongoing efforts to address perchlorate problems. EPA's draft reference dose represents a preliminary estimate of a protective health level and is not a drinking water standard. In the future, EPA may issue a Health Advisory that will provide information on protective levels for drinking water. This is one step in the process of developing a broader response to perchlorate including, for example, technical guidance, possible regulations and additional health information. A federal drinking water regulation for perchlorate, if ultimately developed, could take several years.

In 1998, perchlorate was placed on EPA's Contaminant Candidate List for consideration for possible regulation. In 1999, EPA required drinking water monitoring for perchlorate under the Unregulated Contaminant Monitoring Rule (UCMR). Under the UCMR, all large public water systems and a representative sample of small public water systems are required to monitor for perchlorate over the next two years to determine whether the public is exposed to perchlorate in drinking water nationwide.

How is Perchlorate Removed from Water?

Several types of treatment systems designed to reduce perchlorate concentrations are operating around the United States, reducing perchlorate to below the 4 ppb reporting level. Biological treatment and ion (anion) exchange systems are among the technologies that are being used, with additional treatment technologies under development.

Many other perchlorate studies have been completed during the last several years. A May 2001 summary of 65 perchlorate treatment studies is available online at www.gwrtac.org/ (click on "Technical Documents" then look for "Technology Status Reports"). The summary report was prepared by the Ground-Water Remediation Technologies Analysis Center. Most of the projects described in the report are bench-scale and pilot-scale demonstrations of water treatment technologies, although several entries describe full-scale systems and soil treatment methods. Most of the projects employ biological treatment methods or ion (anion) exchange technology, although reverse osmosis, nanofiltration, granular activated carbon, and chemical reduction are also discussed. Results of federally-funded perchlorate treatment research, managed by the American Water Works Association Research Foundation (AWWARF), are also becoming available (see www.awwarf.com/research/spperch.asp).

Is Perchlorate-contaminated Water Safe to Drink?

EPA's draft toxicity assessment is preliminary and thus, it is difficult to make definitive recommendations at this stage. Other factors that influence the answer to this question include how much water is consumed, the degree of perchlorate contamination and the health status of the consumer.

Sensitive populations, like pregnant women, children and people who have health problems or compromised thyroid conditions, should follow the advice of their health care provider regarding the amount and type of liquids, including water that should be consumed.

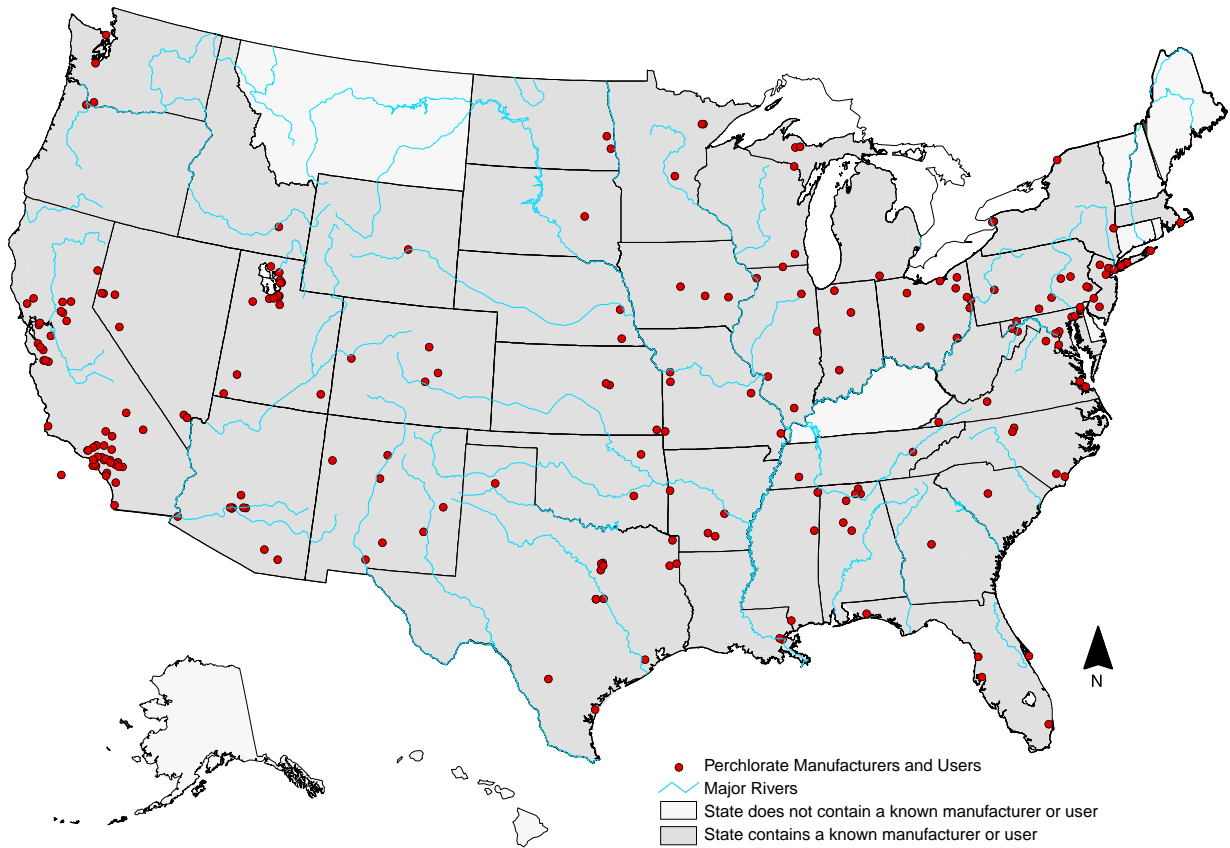


Figure 1: U.S. Perchlorate Manufacturers and Users, as of October 2001

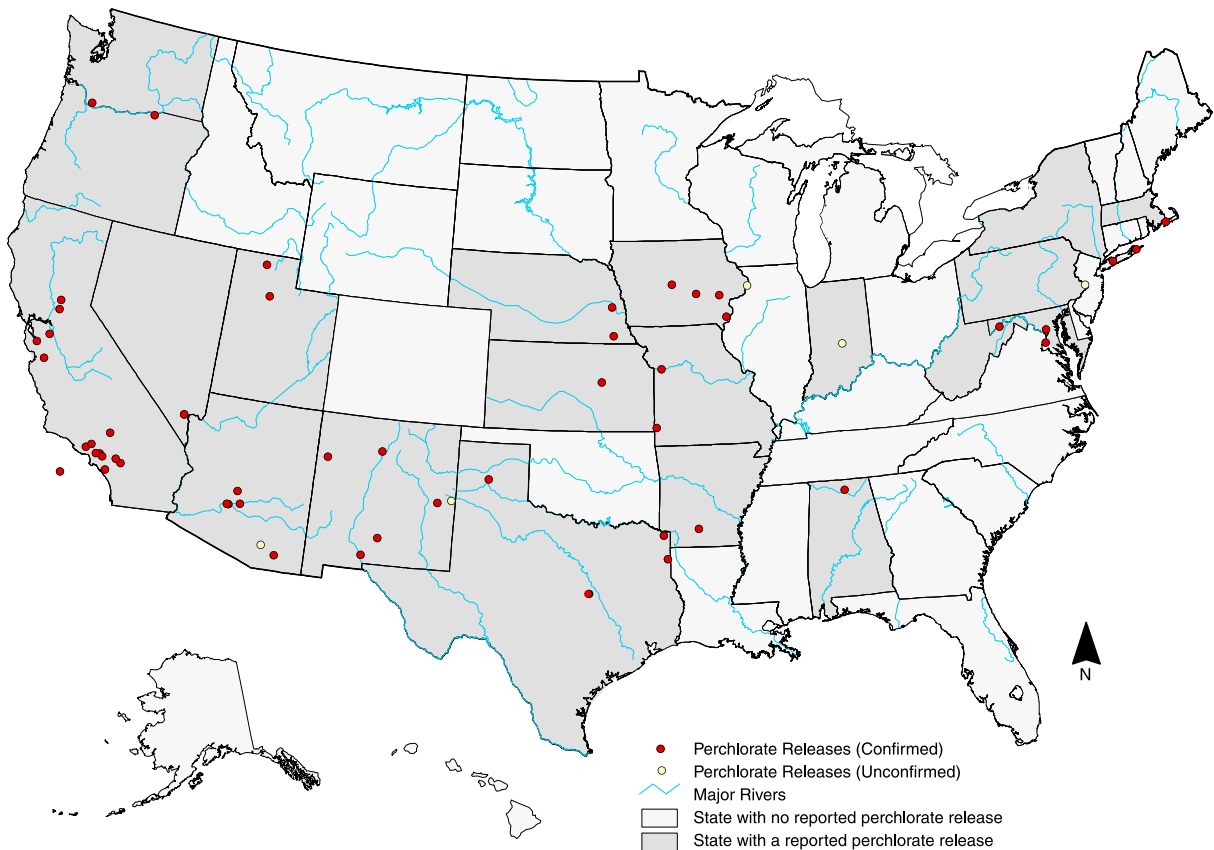


Figure 2: Reported Releases of Perchlorate into the Environment, as of November 2001

For more information

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Immediate Office of the Assistant Administrator
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(202) 564-3376

Direct questions about community involvement or the mailing list to:
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Region 9 Community Involvement Coordinator
Superfund Division
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APPENDIX B

PERCHLORATE FACT SHEET

The California Environmental Protection Agency has prepared this fact sheet to provide general information about the role of the Office of Environmental Health Hazard Assessment (OEHHA), State Water Resources Control Board (SWRCB), and the Department of Toxic Substances Control (DTSC) in managing perchlorate, a drinking water contaminant.

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

OEHHA is responsible under law for developing a Public Health Goal (PHG) for perchlorate and other drinking water contaminants. A PHG is the level of a contaminant in drinking water that would not be expected to pose a significant acute or long-term human health risk. PHGs are based strictly on public health criteria and are not regulatory requirements. Under law, the Department of Health Services is required to set the regulatory Maximum Contaminant Level (MCL) for a contaminant as close to the corresponding PHG as is economically and technically feasible.

STATE WATER RESOURCES CONTROL BOARD

The Water Boards are the principal state agencies with primary responsibility for the coordination and control of water quality in the state. Water Code Section 13304 authorizes the Water Boards to require cleanup of all wastes discharged and restoration of affected water. Perchlorate sites are a high priority for the Water Boards because of the impact that perchlorate has had on water supply wells. Water Boards have identified approximately 30 site-specific sources of perchlorate and responded by initiating investigations and cleanup at several sites in the Central Valley, Los Angeles, and Santa Ana Regional Board areas. Water Boards have been involved in perchlorate cleanups since 1997 at Aerojet near Sacramento. SWRCB/RWQCBs and DTSC are working jointly to share data and streamline regulatory oversight of a statewide problem.

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

State and federal law vest DTSC with the authority to require the cleanup of any site in California where a toxic substance has been released, including perchlorate.

Corrective Action Orders at Hazardous Waste Management Facilities. Under Chapter 6.5 of the Health and Safety Code, DTSC oversees cleanup activities at

FIGURES

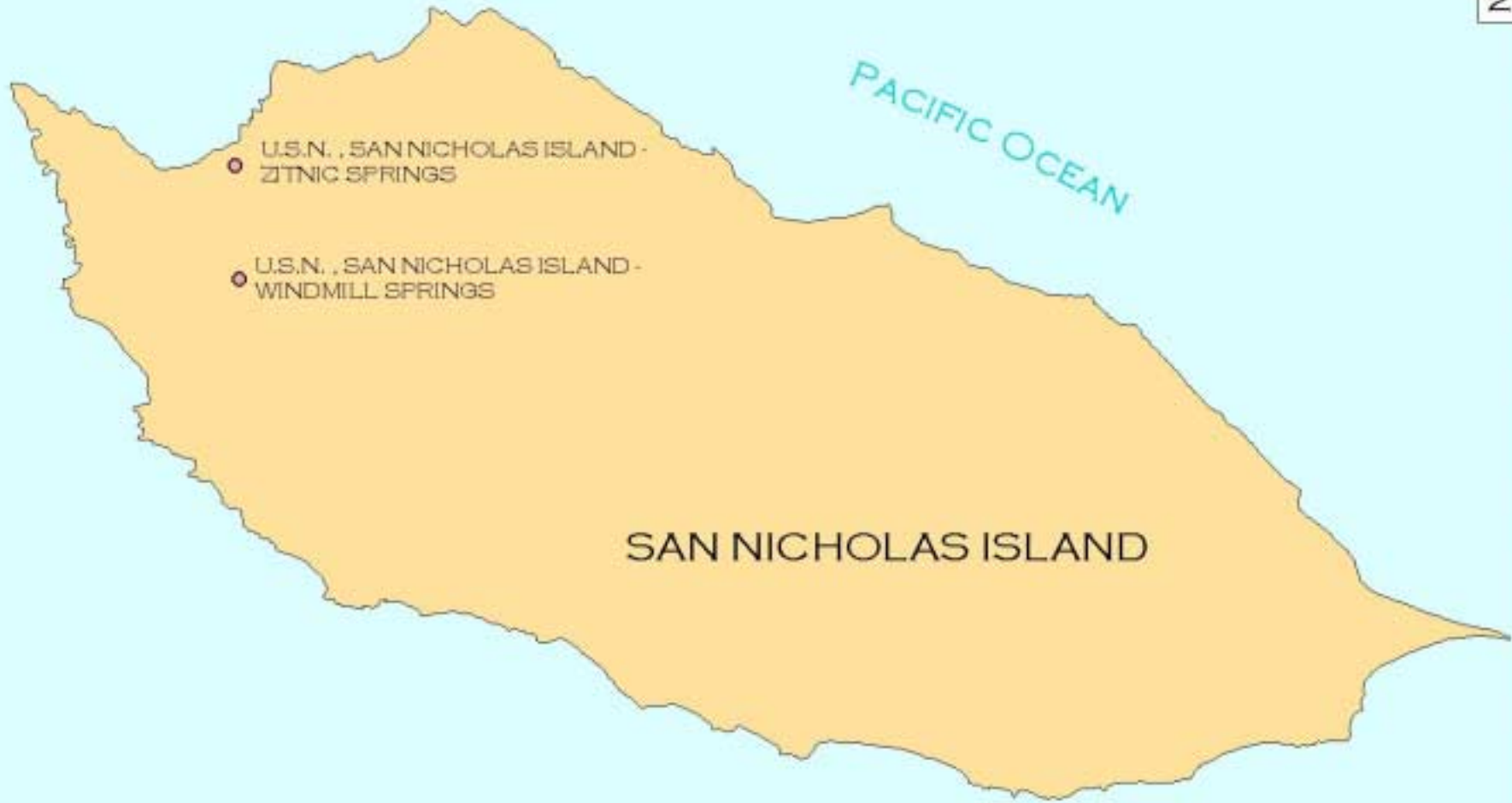


IMPACTED DRINKING WATER SOURCES IN VENTURA COUNTY

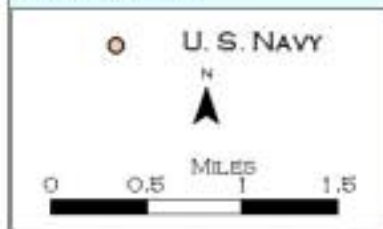


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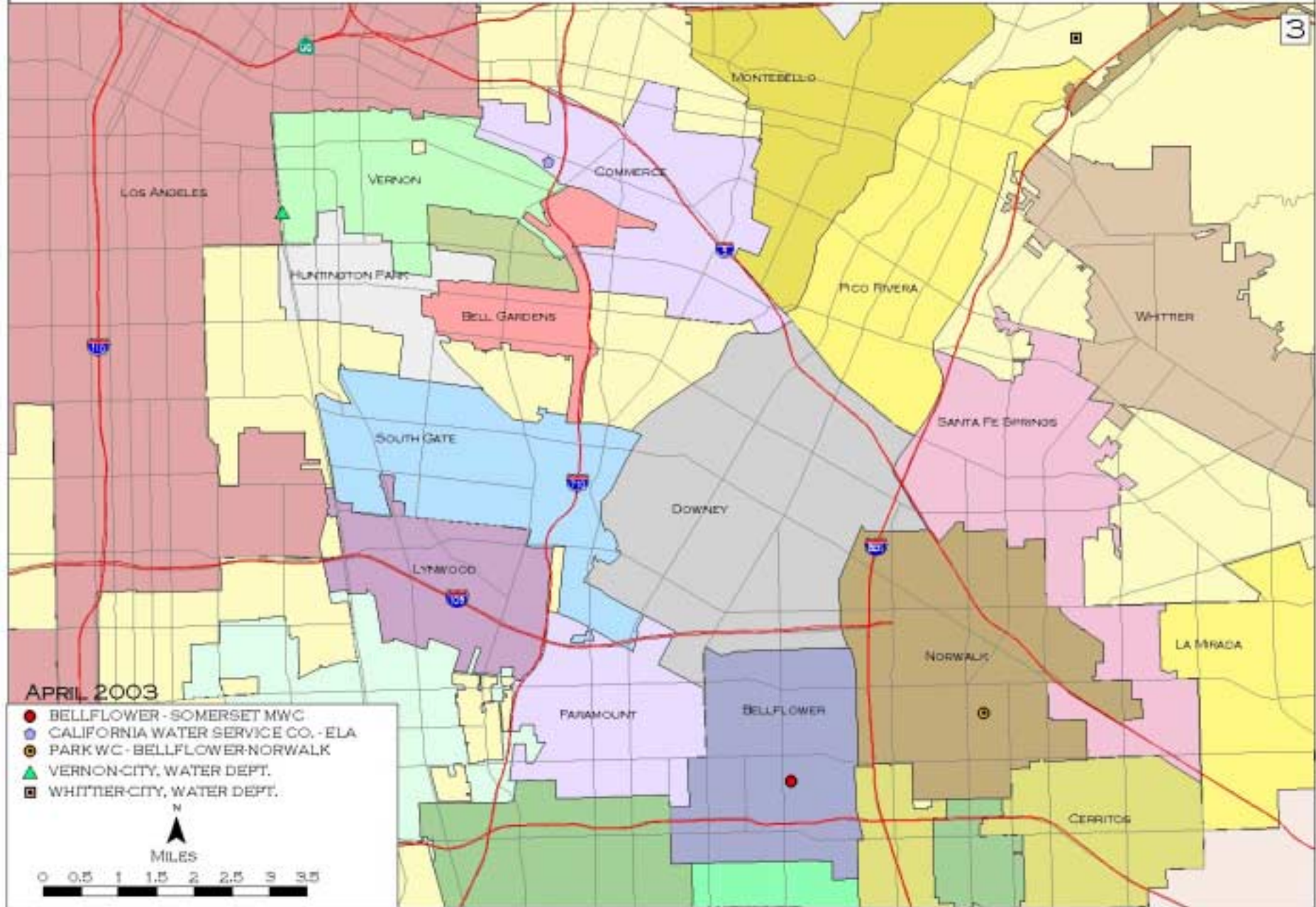


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IMPACTED DRINKING WATER SOURCES IN THE CENTRAL BASIN

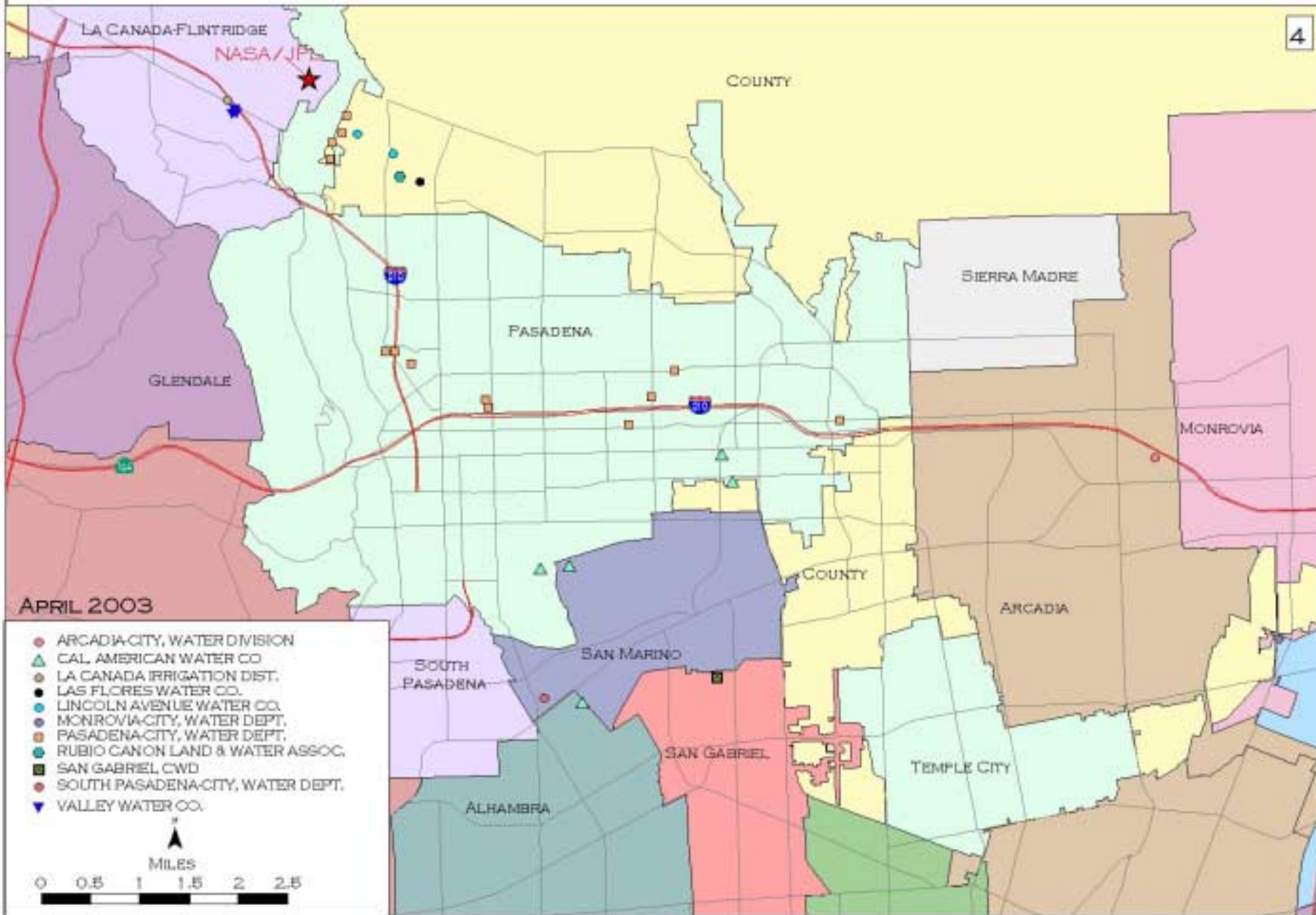




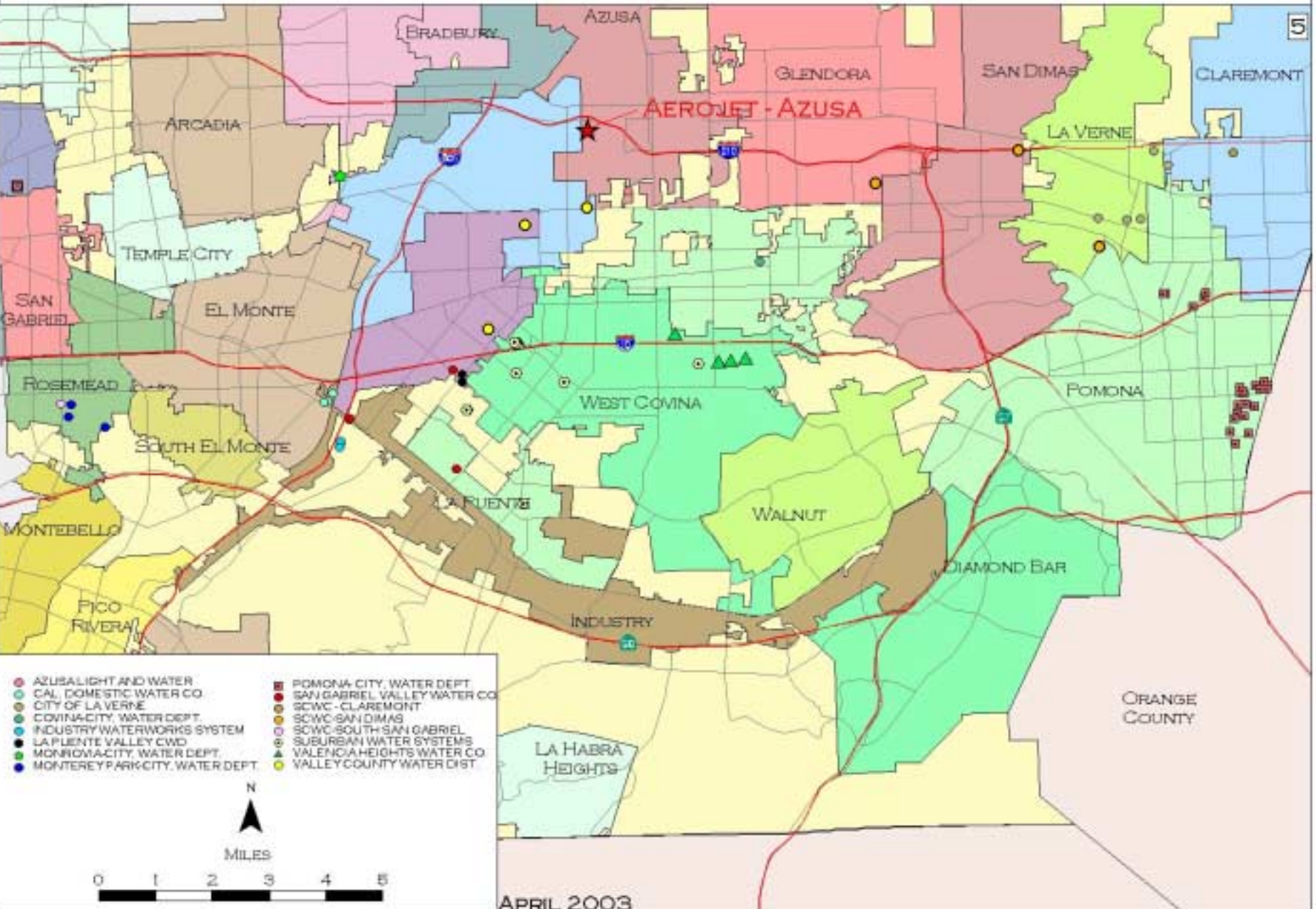
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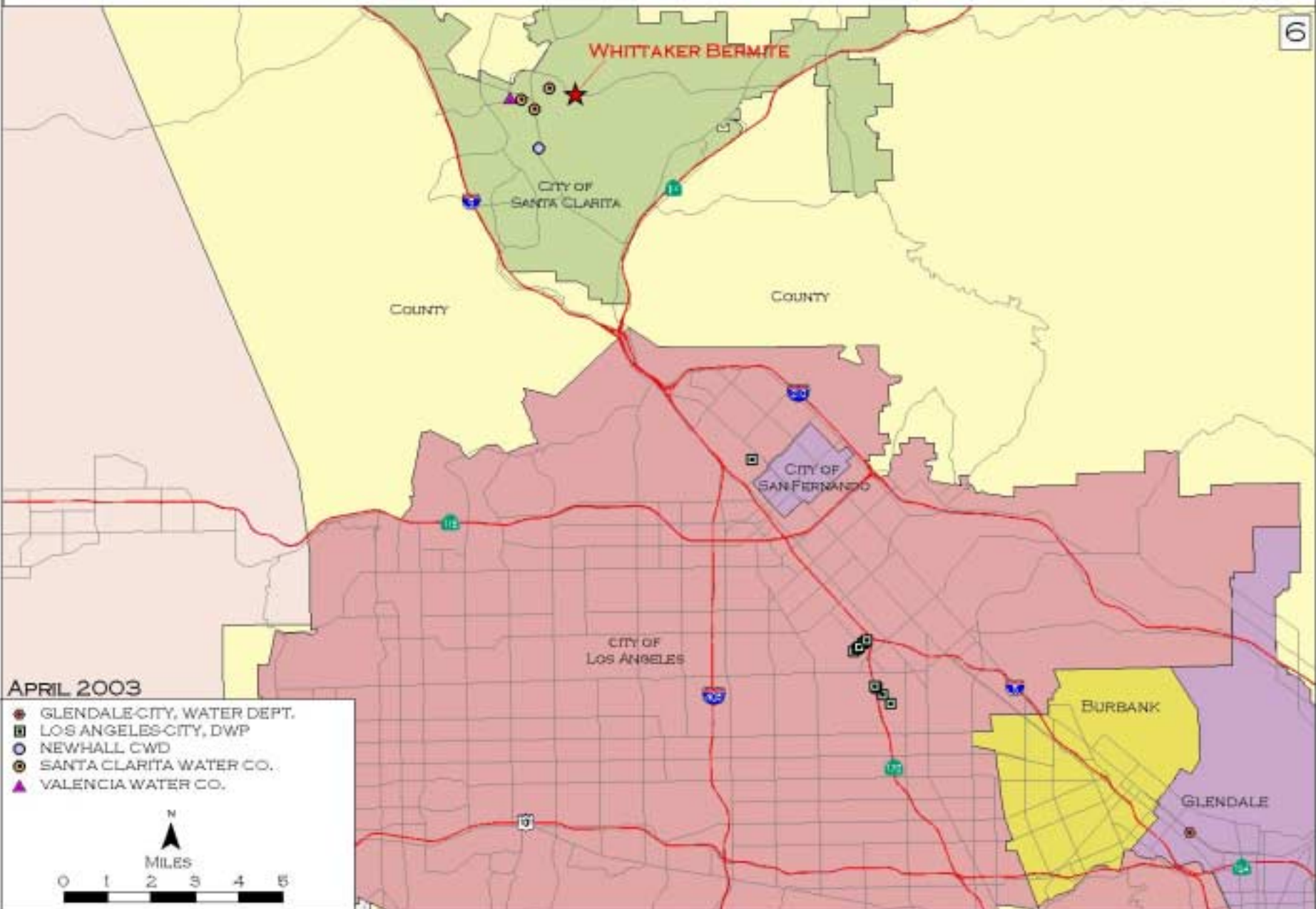
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IMPACTED DRINKING WATER SOURCES IN THE SAN GABRIEL AND POMONA VALLEYS



IMPACTED DRINKING WATER SOURCES IN THE SANTA CLARITA AND SAN FERNANDO VALLEYS



APRIL 2003

- GLENDALE-CITY, WATER DEPT.
- LOS ANGELES-CITY, DWP
- NEWHALL CWD
- ⊙ SANTA CLARITA WATER CO.
- ▲ VALENCIA WATER CO.



MILES

