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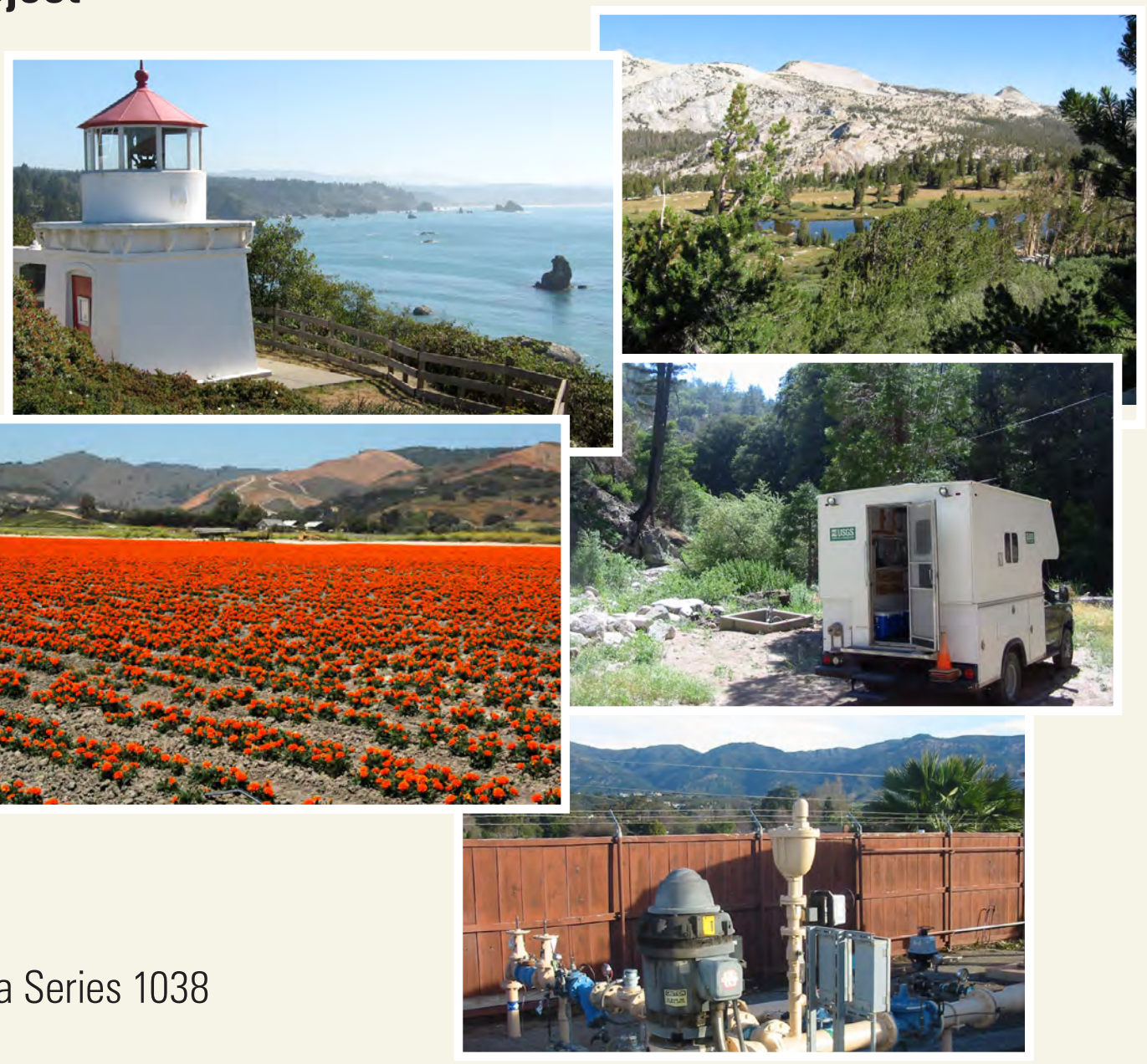
Prepared in cooperation with the California State Water Resources Control Board
A product of the California Groundwater Ambient Monitoring and Assessment (GAMA) Program

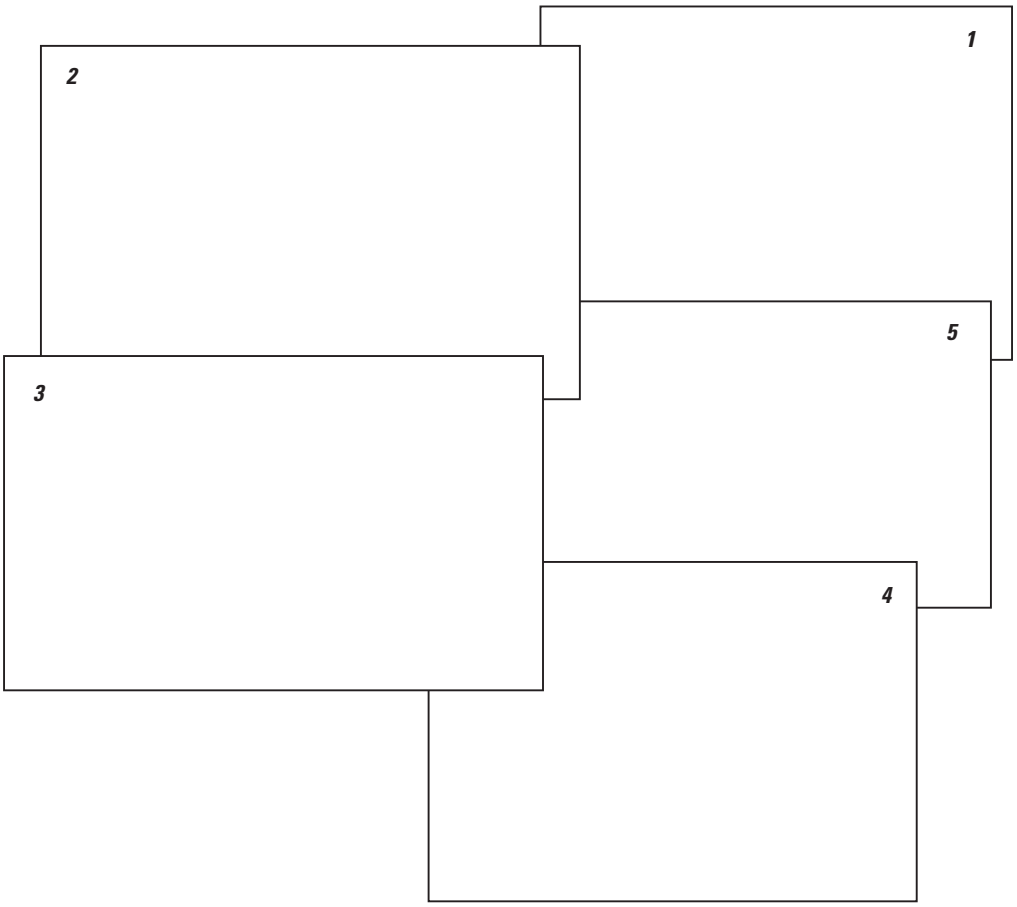
Groundwater-Quality Data in 12 GAMA Study Units: Results from the 2006–10 Initial Sampling Period and the 2008–13 Trend Sampling Period, California GAMA Priority Basin Project



Data Series 1038

U.S. Department of the Interior
U.S. Geological Survey

Cover photographs



Cover. **1.** View near Tuolumne Meadows in Yosemite National Park, California. (Photograph taken by George Bennett V, U.S. Geological Survey.)

2. Trinidad Head Memorial, Trinidad, California. (Photograph taken by George Bennett V, U.S. Geological Survey.)

3. Marigold farm near Lompoc, California. (Photograph taken by Cathy Munday, U.S. Geological Survey.)

4. Well facing Santa Ynez Mountains, California. (Photograph taken by Carmen Burton, U.S. Geological Survey.)

5. Well near Lake Arrowhead, California. (Photograph taken by Tracy Davis, U.S. Geological Survey.)

Groundwater-Quality Data in 12 GAMA Study Units: Results from the 2006–10 Initial Sampling Period and the 2008–13 Trend Sampling Period, California GAMA Priority Basin Project

By Timothy M. Mathany

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U.S. Department of the Interior
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U.S. Geological Survey
William H. Werkheiser, Acting Director

U.S. Geological Survey, Reston, Virginia: 2017

Suggested citation:
Mathany, T.M., 2017, Groundwater-quality data in 12 GAMA study units: Results from the 2006–10 initial sampling period and the 2008–13 trend sampling period, California GAMA Priority Basin Project: U.S. Geological Survey Data Series Report 1038, 140 p., http://dx.doi.org/10.3133/ds1038.

ISSN 2327-638X (online)

Acknowledgments

The authors thank the following cooperators for their support: the California State Water Resources Control Board, California Department of Public Health, California Department of Water Resources, and Lawrence Livermore National Laboratory. In addition, we especially thank the site owners and water purveyors for allowing the U.S. Geological Survey to collect samples from their sites.

Contents

Contents—Continued

Figures

Figures—Continued

Tables

Tables—Continued

Conversion Factors, Datums, Abbreviations, and Acronyms

Conversion Factors

International System of Units to U.S. customary units

Multiply	By	To obtain
	Length	
meter (m)	3.281	foot (ft)
	Area	
hectare (ha)	0.003861	square mile (mi^2)
square kilometer (km^2)	0.3861	square mile (mi^2)
	Volume	
liter (L)	33.81402	ounce, fluid (fl oz)
liter (L)	2.113	pint (pt)
liter (L)	1.057	quart (qt)
liter (L)	0.2642	gallon (gal)
	Mass	
kilogram (kg)	2.205	pound avoirdupois (lb)
	Radioactivity	
becquerel per liter (Bq/L)	27.027	picocurie per liter (pCi/L)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32.$$

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25°C).

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (µg/L) or nanograms per liter (ng/L). One milligram per liter is equivalent to 1 part per million (ppm); 1 microgram per liter is equivalent to 1 part per billion (ppb); 1 nanogram per liter (ng/L) is equivalent to 1 part per trillion (ppt).

Isotopic constituents are given in delta notation (δE) as the ratio of a heavier isotope of an element (^{i}E) relative to the more common lighter isotope of that element, relative to the ratio for a standard reference material, expressed as per mil; 1 per mil is equivalent to 1 part per thousand.

Datum

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Abbreviations and Acronyms

AL-US	U.S. Environmental Protection Agency action level
CDPH	California Department of Public Health
CDPR	California Department of Pesticide Regulation
CDWR	California Department of Water Resources
CSU	combined standard uncertainty
DDW	Division of Drinking Water (SWRCB, California)
EPA	U.S. Environmental Protection Agency
GAMA	Groundwater Ambient Monitoring and Assessment Program
HAL-US	U.S. Environmental Protection Agency lifetime health advisory level
LLNL	Lawrence Livermore National Laboratory, Livermore, California
LRL	laboratory reporting level
LT-MDL	long-term method detection level
MCL-CA	State of California maximum contaminant level
MCL-US	U.S. Environmental Protection Agency maximum contaminant level
MDL	method detection limit
MRL	minimum reporting level
MWH	Montgomery Watson Harza Laboratory, Monrovia, California
NAWQA	National Water-Quality Assessment Program (USGS)
NFM	National Field Manual (USGS)
NL-CA	State of California notification level
NWIS	National Water Information System (USGS)
NWQL	National Water Quality Laboratory, Denver, Colorado (USGS)
PBP	Priority Basin Project
pmc	percent modern carbon
QA	quality assurance
QC	quality control
RSD	relative standard deviation
RSD5-US	U.S. Environmental Protection Agency risk-specific dose at a risk factor of 10^{-5}
SMCL-CA	State of California secondary maximum contaminant level
SMCL-US	U.S. Environmental Protection Agency secondary maximum contaminant level
SRL	study reporting level
SWRCB	State Water Resources Control Board (California)
USGS	U.S. Geological Survey
Weck	Weck Laboratories, Inc., City of Industry, California

Site Identifier Prefixes

BEAR	Bear Valley–Lake Arrowhead Watershed study unit
BEAR-G	Lake Arrowhead Watershed study area of the BEAR study unit
BEAR-S	Bear Valley study area of the BEAR study unit
CAMP	Cascade Range–Modoc Plateau study unit
CAMP-ES	Sacramento Valley Eastside study area of the CAMP study unit
CAMP-HL	Honey Lake study area of the CAMP study unit
CAMP-LU	Cascade Range and Modoc Plateau Low-Use Basins study area of the CAMP study unit
CAMP-QV	Quaternary Volcanic Areas study area of the CAMP study unit
CAMP-SH	Shasta Valley and Mount Shasta Volcanic Area study area of the CAMP study unit
CAMP-TV	Tertiary Volcanic Areas study area of the CAMP study unit
CENSIE	Central Sierra study unit
CGOLD	Central Sierra Coarse Gold study area of the CENSIE study unit
CUY	Cuyama study area of the SCI study unit
GIL	Gilroy study area of the SCI study unit
KLAM	Klamath Mountains study unit
LIV	Livermore study area of the SCI study unit
NOCO	Northern Coast Ranges study unit
NOCO-CO	Coastal Basins study area of the NOCO study unit
NOCO-IN	Interior Basins study area of the NOCO study unit
SB	Santa Barbara study unit
SCRC	Southern Coast Range–Coastal study unit
SCRC-B	Basins study area of the SCRC study unit
SCRC-H	Uplands study area of the SCRC study unit
SFBAY	San Francisco Bay study unit
SCI	Southern Coast Range–Interior Basins study unit
SIERRA	Sierra Nevada Regional study unit
SIERRA-G	primary grid site in granitic rocks of the SIERRA study unit
SIERRA-M	primary grid site in metamorphic rocks of the SIERRA study unit
SIERRA-S	primary grid site in sedimentary deposits of the SIERRA study unit
SIERRA-V	primary grid site in volcanic rocks of the SIERRA study unit
SOSA	Southern Sierra study unit
TAHOE	Tahoe–Martis study unit
TMART	Martis study area of the TAHOE study unit
TTAHO	Tahoe study area of the TAHOE study unit

Selected Chemical Names

DBCP	1,2-dibromo-3-chloropropane
EDB	1,2-dibromoethane
PCE	perchloroethene, tetrachloroethene
1,2,3-TCP	1,2,3-trichloropropane
TDS	total dissolved solids
VOC	volatile organic compound

Groundwater-Quality Data in 12 GAMA Study Units: Results from the 2006–10 Initial Sampling Period and the 2008–13 Trend Sampling Period, California GAMA Priority Basin Project

By Timothy M. Mathany

Abstract

The Priority Basin Project (PBP) of the Groundwater Ambient Monitoring and Assessment (GAMA) program was developed in response to the Groundwater Quality Monitoring Act of 2001 and is being conducted by the U.S. Geological Survey in cooperation with the California State Water Resources Control Board. From 2004 through 2012, the GAMA-PBP collected samples and assessed the quality of groundwater resources that supply public drinking water in 35 study units across the State. Selected sites in each study unit were sampled again approximately 3 years after initial sampling as part of an assessment of temporal trends in water quality by the GAMA-PBP. Twelve of the study units, initially sampled during 2006–11 (initial sampling period) and sampled a second time during 2008–13 (trend sampling period) to assess temporal trends, are the subject of this report.

The initial sampling was designed to provide a spatially unbiased assessment of the quality of untreated groundwater used for public water supplies in the 12 study units. In these study units, 550 sampling sites were selected by using a spatially distributed, randomized, grid-based method to provide spatially unbiased representation of the areas assessed (grid sites, also called "status sites"). After the initial sampling period, 76 of the previously sampled status sites (approximately 10 percent in each study unit) were randomly selected for trend sampling ("trend sites"). The 12 study units sampled both during the initial sampling and during the trend sampling period were distributed among 6 hydrogeologic provinces: Coastal (Northern and Southern), Transverse Ranges and Selected Peninsular Ranges, Klamath, Modoc Plateau and Cascades, and Sierra Nevada Hydrogeologic Provinces. For the purposes of this trend report, the six hydrogeologic provinces were grouped into two hydrogeologic regions based on location: Coastal and Mountain.

The groundwater samples were analyzed for a number of synthetic organic constituents (volatile organic compounds, pesticides, and pesticide degradates), constituents of special interest (perchlorate and 1,2,3-trichloropropane), and natural inorganic constituents (nutrients, major and minor ions, and trace elements). Isotopic tracers (tritium, carbon-14, and stable isotopes of hydrogen and oxygen in water) also were measured to help identify processes affecting groundwater quality and the sources and ages of the sampled groundwater. More than 200 constituents and water-quality indicators were measured during the trend sampling period.

Quality-control samples (blanks, replicates, matrix-spikes, and surrogate compounds) were collected at about one-third of the trend sites, and the results for these samples were used to evaluate the quality of the data for the groundwater samples. On the basis of detections in laboratory and field blank samples collected by GAMA-PBP study units, including the 12 study units presented here, reporting levels for some groundwater results were adjusted in this report. Differences between replicate samples were mostly within acceptable ranges, indicating low variability in analytical results. Matrix-spike recoveries were largely within the acceptable range (70 to 130 percent).

This study did not attempt to evaluate the quality of water delivered to consumers. After withdrawal, groundwater used for drinking water typically is treated, disinfected, and blended with other waters to achieve acceptable water quality. The comparison benchmarks used in this report apply to treated water that is served to the consumer, not to untreated groundwater. To provide some context for the results, however, concentrations of constituents measured in these groundwater samples were compared with benchmarks established by the U.S. Environmental Protection Agency and the State of California. Comparisons between data collected for this study and benchmarks for drinking water are for illustrative purposes only and are not indicative of compliance or non-compliance with those benchmarks.

Most organic constituents that were detected in groundwater samples from the trend sites were found at concentrations less than health-based benchmarks. One volatile organic compound—perchloroethene—was detected at a concentration greater than the health-based benchmark in samples from one trend site during the initial and trend sampling periods. Chloroform was detected in at least 10 percent of the samples at trend sites in both sampling periods. Methyl *tert*-butyl ether was detected in samples from more than 10 percent of the trend sites during the initial sampling period. No pesticide or pesticide degradate was detected in greater than 10 percent of the samples from trend sites or at concentrations greater than their health-based benchmarks during either sampling period. Nutrients were not detected at concentrations greater than their health-based benchmarks during either sampling period.

Most detections of major ions and trace elements in samples from trend sites were less than health-based benchmarks during both sampling periods. Arsenic and boron each were detected at concentrations greater than the health-based benchmark in samples from four trend sites during the initial and trend sampling periods. Molybdenum was detected in samples from four trend sites at concentrations greater than the health-based benchmark during both sampling periods. Samples from two of these trend sites had similar molybdenum concentrations, and two had substantially different concentrations during the initial and trend sampling periods. Uranium was detected at a concentration greater than the health-based benchmark only at two trend sites.

Introduction

Groundwater composes approximately half of the water used for public and domestic drinking-water supply in California (Maupin and others, 2014). To assess the quality of ambient groundwater in aquifers used for drinking-water supply and to establish a baseline groundwater-quality monitoring program, the California State Water Resources Control Board (SWRCB), in collaboration with the U.S. Geological Survey (USGS) and Lawrence Livermore National Laboratory (LLNL), implemented the Groundwater Ambient Monitoring and Assessment (GAMA) Program (http://www.waterboards.ca.gov/gama/). The SWRCB initiated the GAMA Program in 2000 in response to legislative mandates (State of California, 1999, 2001a). Funding for this work was provided by State of California bonds authorized by Proposition 50 and administered by the SWRCB. The program consists of four projects: (1) the GAMA Priority Basin Project (GAMA-PBP), carried out by the USGS (http://ca.water.usgs.gov/gama/); (2) the GAMA Domestic Well Project, carried out by the SWRCB; (3) the GAMA Special Studies, carried out by the LLNL; and (4) the GeoTracker GAMA on-line groundwater information system, led by the SWRCB (http://geotracker.waterboards.ca.gov/gama/). The SWRCB GeoTracker GAMA database and the USGS National Water Information System (NWIS) database (http://nwis.waterdata.usgs.gov/ca/nwis/qwdata) store all published and quality-assurance/quality-control (QA/QC) approved analytical data collected for the GAMA Program. The SWRCB GeoTracker database also stores groundwater-quality data and related reports collected by other State agencies, such as the California Department of Public Health (CDPH), California Department of Water Resources (CDWR), and California Department of Pesticide Regulation (CDPR), and data collected by the SWRCB and Regional Boards from environmental monitoring wells at contaminated and remediated sites. For the GAMA Domestic Well Project, SWRCB sampled private domestic wells on a voluntary, first-come-first-serve basis in six counties between 2002 and 2011. From 2004 through 2012, the GAMA Priority Basin Project assessed the water-quality of groundwater resources used for public drinking water. The groundwater resources used for public drinking-water supplies typically are deeper than the groundwater resources used for domestic drinking-water supplies. In 2012, the GAMA Priority Basin Project began water-quality assessments of shallow aquifers, the groundwater resources typically used for private domestic and small-system drinking-water supplies.

The GAMA Priority Basin Project was initiated in response to the Groundwater Quality Monitoring Act of 2001 to assess and monitor the quality of groundwater in California, to help gain a better understanding of and identify risks to groundwater resources, and to increase the availability of information about groundwater quality to the public (State of California, 2001b). The USGS, in collaboration with the SWRCB, developed a monitoring plan to assess groundwater basins through statistically reliable sampling approaches (Belitz and others, 2003; California State Water Resources Control Board, 2003). Additional partners in the GAMA-PBP include the CDPH, CDPR, CDWR, and local water agencies and well owners (Kulongoski and Belitz, 2004). Responsibility for regulation of public-supply wells was transferred from the CDPH Drinking Water Program to the SWRCB Division of Drinking Water (DDW) on July 1, 2014.

The range of hydrologic, geologic, and climatic conditions in California were considered in this statewide assessment of groundwater quality. Belitz and others (2003) partitioned the State into 10 hydrogeologic provinces, each with distinctive hydrologic, geologic, and climatic characteristics (fig. 1). These 10 hydrogeologic provinces include groundwater basins designated by the CDWR (California Department of Water Resources, 2003).

Groundwater basins in California generally consist of relatively permeable, unconsolidated deposits of alluvial origin. Of California's approximately 16,000 active and standby public-supply groundwater sources (wells and springs) listed in the statewide database maintained by the SWRCB (DDW sites), 80 percent are in CDWR-designated groundwater basins (Belitz and others, 2003). Of the DDW sites, 20 percent are in areas composed of igneous, metamorphic, or volcanic rocks, rather than in alluvial basins. Groundwater basins were prioritized for sampling on the basis of the number of DDW sites in the basin, with secondary consideration given to municipal groundwater use, agricultural pumping, the number of historically leaking underground fuel tanks, and the number of square-mile sections having registered pesticide applications (Belitz and others, 2003). Of the 472 CDWR-designated basins, 116 basins contain approximately 95 percent of DDW sites in CDWR-designated groundwater basins and were defined as "priority" basins (Belitz and others, 2003). The remaining 356 basins were defined as "low-use" basins. All of the priority basins, selected low-use basins, and selected areas outside of basins were grouped into 35 GAMA-PBP study units that together represent approximately 95 percent of all DDW sites.

The goal of the GAMA Priority Basin Project is to produce three types of water-quality assessments for each study unit: (1) "status," assessment of the current quality of the groundwater resource; (2) "understanding," identification of the natural and human factors affecting groundwater quality and explanation of the relations between water quality and selected explanatory factors; and (3) "trends," detection of changes in groundwater quality over time (Kulongoski and Belitz, 2004). These three objectives were modeled after those of the USGS National Water Quality Assessment (NAWQA) Program (Hirsch and others, 1988). The assessments are intended to characterize the quality of groundwater resources within the study units used for public drinking water, not the treated drinking water delivered to consumers by water purveyors. The parts of the aquifer systems in a study unit used for public drinking water are defined by springs and the depths of the perforations or open intervals of the wells listed in the DDW database of public-supply groundwater sources for the study unit. The database includes springs and wells from systems that serve 25 or more people or have 15 or more service connections; these systems are classified as either community (such as those in cities, towns, and mobile-home parks); non-transient, non-community (such as those in schools, workplaces, and restaurants); or transient, non-community (such as those in campgrounds and parks; California State Water Resources Control Board, 2016). The quality of groundwater in shallower or deeper water-bearing zones can differ from that in the primary aquifer system. Shallower groundwater can be more vulnerable to contamination from the land surface and from near-surface processes.

Purpose and Scope

This report presents water-quality data collected in 12 GAMA-PBP study units at sites that were initially sampled between May 2006 and February 2011 and then were sampled again approximately 3 years after initial sampling between June 2008 and December 2013 to evaluate temporal trends (table 1).

Data for additional parameters, evaluations of the QC data, and detailed descriptions of the study units can be found in published USGS data series reports for each study unit (table 2). Discussion of the constituents detected in groundwater samples and factors influencing their distribution in each study unit can be found in published USGS scientific investigation reports for each study unit (table 2).

The purposes of this report are (1) to describe the study design and study methods, (2) to present the results of QC measurements, and (3) to present the water-quality data from the initial and trend sampling periods that are suitable for an assessment of trends in 12 GAMA study units (fig. 1). Groundwater samples were analyzed for field parameters, organic and inorganic constituents, and chemical tracers of groundwater source and age. The data presented in this report were evaluated by comparison to State and Federal drinking-water standards. The health-based and non-health-based benchmarks used in this report are those established by the U.S. Environmental Protection Agency (EPA) and the State of California. The data presented in this report are intended to characterize the quality of untreated groundwater resources in the 12 study units and to provide a basis to evaluate changes in the groundwater quality over time.

Study Units

The 12 GAMA-PBP study units discussed in this report are grouped into two hydrogeologic regions in this report: coastal and mountain. Within each region, the study units are presented in the chronological order in which they were initially sampled by the GAMA-PBP. Information about the hydrogeologic settings of the 12 GAMA-PBP study units, along with descriptions of data collection and analytical results from the initial sampling period, can be found in published USGS data series and scientific investigations reports for the study units (table 2). In the following subsections of this report, brief introductions are presented that include the general location and areal extent of each study unit, how it was divided into study areas, the number of sites that were initially sampled, and the number of trend sites that were sampled in the trend sampling period. Initial sampling of each study unit included "status" sites (selected by using a spatially distributed, randomized, grid-based method to provide statistical representation of the areas assessed) and "understanding" sites (sampled to aid in the understanding of aquifer-system flow and related groundwater-quality issues).

Figure 1. Hydrogeologic provinces of California and the locations of the 12 Groundwater Ambient Monitoring and Assessment (GAMA) study units featured in this report.

Trend sites were selected from among the status sites. In some study units, sites available for sampling were scarce or unevenly distributed. In these study units, circular buffer areas were drawn around each available site to delineate the area used to characterize groundwater quality to obtain the desired sampling density. As a result, the sampled area was smaller than the total area of the study unit.

Coastal Region (five study units)

San Francisco Bay Study Unit

The San Francisco Bay (SFBAY) study unit is in the northern part of the Southern Coast Ranges hydrogeologic province (fig. 1) and covers approximately 620 square miles (mi^2) in San Francisco, San Mateo, Santa Clara, Alameda, and Contra Costa Counties (fig. 2). The study unit consists of a single study area and contains eight groundwater basins defined by the CDWR: Marina, Lobos, Downtown, Islais Valley, South San Francisco, Visitacion Valley, Westside, and Santa Clara Valley (California Department of Water Resources, 2003). The hydrogeologic setting of the SFBAY study unit and the primary aquifer system are described by Ray and others (2009). Originally, 43 status sites were sampled between April and June 2007. Five of the status sites (11.6 percent) were sampled as trend sites in March 2011 (table 1; fig. 2).

Southern Coast Range–Coastal Study Unit

The Southern Coast Range–Coastal (SCRC) study unit is in the southwestern part of the Southern Coast Ranges hydrogeologic province (fig. 1) and covers approximately 766 mi^2 in Santa Barbara and San Luis Obispo Counties (fig. 3). The SCRC study unit includes five CDWR-defined groundwater basins: Los Osos Valley, San Luis Obispo, Santa Maria River Valley, San Antonio Creek Valley, and Santa Ynez River Valley (California Department of Water Resources, 2003). The study unit was separated into two study areas (Basins and Uplands) based on lithological differences between the alluvial and terrace deposits found in the five groundwater basins and upland areas around the basins. The hydrogeologic settings of the SCRC study unit, the primary aquifer systems, and the study areas are described by Mathany and others (2010). Originally, 55 status sites were sampled between May and December 2008; six of the status sites (10.9 percent) were sampled as trend sites in June 2012 (table 1); four in the Basins study area and two in the Uplands study area (fig. 3).

Southern Coast Range–Interior Basins Study Unit

The Southern Coast Range–Interior Basins (SCI) study unit includes selected inland valleys of the Southern Coast Ranges hydrogeologic province (fig. 1) and covers approximately 653 mi^2 in Alameda, Contra Costa, Santa Clara, San Benito, Santa Barbara, San Luis Obispo, Ventura, and Kern Counties (fig. 4). The SCI study unit includes 11 CDWR-defined groundwater basins and subbasins (California Department of Water Resources, 2003). The study unit was divided into three, non-contiguous study areas (Livermore, Gilroy, and Cuyama) based on inland valley location (figs. 4*A*–*C*). The hydrogeologic settings of the SCI study unit, the primary aquifer systems, and the study areas are described by Mathany and others (2009). Originally, 35 status sites were sampled between August and December 2008. Five of the status sites (11.3 percent) were sampled as trend sites in September 2012 (table 1): one in the Livermore study area and two each in the Gilroy and Cuyama study areas (figs. 4*A*–*C*).

Northern Coast Ranges Study Unit

The Northern Coast Ranges (NOCO) study unit is in the Northern Coast Ranges hydrogeologic province (fig. 1) and covers approximately 633 mi^2 in Napa, Sonoma, Colusa, Lake, Mendocino, Glenn, Humboldt, and Del Norte Counties (fig. 5). The NOCO study unit includes 34 CDWR-defined groundwater basins and subbasins (California Department of Water Resources, 2003). The study unit was divided into two study areas (Interior Basins and Coastal Basins) based on proximity to the Pacific Ocean (figs. 5*A*, *B*). The hydrogeologic settings of the NOCO study unit, the primary aquifer systems, and the study areas are described by Mathany and others (2011). Originally, 58 status sites were sampled between June and November 2009. Eight of the status sites (13.9 percent) were sampled as trend sites in May 2012 (table 1): three in the Interior Basins study area and five in the Coastal Basins study area (figs. 5*A*, *B*).

Santa Barbara Study Unit

The Santa Barbara (SB) study unit is in the western part of the Transverse Ranges and Selected Peninsular Ranges hydrogeologic province (fig. 1) and covers approximately 48 mi^2 in Santa Barbara and Ventura Counties (fig. 6). The SB study unit consists of a single study area that includes five CDWR-defined groundwater basins and subbasins: Goleta, Foothill, Santa Barbara, Montecito, and Carpinteria (California Department of Water Resources, 2003). The hydrogeologic setting of the SB study unit and the primary aquifer system are described by Davis and others (2013). Originally, 18 status sites were sampled between January and February 2011. Two of the status sites (11.1 percent) were sampled as trend sites in December 2013 (table 1; fig. 6).

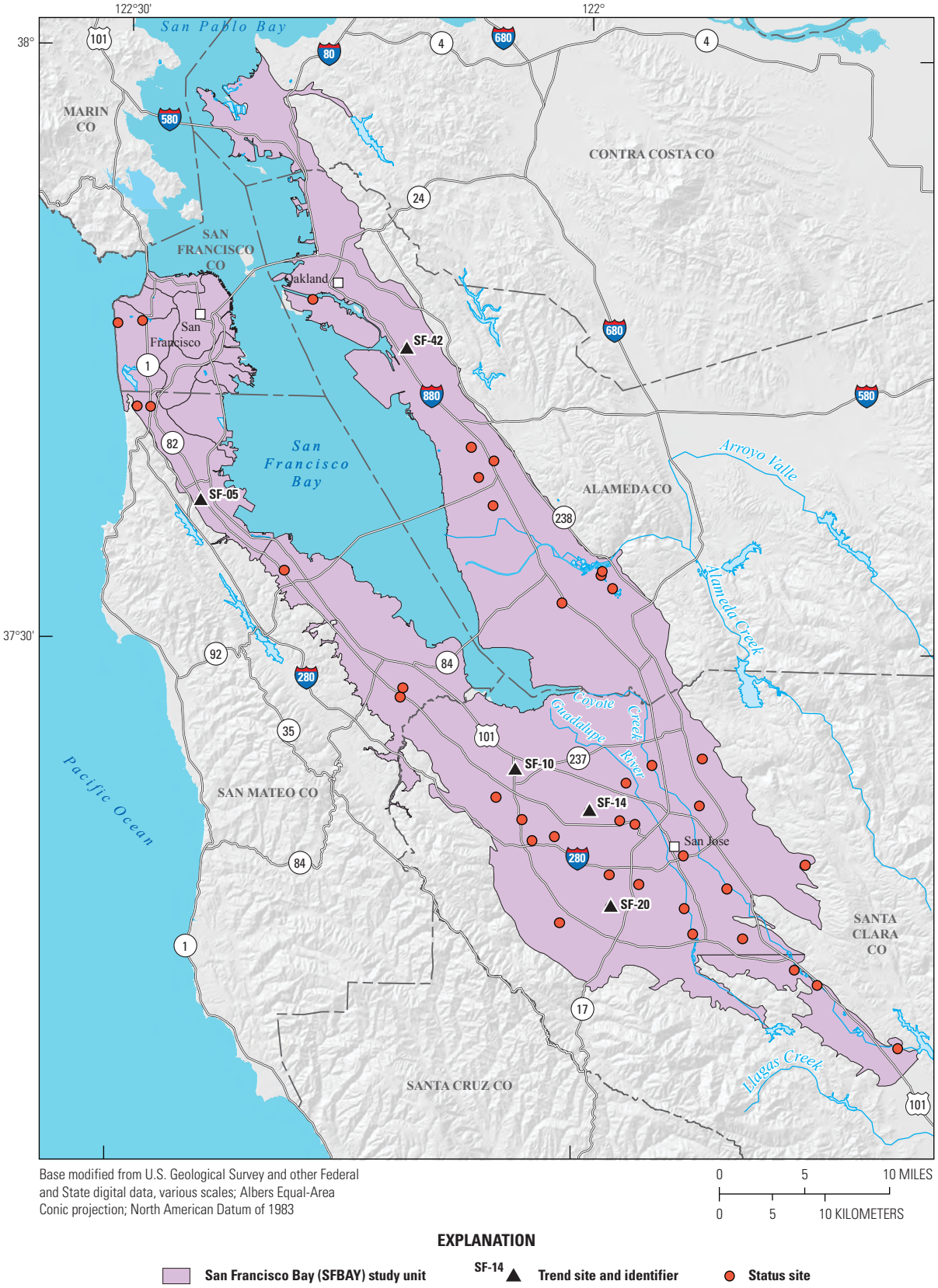

Figure 2. San Francisco Bay Groundwater Ambient Monitoring and Assessment (GAMA) study unit status sites and trend sites.

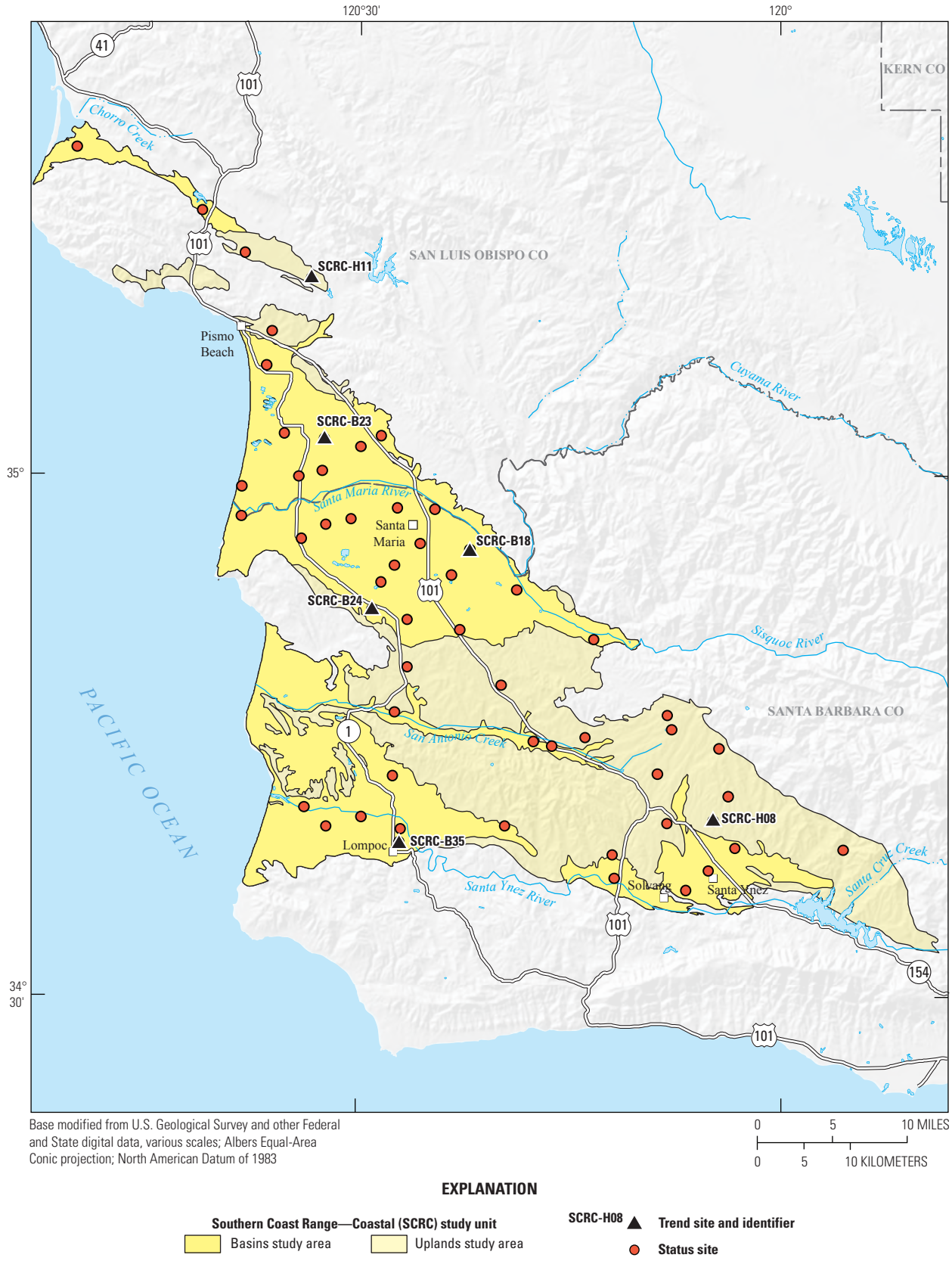

Figure 3. Southern Coast Range–Coastal Groundwater Ambient Monitoring and Assessment (GAMA) study unit study areas, status sites, and trend sites.

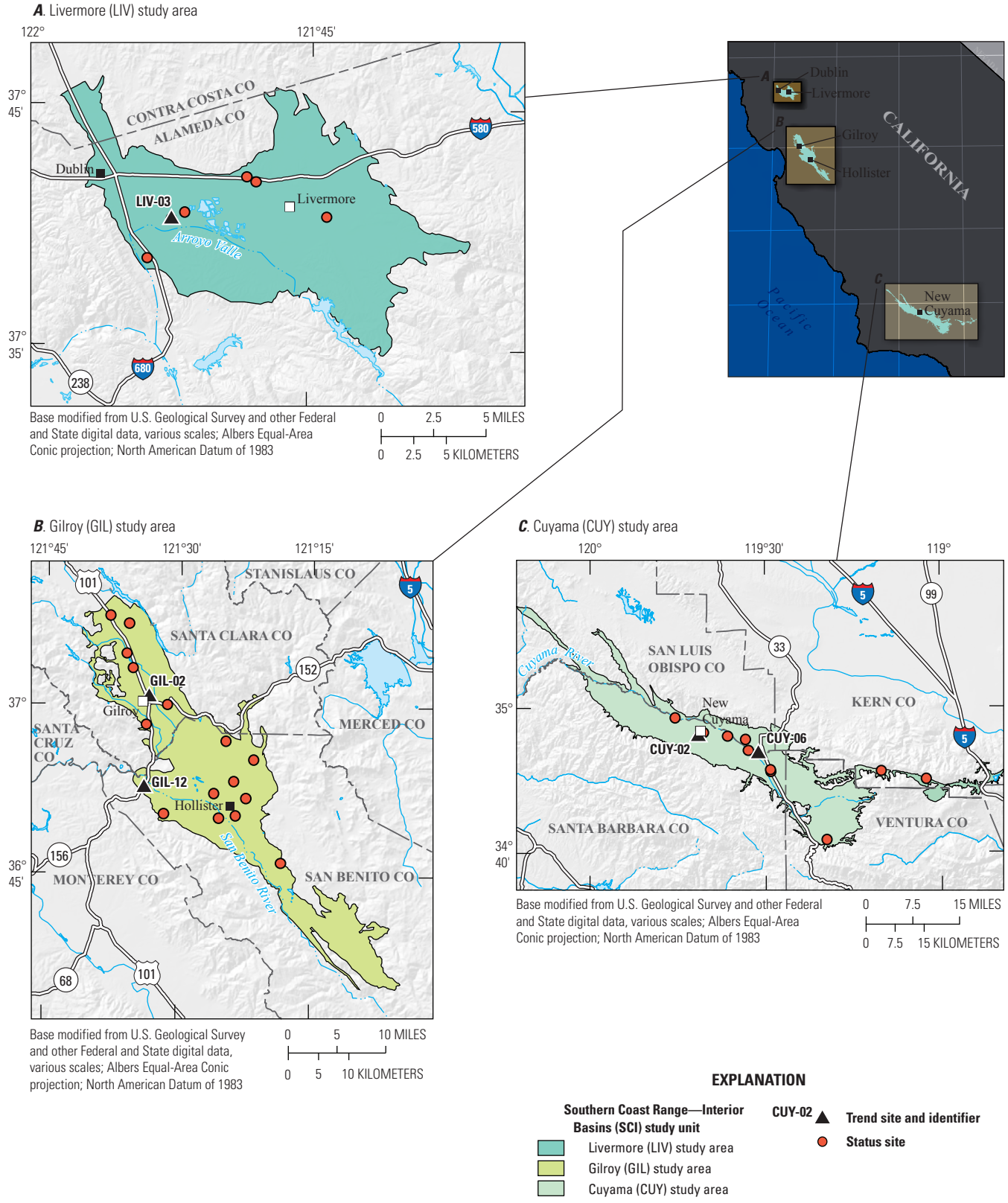

Figure 4. Southern Coast Range–Interior Basins Groundwater Ambient Monitoring and Assessment (GAMA) study unit study areas, status sites, and trend sites: *A*, Livermore study area; *B*, Gilroy study area; and *C*, Cuyama study area.

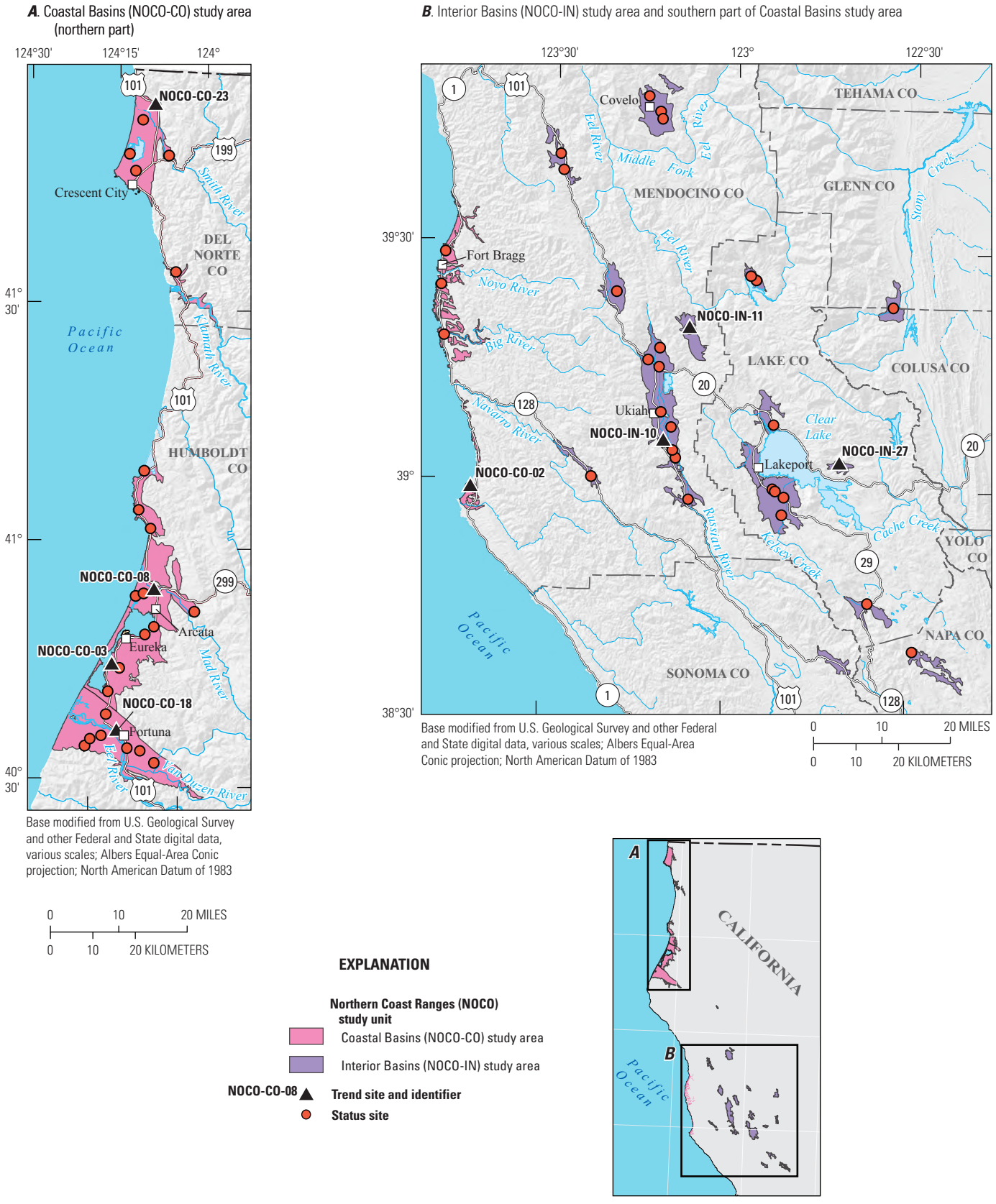

Figure 5. Northern Coast Ranges Groundwater Ambient Monitoring and Assessment (GAMA) study unit status sites and trend sites in *A*, the Interior Basins study area, and *B*, the Coastal Basins study area.

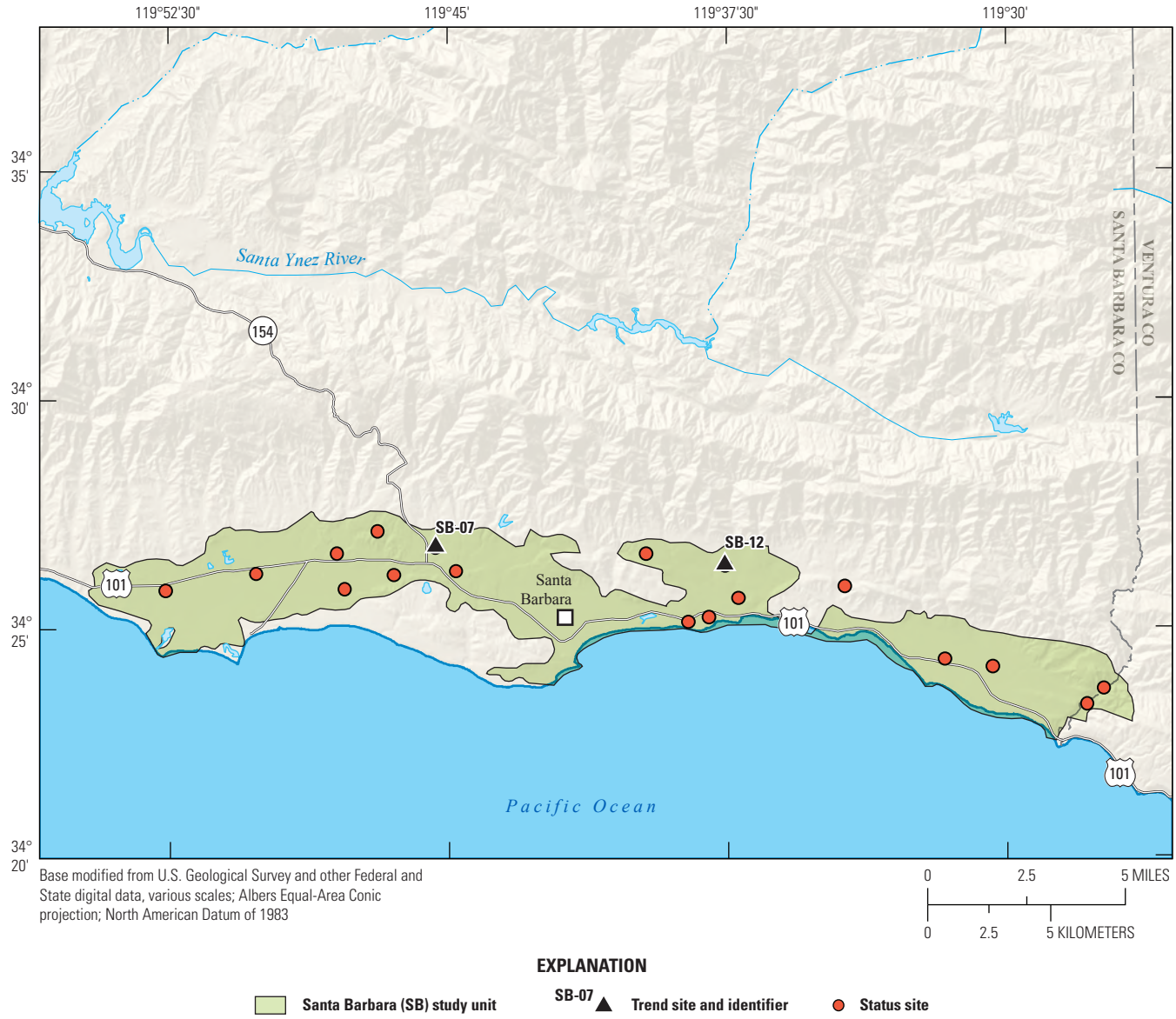

Figure 6. Santa Barbara Groundwater Ambient Monitoring and Assessment (GAMA) study unit status sites and trend sites.

Mountain Region (seven study units)

Central Sierra Study Unit

The Central Sierra (CENSIE) study unit is in the central part of the Sierra Nevada hydrogeologic province (fig. 1) and covers approximately 950 mi^2 in Madera and Mariposa Counties (fig. 7). Unlike most of the other 35 GAMA study units, the CENSIE study unit is not composed of groundwater basins defined by the CDWR. The study unit is defined by the watershed boundaries of the Fresno River and the North Fork Willow Creek and consists of two study areas (Coarse Gold and Wishon; fig. 7). The hydrogeologic settings of the CENSIE study unit, the primary aquifer systems, and the study areas are described by Ferrari and others (2008). Originally, 27 status sites were sampled in May 2006. Three of the status sites (11.1 percent) were sampled as trend sites between May and June 2010 (table 1): two in the Coarse Gold study area and one in the Wishon study area (fig. 7).

Southern Sierra Study Unit

The Southern Sierra (SOSA) study unit is in the southern part of the Sierra Nevada hydrogeologic province (fig. 1) and covers approximately 1,800 mi^2 in Kern and Tulare Counties (fig. 8). The SOSA study unit consists of one study area and includes five CDWR-defined groundwater basins: Cummings Valley, Brite Valley, Tehachapi Valley West, Tehachapi Valley East, and Kern River Valley (California Department of Water Resources, 2003). The hydrogeologic setting of the SOSA study unit and the primary aquifer system are described by Fram and Belitz (2007). Originally, 35 status sites were sampled in June 2006. Five of the status sites (14.2 percent) were sampled as trend sites between June and July 2008 (table 1; fig. 8).

Tahoe–Martis Study Unit

The Tahoe–Martis (TAHOE) study unit is in the northern part of the Sierra Nevada hydrogeologic province (fig. 1) and covers approximately 460 mi^2 in El Dorado, Placer, and Nevada Counties (fig. 9). The TAHOE study unit includes five CDWR-defined groundwater basins and subbasins: Tahoe Valley and Martis Valley Basins and the Tahoe Valley North, West, and South subbasins (California Department of Water Resources, 2003). The TAHOE study unit was divided into three study areas. Two study areas, Tahoe and Martis, are based on the CDWR-defined Tahoe Valley and Martis Valley groundwater basins; the third study area, Hard Rock study area, is based on the watersheds surrounding the Tahoe and Martis Valley basins and Lake Tahoe. The hydrogeologic settings of the TAHOE study unit, the primary aquifer systems, and the study areas are described by Fram and others (2009). Originally, 41 status sites were sampled between June and September 2007. Six of the status sites (14.6 percent) were sampled as trend sites in August 2012 (table 1); two trend sites were in each of the three study areas (fig. 9).

Sierra Nevada Regional Study Unit

The Sierra Nevada Regional (SIERRA) study unit is defined by the boundaries of the Sierra Nevada hydrogeologic province (fig. 1) and covers approximately 25,550 mi^2 in Lassen, Plumas, Butte, Sierra, Yuba, Nevada, Placer, El Dorado, Amador, Alpine, Calaveras, Tuolumne, Madera, Mariposa, Fresno, Inyo, Tulare, and Kern Counties (fig. 10). The SIERRA study unit includes 22 CDWR-defined groundwater basins and 61 watersheds grouped into one study area. Unlike other study units, the SIERRA study unit primarily consists of areas not mapped as basins defined by the CDWR (California Department of Water Resources, 2003). The SIERRA study unit has two overlapping grid networks, a primary grid network, based on spatial location and a secondary grid network, based on the four major lithologic types in the Sierra Nevada Mountains (granitic, metamorphic, sedimentary, and volcanic rocks). The hydrogeologic settings of the SIERRA study unit and the primary aquifer systems are described by Shelton and others (2010). Originally, 83 sites in the SIERRA study unit were sampled between June and October 2008; 30 were status sites in the primary grid network, and 53 were status sites in a secondary lithologic grid network. Sixteen of the status sites (19.3 percent) were sampled as trend sites during August through October 2012 (table 1; fig. 10).

Bear Valley–Lake Arrowhead Watershed Study Unit

The Bear Valley–Lake Arrowhead Watershed (BEAR) study unit is in the eastern part of the Transverse Ranges and Selected Peninsular Ranges hydrogeologic province (fig. 1) and covers approximately 112 mi^2 in San Bernardino County (fig. 11). The BEAR study unit consists of two study areas: Bear Valley and Lake Arrowhead Watershed. The Bear Valley study area occupies the extent of the CDWR-defined Bear Valley groundwater basin (California Department of Water Resources, 2003). The Lake Arrowhead Watershed study area was defined by the USGS as the granitic bedrock area in the six watersheds surrounding Lake Arrowhead (U.S. Department of Agriculture, 2013). The hydrogeologic settings of the BEAR study unit, the primary aquifer systems, and the study areas are described by Mathany and Belitz (2013). Please note that the Lake Arrowhead Watershed study area was referred to as the Selected Hard Rock Areas study area in Mathany and Belitz (2013). Originally, 27 status sites were sampled between April and August 2010. Four of the status sites (14.8 percent) were sampled as trend sites in June 2013 (table 1); two were in each of the study areas (fig. 11).

Cascade Range–Modoc Plateau Study Unit

The Cascade Range–Modoc Plateau (CAMP) study unit is defined by the boundaries of the Cascade Range and Modoc Plateau hydrogeologic province (fig. 1) and covers approximately 39,000 mi^2 in Butte, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Tehama Counties (fig. 12). The CAMP study unit includes 13 CDWR-defined groundwater basins (California Department of Water Resources, 2003). The CAMP study unit was divided into six study areas: four study areas defined by CDWR-defined groundwater basins (Sacramento Valley Eastside study area, Honey Lake Valley study area, Cascade Range and Modoc Plateau Low-Use Basins study area, and Shasta Valley and Mount Shasta Volcanic Area study area) and two study areas corresponding to mapped geologic units on the State of California geologic map (Quaternary Volcanic study area and Tertiary Volcanic study area; Saucedo and others, 2000). The hydrogeologic settings of the CAMP study unit, the primary aquifer systems, and the study areas are described by Shelton and others (2013). Originally, 90 status sites were sampled between July and October 2010. Twelve of the status sites (13.3 percent) were sampled as trend sites between July and August 2013 (table 1); two were in each of the study areas.

Klamath Mountains Study Unit

The Klamath Mountains (KLAM) study unit is defined by the boundary of the Klamath Mountains hydrogeologic province (fig. 1) and covers approximately 8,800 mi^2 in Del Norte, Siskiyou, Humboldt, Trinity, Tehama, and Shasta Counties (fig. 13). The KLAM study unit includes seven CDWR-defined groundwater basins: Scott River Valley, Hayfork Valley, Hoopa Valley, Happy Camp Town Area, Seiad Valley, Hyampom Valley, and Wilson Point Area (California Department of Water Resources, 2003). The hydrogeologic setting of the KLAM study unit and the primary aquifer system are described by Mathany and Belitz (2014). Originally, 38 status sites in the KLAM study unit were sampled between October and December 2010. Four of the status sites (10.5 percent) were sampled as trend sites in October 2013 (table 1; fig. 13).

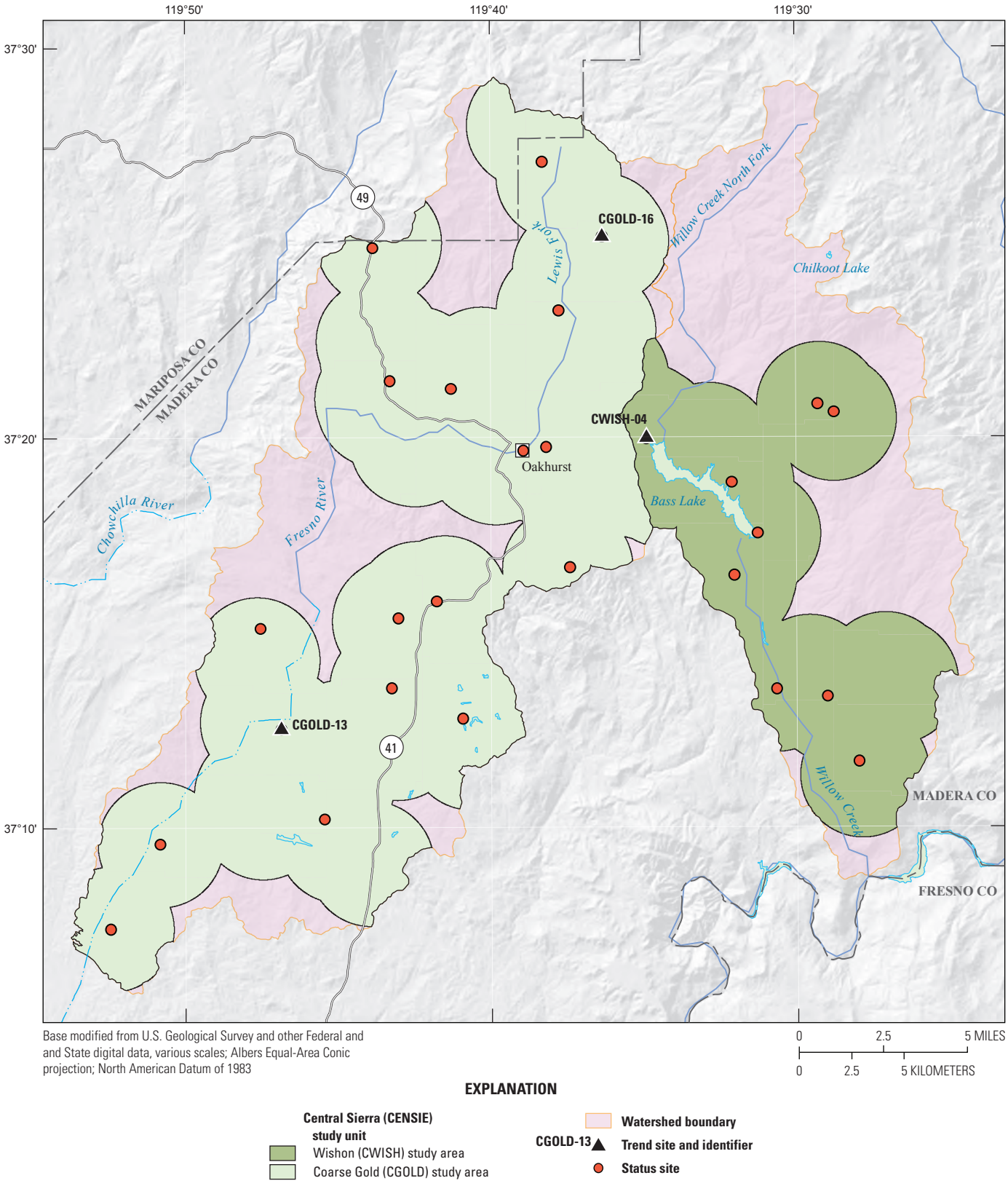

Figure 7. Central Sierra Groundwater Ambient Monitoring and Assessment (GAMA) study unit study areas, status sites, and trend sites.

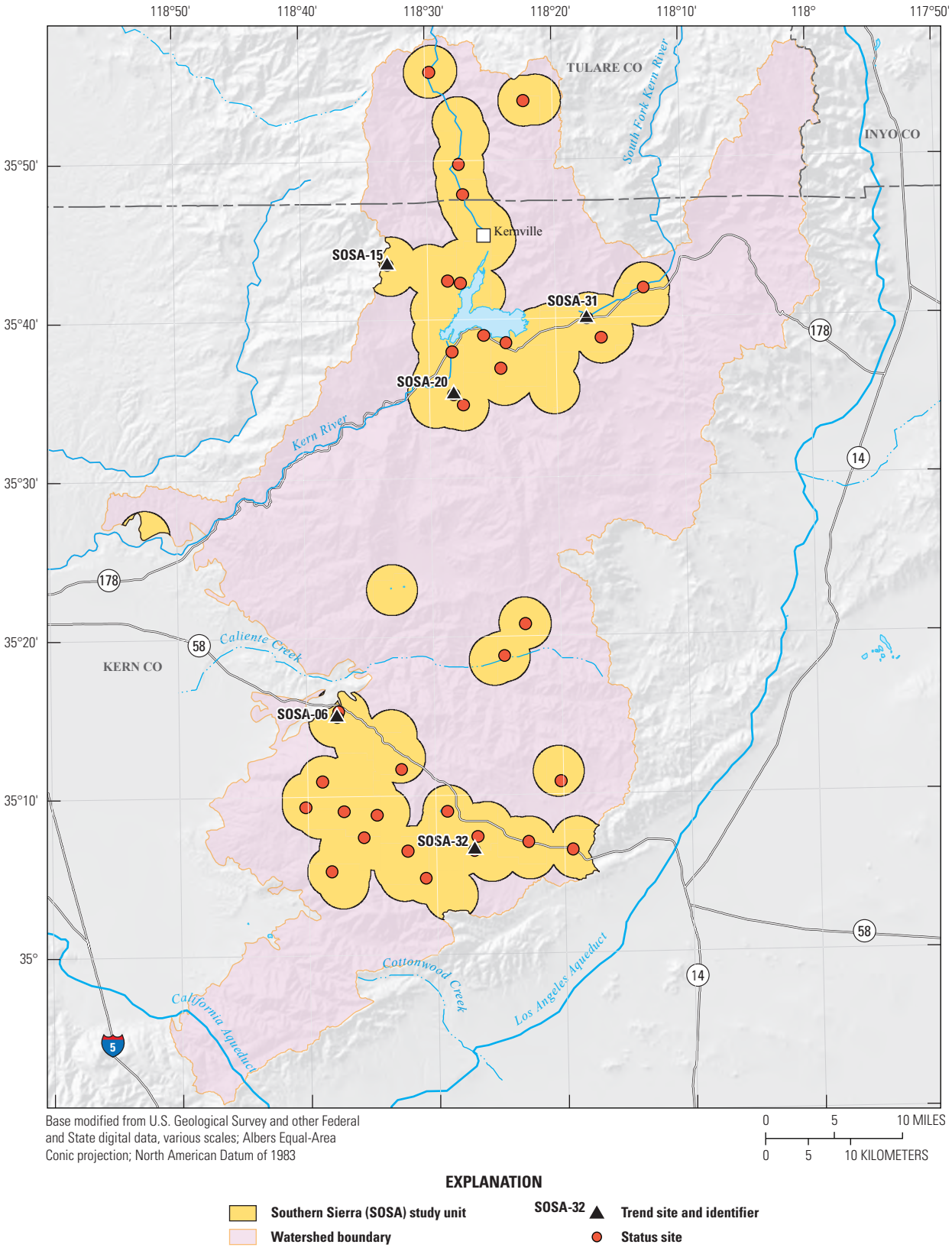

Figure 8. Southern Sierra Groundwater Ambient Monitoring and Assessment (GAMA) study unit status sites and trend sites.

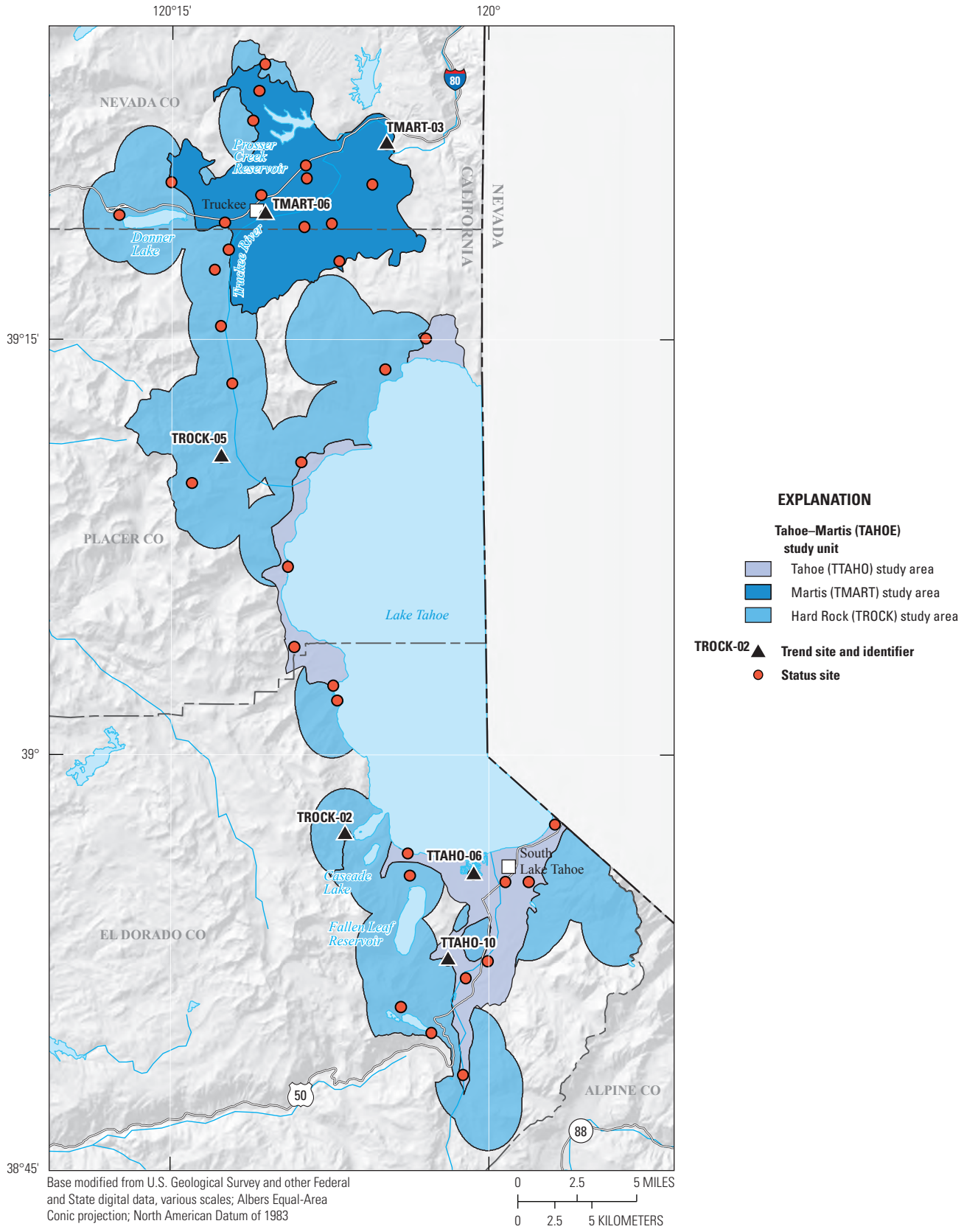

Figure 9. Tahoe–Martis Groundwater Ambient Monitoring and Assessment (GAMA) study unit status sites and trend sites in the Martis, Tahoe, and Hard Rock study areas.

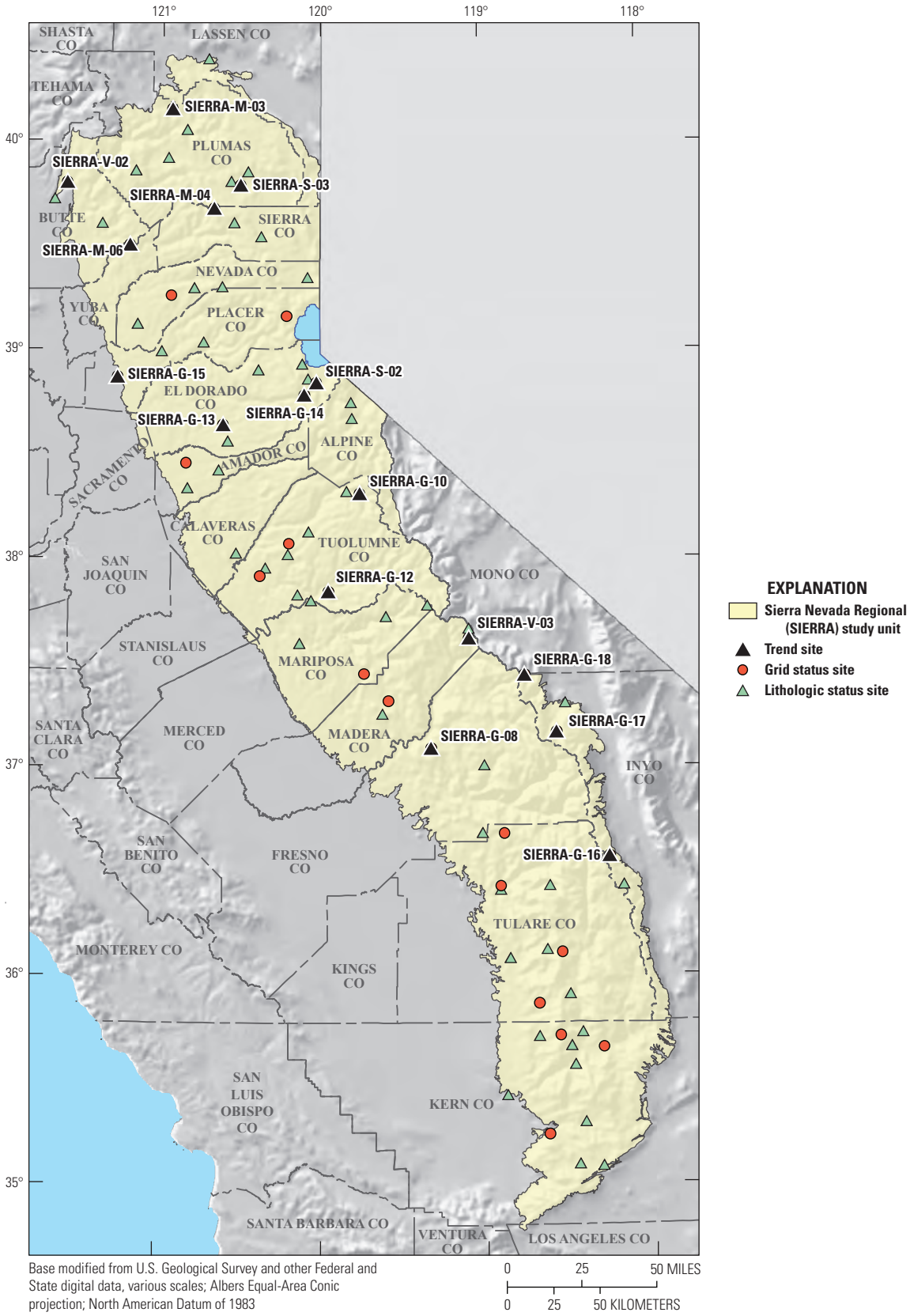

Figure 10. Sierra Nevada Regional Groundwater Ambient Monitoring and Assessment (GAMA) study unit status sites and trend sites.

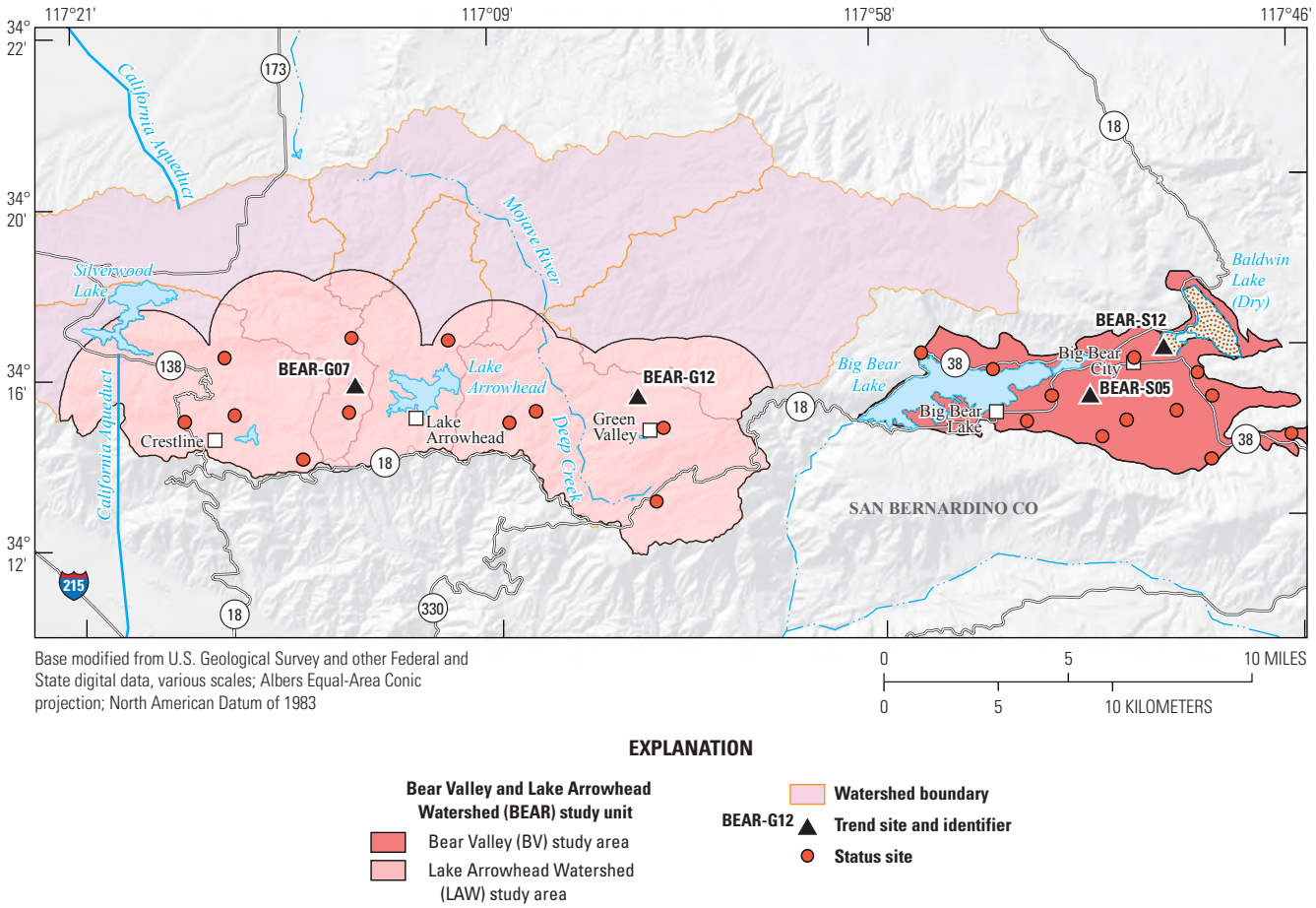

Figure 11. Bear Valley–Lake Arrowhead Watershed Groundwater Ambient Monitoring and Assessment (GAMA) study unit study areas, status sites, and trend sites.

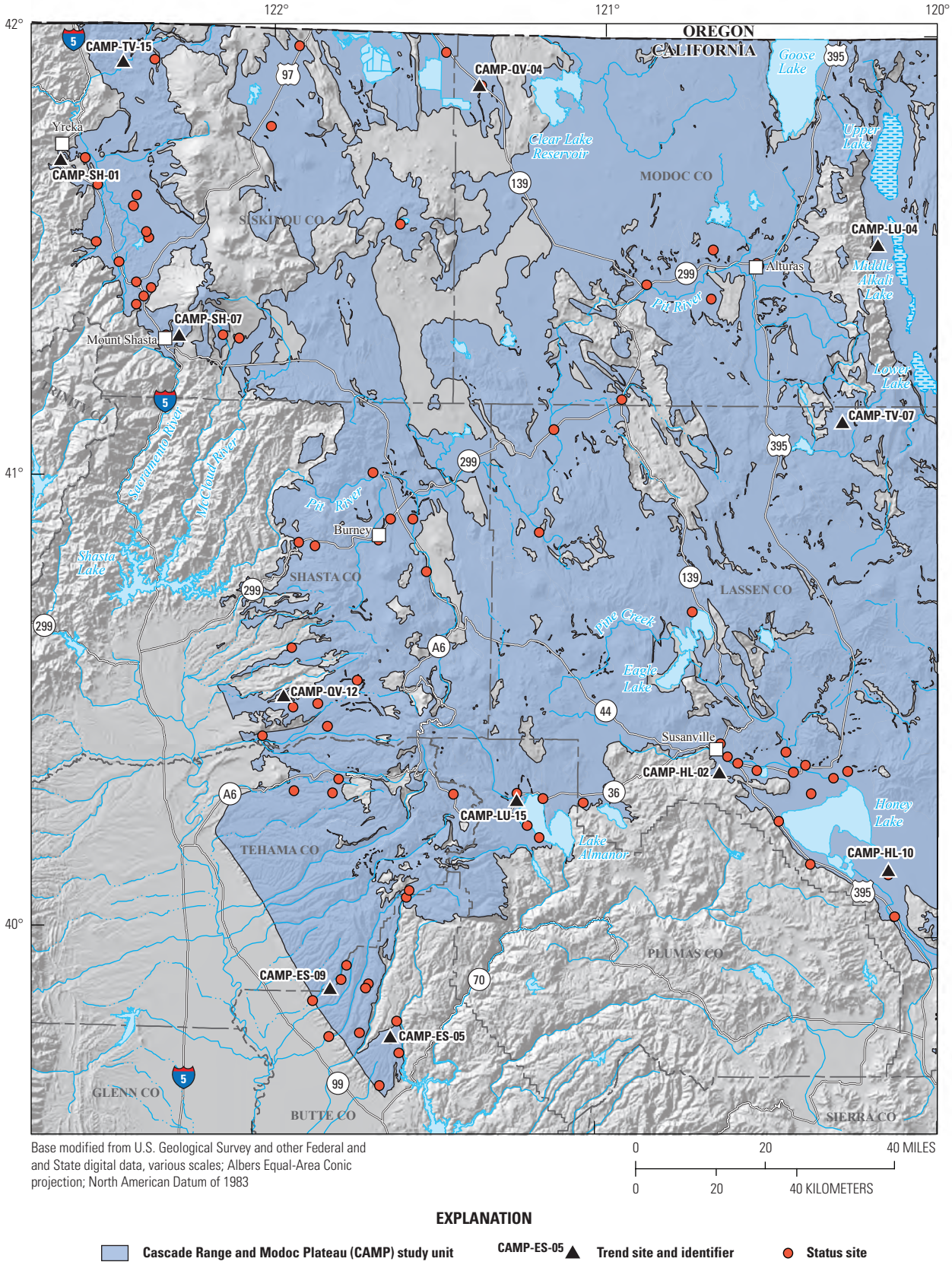

Figure 12. Cascade Range–Modoc Plateau Groundwater Ambient Monitoring and Assessment (GAMA) study unit, status sites, and trend sites.

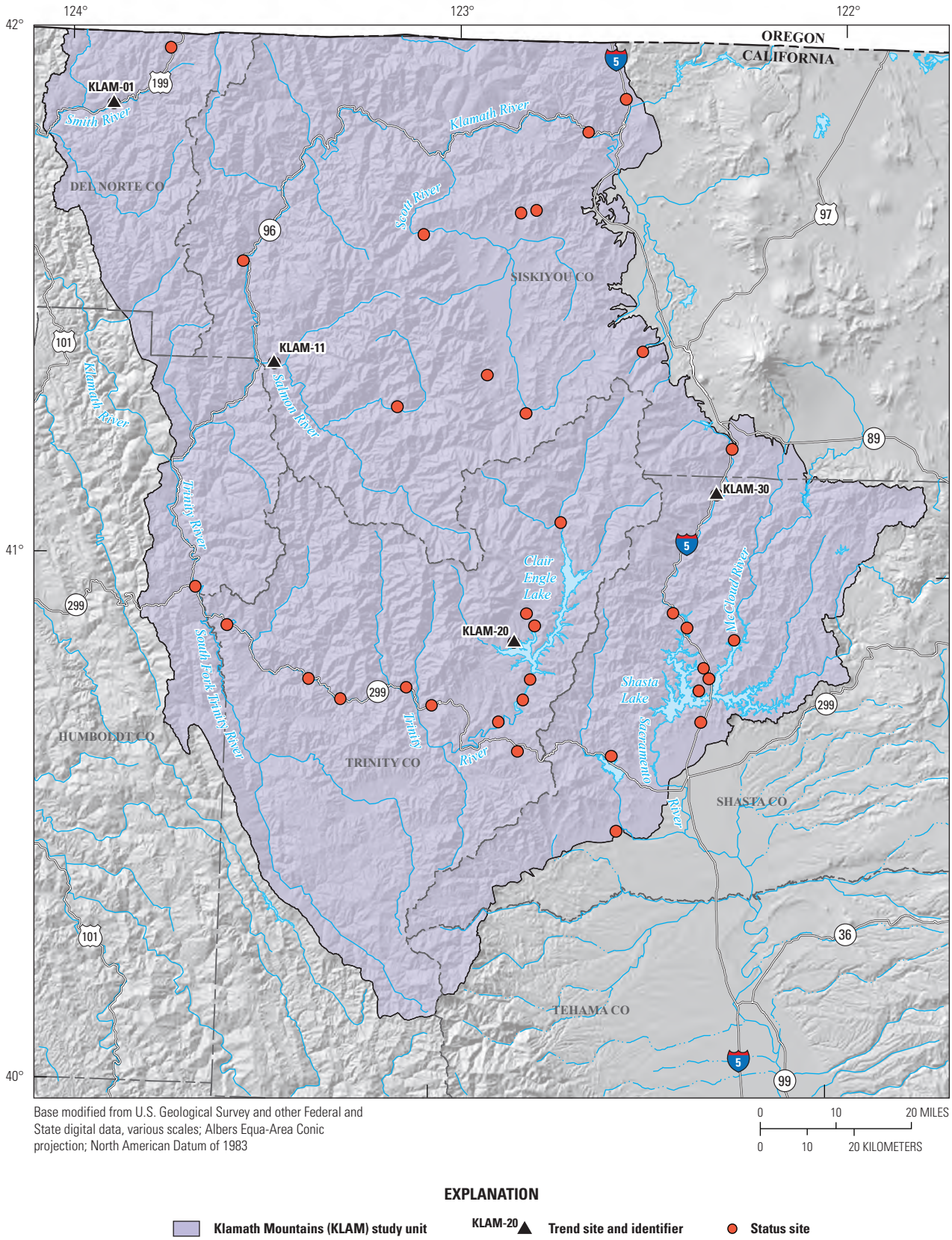

Figure 13. Klamath Mountains Groundwater Ambient Monitoring and Assessment (GAMA) study unit status sites and trend sites.

Methods

Methods used by the GAMA-PBP were selected to achieve the following objectives: (1) to collect groundwater samples that are statistically representative of the primary aquifer system in each study unit, (2) to collect samples in a consistent manner, (3) to analyze samples by using proven and reliable laboratory methods, (4) to assure the quality of the groundwater data, and (5) to maintain data securely and with relevant documentation.

The initial sampling period was designed to provide a spatially unbiased assessment of the quality of untreated groundwater used for public water supplies in the 12 study units. The 12 study units contained 28 study areas, and each study area was divided into equal-area grid cells. A total of 556 grid cells were defined in the 28 study areas, and the number of grid cells in each study area ranged from 7 to 90 cells. The DDW sites in each cell were assigned random ranks, and the highest ranked site that met basic sampling criteria, and for which sampling permission could be obtained, was sampled. For cells that had no available DDW site, an irrigation well or domestic site that had a perforation interval similar to that of DDW sites in the area was sampled, if available. Status sites were sampled in 550 of the 556 grid cells.

In total, 76 of the 550 status sites were selected for sampling as part of the trend analysis (trend sites) by randomly ranking the status sites in each study area and then sampling the highest ranked sites. At least 10 percent of the status sites in each study area were sampled for trends. Typically, the number of trend sites in each study area was rounded up so that, for example, if a study area had 11 status sites, 2 status sites were selected to be trend sites. In addition, for some study units that had not been divided into study areas, groundwater basins and subbasins or watersheds were treated like individual study areas for the purpose of selecting trend sites so that all of the basins and subbasins or watersheds were represented in the trend evaluation, and the trend sites were spatially distributed. Table 1 lists the 76 trend sites by study unit and provides the GAMA site identification number, along with the paired sampling dates, land-surface elevation, and construction information (when available) for each site. The GAMA site identification numbers were assigned when the sites were initially sampled by the GAMA-PBP.

Site locations were verified by using a global positioning system (GPS); 1:24,000-scale USGS topographic maps; site information in USGS and DDW databases; and information provided by site owners, well drillers' logs, or other sources of well construction information. Information gathered at any site during the initial sampling period was updated and entered in the USGS NWIS database. Site owner information is kept confidential.

Sample Collection and Analysis

Samples were collected following modified USGS National Field Manual (NFM; U.S. Geological Survey, variously dated) and modified USGS NAWQA Program (Koterba and others, 1995) sampling protocols. These sampling protocols were followed so that samples collected at each site were representative of groundwater in the aquifer and that the samples were collected and handled in ways that minimized the potential for contamination. Following these protocols also allows for comparison of data collected by GAMA-PBP throughout California and with other USGS projects in California and the Nation. The methods used for sample collection and analysis are listed in table A–1 and described in the "Sample Analysis" section in the appendix.

Table 3 lists the chemical constituents, by class, that were collected for each trend site in the initial sampling and the trend sampling periods. Tables 4*A–G* list the constituents in each constituent class by name and other identifiers, their primary use or source (for organic and special interest constituents), and their minimum and maximum reporting levels and benchmark levels. Tables 4*A–G* also indicate whether or not each constituent was detected during the initial sampling or the trend sampling period and, if so, in which of the study units they were detected. In total, 213 to 221 constituents were measured during the trend sampling period. The difference in the number of constituents analyzed during the trend sampling period was due to the fact that at some trend sites, data for field alkalinity measurements, the major ions bromide and iodide, and the trace element mercury were collected, whereas at others, these data were not collected.

Quality-Assurance Procedures

The QA procedures used for this study followed the protocols described in the NFM (U.S. Geological Survey, variously dated) and used by the NAWQA Program (Koterba and others, 1995). The QA plan followed by the National Water Quality Laboratory (NWQL), the primary laboratory used to analyze samples for this study, is described by Pirkey and Glodt (1998), Maloney (2005), and Stevenson (2012).

Quality-Control Samples

The QC samples collected in the GAMA-PBP study units during the trend sampling period included blanks, replicates, matrix-spikes, and surrogate compounds. The QC samples were collected at about one-third (24 of 76) of the trend sites. Methods used to select and collect QC samples are described in the published USGS data series reports for each study unit (table 2). The QC sample results were used to evaluate potential contamination, as well as bias and variability of the data, which could result from sample collection, processing, storage, transportation, and laboratory analysis.

Quality-Control Results

Results of QC analyses (blank samples, replicate samples, matrix-spike, and surrogate compounds) were used to evaluate the quality of the data for the groundwater samples. On the basis of the QC data, the reporting levels for six volatile organic compounds (VOCs) (table 4*A*) and nine inorganic constituents (table 4*F*) were adjusted for this report. The adjusted reporting levels were greater than or equal to those provided by the NWQL and are referred to as "study reporting levels" (SRLs) by the GAMA Program. The SRLs were defined by the laboratory and field blank detections in samples collected by GAMA-PBP study units from May 2004 to March 2013 by using methods described by Olsen and others (2010), Fram and others (2012), and Davis and others (2014). Detections of VOCs at concentrations less than their respective SRLs were reclassified as non-detections in order to reduce the possibility of reporting false positives. The reclassified values were identified as bounded intervals (that is, with a "less than or equal to" symbol [≤]) in the USGS NWIS database and were not used when calculating detection frequencies for VOCs. Detections of inorganic constituents with concentrations less than their respective SRLs were marked as bounded intervals (with a "less than or equal to" symbol) because the concentrations of these constituents could be less than or equal to the reported value (see table A–3 and additional discussion in the appendix section, "Blank Samples").

Variability for 99 percent of the replicate results for the constituents detected in samples was within the acceptable limits. Results from the replicate samples confirmed that the procedures used to collect and analyze the samples did not introduce unacceptable levels of contamination or variability (see tables A–4*A*, A–4*B* and additional discussion in the appendix section, "Replicate Samples").

Median matrix-spike analyte recoveries for 16 percent of the organic and special-interest constituents analyzed were outside of the acceptable range of 70–130 percent. Constituents for which recoveries were poor might not be detected in samples in which they are present at concentrations near the laboratory reporting level (LRL), and constituents for which recoveries were high can have reported values greater than what actually is in the sample (see tables A–5*A–C* and additional discussion in the appendix section, "Matrix Spike Samples").

Median surrogate compound recoveries were all within the acceptable range of 70–130 percent. Surrogate compounds were used to identify laboratory sample-analysis problems, such as matrix interferences, which can produce a positive or negative bias, or incomplete laboratory recovery, which can produce a negative bias (see table A–6 and additional discussion in the appendix section, "Surrogate Compounds").

Comparison Benchmarks

Concentrations of constituents detected in groundwater samples were compared with the EPA and the State of California regulatory and non-regulatory drinking-water health-based benchmarks and benchmarks established for aesthetic purposes (U.S. Environmental Protection Agency, 2006, 2013; California State Water Resources Control Board, 2016). The chemical data presented in this report are meant to characterize the quality of the untreated groundwater in samples from the trend sites and are not intended to represent the treated drinking water delivered to consumers by water purveyors. The chemical composition of treated drinking water can differ from untreated groundwater because treated drinking water may be subjected to disinfection, filtration, mixing with other waters, or exposure to the atmosphere prior to its delivery to consumers. Comparisons of untreated groundwater to benchmarks are used for illustrative purposes only and are not indicative of compliance or non-compliance with drinking-water regulations. The benchmarks used for each constituent were selected in the following order of priority:

1. Regulatory, health-based levels established by the EPA and the DDW: maximum contaminant levels (MCLs) and action levels (ALs). These benchmarks are legally enforceable standards that apply to public-water systems and are designed to protect public health by limiting the levels of contaminants in drinking water. The MCLs established by the EPA are the minimum standards with which states are required to comply, although individual states may choose to set more stringent standards. The DDW has established MCLs for additional constituents not regulated by the EPA and also has lowered the benchmark concentrations for a number of constituents with MCLs established by the EPA. In this report, a benchmark set by the EPA and adopted by the DDW is labeled "MCL-US," and a benchmark set by DDW that is more stringent than the MCL-US is labeled "MCL-CA." Site owners were notified when constituents were detected at concentrations greater than the MCL-US or the MCL-CA benchmark in samples collected for the GAMA-PBP, but these detections did not constitute violations of DDW regulations. Detections of copper or lead greater than the AL benchmarks in tap water from public supplies can trigger requirements for mandatory water treatment to reduce the corrosiveness of water-to-water pipes. The ALs established by the EPA and DDW are the same; thus, the benchmarks are labeled "AL-US" in this report.

2. Non-regulatory, non-health-based, aesthetic-based levels established by the DDW: secondary maximum contaminant levels (SMCLs). These are non-enforceable standards applied to constituents that affect the aesthetic qualities of drinking water, such as taste, odor, and color, or the technical qualities of drinking water, such as scaling and staining. The EPA and DDW both define SMCLs, but unlike MCLs, SMCLs established by the DDW are not required to be as stringent as those established by the EPA. The SMCLs established by the DDW are used in this report (SMCL-CA) for all constituents that have SMCL-CA values. The salinity indicators chloride, sulfate, and total dissolved solids have recommended and upper SMCL-CA levels, and the values for the upper levels were used. The SMCL-US was used for pH because no SMCL-CA has been defined.

3. Non-regulatory, health-based levels established by the DDW and the EPA: DDW notification levels (NL-CA), EPA lifetime health advisory levels (HAL-US; California State Water Resources Control Board, 2015a), and EPA 1:100,000 risk level (10^{-5}; RSD5-US). If a constituent is detected at concentrations greater than its NL-CA, California state law requires timely notification of local governing bodies and recommends consumer notification. The HAL-US is the maximum concentration of a constituent at which its presence in drinking water is not expected to cause any adverse carcinogenic effects from a lifetime of exposure. The HAL-US are calculated assuming consumption of 2 liters (1 quarts) of water a day during a 70-year lifetime by a 70-kilogram (154-pound) adult and that 20 percent of a person's exposure comes from drinking water. The RSD5-US were calculated by dividing the 10^{-4} cancer-risk concentration established by the EPA by 10.

For constituents with multiple types of benchmarks, this hierarchy does not necessarily result in selection of the benchmark with the lowest concentration. For example, for zinc, the SMCL-CA is 5,000 micrograms per liter (µg/L), and the HAL-US is 2,000 µg/L, but the comparison benchmark selected by this hierarchy is the SMCL-CA.

Water-Quality Results

Tables 5–12 present paired results of the samples collected from the 76 trend sites during both sampling periods. Table 5 lists water-quality indicators measured in the field and at the NWQL, and tables 6–12 present the results of groundwater analyses organized by compound classes. Constituents collected during the initial sampling period that were not collected during the trend sampling period are not presented in this report. Of the 172 organic constituents that were analyzed in one or more of the study units during both sampling periods, 27 were detected in at least one sample from either sample period (tables 4*A–C*). All of the inorganic constituents and isotopic tracers were detected at least once in either sampling period (tables 4*E–G*).

Organic constituents listed in tables 4*A–C* that were not detected in any samples are not included in tables 6–7. Concentrations of organic constituents that were less than the maximum LRL for both sampling periods were not counted as detections for the purposes of calculating detection frequency. However, these constituents were included in the total detected constituent count and included in tables 6 and 7 for completeness.

Water-Quality Indicators

Measurements of dissolved oxygen, water temperature, pH, specific conductance, and alkalinity and calculated parameters (bicarbonate and carbonate concentrations) are presented in table 5. Dissolved oxygen, alkalinity, bicarbonate, and carbonate concentrations are used as indicators of natural processes that affect water chemistry. The pH value indicates the acidity of the water. Specific conductance is the measure of electrical conductivity of the water and is proportional to the amount of dissolved solids in the water.

The specific conductance of samples was measured in the field and by the NWQL using samples collected during the initial sampling, trend sampling, or both sampling periods (table 5). In most cases where specific conductance was measured both in the field and by the laboratory, the field and laboratory measurements were comparable.

Specific conductance has an upper SMCL-CA benchmark of 1,600 microsiemens per centimeter (µS/cm) at 25 °C. Specific conductance was greater than the upper benchmark at three trend sites during both sampling periods: SCRC-B35, CUY-06, and SB-07 (table 5). Specific conductance was greater than the upper SMCL-CA benchmark (2,090 µS/cm at 25 °C) at SF-42 during the initial sampling period, but was less than the upper benchmark (1,200 µS/cm at 25 °C) during the trend sampling period. All remaining specific conductance values measured in the 12 study units were generally similar for samples from the trend sites during both sampling periods (less than the SMCL-CA benchmark).

The pH of groundwater samples was measured in the field and by the NWQL using samples collected during the initial sampling, trend sampling, or both sampling periods (table 5). In most cases where pH was measured both in the field and by the laboratory, the field and laboratory measurements were comparable.

Field measurement is the preferred value because the pH of groundwater can change upon removal from the ambient environment and exposure to the atmosphere (Hem, 1985). The pH has a SMCL-US acceptable range benchmark of greater than 6.5 and less than 8.5. Field pH levels were outside of the SMCL-US acceptable range at 17 trend sites during both sampling periods (table 5). Field pH levels at four trend sites were outside the acceptable range during the initial sampling period, but not during the trend sampling period. At six trend sites, field pH levels were outside the acceptable range during the trend sampling period, but not during the initial sampling period. All remaining pH measurements in the 12 study units were generally at similar concentrations in samples from the trend sites during both sampling periods.

Organic Constituents

Organic constituents typically are human-made chemicals that enter groundwater or surface water through human activities (anthropogenic). The two broad categories of organic constituents discussed in this report are volatile organic compounds and pesticides (including pesticide degradates). Volatile organic compounds can be present in paints, solvents, fuels, fuel additives, refrigerants, fumigants, and disinfected water and are characterized by their tendency to evaporate (Zogorski and others, 2006). Volatile organic compounds generally persist longer in groundwater than in surface water because groundwater is isolated from the atmosphere. Pesticides are chemicals used to control weeds, insects, fungi, and other pests in agricultural, urban, and suburban settings and include herbicides, insecticides, and fungicides (Gilliom and others, 2006). Pesticide degradates are the products of the environmental transformations of the parent pesticide, and they can have similar properties to the parent pesticide.

Volatile Organic Compounds

Of the 85 VOCs analyzed by the NWQL, 20 were detected in at least one groundwater sample from the trend sites during the initial sampling, trend sampling, or both sampling periods (table 4*A*). The trihalomethane chloroform (a byproduct of drinking-water disinfection) was detected in samples from more than 10 percent of the trend sites during both sampling periods. The gasoline component methyl *tert*-butyl ether was detected at three to eight trend sites during both sampling periods, but had a detection frequency greater than 10 percent only during the initial sampling period. The other 18 VOCs were detected in samples from less than 10 percent of the trend sites during both sampling periods (table 6).

Nearly all VOC detections were less than the health-based benchmarks, with most less than one-tenth of the benchmarks. The solvent perchlorethene (PCE) was detected at a concentration greater than the MCL-US of 5 µg/L in samples from one trend site during both sampling periods: TTAHO-06 (table 6). The PCE concentration at TTAHO-06 during the trend sampling period (13.3 µg/L) was less than the concentration detected during the initial sampling period (19.5 µg/L). In summary, 52 trend sites (68.4 percent) had at least one VOC detection during the initial sampling period, but this detection frequency had decreased to 38 sites (50.0 percent) by the trend sampling period.

Pesticides and Pesticide Degradates

Of the pesticides and pesticide degradates analyzed by the NWQL, seven were detected in groundwater samples from the trend sites during the initial sampling, trend sampling, or both sampling periods (table 7). These seven constituents were all herbicides or herbicide degradates: atrazine, deethylatrazine, 3,4-dichloroaniline, hexazinone, prometon, simazine, and tebuthiuron. Simazine, atrazine, and deethylatrazine were detected during both sampling periods; 3,4-dichloroaniline was detected only during the initial sampling period; and hexazinone, prometon, and tebuthiuron were detected only during the trend sampling period. Atrazine, deethylatrazine, prometon, simazine, and tebuthiuron are among the most frequently detected pesticides nationwide (Gilliom and others, 2006). None of these constituents were detected in samples from more than 10 percent of the trend sites during either sampling period (table 7). All detections of pesticides and pesticide-degradates were at concentrations less than health-based benchmarks, and the number of detections in samples from the trend sites was inadequate to allow reliable calculation of statistics for comparison between sampling periods.

Constituents of Special Interest

Perchlorate and 1,2,3-trichloropropane (1,2,3-TCP) were defined as constituents of special interest at the beginning of the GAMA-PBP in 2004 because they began to be detected in groundwater in the late 1990s, after advances in analytical methods resulted in lower detection limits, and because they were considered to have the potential to adversely affect drinking-water quality in California (California State Water Resources Control Board, 2015b, c). The State of California began regulating perchlorate in October 2007.

Perchlorate has a MCL-CA benchmark of 6 µg/L and was not detected at concentrations greater than the benchmark in groundwater samples from the trend sites during either sampling period (table 8). Generally, perchlorate detections were at similarly low concentrations during both sampling periods—less than 2 µg/L—except for one site (GIL-02) where perchlorate concentrations of 2.1 and 3.1 µg/L were measured. All samples from both sampling periods were analyzed for 1,2,3-TCP with a reporting level ranging from 0.12 to 0.18 µg/L as part of NWQL Schedule 2020 (table 4*A*).

Samples from 6 of the 12 study units were analyzed for low-level 1,2,3-TCP with a reporting level of 0.005 µg/L at Weck Laboratories, Inc. (table 4*D*). No 1,2,3-TCP was detected in samples from the trend sites during the initial or trend sampling periods (tables 6, 8).

Inorganic Constituents

Unlike the organic constituents and the constituents of special interest, most of the inorganic constituents are naturally present in groundwater, although their concentrations can be influenced by human activities.

Nutrients

Nutrients (nitrogen and phosphorus) present in groundwater can affect biological activity in aquifers and in surface-water bodies that receive groundwater discharge. Inorganic nitrogen can be present in the form of ammonia, nitrite, or nitrate, depending on the oxidation-reduction state of the groundwater. Analyses for nutrients in samples included the determination of these forms of nitrogen, as well as total nitrogen (dissolved) and orthophosphate (the most biologically available form of phosphorus). Nutrients were measured in samples from most of the trend sites (69 out of 76) during the initial sampling period and at all of the trend sites during the trend sampling period (table 3). Most results for ammonia and nitrite in samples from trend sites for both sampling periods were non-detections (table 9). In contrast, nitrate plus nitrite (as nitrogen) was detected in samples from most of the trend sites during both sampling periods. In most cases, sample concentrations of nitrate plus nitrite (as nitrogen) consisted nearly entirely of nitrate, so this analysis is referred to as nitrate in this report. As with nitrate, orthophosphate was detected in samples from most of the trend sites. All nutrient detections in samples from trend sites were less than the health-based benchmarks (table 9). No Federal or State drinking-water standard, such as an MCL, exists for elemental phosphorus or phosphorus compounds. Most orthophosphate concentrations in samples from the trend sites were less than 0.1 milligrams per liter (mg/L; as phosphorus), a desired limit for total phosphates recommended by the EPA to prevent plant nuisances in streams (Mackenthun, 1973).

Major Ions, Total Dissolved Solids, and Trace Elements

Major ions, total dissolved solids (TDS), and trace elements in water used for public supply have benchmarks based on human-health concerns, aesthetic properties (such as taste, color, and odor), or technical properties (such as scaling and staining). The DDW has established SMCL-CAs based on aesthetic and technical properties for iron, manganese, silver, zinc, chloride, sulfate, and TDS. Fluoride and 17 of the 24 trace elements analyzed in this study have health-based benchmarks (MCL-US, MCL-CA, NL-US, AL-US, or HAL-US). Samples for analyses of major ions, TDS, and trace elements were collected at most of the trend sites (62 out of 76) during the initial sampling period and at all of the trend sites during the trend sampling period (table 3). Sulfate, TDS, fluoride, arsenic, boron, molybdenum, uranium, iron, and manganese were detected at concentrations above their comparison benchmarks in samples from trend sites during the initial or trend sampling periods.

Sulfate has an upper SMCL-CA benchmark of 500 mg/L. Sulfate was detected at concentrations greater than the upper SMCL-CA benchmark in samples from two sites during both sampling periods: CUY-02 and CUY-06 (table 10). Additionally, sulfate was detected at a concentration greater than the upper SMCL-CA benchmark at SCRC-B35 during the trend sampling period, but no sample for sulfate was collected at SCRC-B35 during the initial sampling period. Generally, the remaining sulfate concentrations in samples from trend sites were similar during both sampling periods.

Total dissolved solids has an upper SMCL-CA benchmark of 1,000 mg/L. Total dissolved solids was detected at concentrations greater than the upper benchmark in samples from two sites during both sampling periods: CUY-06 and SB-07 (table 10). Generally, the remaining TDS concentrations in samples from trend sites were similar during both sampling periods. Additionally, TDS was greater than the upper benchmark in a sample from SCRC-B35 during the trend sampling period, but no sample for TDS was collected at this site during the initial sampling period.

Fluoride was detected at concentrations greater than its MCL-CA of 2 mg/L in samples from two trend sites: BEAR-S12 and SIERRA-G-15 (table 10). The samples from BEAR-S12 had fluoride concentrations of 2.76 mg/L during the initial sampling period and 2.62 mg/L during the trend sampling period. The sample from SIERRA-G-15 had a fluoride concentration of 2.01 mg/L during the initial sampling period, but fluoride was detected at a concentration less than the MCL-CA (1.89 mg/L) in the sample from the trend sampling period. Site SIERRA-G-15 is to be included in future trend sampling periods to gather more information about fluoride-concentration trends at this site. Generally, the remaining fluoride concentrations in samples from trend sites were similar during both the sampling periods.

Arsenic was detected at concentrations greater than its MCL-US benchmark of 10 µg/L in samples from four trend sites during both sampling periods: CUY-02, NOCO-IN-27, TMART-03, and SIERRA-V-03 (table 11). Generally, arsenic concentrations in samples from trend sites were similar during both sampling periods.

Boron was detected at concentrations greater than its NL-CA benchmark of 1,000 µg/L in samples from four trend sites during both sampling periods: SIERRA-G-15, CAMP-TV-15, NOCO-IN-11, and NOCO-IN-27 (table 11). Generally, boron concentrations in samples from trend sites were similar during both sampling periods.

Molybdenum was detected at concentrations greater than its HAL-US benchmark of 40 µg/L in samples from four trend sites during both sampling periods: SCRC-H08, SCRC-H11, CUY-02, and CGOLD-13 (table 11). Samples from SCRC-H08 and CUY-02 had similar molybdenum concentrations during both sampling periods. In samples from SCRC-H11, molybdenum was measured at 80.9 µg/L during the initial sampling period and at 56.3 µg/L during the trend sampling period. In samples from CGOLD-13, molybdenum concentrations were 84.7 µg/L during the initial sampling period and 132 µg/L during the trend sampling period. Sites SCRC-H11 and CGOLD-13 are to be included in future trend sampling periods to gather more information about molybdenum concentration trends at these sites. Generally, all remaining molybdenum concentrations in samples from the trend sites were similar during both sampling periods.

Uranium was detected at a concentration greater than its MCL-US benchmark of 30 µg/L in samples from one trend site during both sampling periods: BEAR-G07 (table 11). Additionally, uranium was detected at a concentration greater than the benchmark at SOSA-31 during the trend sampling period, but no sample for uranium was collected at this site during the initial sampling period. Generally, the remaining uranium concentrations in samples from trend sites were similar during both sampling periods.

Iron was detected at concentrations greater than its SMCL-CA benchmark of 300 µg/L in samples from five trend sites during both sampling periods: CAMP-HL-10, KLAM-30, NOCO-IN-11, NOCO-IN-27, and NOCO-CO-18 (table 11). Iron was detected at a concentration greater than the benchmark in a sample from SCRC-B35 during the trend sampling period, but no sample for iron was collected at this site during the initial sampling period. Generally, the remaining iron concentrations in samples from the trend sites were similar during both sampling periods.

Manganese was detected at concentrations greater than its SMCL-CA benchmark of 50 µg/L in samples from nine trend sites during both sampling periods: GIL-12, CGOLD-13, TMART-03, KLAM-30, CAMP-HL-10, CAMP-QV-04, NOCO-IN-11, NOCO-IN-27, and NOCO-CO-18 (table 11). Manganese was detected at a concentration greater than the benchmark in samples from SF-42 and SCRC-B35 during the trend sampling period, but no samples for manganese were collected at these sites during the initial sampling period. Generally, the remaining manganese concentrations in samples from the trend sites were similar during both sampling periods.

Isotopic Tracers

The isotopic ratios of oxygen and hydrogen in water and tritium and carbon-14 activities can be used as tracers of hydrologic processes. The isotopic ratios of hydrogen and oxygen in water (δ^2H and $\delta^{18}O$) aid in interpretation of the sources of groundwater recharge. These stable isotopic ratios reflect the altitude, latitude, and temperature of precipitation and also the extent of evaporation of the water in surface-water bodies or soils prior to infiltration into the aquifer. Samples for analyses of δ^2H and $\delta^{18}O$ were collected at all trend sites during both sampling periods (with the exception of CUY-10), and the isotopic ratios changed little between sampling periods (table 12).

Tritium and carbon-14 activities provide information about the age (time since recharge) of the groundwater. Tritium is a short-lived radioactive isotope of hydrogen that is incorporated into the water molecule. Low levels of tritium are continuously produced by interaction of cosmic radiation with the Earth's atmosphere, and a large amount of tritium was produced as a result of atmospheric testing of nuclear weapons between 1952 and 1963. Thus, activities of tritium above background generally indicate the presence of water recharged since the early 1950s. Activities of tritium were analyzed in samples from 73 trend sites during the initial sampling period and from all trend sites, except CUY-10, during the trend sampling period (tables 3, 12). Of the isotopic tracers analyzed for this study, tritium is the only one with a health-based benchmark—an MCL-CA of 20,000 picocuries per liter (pCi/L). All tritium activities measured in samples from trend sites during both sampling periods were about (or less than) one-thousandth of the benchmark (table 12).

Tritium activity was reported as a non-detection during the initial sampling period and as a detection during the trend sampling period at four sites: SF-42, GIL-12, TMART-03, and BEAR-S12 (table 12). The reporting level for tritium at these sites during the initial sampling period, however, was greater than the detected tritium activities during the trend sampling period; therefore, the tritium activities in the initial and trend sampling periods were not considered dissimilar. Tritium activity was reported as a detection during the initial sampling period and as a non-detection during the trend sampling period at four other sites: SCRC-B24, NOCO-CO-03, TTAHO-10, and SIERRA-M-03. Because the reporting level for tritium at these sites during the trend sampling period was less than the detected tritium activities during the initial sampling period, the tritium activities in the initial and trend sampling periods could be different. Sites SCRC-B24, NOCO-CO-03, TTAHO-10, and SIERRA-M-03 are to be included in future trend sampling periods to gather more information about tritium activity trends at these sites.

Carbon-14 is a radioactive isotope of carbon. Low levels of carbon-14 are continuously produced by interaction of cosmic radiation with the Earth's atmosphere and are incorporated into atmospheric carbon dioxide. Carbon dioxide dissolves in precipitation, surface water, and groundwater exposed to the atmosphere, thereby entering the hydrologic cycle. Because carbon-14 decays at a half-life of approximately 5,700 years, low activities of carbon-14 relative to modern values generally indicate presence of groundwater that is several thousand years old. Samples for analysis of carbon-14 were collected at 66 trend sites during the initial sampling period and at 74 trend sites during the trend sampling period (tables 3, 12). Most samples from trend sites that were analyzed for carbon-14 activities (expressed as percent modern carbon [pmc]) during both sampling periods had values that were similar. However, carbon-14 activities in samples from five trend sites differed substantially between sampling periods.

Carbon-14 activities of samples from three trend sites, SF-05, SF-42, and LIV-03, were substantially greater during the trend sampling period (73, 22, and 97 pmc, respectively) than during the initial sampling period (50, 2.2, and 66 pmc, respectively). In contrast, the carbon-14 activities of samples from two trend sites, SIERRA-G-17 and SIERRA-V-03, were substantially less during the trend sampling period (66, 21 pmc, respectively) than during the initial sampling period (99, 59 pmc, respectively; table 12). Sites SF-05, SF-42, LIV-03, SIERRA-G-17, and SIERRA-V-03 are to be included in future trend sampling periods to gather more information about carbon-14 activity trends at these sites.

Future Work

Reports subsequent to the trend data reports are to focus on assessment of the data presented in this report and other trend data reports by using a variety of statistical, qualitative, and quantitative approaches to analyze temporal trends and evaluate the natural and human factors affecting temporal changes in groundwater quality. Water-quality data maintained in the DDW and USGS databases, and water-quality data available from other State and local water agencies are to be compiled, evaluated, and used in combination with the data presented in the trend data reports. The results of these efforts are to be presented in one or more subsequent reports.

Summary

Samples were collected for evaluation of groundwater quality temporal trends in 12 study units in the coastal and mountain regions of California as part of the California State Water Resources Control Board's Groundwater Ambient Monitoring and Assessment (GAMA) Program Priority Basin Project. This report presents water-quality data for 76 groundwater sites that were sampled during an initial sampling period (2006–11) and resampled approximately 3 years later during a trend sampling period (2008–13).

The GAMA Priority Basin Project was designed to provide initially a spatially unbiased assessment of untreated-groundwater quality in the primary aquifer systems and to facilitate statistically consistent comparisons of untreated-groundwater quality throughout California. The primary aquifer systems are defined as parts of aquifers corresponding to the depths of perforation or open intervals of sites listed in the California Division of Drinking Water (DDW) database of wells used for public drinking-water supply for each study unit. The quality of groundwater in shallower or deeper water-bearing zones can differ from that in the primary aquifer systems; shallow groundwater can be more vulnerable to surficial contamination.

This study did not attempt to evaluate the quality of water delivered to consumers; after withdrawal from the ground, water typically is treated, disinfected, or blended with other waters to maintain acceptable water quality. The comparison benchmarks used in this report apply to treated water that is served to the consumer, not to untreated groundwater. To provide some context for the results, however, concentrations of constituents measured in these groundwater samples were compared to benchmarks established by the U.S. Environmental Protection Agency and DDW. Comparisons between data collected for this study and benchmarks for drinking water are for illustrative purposes only and are not indicative of compliance or non-compliance with those benchmarks.

During the initial sampling period for the 12 study units discussed in this report, 550 sites were selected using a randomized grid approach to achieve a spatially unbiased representation of groundwater used for public drinking-water supplies (status sites). Of these status sites, 76 (a minimum of 10 percent in each of the 28 study areas in the 12 study units) were sampled again during the trend sampling period. For this report, the study units were split into two groups based on the hydrogeology in each of the study units: Coastal and Mountain.

In the Coastal Region, the numbers of status sites and trend sites in each study unit were as follows:

- San Francisco Bay study unit—43 status sites, 5 trend sites.
- Southern Coast Range–Coastal study unit—55 status sites, 6 trend sites.
- Southern Coast Range–Interior Basins study unit—35 status sites, 5 trend sites.
- Northern Coast Ranges study unit—58 status sites, 8 trend sites.
- Santa Barbara study unit—18 status sites, 2 trend sites.

In the Mountain Region, the number of status sites and trend sites in each study unit were as follows:

- Central Sierra study unit—27 status sites, 3 trend sites.
- Southern Sierra study unit—35 status sites, 5 trend sites.
- Tahoe–Martis study unit—41 status sites, 6 trend sites.
- Sierra Nevada Regional study unit—83 status sites, 16 trend sites.
- Bear Valley and Lake Arrowhead Watershed study unit—27 status sites, 4 trend sites.
- Cascade Range and Modoc Plateau study unit—90 status sites, 12 trend sites.
- Klamath Mountains study unit—38 status sites, 4 trend sites.

Groundwater samples were analyzed for water-quality indicators, organic constituents, special-interest constituents, inorganic constituents, and isotopic tracers. This report describes the sampling, analytical, and quality-assurance methods used in the study and presents the results of the chemical analyses of samples from the trend sites during the initial sampling and trend sampling periods in the primary aquifer system.

Quality-control samples (blanks, replicates, matrix-spikes, and surrogate compounds) were collected at about one-third of the sites during the trend sampling period, and the results for these samples were used to evaluate the quality of the data for the groundwater samples.

A total of 20 volatile organic compounds (VOCs) and 7 pesticide and pesticide degradates were detected in samples from trend sites during the initial sampling, trend sampling, or both sampling periods. All pesticide and pesticide degradate detections and nearly all VOC detections were at concentrations less than the health-based benchmarks. The VOC perchloroethene was detected at concentrations greater than the maximum contaminant level (MCL-US) in samples from one trend site during both sampling periods. The VOC chloroform was detected in samples from more than 10 percent of the trend sites during both sampling periods.

Perchlorate and 1,2,3-trichloropropane (1,2,3-TCP) are constituents of special interest in California. Perchlorate was not detected at a concentration greater than the health-based benchmark in samples from trend sites during either of the sampling periods. Additionally, 1,2,3-TCP was not detected in samples from trend sites during either sampling period.

Most detections of major ions and trace elements in samples from trend sites were less than health-based benchmarks during both sampling periods. Arsenic and boron each were detected at concentrations greater than the health-based benchmark in samples from four trend sites during the initial and trend sampling periods. Molybdenum was detected in samples from four trend sites at concentrations greater than the health-based benchmark during both sampling periods. Samples from two of these trend sites had similar molybdenum concentrations, and two had substantially different concentrations during the initial and trend sampling periods. Uranium was detected at a concentration greater than the health-based benchmark in samples from one site during both sampling periods, and in one sample from a different site during only the trend sampling period (a sample for uranium analysis was not collected from this site during the initial sampling period).

Iron was detected at concentrations greater than the secondary maximum contaminant level (SMCL-CA; non-health-based benchmark set for aesthetic concerns) in samples from five trend sites from both sampling periods and in one site during only the trend sampling period (a sample for iron analysis was not collected from this site during the initial sampling period). Manganese was detected at concentrations greater than the SMCL-CA in samples from nine trend sites during both sampling periods and in two sites during only the trend sampling period (samples for manganese analysis were not collected from these sites during the initial sampling period).

Total dissolved solids and sulfate have a recommended and an upper SMCL-CA. Total dissolved solids and sulfate were detected at concentrations greater than the upper SMCL-CA in samples from two trend sites during both sampling periods and in one site during only the trend sampling period (samples for total dissolved solids and sulfate analysis were not collected from this site during the initial sampling period). Nitrate was not detected at concentrations greater than the health-based benchmark in samples from any of the trend sites during either sampling period.

References Cited

Belitz, Kenneth, Dubrovsky, N.M., Burow, Karen, Jurgens, B.C., and Johnson, Tyler, 2003, Framework for a ground-water quality monitoring and assessment program for California: U.S. Geological Survey Water-Resources Investigations Report 2003–4166, 78 p., https://pubs.er.usgs.gov/publication/wri034166.

Bennett, G.L., V, Fram, M.S., and Belitz, Kenneth, 2014, Status and understanding of groundwater quality in the Klamath Mountains study unit, 2010—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2014–5065, 58 p., https://doi.org/10.3133/sir20145065.

Burton, C.A., Land, Michael, and Belitz, Kenneth, 2013, Status and understanding of groundwater quality in the South Coast Range–Coastal study unit, 2008—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2013–5053, 86 p., https://pubs.er.usgs.gov/publication/sir20135053.

California Department of Water Resources, 2003, California's groundwater update 2003: California Department of Water Resources Bulletin 118, 246 p., accessed August 2, 2011, at http://www.water.ca.gov/groundwater/bulletin118/gwbasins2003.cfm.

California State Water Resources Control Board, 2003, Report to the Governor and Legislature—A comprehensive groundwater quality monitoring program for California: Assembly Bill 599, March 2003, 100 p., accessed March 4, 2015, at http://www.waterboards.ca.gov/gama/docs/final_ab_599_rpt_to_legis_7_31_03.pdf.

California State Water Resources Control Board, 2015a, Drinking water notification levels: Notification levels (pdf document), accessed August 3, 2015, at http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/NotificationLevels.shtml.

California State Water Resources Control Board, 2015b, Perchlorate in drinking water: California State Water Resources Control Board website, accessed August 4, 2015, at http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Perchlorate.shtml.

California State Water Resources Control Board, 2015c, 1,2,3-Trichloropropane: California State Water Resources Control Board website, accessed August 4, 2015, at http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/123TCP.shtml.

California State Water Resources Control Board, 2016, Title 22, California Code of Regulations, Division 4, Environmental Health, Chapter 15, Domestic water quality and monitoring regulations, Article 4, Primary standards—inorganic chemicals, §64431 Maximum contaminant levels—inorganic chemicals; Article 5 Radioactivity, §64442 MCLs and monitoring—gross alpha particle activity, radium-226, radium-228, and uranium; Article 5.5, Primary standards—organic chemicals, §64444 Maximum contaminant levels—organic chemicals; and Article 16, Secondary drinking water standards, §64449 Secondary maximum contaminant levels and compliance, accessed February 21, 2017, at http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dwregulations-2016-09-23.doc.

Davis, T.A., Kulongoski, J.T., and Belitz, Kenneth, 2013, Groundwater-quality data in the Santa Barbara study unit, 2011—Results from the California GAMA Program: U.S. Geological Survey Data Series 742, 72 p., https://pubs.er.usgs.gov/publication/ds742.

Davis, T.A., Olsen, L.D., Fram, M.S., and Belitz, Kenneth, 2014, Updated study reporting levels (SRLs) for trace-element data collected for the California Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project, October 2009–March 2013: U.S. Geological Survey Scientific Investigations Report 2014–5105, 52 p., https://doi.org/10.3133/sir20145105.

Davis, T.A., and Kulongoski, J.T., 2016, Status of groundwater quality in the Santa Barbara study unit, 2011—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2016–5112, 70 p., https://doi.org/10.3133/sir20165112.

Ferrari, M.J., Fram, M.S., and Belitz, Kenneth, 2008, Ground-water quality data in the Central Sierra study unit, 2006—Results from the California GAMA program: U.S. Geological Survey Data Series 335, 61 p., https://pubs.er.usgs.gov/publication/ds335.

Fram, M.S., and Belitz, Kenneth, 2007, Ground-water quality data in the Southern Sierra study unit, 2006—Results from the California GAMA Program: U.S. Geological Survey Data Series 301, 78 p., https://pubs.er.usgs.gov/publication/ds301.

Fram, M.S., and Belitz, Kenneth, 2012, Status and understanding of groundwater quality in the Tahoe–Martis, Central Sierra, and Southern Sierra study units, 2006–2007—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2011–5216, 222 p., https://pubs.er.usgs.gov/publication/sir20115216.

Fram, M.S., and Belitz, Kenneth, 2014, Status and understanding of groundwater quality in the Sierra Nevada Regional study unit, 2008—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2014–5174, 118 p., https://doi.org/10.3133/sir20145174.

Fram, M.S., and Shelton, J.L., 2015, Status and understanding of groundwater quality in the Cascade Range and Modoc Plateau study unit, 2010—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2014–5238, 131 p., https://doi.org/10.3133/sir20145238.

Fram, M.S., Munday, Cathy, and Belitz, Kenneth, 2009, Groundwater quality data for the Tahoe–Martis study unit, 2007—Results from the California GAMA Program: U.S. Geological Survey Data Series 432, 89 p., https://pubs.er.usgs.gov/publication/ds432.

Fram, M.S., Olsen, L.D., and Belitz, Kenneth, 2012, Evaluation of volatile organic compound (VOC) blank data and application of study reporting levels to groundwater data collected for the California GAMA Priority Basin Project, May 2004 through September 2010: U.S. Geological Survey Scientific Investigations Report 2012–5139, 94 p., https://pubs.er.usgs.gov/publication/sir20125139.

Gilliom, R.J., Barbash, J.E., Crawford, C.G., Hamilton, P.A., Martin, J.D., Nakagaki, Naomi, Nowell, L.H., Scott, J.C., Stackelberg, P.E., Thelin, G.P., and Wolock, D.M., 2006, The quality of our nation's waters—Pesticides in the Nation's streams and ground water, 1992–2001: U.S. Geological Survey Circular 1291, 173 p., https://pubs.er.usgs.gov/publication/cir1291.

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water: U.S. Geological Survey Water Supply Paper 2254, 263 p., 3 pls., https://pubs.er.usgs.gov/publication/wsp2254.

Hirsch, R.M., Alley, W.M., and Wilber, W.G., 1988, Concepts for a National Water-Quality Assessment Program: U.S. Geological Survey Circular 1021, 42 p., https://pubs.er.usgs.gov/publication/cir1021.

Koterba, M.T., Wilde, F.D., and Lapham, W.W., 1995, Groundwater data-collection protocols and procedures for the National Water-Quality Assessment Program—Collection and documentation of water-quality samples and related data: U.S. Geological Survey Open-File Report 95–399, 114 p., https://pubs.er.usgs.gov/publication/ofr95399.

Kulongoski, J.T., and Belitz, Kenneth, 2004, Groundwater ambient monitoring and assessment program: U.S. Geological Survey Fact Sheet 2004–3088, 2 p., https://pubs.er.usgs.gov/publication/fs20043088.

Mackenthun, K.M., 1973, Toward a cleaner aquatic environment: U.S. Environmental Protection Agency, Office of Air and Water Programs, 273 p., http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=9100M9RA.txt.

Maloney, T.J., ed., 2005, Quality management system, U.S. Geological Survey National Water Quality Laboratory: U.S. Geological Survey Open-File Report 2005–1263, version 1.3, chapters and appendixes variously paged, https://pubs.er.usgs.gov/publication/ofr20051263.

Mathany, T.M., and Belitz, Kenneth, 2013, Groundwater-quality data in the Bear Valley and selected Hard Rock Areas study unit, 2010—Results from the California GAMA Program: U.S. Geological Survey Data Series 747, 86 p., https://pubs.er.usgs.gov/publication/ds747.

Mathany, T.M., and Belitz, Kenneth, 2014, Groundwater-quality data in the Klamath Mountains study unit, 2010—Results from the California GAMA Program: U.S. Geological Survey Data Series 803, 82 p., https://doi.org/10.3133/ds803.

Mathany, T.M., and Belitz, Kenneth, 2015, Status and understanding of groundwater quality in the Northern Coast Ranges study unit, 2009—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2014–5215, 86 p., https://doi.org/10.3133/sir20145215.

Mathany, T.M., Kulongoski, J.T., Ray, M.C., and Belitz, Kenneth, 2009, Groundwater-quality data in the South Coast Interior Basins study unit, 2008—Results from the California GAMA program: U.S. Geological Survey Data Series 463, 83 p., https://pubs.er.usgs.gov/publication/ds463.

Mathany, T.M., Burton, C.A., Land, Michael, and Belitz, Kenneth, 2010, Groundwater-quality data in the South Coast Range–Coastal study unit, 2008—Results from the California GAMA program: U.S. Geological Survey Data Series 504, 106 p., https://pubs.er.usgs.gov/publication/ds504.

Mathany, T.M., Dawson, B.J., Shelton, J.L., and Belitz, Kenneth, 2011, Groundwater-quality data in the northern Coast Ranges study unit, 2009—Results from the California GAMA Program: U.S. Geological Survey Data Series 609, 65 p., https://pubs.er.usgs.gov/publication/ds609.

Maupin, M.A., Kenny, J.F., Hutson, S.S., Lovelace, J.K., Barber, N.L., and Linsey, K.S., 2014, Estimated use of water in the United States in 2010: U.S. Geological Survey Circular 1405, 56 p., https://doi.org/10.3133/cir1405.

Olsen, L.D., Fram, M.S., and Belitz, Kenneth, 2010, Review of trace-element field-blank data collected for the California Groundwater Ambient Monitoring and Assessment (GAMA) Program, May 2004–January 2008: U.S. Geological Survey Scientific Investigations Report 2009–5220, 47 p., https://pubs.er.usgs.gov/publication/sir20095220.

Parsons, M.C., Kulongoski, J.T., and Belitz, Kenneth, 2013, Status and understanding of groundwater quality in the San Francisco Bay groundwater basins, 2007—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2012–5248, 78 p., https://pubs.er.usgs.gov/publication/sir20125248.

Parsons, M.C., Kulongoski, J.T., and Belitz, Kenneth, 2014, Status and understanding of groundwater quality in the South Coast Interior groundwater basins, 2008—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2014–5023, 68 p., https://doi.org/10.3133/sir20145023.

Pirkey, K.D., and Glodt, S.R., 1998, Quality control at the U.S. Geological Survey National Water Quality Laboratory: U.S. Geological Survey Fact Sheet 026–98, 4 p., https://pubs.er.usgs.gov/publication/fs02698.

Ray, M.C., Kulongoski, J.T., and Belitz, Kenneth, 2009, Ground-water quality data in the San Francisco Bay study unit, 2007—Results from the California GAMA program: U.S. Geological Survey Data Series 396, 93 p., https://pubs.er.usgs.gov/publication/ds396.

Saucedo, G.J., Bedford, D.R., Raines, G.L., Miller, R.J., and Wentworth, C.M., 2000, GIS data for the geologic map of California: California Department of Conservation, Division of Mines and Geology, CD-ROM 2000-007.

Shelton, J.L., Fram, M.S., Munday, C.M., and Belitz, Kenneth, 2010, Groundwater-quality data for the Sierra Nevada study unit, 2008—Results from the California GAMA program: U.S. Geological Survey Data Series 534, 82 p., https://pubs.er.usgs.gov/publication/ds534.

Shelton, J.L., Fram, M.S., and Belitz, Kenneth, 2013, Groundwater-quality data in the Cascade Range and Modoc Plateau study unit, 2010—Results from the California GAMA Program: U.S. Geological Survey Data Series 688, 126 p., https://pubs.er.usgs.gov/publication/ds688.

State of California, 1999, Supplemental Report of the 1999 Budget Act 1999–00 Fiscal Year, Item 3940-001-0001, State Water Resources Control Board, accessed July 7, 2015, at http://www.lao.ca.gov/1999/99-00_supp_rpt_lang.html#3940.

State of California, 2001a, Assembly Bill No. 599, Chapter 522, accessed March 4, 2015, at http://www.swrcb.ca.gov/gama/docs/ab_599_bill_20011005_chaptered.pdf.

State of California, 2001b, Groundwater Monitoring Act of 2001: California Water Code, part 2.76, sec. 10780–10782.3, accessed March 4, 2015, at http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=WAT&division=6.&title=&part=2.76.&chapter=&article=.

Stevenson, D.L., ed., 2012, Quality management system, U.S. Geological Survey National Water Quality Laboratory: unpublished U.S. Geological Survey Report, version 2.0, January 3, 2012, chapters variously paged, http://nwql.usgs.gov/elec/QMS_v2.pdf.

U.S. Department of Agriculture, 2013, Watershed Boundary Dataset: United States Department of Agriculture-Natural Resources Conservation Service, United States Geological Survey, and the Environmental Protection Agency, digital data, accessed January 7, 2016, at https://nhd.usgs.gov/wbd.html.

U.S. Environmental Protection Agency, 2006, 2006 edition of the drinking water standards and health advisory, EPA 822–R–06–013, accessed March 4, 2015, at http://nepis.epa.gov/Exe/ZyPDF.cgi/P1004X78.PDF?Dockey=P1004X78.PDF.

U.S. Environmental Protection Agency, 2013, Drinking water contaminants—Standards and regulations, accessed March 4, 2015, at http://water.epa.gov/drink/contaminants/.

U.S. Geological Survey, variously dated, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A1–A9, accessed June 3, 2015, at http://water.usgs.gov/owq/FieldManual/.

Zogorski, J.S., Carter, J.M., Ivahnenko, Tamara, Lapham, W.W., Moran, M.J., Rowe, B.L., Squillace, P.J., and Toccalino, P.L., 2006, The quality of our Nation's waters—Volatile organic compounds in the Nation's ground water and drinking-water supply wells: U.S. Geological Survey Circular 1292, 101 p., https://pubs.er.usgs.gov/publication/cir1292.

Table 1. Identification, sampling, and construction information for the trend sites of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[**GAMA site identification number acronyms**: **San Francisco Bay study unit**: SF. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **Santa Barbara study unit**: SB. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Klamath Mountains study unit**: KLAM. **Abbreviations**: ft, foot; LSD, land-surface datum; mm/dd/yyyy, month/day/year; na, not available]

GAMA site identification number	Trend sample date (mm/dd/yyyy)	Initial sample date (mm/dd/yyyy)	Elevation[1]	Well depth (ft below LSD)	Top of highest perforation (ft below LSD)	Bottom of lowest perforation (ft below LSD)
Coastal region						
San Francisco Bay study unit						
SF-05	03/23/2011	05/23/2007	53	480	na	na
SF-10	03/22/2011	05/03/2007	73	680	290	660
SF-14	03/21/2011	04/25/2007	63	528	165	363
SF-20	03/21/2011	05/02/2007	203	840	358	798
SF-42	03/22/2011	06/19/2007	13	495	324	479
Southern Coast Range–Coastal study unit						
SCRC-B18	06/06/2012	06/23/2008	303	210	98	na
SCRC-B23	06/07/2012	07/07/2008	262	620	375	600
SCRC-B24	06/06/2012	07/07/2008	282	600	na	na
SCRC-B35	06/05/2012	07/30/2008	93	140	80	140
SCRC-H08	06/05/2012	06/10/2008	958	920	535	910
SCRC-H11	06/07/2012	06/26/2008	322	260	200	260
Southern Coast Range–Interior Basins study unit						
LIV-03	09/18/2012	08/25/2008	348	650	149	650
GIL-02	09/18/2012	08/12/2008	193	470	240	460
GIL-12	09/19/2012	08/19/2008	155	700	na	na
CUY-02	09/20/2012	09/15/2008	2,258	790	340	790
CUY-06	09/20/2012	09/17/2008	2,552	800	640	800
Northern Coast Ranges study unit						
NOCO-IN-10	05/02/2012	06/18/2009	553	101	35	94
NOCO-IN-11	05/02/2012	06/22/2009	958	100	60	100
NOCO-IN-27	05/01/2012	07/27/2009	1,776	155	40	115
NOCO-CO-02	05/10/2012	07/30/2009	48	55	35	55
NOCO-CO-03	05/09/2012	08/03/2009	38	380	280	370
NOCO-CO-08	05/08/2012	08/11/2009	33	215	150	210
NOCO-CO-18	05/09/2012	08/31/2009	39	65	55	60
NOCO-CO-23	05/08/2012	09/15/2009	39	45	35	45
Santa Barbara study unit						
SB-07	12/18/2013	01/26/2011	191	427	215	427
SB-12	12/18/2013	02/07/2011	267	140	na	na

Table 1. Identification, sampling, and construction information for the trend sites of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[**GAMA site identification number acronyms**: **San Francisco Bay study unit**: SF. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **Santa Barbara study unit**: SB. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Klamath Mountains study unit**: KLAM. **Abbreviations**: ft, foot; LSD, land-surface datum; mm/dd/yyyy, month/day/year; na, not available]

GAMA site identification number	Trend sample date (mm/dd/yyyy)	Initial sample date (mm/dd/yyyy)	Elevation[1]	Well depth (ft below LSD)	Top of highest perforation (ft below LSD)	Bottom of lowest perforation (ft below LSD)
Mountain region						
Central Sierra study unit						
CGOLD-13	06/14/2010	05/23/2006	1,090	302	60	302
CGOLD-16	05/25/2010	05/24/2006	4,800	500	120	500
CWISH-04	06/14/2010	05/15/2006	3,400	700	52	700
Southern Sierra study unit						
SOSA-06	06/23/2008	06/07/2006	3,245	580	300	580
SOSA-15	07/08/2008	06/12/2006	5,060	at LSD	na	na
SOSA-20	06/25/2008	06/14/2006	2,964	165	140	165
SOSA-31	06/25/2008	06/29/2006	2,650	120	78	120
SOSA-32	06/24/2008	06/29/2006	4,180	400	200	400
Tahoe–Martis study unit						
TMART-03	08/27/2012	06/26/2007	5,596	383	363	383
TMART-06	08/27/2012	06/28/2007	5,879	900	40	900
TROCK-02	08/28/2012	07/11/2007	6,584	at LSD	na	na
TROCK-05	08/28/2012	07/17/2007	6,319	at LSD	na	na
TTAHO-06	08/29/2012	08/02/2007	6,232	495	138	480
TTAHO-10	08/29/2012	08/16/2007	6,319	250	95	245
Sierra Nevada Regional study unit						
SIERRA-G-08	10/03/2012	07/23/2008	5,606	120	57	120
SIERRA-G-10	10/03/2012	07/28/2008	6,248	105	105	105
SIERRA-G-12	10/04/2012	08/14/2008	3,870	675	57	675
SIERRA-G-13	10/02/2012	08/21/2008	2,763	400	60	400
SIERRA-G-14	08/30/2012	08/26/2008	6,755	400	50	400
SIERRA-G-15	10/01/2012	09/08/2008	200	480	60	480
SIERRA-G-16	09/17/2012	09/22/2008	8,596	at LSD	na	na
SIERRA-G-17	09/18/2012	09/23/2008	9,800	at LSD	na	na
SIERRA-G-18	09/19/2012	09/24/2008	10,110	at LSD	na	na
SIERRA-M-03	09/11/2012	09/10/2008	3,903	at LSD	na	na
SIERRA-M-04	09/12/2012	09/17/2008	6,424	at LSD	na	na
SIERRA-M-06	09/13/2012	10/08/2008	3,361	190	150	190
SIERRA-S-02	08/30/2012	08/19/2008	6,304	600	130	310
SIERRA-S-03	09/12/2012	10/20/2008	4,845	520	110	520
SIERRA-V-02	09/10/2012	10/07/2008	2,364	702	280	702
SIERRA-V-03	09/20/2012	10/21/2008	7,654	220	60	220

Table 1. Identification, sampling, and construction information for the trend sites of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[**GAMA site identification number acronyms**: **San Francisco Bay study unit**: SF. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **Santa Barbara study unit**: SB. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Klamath Mountains study unit**: KLAM. **Abbreviations**: ft, foot; LSD, land-surface datum; mm/dd/yyyy, month/day/year; na, not available]

GAMA site identification number	Trend sample date (mm/dd/yyyy)	Initial sample date (mm/dd/yyyy)	Elevation[1]	Well depth (ft below LSD)	Top of highest perforation (ft below LSD)	Bottom of lowest perforation (ft below LSD)
Mountain region—Continued						
Bear Valley–Lake Arrowhead Watershed study unit						
BEAR-S05	06/06/2013	04/28/2010	6,917	710	210	690
BEAR-S12	06/06/2013	05/05/2010	6,719	174	91	166
BEAR-G07	06/05/2013	05/10/2010	5,143	500	120	500
BEAR-G12	06/05/2013	05/19/2010	6,113	at LSD	na	na
Cascade Range–Modoc Plateau study unit						
CAMP-ES-05	08/01/2013	09/20/2010	1,934	550	395	525
CAMP-ES-09	08/01/2013	10/04/2010	1,524	730	500	730
CAMP-HL-02	08/05/2013	08/11/2010	4,344	240	140	240
CAMP-HL-10	08/05/2013	08/23/2010	4,123	545	na	na
CAMP-LU-04	08/06/2013	07/21/2010	4,666	353	126	350
CAMP-LU-15	07/30/2013	08/30/2010	4,528	371	228	360
CAMP-QV-04	08/08/2013	08/03/2010	4,090	325	211	325
CAMP-QV-12	07/31/2013	09/14/2010	2,588	232	3	232
CAMP-SH-01	07/29/2013	07/12/2010	2,744	120	12	120
CAMP-SH-07	07/30/2013	07/15/2010	4,465	at LSD	na	na
CAMP-TV-07	08/07/2013	08/26/2010	6,262	230	50	230
CAMP-TV-15	07/29/2013	10/13/2010	2,273	275	54	275
Klamath Mountains study unit						
KLAM-01	10/29/2013	10/18/2010	723	at LSD	na	na
KLAM-11	10/30/2013	11/02/2010	647	89	49	89
KLAM-20	10/30/2013	11/17/2010	2,465	at LSD	na	na
KLAM-30	10/31/2013	12/02/2010	2,008	120	60	120

[1]Elevation is expressed as altitude of LSD. The LSD is a datum plane that is approximately at land surface at each site. The altitude of the LSD is described in feet above the North American Vertical Datum 1988.

Table 2. Sampling and previous publications information for the 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

GAMA Priority Basin Project study units	Initial sampling period		Trend sampling period		GAMA publication	
	Year	Status sites	Year	Trend sites	Data series report	Scientific investigations report
Coastal region						
San Francisco Bay study unit	2007	43	2011	5	396 (Ray and others, 2009)	2012–5248 (Parsons and others, 2013)
Southern Coast Range–Coastal Basins study unit	2008	55	2012	6	504 (Mathany and others, 2010)	2013–5053 (Burton and others, 2013)
Southern Coast Range–Interior Basins study unit	2008	35	2012	5	463 (Mathany and others, 2009)	2014–5023 (Parsons and others, 2014)
Northern Coast Ranges study unit	2009	58	2012	8	609 (Mathany and others, 2011)	2014–5215 (Mathany and Belitz, 2015)
Santa Barbara study unit	2011	18	2013	2	742 (Davis and others, 2013)	2016–5112 (Davis and Kulongoski, 2016)
Mountain region						
Central Sierra Nevada study unit	2006	27	2010	3	335 (Ferrari and others, 2008)	2011–5206 (Fram and Belitz, 2012)
Southern Sierra Nevada study unit	2006	35	2008	5	301 (Fram and Belitz, 2007)	2011–5206 (Fram and Belitz, 2012)
Tahoe–Martis study unit	2007	41	2012	6	432 (Fram and others, 2009)	2011–5206 (Fram and Belitz, 2012)
Sierra Nevada Regional study unit	2008	83	2012	16	534 (Shelton and others, 2010)	2014–5174 (Fram and Belitz, 2014)
Bear Valley–Lake Arrowhead Watershed study unit	2010	27	2013	4	747 (Mathany and Belitz, 2013)	Report in progress
Cascade Range–Modoc Plateau study unit	2010	90	2013	12	688 (Shelton and others, 2013)	2014–5238 (Fram and Shelton, 2015)
Klamath Mountains study unit	2010	38	2013	4	803 (Mathany and others, 2010)	2014–5065 (Bennett and others, 2014)

Table 3. Water-quality indicators and chemical constituents analyzed in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[Analytical methods are reported in table A1. **Abbreviations**: 1,2,3–TCP, 1,2,3–trichloropropane; DBCP, 1,2-dibromo-3-chloropropane; EDB, 1,2-dibromoethane; NWQL, National Water Quality Laboratory; VOCs, volatile organic compounds]

GAMA Priority Basin Project study units	Sampling period	Field water-quality indicators [1]	Organic constituents			Special-interest constituents		Inorganic constituents		Geochemical and age-dating tracers		
			VOCs	DBCP and EDB	Pesticides and pesticide degradates [2]	1,2,3–TCP	Perchlorate	Nutrients	Major ions and trace elements [3]	Stable isotopes of hydrogen and oxygen in water	Tritium	Carbon isotopes
Table of analytes		5	4*A*	4*B*	4*C*	4*D*	4*D*	4*E*	4*F*	4*G*	4*G*	4*G*
Table of results		5	6	6	7	8	8	9	10, 11	12	12	12
Coastal region												
San Francisco Bay study unit	Initial	some	all	none	all	none	all	some	none	all	all	all
San Francisco Bay study unit	Trend	all	all	all	all	all	all	all	all	all	all	all
Southern Coast Range–Coastal Basins study unit	Initial	some	all	none	all	all	all	some	some	all	all	some
Southern Coast Range–Coastal Basins study unit	Trend	all	all	all	all	all	all	all	all	all	all	all
Southern Coast Range–Interior Basins study unit	Initial	all	all	none	all	none	all	all	all	all	all	all
Southern Coast Range–Interior Basins study unit	Trend	all	all	all	all	all	all	all	all	some	all	all
Northern Coast Ranges study unit	Initial	all	all	none	all	none	all	all	all	all	all	all
Northern Coast Ranges study unit	Trend	all	all	all	all	all	all	all	all	all	all	all
Santa Barbara study unit	Initial	all	all	none	all	none	all	all	all	all	all	all
Santa Barbara study unit	Trend	all	all	none	all	none	all	all	all	all	all	all
Mountain region												
Central Sierra Nevada study unit	Initial	all	all	none	all	all	all	all	all	all	all	some
Central Sierra Nevada study unit	Trend	all	all	none	all	none	all	all	all	all	all	some

Table 3. Water-quality indicators and chemical constituents analyzed in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[Analytical methods are reported in table A1. **Abbreviations**: 1,2,3–TCP, 1,2,3–trichloropropane; DBCP, 1,2-dibromo-3-chloropropane; EDB, 1,2-dibromoethane; NWQL, National Water Quality Laboratory; VOCs, volatile organic compounds]

GAMA Priority Basin Project study units	Sampling period	Field water-quality indicators [1]	Organic constituents			Special-interest constituents		Inorganic constituents		Geochemical and age-dating tracers		
			VOCs	DBCP and EDB	Pesticides and pesticide degradates [2]	1,2,3–TCP	Perchlorate	Nutrients	Major ions and trace elements [3]	Stable isotopes of hydrogen and oxygen in water	Tritium	Carbon isotopes
Mountain region—Continued												
Southern Sierra Nevada study unit	Initial	some	all	none	all	some	all	some	some	all	some	some
Southern Sierra Nevada study unit	Trend	all	all	none	all	none	all	all	all	all	all	all
Tahoe–Martis study unit	Initial	all	all	none	all	none	all	all	all	all	all	all
Tahoe–Martis study unit	Trend	all	all	none	all	none	all	all	all	all	all	all
Sierra Nevada Regional study unit	Initial	all	all	none	all	none	all	all	all	all	all	some
Sierra Nevada Regional study unit	Trend	all	all	none	all	none	all	all	all	all	all	all
Bear Valley–Lake Arrowhead Watershed study unit	Initial	all	all	none	all	all	all	all	all	all	all	some
Bear Valley–Lake Arrowhead Watershed study unit	Trend	all	all	all	all	none	all	all	all	all	all	all
Cascade Range–Modoc Plateau study unit	Initial	all	all	none	all	none	all	all	all	all	all	all
Cascade Range–Modoc Plateau study unit	Trend	all	all	none	all	none	all	all	all	all	all	all
Klamath Mountains study unit	Initial	all	all	none	all	none	all	all	all	all	all	all
Klamath Mountains study unit	Trend	all	all	none	all	none	all	all	all	all	all	all

[1]The pH, temperature, dissolved oxygen concentrations, and specific conductance were generally measured during the initial and trend sampling periods. Field alkalinity was measured at 10 percent of trend sites sampled. Laboratory alkalinity was measured only at sites where major ion analyses were included during the initial and trend sampling periods.

[2]Pesticides and pesticide degradates were analyzed using NWQL Schedule 2003 (63 constituents) or NWQL Schedule 2033 (83 constituents). The base set of 63 constituents are included on both analytical schedules.

[3]Some sites were sampled for the major ions bromide and iodide and the trace element mercury, whereas others were not.

Table 4*A*. Volatile organic compounds, primary uses or sources, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 2020.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, State of California notification level; RSD5-US, EPA risk specific dose at a risk factor of 10^{-5}. This report contains Chemical Abstracts Service (CAS) Registry Numbers® (CASRN), which is a registered trademark of the American Chemical Society. The CAS recommends the verification of the CASRNs through CAS Client Services℠. **Abbreviations**: D, detected; EPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; SRL, study reporting level; THM, trihalomethane; —, not detected; µg/L, micrograms per liter]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS Registry Number	Minimum LRL 2006–13 (µg/L)	Maximum LRL 2006–13 (µg/L)	SRL (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Intial sampling detection	Trend sampling detection
Acetone	Solvent	81552	67-64-1	3.4	6	all data reviewed and rejected[3]	none	none	—	—
Acrylonitrile	Organic synthesis	34215	107-13-1	0.4	0.8	none	RSD5-US	0.6	—	—
tert-Amyl methyl ether (TAME)	Gasoline oxygenate	50005	994-05-8	0.04	0.06	none	none	none	—	—
Benzene	Gasoline hydrocarbon	34030	71-43-2	0.016	0.026	none	MCL-CA	1	—	—
Bromobenzene	Solvent	81555	108-86-1	0.02	0.028	none	none	none	—	—
Bromochloromethane	Fire retardant	77297	74-97-5	0.06	0.12	none	HAL-US	90	—	—
Bromodichloromethane	Disinfection byproduct (THM)	32101	75-27-4	0.028	0.04	none	MCL-US	[5]80	D	D
Bromoform (Tribromomethane)	Disinfection byproduct (THM)	32104	75-25-2	0.08	0.1	none	MCL-US	[5]80	—	—
Bromomethane (Methyl bromide)	Fumigant	34413	74-83-9	0.2	0.4	none	HAL-US	10	—	—
n-Butylbenzene	Gasoline hydrocarbon	77342	104-51-8	0.08	0.14	none	NL-CA	260	—	—
sec-Butylbenzene	Gasoline hydrocarbon	77350	135-98-8	0.02	0.06	none	NL-CA	260	—	—
tert-Butylbenzene	Gasoline hydrocarbon	77353	98-06-6	0.06	0.08	none	NL-CA	260	—	—
Carbon disulfide	Organic synthesis	77041	75-15-0	0.038	0.1	[4]0.03	NL-CA	160	D	—
Carbon tetrachloride (Tetrachloromethane)	Solvent	32102	56-23-5	0.06	0.08	none	MCL-CA	0.5	D	D
Chlorobenzene	Solvent	34301	108-90-7	0.016	0.028	none	MCL-CA	70	—	D
Chloroethane	Solvent	34311	75-00-3	0.06	0.12	none	none	none	—	—
Chloroform (Trichloromethane)	Disinfection byproduct (THM)	32106	67-66-3	0.02	0.04	none	MCL-US	[5]80	D	D
Chloromethane	Solvent	34418	74-87-3	0.1	0.2	none	HAL-US	30	—	—
3-Chloropropene	Organic synthesis	78109	107-05-1	0.08	0.5	none	none	none	—	—
2-Chlorotoluene	Solvent	77275	95-49-8	0.02	0.04	none	NL-CA	140	—	—
4-Chlorotoluene	Solvent	77277	106-43-4	0.02	0.05	none	NL-CA	140	—	—

Table 4*A*. Volatile organic compounds, primary uses or sources, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 2020.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, State of California notification level; RSD5-US, EPA risk specific dose at a risk factor of 10^{-5}. This report contains Chemical Abstracts Service (CAS) Registry Numbers® (CASRN), which is a registered trademark of the American Chemical Society. The CAS recommends the verification of the CASRNs through CAS Client Services℠. **Abbreviations**: D, detected; EPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; SRL, study reporting level; THM, trihalomethane; —, not detected; µg/L, micrograms per liter]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS Registry Number	Minimum LRL 2006–13 (µg/L)	Maximum LRL 2006–13 (µg/L)	SRL (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Intial sampling detection	Trend sampling detection
Dibromochloromethane	Disinfection byproduct (THM)	32105	124-48-1	0.1	0.12	none	MCL-US	[5]80	—	—
1,2-Dibromo-3-chloropropane (DBCP)	Fumigant	82625	96-12-8	0.5	1	none	MCL-US	0.2	—	—
1,2-Dibromoethane (EDB)	Fumigant	77651	106-93-4	0.028	0.05	none	MCL-US	0.05	—	—
Dibromomethane	Solvent	30217	74-95-3	0.04	0.05	none	none	none	D	—
1,2-Dichlorobenzene	Solvent	34536	95-50-1	0.02	0.048	none	MCL-US	600	—	—
1,3-Dichlorobenzene	Solvent	34566	541-73-1	0.02	0.04	none	HAL-US	600	—	—
1,4-Dichlorobenzene	Fumigant	34571	106-46-7	0.02	0.04	none	MCL-CA	5	—	D
trans-1,4-Dichloro-2-butene	Organic synthesis	73547	110-57-6	0.36	2	none	none	none	—	—
Dichlorodifluoromethane (CFC-12)	Refrigerant	34668	75-71-8	0.1	0.18	none	NL-CA	1,000	D	—
1,1-Dichloroethane (1,1-DCA)	Solvent	34496	75-34-3	0.035	0.06	none	MCL-CA	5	D	D
1,2-Dichloroethane (1,2-DCA)	Solvent	32103	107-06-2	0.06	0.13	none	MCL-CA	0.5	D	—
1,1-Dichloroethene (1,1-DCE)	Organic synthesis	34501	75-35-4	0.02	0.024	[4]0.023	MCL-CA	6	D	D
cis-1,2-Dichloroethene (*cis*-1,2-DCE)	Solvent	77093	156-59-2	0.02	0.024	none	MCL-CA	6	D	D
trans-1,2-Dichloroethene (*trans*-1,2-DCE)	Solvent	34546	156-60-5	0.018	0.032	none	MCL-CA	10	—	—
1,2-Dichloropropane	Fumigant	34541	78-87-5	0.02	0.029	none	MCL-US	5	—	—
1,3-Dichloropropane	Fumigant	77173	142-28-9	0.06	0.06	none	none	none	—	—
2,2-Dichloropropane	Fumigant	77170	594-20-7	0.05	0.06	none	none	none	—	—
1,1-Dichloropropene	Organic synthesis	77168	563-58-6	0.026	0.04	none	none	none	—	—
cis-1,3-Dichloropropene	Fumigant	34704	10061-01-5	0.05	0.1	none	RSD5-US	[6]4	—	—

Table 4*A*. Volatile organic compounds, primary uses or sources, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 2020.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, State of California notification level; RSD5-US, EPA risk specific dose at a risk factor of 10^{-5}. This report contains Chemical Abstracts Service (CAS) Registry Numbers® (CASRN), which is a registered trademark of the American Chemical Society. The CAS recommends the verification of the CASRNs through CAS Client Services℠. **Abbreviations**: D, detected; EPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; SRL, study reporting level; THM, trihalomethane; —, not detected; µg/L, micrograms per liter]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS Registry Number	Minimum LRL 2006–13 (µg/L)	Maximum LRL 2006–13 (µg/L)	SRL (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Intial sampling detection	Trend sampling detection
trans-1,3-Dichloropropene	Fumigant	34699	10061-02-6	0.09	0.14	none	RSD5-US	[6]4	—	—
Diethyl ether	Solvent	81576	60-29-7	0.08	0.12	none	none	none	—	—
Diisopropyl ether (DIPE)	Gasoline oxygenate	81577	108-20-3	0.06	0.1	none	none	none	—	—
Ethylbenzene	Gasoline hydrocarbon	34371	100-41-4	0.02	0.04	none	MCL-CA	300	—	—
Ethyl *tert*-butyl ether (ETBE)	Gasoline oxygenate	50004	637-92-3	0.03	0.04	none	none	none	—	—
Ethyl methacrylate	Organic synthesis	73570	97-63-2	0.14	0.2	none	none	none	—	—
Ethyl methyl ketone (2-butanone)	Solvent	81595	78-93-3	1.6	2	all data reviewed and rejected[3]	HAL-US	4,000	—	—
o-Ethyl toluene (1-Ethyl-2-methyl benzene)	Gasoline hydrocarbon	77220	611-14-3	0.02	0.06	none	none	none	—	—
Hexachlorobutadiene	Organic synthesis	39702	87-68-3	0.06	0.14	none	RSD5-US	9	—	—
Hexachloroethane	Solvent	34396	67-72-1	0.1	0.22	none	HAL-US	1	—	—
2-Hexanone (*n*-Butyl methyl ketone)	Solvent	77103	591-78-6	0.4	0.6	none	none	none	—	—
Iodomethane (Methyl iodide)	Fumigant, natural	77424	74-88-4	0.26	0.8	none	none	none	—	—
Isopropylbenzene	Gasoline hydrocarbon	77223	98-82-8	0.038	0.042	none	NL-CA	770	—	—
4-Isopropyltoluene (p-isopropyltoluene)	Gasoline hydrocarbon	77356	99-87-6	0.06	0.08	none	none	none	—	—
Methyl acrylate	Organic synthesis	49991	96-33-3	0.4	1	none	none	none	—	—
Methyl acrylonitrile	Organic synthesis	81593	126-98-7	0.2	0.40	none	none	none	—	—
Methyl *tert*-butyl ether (MTBE)	Gasoline oxygenate	78032	1634-04-4	0.1	0.17	none	MCL-CA	13	D	D
Methyl *iso*-butyl ketone (MIBK)	Solvent	78133	108-10-1	0.2	0.4	none	NL-CA	120	—	—
Methylene chloride (Dichloromethane)	Solvent	34423	75-09-2	0.04	0.06	none	MCL-US	5	—	—
Methyl methacrylate	Organic synthesis	81597	80-62-6	0.20	0.40	none	none	none	—	—
Naphthalene	Gasoline hydrocarbon	34696	91-20-3	0.18	0.52	none	NL-CA	17	—	—

Table 4*A*. Volatile organic compounds, primary uses or sources, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 2020.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, State of California notification level; RSD5-US, EPA risk specific dose at a risk factor of 10^{-5}. This report contains Chemical Abstracts Service (CAS) Registry Numbers® (CASRN), which is a registered trademark of the American Chemical Society. The CAS recommends the verification of the CASRNs through CAS Client Services℠. **Abbreviations**: D, detected; EPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; SRL, study reporting level; THM, trihalomethane; —, not detected; µg/L, micrograms per liter]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS Registry Number	Minimum LRL 2006–13 (µg/L)	Maximum LRL 2006–13 (µg/L)	SRL (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Intial sampling detection	Trend sampling detection
n-Propylbenzene	Solvent	77224	103-65-1	0.036	0.042	none	NL-CA	260	—	—
Styrene	Gasoline hydrocarbon	77128	100-42-5	0.03	0.042	none	MCL-US	100	—	—
1,1,1,2-Tetrachloroethane	Solvent	77562	630-20-6	0.030	0.040	none	HAL-US	70	—	—
1,1,2,2-Tetrachloroethane	Solvent	34516	79-34-5	0.08	0.14	none	MCL-CA	1	—	—
Perchloroethene (PCE, Tetrachloroethene)	Solvent	34475	127-18-4	0.026	0.04	[4]0.05	MCL-US	5	D	D
Tetrahydrofuran	Solvent	81607	109-99-9	1	1.4	all data reviewed and rejected[3]	none	none	D	D
1,2,3,4-Tetramethylbenzene	Gasoline hydrocarbon	49999	488-23-3	0.08	0.14	none	none	none	—	—
1,2,3,5-Tetramethylbenzene	Gasoline hydrocarbon	50000	527-53-7	0.08	0.18	none	none	none	—	—
Toluene	Gasoline hydrocarbon	34010	108-88-3	0.018	0.02	[3]0.69	MCL-CA	150	—	—
1,2,3-Trichlorobenzene	Organic synthesis	77613	87-61-6	0.06	0.18	none	none	none	—	—
1,2,4-Trichlorobenzene	Solvent	34551	120-82-1	0.04	0.12	none	MCL-CA	5	—	—
1,1,1-Trichloroethane (TCA)	Solvent	34506	71-55-6	0.02	0.04	none	MCL-US	200	D	D
1,1,2-Trichloroethane	Solvent	34511	79-00-5	0.028	0.06	none	MCL-CA	5	—	—
Trichloroethene (TCE)	Solvent	39180	79-01-6	0.02	0.038	none	MCL-US	5	D	D
Trichlorofluoromethane (CFC-11)	Refrigerant	34488	75-69-4	0.06	0.16	none	MCL-CA	150	D	D
1,2,3-Trichloropropane (1,2,3-TCP)	Fumigant/solvent	77443	96-18-4	0.12	0.18	none	HAL-US	40	—	—
Trichlorotrifluoroethane (CFC-113)	Refrigerant	77652	76-13-1	0.038	0.04	none	MCL-CA	1,200	D	D
1,2,3-Trimethylbenzene	Gasoline hydrocarbon	77221	526-73-8	0.06	0.09	none	none	none	—	—
1,2,4-Trimethylbenzene	Gasoline hydrocarbon	77222	95-63-6	0.032	0.056	[3]0.56	NL-CA	330	D	—
1,3,5-Trimethylbenzene	Organic synthesis	77226	108-67-8	0.032	0.044	none	NL-CA	330	—	—
Vinyl bromide (Bromoethene)	Fire retardant	50002	593-60-2	0.10	0.12	none	none	none	—	—
Vinyl chloride (Chloroethene)	Organic synthesis	39175	75-01-4	0.06	0.08	none	MCL-CA	0.5	—	—

Table 4*A*. Volatile organic compounds, primary uses or sources, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 2020.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, State of California notification level; RSD5-US, EPA risk specific dose at a risk factor of 10^{-5}. This report contains Chemical Abstracts Service (CAS) Registry Numbers® (CASRN), which is a registered trademark of the American Chemical Society. The CAS recommends the verification of the CASRNs through CAS Client Services℠. **Abbreviations**: D, detected; EPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; SRL, study reporting level; THM, trihalomethane; —, not detected; µg/L, micrograms per liter]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS Registry Number	Minimum LRL 2006–13 (µg/L)	Maximum LRL 2006–13 (µg/L)	SRL (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Intial sampling detection	Trend sampling detection
m- and *p*-Xylene	Gasoline hydrocarbon	85795	108-38-3, 106-42-3	0.06	0.08	none	MCL-CA	[7]1,750	—	—
o-Xylene	Gasoline hydrocarbon	77135	95-47-6	0.032	0.04	none	MCL-CA	[7]1,750	—	—

[1]Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2]GAMA Program policy for acetone, ethyl methyl ketone, and tetrahydrofuran is to report all detections as "all data reviewed and rejected" (Fram and others, 2012).

[3]The SRL was based on Fram and others (2012).

[4]The SRL was based on highest concentration in blanks during the trend sampling period.

[5]The MCL-US benchmark for trihalomethanes is the sum of chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

[6]The RSD5-US benchmark for 1,3-dichloropropene is the sum of its isomers (*cis* and *trans*).

[7]The MCL-CA benchmarks for *m*- plus *p*-Xylene and *o*-Xylene is the sum all three xylene compounds.

Table 4*B*. 1,2-Dibromo-3-chloropropane (DBCP) and 1,2-Dibromoethane (EDB), primary uses or sources, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 1306.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. This analytical schedule is the preferred method for these two constituents, but was not used for all study units. Benchmarks and benchmark values as of August 1, 2013. **Benchmark type**: MCL-US, U.S. Environmental Protection Agency maximum contaminant level. This report contains Chemical Abstract Society (CAS) Registry Numbers® (CASRNs), which is a registered trademark of the American Chemical Society. The CAS recommends the verification of the CASRNs through CAS Client Services℠. **Abbreviations**: LRL, laboratory reporting level; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS Registry Number	Minimum LRL 2006–13 (µg/L)	Maximum LRL 2006–13 (µg/L)	Benchmark type	Benchmark value (µg/L)	Initial sampling detection	Trend sampling detection
1,2-Dibromo-3-chloropropane (DBCP)[1]	Fumigant	82625	96-12-8	0.030	0.030	MCL-US	0.2	—	—
1,2-Dibromoethane (EDB)	Fumigant	77651	106-93-4	0.02	0.040	MCL-US	0.05	—	—

[1]The median matrix-spike recovery was less than 70 percent. Low recoveries can indicate that the compound might not have been detected in some samples even if it was present.

Table 4*C*. Pesticides and pesticide degradates, primary uses or sources, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 2003 and the expanded version Schedule 2033.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; RSD5-US, EPA risk-specific dose at a risk factor of 10^{-5}. This report contains Chemical Abstracts Service (CAS) Registry Numbers® (CASRNs), which is a registered trademark of the American Chemical Society. The CAS recommends the verification of the CASRNs through CAS Client Services℠. **Abbreviations**: D, detected; EPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS Registry Number	Minimum LRL 2006–13 (µg/L)	Maximum LRL 2006–13 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Initial sampling detection	Trend sampling detection
1-Naphthol[2]	Insecticide degradate	49295	90-15-3	0.036	0.0882	none	none	—	—
2,6-Diethylaniline	Herbicide degradate	82660	579-66-8	0.006	0.006	none	none	—	—
2-Chloro-2,6-diethylacetanilide	Herbicide degradate	61618	6967-29-9	0.005	0.010	none	none	—	—
2-Ethyl-6-methylaniline	Herbicide degradate	61620	24549-06-2	0.0045	0.010	none	none	—	—
3,4-Dichloroaniline	Herbicide degradate	61625	95-76-1	0.004	0.006	none	none	D	—
3,5-Dichloroaniline[3]	Herbicide degradate	61627	626-43-7	0.0030	0.012	none	none	—	—
4-Chloro-2-methylphenol	Herbicide degradate	61633	1570-64-5	0.0032	0.008	none	none	—	—
Acetochlor	Herbicide	49260	34256-82-1	0.006	0.010	none	none	—	—
Alachlor	Herbicide	46342	15972-60-8	0.005	0.008	MCL-US	2	—	—
Atrazine	Herbicide	39632	1912-24-9	0.007	0.008	MCL-CA	1	D	D
Azinphos-methyl	Insecticide	82686	86-50-0	0.05	0.12	none	none	—	—
Azinphos-methyl oxon[2]	Insecticide degradate	61635	961-22-8	0.042	0.07	none	none	—	—
Benfluralin	Herbicide	82673	1861-40-1	0.004	0.014	none	none	—	—
Carbaryl	Insecticide	82680	63-25-2	0.041	0.2	RSD5-US	400	—	—
Carbofuran[3]	Insecticide	82674	1563-66-2	0.02	0.060	MCL-CA	18	—	—
Chlorpyrifos	Insecticide	38933	2921-88-2	0.0036	0.010	HAL-US	2	—	—
Chlorpyrifos oxon[2]	Insecticide degradate	61636	5598-15-2	0.05	0.08	none	none	—	—
cis-Permethrin[2]	Insecticide	82687	54774-45-7	0.006	0.014	none	none	—	—
cis-Propiconazole[3]	Fungicide	79846	60207-90-1	0.006	0.013	none	none	—	—
Cyanazine[3]	Herbicide	04041	21725-46-2	0.018	0.04	HAL-US	1	—	—
Cyfluthrin[2]	Insecticide	61585	68359-37-5	0.016	0.053	none	none	—	—
Cypermethrin	Insecticide	61586	52315-07-8	0.0086	0.046	none	none	—	—
DCPA (Dacthal)	Herbicide	82682	1861-32-1	0.003	0.0076	HAL-US	70	—	—
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine)[2]	Herbicide degradate	04040	6190-65-4	0.006	0.014	none	none	D	D
Desulfinylfipronil	Insecticide degradate	62170	none	0.012	0.012	none	none	—	—
Desulfinylfipronil amide	Insecticide degradate	62169	none	0.029	0.029	none	none	—	—
Diazinon	Insecticide	39572	333-41-5	0.005	0.0060	HAL-US	1	—	—
Diazinon oxon[3]	Insecticide	61638	962-58-3	0.010	0.012	none	none	—	—

Table 4*C*. Pesticides and pesticide degradates, primary uses or sources, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 2003 and the expanded version Schedule 2033.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; RSD5-US, EPA risk-specific dose at a risk factor of 10^{-5}. This report contains Chemical Abstracts Service (CAS) Registry Numbers® (CASRNs), which is a registered trademark of the American Chemical Society. The CAS recommends the verification of the CASRNs through CAS Client Services℠. **Abbreviations**: D, detected; EPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS Registry Number	Minimum LRL 2006–13 (µg/L)	Maximum LRL 2006–13 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Initial sampling detection	Trend sampling detection
Dichlorvos[2]	Insecticide	38775	62-73-7	0.0118	0.04	none	none	—	—
Dicrotophos[2]	Insecticide	38454	141-66-2	0.08	0.0843	none	none	—	—
Dieldrin	Insecticide	39381	60-57-1	0.008	0.009	RSD5-US	0.02	—	—
Dimethoate[2]	Insecticide	82662	60-51-5	0.006	0.0061	none	none	—	—
Disulfoton[2,3]	Insecticide	82677	298-04-4	0.02	0.04	HAL-US	0.7	—	—
Disulfoton sulfone[3]	Insecticide degradate	61640	2497-06-5	0.0059	0.014	none	none	—	—
Endosulfan sulfate[3]	Insecticide degradate	61590	1031-07-8	0.0138	0.022	none	none	—	—
Ethion	Insecticide	82346	563-12-2	0.004	0.016	none	none	—	—
Ethion monoxon	Insecticide degradate	61644	17356-42-2	0.002	0.021	none	none	—	—
Ethoprophos[3]	Herbicide	82672	13194-48-4	0.005	0.016	none	none	—	—
Fenamiphos	Insecticide	61591	22224-92-6	0.029	0.030	HAL-US	0.7	—	—
Fenamiphos sulfone	Insecticide degradate	61645	31972-44-8	0.0491	0.054	none	none	—	—
Fenamiphos sulfoxide[2]	Insecticide degradate	61646	31972-43-7	0.0387	0.2	none	none	—	—
Fipronil	Insecticide	62166	120068-37-3	0.016	0.04	none	none	—	—
Fipronil sulfide	Insecticide degradate	62167	120067-83-6	0.012	0.013	none	none	—	—
Fipronil sulfone	Insecticide degradate	62168	120068-36-2	0.024	0.024	none	none	—	—
Fonofos	Insecticide	04095	944-22-9	0.003	0.01	HAL-US	10	—	—
Hexazinone[2]	Herbicide	04025	51235-04-2	0.008	0.026	HAL-US	400	—	D
Iprodione	Fungicide	61593	36734-19-7	0.01	0.538	none	none	—	—
Isofenphos	Insecticide	61594	25311-71-1	0.0034	0.011	none	none	—	—
Malaoxon	Insecticide degradate	61652	1634-78-2	0.02	0.08	none	none	—	—
Malathion	Insecticide	39532	121-75-5	0.016	0.027	HAL-US	100	—	—
Metalaxyl	Fungicide	61596	57837-19-1	0.0051	0.014	none	none	—	—
Methidathion	Insecticide	61598	950-37-8	0.004	0.012	none	none	—	—
Metolachlor	Herbicide	39415	51218-45-2	0.006	0.020	HAL-US	700	—	—
Metribuzin	Herbicide	82630	21087-64-9	0.006	0.028	HAL-US	70	—	—
Molinate[3]	Herbicide	82671	2212-67-1	0.002	0.008	MCL-CA	20	—	—
Myclobutanil	Fungicide	61599	88671-89-0	0.008	0.033	none	none	—	—
Oxyfluorfen[3]	Herbicide	61600	42874-03-3	0.006	0.017	none	none	—	—

Table 4*C*. Pesticides and pesticide degradates, primary uses or sources, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 2003 and the expanded version Schedule 2033.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; RSD5-US, EPA risk-specific dose at a risk factor of 10^{-5}. This report contains Chemical Abstracts Service (CAS) Registry Numbers® (CASRNs), which is a registered trademark of the American Chemical Society. The CAS recommends the verification of the CASRNs through CAS Client Services℠. **Abbreviations**: D, detected; EPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; µg/L, micrograms per liter; —, not detected]

Constituent (synonym or abbreviation)	Primary use or source	USGS parameter code	CAS Registry Number	Minimum LRL 2006–13 (µg/L)	Maximum LRL 2006–13 (µg/L)	Benchmark type[1]	Benchmark value (µg/L)	Initial sampling detection	Trend sampling detection
Paraoxon-methyl[2]	Insecticide degradate	61664	950-35-6	0.010	0.0299	none	none	—	—
Parathion-methyl	Insecticide	82667	298-00-0	0.008	0.015	HAL-US	1	—	—
Pendimethalin	Herbicide	82683	40487-42-1	0.012	0.022	none	none	—	—
Phorate[2]	Insecticide	82664	298-02-2	0.011	0.055	none	none	—	—
Phorate oxon	Insecticide degradate	61666	2600-69-3	0.027	0.1048	none	none	—	—
Phosmet[2]	Insecticide	61601	732-11-6	0.0079	0.2	none	none	—	—
Phosmet oxon[2]	Insecticide degradate	61668	3735-33-9	0.0511	0.0511	none	none	—	—
Prometon	Herbicide	04037	1610-18-0	0.01	0.012	HAL-US	100	—	D
Prometryn	Herbicide	04036	7287-19-6	0.0054	0.010	none	none	—	—
Pronamide (Propyzamide)	Herbicide	82676	23950-58-5	0.0036	0.004	RSD5-US	20	—	—
Propanil[3]	Herbicide	82679	709-98-8	0.006	0.014	none	none	—	—
Propargite[3]	Insecticide	82685	2312-35-8	0.020	0.04	none	none	—	—
S-Ethyl-dipropylthiocarbamate (EPTC)[3]	Herbicide	82668	759-94-4	0.002	0.0056	none	none	—	—
Simazine	Herbicide	04035	122-34-9	0.005	0.01	MCL-US	4	D	D
Tebuconazole[3]	Fungicide	62852	107534-96-3	0.020	0.020	none	none	—	—
Tebuthiuron	Herbicide	82670	34014-18-1	0.016	0.028	HAL-US	500	—	D
Tefluthrin[2,3]	Insecticide	61606	79538-32-2	0.0033	0.014	none	none	—	—
Terbufos	Insecticide	82675	13071-79-9	0.012	0.018	HAL-US	0.4	—	—
Terbufos oxon sulfone[2]	Insecticide degradate	61674	56070-15-6	0.045	0.0676	none	none	—	—
Terbuthylazine	Herbicide	04022	5915-41-3	0.006	0.0102	none	none	—	—
Thiobencarb	Herbicide	82681	28249-77-6	0.010	0.016	MCL-CA	70	—	—
trans-Propiconazole[3]	Fungicide	79847	60207-90-1	0.010	0.034	none	none	—	—
Tribufos[2]	Defoliant	61610	78-48-8	0.0044	0.035	none	none	—	—
Trifluralin	Herbicide	82661	1582-09-8	0.006	0.018	HAL-US	10	—	—
α-Endosulfan[3]	Insecticide	34362	959-98-8	0.0047	0.011	none	none	—	—
λ-Cyhalothrin[2,3]	Insecticide	61595	91465-08-6	0.004	0.014	none	none	—	—

[1]Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2]The median matrix-spike recovery was less than 70 percent. Low recoveries can indicate that the compound might not have been detected in some samples even if it was present.

[3]Compound analyzed only by Schedule 2033.

Table 4*D*. Constituents of special interest, primary uses or sources, comparative benchmarks, and reporting information for the Montgomery Watson Harza Laboratory and Weck Laboratories, Inc.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, U.S. Environmental Protection Agency (EPA) lifetime health advisory level; MCL-CA, State of California maximum contaminant level; NL-CA, State of California notification level. **Abbreviations**: CAS, Chemical Abstract Service; D, detected; EPA, U.S. Environmental Protection Agency; LRL, laboratory reporting level; MRL, minimum reporting level; MWH, Montgomery Watson-Harza Laboratory; USGS, U.S. Geological Survey; Weck, Weck Laboratories Inc.; —, not detected; µg/L, micrograms per liter]

Constituent	Primary use or source	USGS parameter code	CAS Registry Number	MRL/LRL (µg/L)	Benchmark type	Benchmark value (µg/L)	Intial sampling detection	Trend sampling detection
Perchlorate (unfiltered)[1]	Rocket fuel, fireworks, flares, natural	61209	14797-73-0	0.5	MCL-CA	6	D	D
Perchlorate (filtered)[2]	Rocket fuel, fireworks, flares, natural	63790	14797-73-0	0.1	MCL-CA	6	D	D
1,2,3-Trichloropropane (1,2,3-TCP)[3]	Fumigant, solvent	77443	96-18-4	0.005	HAL-US	40	—	—

[1]Perchlorate analyses from unfiltered samples were performed by MWH.

[2]Perchlorate analyses from filtered samples were performed by Weck.

[3]In some earlier reports in this series, the NL-CA (0.005 µg/L) was used as the comparison benchmark for 1,2,3-TCP.

Table 4*E*. Nutrients, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 2755.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: HAL-US, U.S. Environmental Protection Agency (EPA) lifetime health advisory level; MCL-US, EPA maximum contaminant level. **Abbreviations**: CAS, Chemical Abstracts Service; D, detected; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mg/L, milligrams per liter]

Constituent	USGS parameter code	CAS Registry Number	Minimum IRL/LRL/ LT-MDL 2006–13 (mg/L)	Maximum IRL/LRL/LT-MDL 2006–13 (mg/L)	Benchmark type	Benchmark value (mg/L)	Initial sampling detection	Trend sampling detection
Ammonia (as nitrogen)	00608	7664-41-7	0.010	0.02	HAL-US	[1]24.7	D	D
Nitrite (as nitrogen)	00613	14797-65-0	0.002	0.002	MCL-US	1	D	D
Nitrate (as nitrogen)[2]	00631	none	0.04	0.08	MCL-US	10	D	D
Total nitrogen (ammonia, nitrite, nitrate, organic nitrogen)	62854	17778-88-0	0.06	0.1	none	none	D	D
Orthophosphate (as phosphorus)	00671	14265-44-2	0.006	0.008	none	none	D	D

[1]The HAL-US is 30 mg/L "as ammonia." To facilitate comparison to the analytical results, we have converted and reported this HAL-US as 24.7 mg/L (as nitrogen).

[2]Nitrite plus nitrate (as nitrogen) is referred to as nitrate because sample concentrations nearly consist entirely of nitrate.

Table 4*F*. Major ions, total dissolved solids, trace elements, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 1948.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: AL-US, U.S. Environmental Protection Agency (EPA) action level; HAL-US, EPA lifetime health advisory; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, State of California notification level; SMCL-CA, State of California secondary maximum contaminant level. **Abbreviations**: CAS, Chemical Abstracts Service; D, detected; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mg/L, milligrams per liter; MRL, minimum reporting level; SRL, study reporting level; µg/L, micrograms per liter]

Constituent	USGS parameter code	CAS Registry Number	Minimum IRL/LRL/LT-MDL/MRL 2006–13	Maximum IRL/LRL/LT-MDL/MRL 2006–13	SRL[1]	SRL[2]	SRL[3]	Benchmark type[5]	Benchmark value	Intial sampling detection	Trend sampling detection
Major ions (mg/L)											
Bromide	71870	24959-67-9	0.01	0.02	none	none	none	none	none	D	D
Calcium	00915	7440-70-2	0.02	0.044	none	none	none	none	none	D	D
Chloride	00940	16887-00-6	0.06	0.20	none	none	none	SMCL-CA	[6]500	D	D
Fluoride	00950	16984-48-8	0.04	0.12	none	none	none	MCL-CA	2	D	D
Iodide	71865	7553-56-2	0.001	0.002	none	none	none	none	none	D	D
Magnesium	00925	7439-95-4	0.008	0.022	none	none	none	none	none	D	D
Potassium	00935	7440-09-7	0.02	0.16	none	none	none	none	none	D	D
Silica	00955	7631-86-9	0.018	0.058	none	none	none	none	none	D	D
Sodium	00930	7440-23-5	0.06	0.20	none	none	none	none	none	D	D
Sulfate	00945	14808-79-8	0.09	0.18	none	none	none	SMCL-CA	[6]500	D	D
Residue on evaporation (total dissolved solids, TDS)	70300	none	10	20	none	none	none	SMCL-CA	[6]1,000	D	D
Trace elements (µg/L)											
Aluminum	01106	7429-90-5	1.6	4.4	1.6	none	none	MCL-CA	1,000	D	D
Antimony	01095	7440-36-0	0.027	0.2	none	none	none	MCL-US	6	D	D
Arsenic	01000	7440-38-2	0.022	0.12	none	none	none	MCL-US	10	D	D
Barium	01005	7440-39-3	0.07	0.4	0.36	none	none	MCL-CA	1,000	D	D
Beryllium	01010	7440-41-7	0.006	0.06	none	none	none	MCL-US	4	D	D
Boron	01020	7440-42-8	2.8	8	none	none	none	NL-CA	1,000	D	D
Cadmium	01025	7440-43-9	0.016	0.04	none	none	none	MCL-US	5	D	D
Chromium	01030	7440-47-3	0.04	0.14	0.42	none	0.20	MCL-CA	50	D	D
Cobalt	01035	7440-48-4	0.010	0.046	none	all data reviewed and rejected[4]	none	none	none	D	D
Copper	01040	7440-50-8	0.4	1.6	1.7	2.1	none	AL-US	1,300	D	D
Iron	01046	7439-89-6	3.2	8	6	6	none	SMCL-CA	300	D	D
Lead	01049	7439-92-1	0.025	0.12	0.65	0.82	none	AL-US	15	D	D

Table 4*F*. Major ions, total dissolved solids, trace elements, comparative benchmarks, and reporting information for the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) Schedule 1948.—Continued

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Benchmarks and benchmark values as of August 1, 2013. **Benchmark types**: AL-US, U.S. Environmental Protection Agency (EPA) action level; HAL-US, EPA lifetime health advisory; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, State of California notification level; SMCL-CA, State of California secondary maximum contaminant level. **Abbreviations**: CAS, Chemical Abstracts Service; D, detected; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mg/L, milligrams per liter; MRL, minimum reporting level; SRL, study reporting level; µg/L, micrograms per liter]

Constituent	USGS parameter code	CAS Registry Number	Minimum IRL/LRL/LT-MDL/MRL 2006–13	Maximum IRL/LRL/LT-MDL/MRL 2006–13	SRL[1]	SRL[2]	SRL[3]	Benchmark type[5]	Benchmark value	Intial sampling detection	Trend sampling detection
Trace elements (µg/L)—Continued											
Lithium	01130	7439-93-2	0.22	1	none	none	0.41	none	none	D	D
Manganese	01056	7439-96-5	0.13	0.30	0.2	0.66	none	SMCL-CA	50	D	D
Molybdenum	01060	7439-98-7	0.014	0.4	none	0.023	none	HAL-US	40	D	D
Nickel	01065	7440-02-0	0.06	0.2	0.36	0.21	none	MCL-CA	100	D	D
Selenium	01145	7782-49-2	0.03	0.08	none	none	none	MCL-US	50	D	D
Silver	01075	7440-22-4	0.005	0.20	none	none	none	SMCL-CA	100	D	D
Strontium	01080	7440-24-6	0.2	0.8	0.99	none	none	HAL-US	4,000	D	D
Thallium	01057	7440-28-0	0.01	0.04	none	none	none	MCL-US	2	D	D
Tungsten	01155	7440-33-7	0.01	0.06	0.11	0.023	none	none	none	D	D
Uranium	22703	7440-61-1	0.004	0.04	none	none	none	MCL-US	30	D	D
Vanadium	01085	7440-62-2	0.04	0.16	0.10	none	none	NL-CA	50	D	D
Zinc	01090	7440-66-6	0.6	2.8	4.8	6.2	none	SMCL-CA[7]	5,000	D	D

[1]The SRL was based on Olsen and others (2010) and was applied to results for samples collected prior to October 2009.

[2]The SRL was based on Davis and others (2014) and was applied to results for samples collected from October 2009 to December 2013.

[3]The SRL was based on highest concentration in blanks during the trend sampling period.

[4]Groundwater Ambient Monitoring and Assessment (GAMA) Program policy for cobalt is to report all detections as "all data reviewed and rejected" (Davis and others, 2014).

[5]Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[6]The SMCL-CAs for chloride, sulfate, and TDS have recommended and upper benchmarks. The upper benchmark is shown.

[7]The SMCL-CA for zinc is listed as SMCL-CA because SMCLs established by California are used in this report for all constituents that have SMCL-CA values.

Table 4*G*. Isotopic and radioactive constituents, comparative benchmarks, and reporting information for laboratories.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. Stable isotope ratios are reported in the standard delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Benchmarks and benchmark values as of August 1, 2013. **Benchmark type**: MCL-CA, State of California maximum contaminant level. **Abbreviations**: CAS, Chemical Abstracts Service; D, detected; MRL, minimum reporting level; MU, method uncertainty; pCi/L, picocuries per liter; per mil, parts per thousand; USGS, U.S. Geological Survey]

Constituent	USGS parameter code	CAS Registry Number	Reporting level type	Reporting level or uncertainty (range)	Benchmark type	Benchmark value	Initial sampling detection	Trend sampling detection
Stable isotope ratios (per mil)								
$\delta^{2}H$ of water[1]	82082	none	MU	2	none	none	D	D
$\delta^{18}O$ of water[1]	82085	none	MU	0.20	none	none	D	D
$\delta^{13}C$ of dissolved carbonates[2]	82081	none	1 sigma	0.05	none	none	D	D
Radioactive constituents (percent modern)								
Carbon-14[2]	49933	14762-75-5	1 sigma	(0.0015–0.002)	none	none	D	D
Radioactive constituents (pCi/L)								
Tritium[3]	07000	10028-17-8	MRL	(0.3–1)	MCL-CA	20,000	D	D

[1]USGS Stable Isotope Laboratory, Reston, Virginia.

[2]Woods Hole Oceanographic Institution, National Ocean Sciences Accelerator Mass Spectrometry Facility (NOSAMS), Woods Hole, Massachusetts (contract laboratory).

[3]USGS Stable Isotope and Tritium Laboratory, Menlo Park, California.

Table 5. Water-quality indicators in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[The five-digit U.S. Geological Survey (USGS) parameter code below the constituent name is used to uniquely identify a specific constituent or property. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: $CaCO_3$, calcium carbonate; E, estimated or having a higher degree of uncertainty; mg/L, milligrams per liter; mm/dd/yyyy; month/day/year; nc, not collected; RL, reporting level or range; *, concentration is greater than the benchmark level; —, not detected; <, less than; >, greater than; °C, degrees Celsius; µS/cm, microsiemens per centimeter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, calculated from laboratory data[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, calculated from laboratory data[3] (mg/L)	Carbonate, field (mg/L) (63788)
Benchmark type		**none**	**none**	**SMCL-US**	**SMCL-US**	**SMCL-CA**	**SMCL-CA**	**none**	**none**	**none**	**none**	**none**	**none**
Benchmark level		**none**	**none**	**<6.5 or >8.5**	**<6.5 or >8.5**	**[2]1,600**	**[2]1,600**	**none**	**none**	**none**	**none**	**none**	**none**
RL		**0.2**	**0.0–38.5**	**0–14**	**0–14**	**5**	**5**	**1**	**1**	**1**	**1**	**1**	**1**
San Francisco Bay study unit													
SF-05	05/23/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-05	03/23/2011	4.2	20.0	7.5	7.3	544	547	140	nc	170	nc	0.2	nc
SF-10	05/03/2007	1.1	19.5	nc	7.6	nc	571	234	nc	nc	nc	nc	nc
SF-10	03/22/2011	1.2	19.5	7.8	7.7	609	563	235	nc	285	nc	0.8	nc
SF-14	04/25/2007	4.1	20.0	nc	7.4	nc	691	259	nc	nc	nc	nc	nc
SF-14	03/21/2011	1.8	20.5	7.7	7.6	683	646	251	nc	305	nc	0.7	nc
SF-20	05/02/2007	5.9	18.0	nc	7.3	nc	490	168	nc	nc	nc	nc	nc
SF-20	03/21/2011	5.0	18.0	7.5	7.2	558	442	173	nc	210	nc	0.3	nc
SF-42	06/19/2007	0.7	19.5	nc	7.2	nc	*2,090	178	nc	nc	nc	nc	nc
SF-42	03/22/2011	<0.2	25.0	7.5	7.5	1,400	1,200	185	nc	225	nc	0.3	nc
Southern Coast Range–Coastal study unit													
SCRC-B18	06/23/2008	5.4	17.5	nc	7.2	nc	1,150	nc	nc	nc	nc	nc	nc
SCRC-B18	06/06/2012	8.5	17.0	7.6	7.3	1,150	1,120	218	nc	265	nc	0.5	nc
SCRC-B23	07/07/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B23	06/07/2012	5.5	23.0	7.5	7.2	921	905	151	nc	184	nc	0.3	nc

Table 5. Water-quality indicators in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit U.S. Geological Survey (USGS) parameter code below the constituent name is used to uniquely identify a specific constituent or property. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: $CaCO_3$, calcium carbonate; E, estimated or having a higher degree of uncertainty; mg/L, milligrams per liter; mm/dd/yyyy; month/day/year; nc, not collected; RL, reporting level or range; *, concentration is greater than the benchmark level; —, not detected; <, less than; >, greater than; °C, degrees Celsius; µS/cm, microsiemens per centimeter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, calculated from laboratory data[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, calculated from laboratory data[3] (mg/L)	Carbonate, field (mg/L) (63788)
Southern Coast Range–Coastal study unit—Continued													
SCRC-B24	07/07/2008	5.8	20.0	nc	7.3	nc	895	nc	nc	nc	nc	nc	nc
SCRC-B24	06/06/2012	6.3	19.5	7.6	7.4	898	885	199	172	242	209	0.4	0.2
SCRC-B35	07/30/2008	0.7	18.0	nc	7.0	nc	*2,110	nc	nc	nc	nc	nc	nc
SCRC-B35	06/05/2012	0.2	17.5	7.4	7.0	*1,970	*1,930	425	nc	517	nc	0.6	nc
SCRC-H08	06/10/2008	1.1	28.0	7.6	7.4	946	964	373	369	453	448	0.8	1.1
SCRC-H08	06/05/2012	0.5	27.0	7.8	7.5	883	886	360	nc	437	nc	1.3	nc
SCRC-H11	06/26/2008	1.0	21.0	7.3	7.2	849	853	289	275	352	334	0.3	0.4
SCRC-H11	06/07/2012	1.4	21.5	7.4	7.1	840	836	262	nc	319	nc	0.4	nc
Southern Coast Range–Interior Basins study unit													
LIV-03	08/25/2008	4.0	18.5	7.4	7.0	953	873	325	nc	396	nc	0.5	nc
LIV-03	09/18/2012	2.8	18.0	7.4	7.1	973	966	328	nc	399	nc	0.5	nc
GIL-02	08/12/2008	4.6	19.5	7.6	7.3	587	531	208	nc	253	nc	0.5	nc
GIL-02	09/18/2012	3.9	19.0	7.7	7.3	587	581	207	nc	251	nc	0.6	nc
GIL-12	08/19/2008	<0.2	22.0	8.0	7.8	595	596	223	nc	269	nc	1.2	nc
GIL-12	09/19/2012	0.2	21.5	8.0	7.8	639	639	241	230	291	279	1.3	0.8
CUY-02	09/15/2008	1.3	26.0	7.7	7.5	1,320	1,320	153	148	186	179	0.4	—
CUY-02	09/20/2012	0.8	25.5	7.8	7.6	1,340	1,310	151	nc	183	nc	0.5	nc
CUY-06	09/17/2008	5.6	17.0	7.4	7.2	*1,810	*1,810	145	nc	176	nc	0.2	nc
CUY-06	09/20/2012	8.3	16.5	7.5	7.3	*1,840	*1,820	156	nc	190	nc	0.3	nc

Table 5. Water-quality indicators in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit U.S. Geological Survey (USGS) parameter code below the constituent name is used to uniquely identify a specific constituent or property. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: $CaCO_3$, calcium carbonate; E, estimated or having a higher degree of uncertainty; mg/L, milligrams per liter; mm/dd/yyyy; month/day/year; nc, not collected; RL, reporting level or range; *, concentration is greater than the benchmark level; —, not detected; <, less than; >, greater than; °C, degrees Celsius; µS/cm, microsiemens per centimeter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, calculated from laboratory data[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, calculated from laboratory data[3] (mg/L)	Carbonate, field (mg/L) (63788)
Northern Coast Ranges study unit													
NOCO-IN-10	06/18/2009	5.0	16.0	7.0	*6.4	222	219	nc	87.9	nc	107	nc	—
NOCO-IN-10	05/02/2012	2.8	15.5	7.0	6.6	238	247	100	nc	122	nc	0.1	nc
NOCO-IN-11	06/22/2009	0.3	18.0	7.1	6.8	343	341	nc	158	nc	192	nc	0.1
NOCO-IN-11	05/02/2012	0.2	16.0	7.1	7.0	338	336	170	nc	207	nc	0.1	nc
NOCO-IN-27	07/27/2009	<0.2	18.0	*6.2	*6.0	1,040	1,030	nc	578	nc	705	nc	—
NOCO-IN-27	05/01/2012	0.3	19.5	*6.3	*6.1	1,010	1,040	573	nc	699	nc	0.1	nc
NOCO-CO-02	07/30/2009	11.8	13.5	6.7	6.5	247	250	nc	[4]23.9	nc	[4]29.1	nc	—[4]
NOCO-CO-02	05/10/2012	9.2	15.1	6.7	*6.4	267	265	nc	20.0	nc	24.0	nc	—
NOCO-CO-03	08/03/2009	1.3	11.0	7.9	7.7	166	160	nc	56.6	nc	69.0	nc	—
NOCO-CO-03	05/09/2012	2.2	12.5	7.9	7.8	159	161	nc	59.0	nc	72.0	nc	0.2
NOCO-CO-08	08/11/2009	<0.2	14.5	7.2	7.5	328	317	nc	134	nc	164	nc	0.2
NOCO-CO-08	05/08/2012	2.2	14.0	7.6	7.3	320	328	nc	159	nc	194	nc	0.2
NOCO-CO-18	08/31/2009	0.3	14.5	6.7	6.5	436	435	nc	183	nc	223	nc	0.1
NOCO-CO-18	05/09/2012	2.0	14.9	7.0	6.7	398	422	nc	184	nc	224	nc	0.1
NOCO-CO-23	09/15/2009	6.3	14.5	7.4	*6.2	E96.0	92.0	nc	35.0	nc	42.6	nc	—
NOCO-CO-23	05/08/2012	11.3	11.0	E6.7	*6.3	E93.0	95.0	nc	33.0	nc	40.0	nc	—
Santa Barbara study unit													
SB-07	01/26/2011	3.3	21.0	7.2	6.8	*2,080	*2,090	324	nc	395	nc	0.3	nc
SB-07	12/18/2013	12.1	21.0	7.2	6.8	*1,950	*1,980	326	nc	397	nc	0.3	nc

Table 5. Water-quality indicators in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, calculated from laboratory data[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, calculated from laboratory data[3] (mg/L)	Carbonate, field (mg/L) (63788)
Santa Barbara study unit—Continued													
SB-12	02/07/2011	3.8	17.5	6.6	*6.4	1,400	1,400	276	nc	337	nc	0.1	nc
SB-12	12/18/2013	6.3	18.5	7.0	*6.4	1,140	1,130	253	nc	308	nc	0.1	nc
Central Sierra study unit													
CGOLD-13	05/23/2006	8.4	19.5	7.2	7.2	533	534	158	nc	192	nc	0.1	nc
CGOLD-13	06/14/2010	<0.2	19.5	7.3	6.9	546	549	169	nc	206	nc	0.2	nc
CGOLD-16	05/24/2006	9.3	11.0	6.8	nc	128	124	59.9	nc	73.0	nc	—	nc
CGOLD-16	05/25/2010	8.1	11.0	7.0	*6.0	120	113	61.0	nc	74.4	nc	—	nc
CWISH-04	05/15/2006	2.2	15.0	*6.4	*5.7	201	197	85.9	89.0	105	109	—	—
CWISH-04	06/14/2010	3.2	15.0	6.7	*6.0	222	213	93.9	nc	115	nc	—	nc
Southern Sierra study unit													
SOSA-06	06/07/2006	<0.2	19.2	nc	nc	nc	301	nc	nc	nc	nc	nc	nc
SOSA-06	06/23/2008	0.3	19.5	8.0	7.7	303	306	139	134	168	162	0.8	0.7
SOSA-15	06/12/2006	7.8	8.1	6.9	nc	242	241	121	nc	148	nc	0.1	nc
SOSA-15	07/08/2008	7.3	8.5	6.8	*5.9	241	237	120	114	146	139	—	—
SOSA-20	06/14/2006	5.1	18.5	nc	nc	nc	337	nc	nc	nc	nc	nc	nc
SOSA-20	06/25/2008	6.3	18.5	7.3	7.1	378	377	148	nc	180	nc	0.2	nc
SOSA-31	06/29/2006	7.8	16.7	nc	nc	nc	836	nc	nc	nc	nc	nc	nc
SOSA-31	06/25/2008	6.6	17.0	7.5	7.3	842	840	260	248	316	301	0.5	0.7
SOSA-32	06/29/2006	8.4	17.8	nc	7.4	nc	474	nc	nc	nc	nc	nc	nc
SOSA-32	06/24/2008	6.1	18.0	7.7	7.5	459	462	206	nc	250	nc	0.6	nc

Table 5. Water-quality indicators in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, calculated from laboratory data[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, calculated from laboratory data[3] (mg/L)	Carbonate, field (mg/L) (63788)
Tahoe–Martis study unit													
TMART-03	06/26/2007	0.2	15.5	8.0	7.9	327	330	155	nc	187	nc	0.9	nc
TMART-03	08/27/2012	0.9	15.0	7.7	8.0	335	333	160	nc	194	nc	0.4	nc
TMART-06	06/28/2007	8.6	8.5	7.2	7.0	192	187	88.5	83.2	108	101	0.1	—
TMART-06	08/27/2012	7.0	8.0	7.3	6.5	202	200	93	nc	113	nc	0.1	nc
TROCK-02	07/11/2007	2.8	7.5	7.6	*6.0	50.0	47.0	26.1	nc	31.7	nc	0.1	nc
TROCK-02	08/28/2012	3.9	8.0	*5.9	E7.4	E47.0	46.0	25.6	21.4	31.3	26.1	—	—
TROCK-05	07/17/2007	10.7	6.5	7.5	7.2	140	137	74.7	nc	90.8	nc	0.1	nc
TROCK-05	08/28/2012	8.3	6.0	7.8	7.2	137	136	75.4	nc	91.4	nc	0.3	nc
TTAHO-06	08/02/2007	5.2	15.0	*8.9	*9.0	122	116	49.5	39.4	55.8	46.0	2.0	1.0
TTAHO-06	08/29/2012	2.7	12.0	*8.8	*8.7	134	132	48.2	nc	55.2	nc	1.6	nc
TTAHO-10	08/16/2007	5.3	11.5	*8.6	*8.6	80.0	77.0	39.5	35.1	46.2	42.0	0.8	—
TTAHO-10	08/29/2012	4.8	10.0	E8.5	8.2	E77.0	77.0	40.1	nc	47.3	nc	0.7	nc
Sierra Nevada Regional study unit													
SIERRA-G-08	07/23/2008	5.2	9.5	6.7	*5.8	329	324	46.7	43.3	57.0	52.8	—	—
SIERRA-G-08	10/03/2012	3.0	12.0	6.3	*5.5	245	237	59.8	48.9	73.0	59.7	—	—
SIERRA-G-10	07/28/2008	4.7	8.0	7.2	*6.4	119	116	60.3	54.2	73.5	66.0	0.1	—
SIERRA-G-10	10/03/2012	4.7	8.5	6.9	*6.3	116	112	59.7	nc	72.8	nc	—	nc
SIERRA-G-12	08/14/2008	7.5	15.5	7.0	6.6	268	258	131	126	160	154	0.1	0.1
SIERRA-G-12	10/04/2012	3.9	15.5	6.9	*6.2	289	283	140	nc	171	nc	0.1	nc

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, calculated from laboratory data[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, calculated from laboratory data[3] (mg/L)	Carbonate, field (mg/L) (63788)
Sierra Nevada Regional study unit—Continued													
SIERRA-G-13	08/21/2008	9.8	15.0	6.6	*6.2	150	147	61.0	53.6	74.4	65.3	—	—
SIERRA-G-13	10/02/2012	8.8	14.5	6.7	*5.8	146	140	55.8	50.5	68.1	61.6	—	—
SIERRA-G-14	08/26/2008	4.8	9.0	6.6	*6.3	E83.0	80.0	42.9	36.4	52.3	44.4	—	—
SIERRA-G-14	08/30/2012	5.2	8.0	E6.8	*5.9	77.0	76.0	41.1	nc	50.1	nc	—	nc
SIERRA-G-15	09/08/2008	0.2	21.0	*9.2	*9.1	802	792	218	210	231	214	16.8	20.6
SIERRA-G-15	10/01/2012	nc	21.0	*9.1	*9.1	836	800	234	nc	255	nc	14.8	nc
SIERRA-G-16	09/22/2008	8.4	6.5	6.9	*6.4	E54.0	51.0	22.0	18.9	26.8	23.1	—	—
SIERRA-G-16	09/17/2012	8.6	7.5	E7.2	*5.9	E58.0	56.0	24.1	nc	29.4	nc	—	nc
SIERRA-G-17	09/23/2008	9.9	5.0	8.9	*8.6	E69.0	65.0	25.4	20.6	28.4	22.6	1.0	1.0
SIERRA-G-17	09/18/2012	9.8	6.5	E8.7	8.4	E69.0	66.0	25.6	nc	29.5	nc	0.7	nc
SIERRA-G-18	09/24/2008	8.1	7.5	7.8	*6.3	E31.0	27.0	15.5	11.8	18.8	14.4	0.1	—
SIERRA-G-18	09/19/2012	9.1	9.0	E7.6	*6.4	E30.0	27.0	15.9	12.1	19.3	14.8	—	—
SIERRA-M-03	09/10/2008	3.9	14.0	7.7	7.4	264	256	138	74.8	168	90.7	0.4	0.2
SIERRA-M-03	09/11/2012	2.1	12.5	7.8	7.4	264	256	138	nc	167	nc	0.5	nc
SIERRA-M-04	09/17/2008	6.5	12.0	7.7	7.4	147	142	75.3	72.0	91.4	87.6	0.2	0.1
SIERRA-M-04	09/12/2012	5.1	15.5	7.6	7.2	144	140	75.1	nc	91.3	nc	0.2	nc
SIERRA-M-06	10/08/2008	9.6	10.0	*6.3	*6.0	E86.0	80.0	43.7	40.0	53.3	48.8	—	—
SIERRA-M-06	09/13/2012	8.6	10.5	*E6.4	*6.1	E87.0	92.0	45.1	nc	55.0	nc	—	nc
SIERRA-S-02	08/19/2008	3.6	10.5	*8.7	*8.7	166	164	62.8	57.0	72.9	65.7	1.7	1.8
SIERRA-S-02	08/30/2012	4.4	10.0	8.4	8.4	166	168	64.2	nc	76.4	nc	0.9	nc

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Sierra Nevada Regional study unit—Continued													
SIERRA-S-03	10/20/2008	2.7	12.5	7.4	6.9	252	243	101	96.0	123	117	0.1	—
SIERRA-S-03	09/12/2012	4.6	12.0	7.0	6.5	272	267	124	nc	151	nc	0.1	nc
SIERRA-V-02	10/07/2008	6.2	13.0	7.0	7.0	199	195	103	97.0	126	118	0.1	0.1
SIERRA-V-02	09/10/2012	7.8	12.5	7.4	7.2	202	199	105	101	128	123	0.1	0.1
SIERRA-V-03	10/21/2008	nc	6.5	7.3	6.5	112	101	52.2	43.1	63.6	52.5	0.1	—
SIERRA-V-03	09/20/2012	2.1	6.5	6.7	*5.9	255	217	107	nc	130	nc	—	nc
Bear Valley–Lake Arrowhead Watershed study unit													
BEAR-S05	04/28/2010	1.8	14.0	8.2	8.2	256	250	122	nc	147	nc	1.1	nc
BEAR-S05	06/06/2013	2.7	14.5	8.3	8.2	251	252	121	nc	145	nc	1.3	nc
BEAR-S12	05/05/2010	3.4	16.0	7.1	7.4	398	387	175	nc	213	nc	0.1	nc
BEAR-S12	06/06/2013	5.5	15.0	7.7	7.4	395	400	172	nc	209	nc	0.5	nc
BEAR-G07	05/10/2010	2.5	11.5	7.5	7.3	329	325	158	nc	192	nc	0.3	nc
BEAR-G07	06/05/2013	1.1	14.0	7.6	7.0	289	291	141	nc	171	nc	0.3	nc
BEAR-G12	05/19/2010	5.2	9.5	6.8	*6.3	190	191	97.7	nc	119	nc	—	nc
BEAR-G12	06/05/2013	6.6	10.0	6.9	*6.3	193	193	98.2	nc	120	nc	—	nc
Cascade Range–Modoc Plateau study unit													
CAMP-ES-05	09/20/2010	9.8	14.0	7.3	6.7	168	161	89.0	nc	108	nc	0.1	nc
CAMP-ES-05	08/01/2013	7.1	13.0	7.2	*6.3	167	167	90.1	nc	110	nc	0.1	nc
CAMP-ES-09	10/04/2010	6.0	21.0	7.7	7.5	273	274	146	nc	177	nc	0.4	nc
CAMP-ES-09	08/01/2013	5.7	20.5	7.9	7.5	269	273	147	nc	178	nc	0.7	nc

Table 5. Water-quality indicators in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, calculated from laboratory data[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, calculated from laboratory data[3] (mg/L)	Carbonate, field (mg/L) (63788)
Cascade Range–Modoc Plateau study unit—Continued													
CAMP-HL-02	08/11/2010	1.0	13.0	7.9	7.6	204	201	81.9	72.8	99.1	88.3	0.4	0.2
CAMP-HL-02	08/05/2013	1.7	13.0	7.7	7.3	204	197	84.8	81.1	103	98.6	0.2	0.1
CAMP-HL-10	08/23/2010	1.5	17.0	7.5	7.0	727	725	191	148	232	181	0.3	0.2
CAMP-HL-10	08/05/2013	3.7	17.5	7.5	7.1	735	727	195	nc	237	nc	0.3	nc
CAMP-LU-04	07/21/2010	8.5	13.5	8.0	7.8	289	296	131	142	158	171	0.7	1.1
CAMP-LU-04	08/06/2013	7.6	14.0	8.2	8.0	294	293	131	121	157	147	1.1	0.5
CAMP-LU-15	08/30/2010	7.2	8.5	7.7	7.3	156	153	80.2	75.4	97.4	91.9	0.2	—
CAMP-LU-15	07/30/2013	6.4	8.0	7.5	7.0	161	158	82.5	nc	100	nc	0.1	nc
CAMP-QV-04	08/03/2010	1.0	14.5	8.1	7.9	887	872	361	nc	435	nc	2.5	nc
CAMP-QV-04	08/08/2013	1.8	13.5	8.2	8.0	874	867	366	nc	440	nc	3.2	nc
CAMP-QV-12	09/14/2010	4.6	12.0	7.1	*6.3	178	173	94.3	nc	115	nc	0.1	nc
CAMP-QV-12	07/31/2013	3.7	11.5	6.8	*6.1	186	179	100	nc	122	nc	—	nc
CAMP-SH-01	07/12/2010	5.0	15.0	7.2	6.8	435	437	226	nc	275	nc	0.2	nc
CAMP-SH-01	07/29/2013	5.3	14.0	8.1	6.8	434	431	224	nc	270	nc	1.6	nc
CAMP-SH-07	07/15/2010	10.8	6.5	6.8	*6.3	E52.0	50.0	28.5	nc	34.8	nc	—	nc
CAMP-SH-07	07/30/2013	10.4	5.5	7.2	*5.8	E49.0	48.0	26.9	nc	32.8	nc	—	nc
CAMP-TV-07	08/26/2010	7.5	8.5	8.1	7.8	176	170	94.5	nc	114	nc	0.7	nc
CAMP-TV-07	08/07/2013	8.8	9.5	8.2	8.0	174	169	94.6	nc	114	nc	0.8	nc
CAMP-TV-15	10/13/2010	4.9	19.0	*9.2	*9.3	287	280	119	nc	126	nc	9.2	nc
CAMP-TV-15	07/29/2013	3.4	18.5	*9.2	*9.0	366	329	108	nc	114	nc	8.3	nc

Table 5. Water-quality indicators in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit U.S. Geological Survey (USGS) parameter code below the constituent name is used to uniquely identify a specific constituent or property. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: $CaCO_3$, calcium carbonate; E, estimated or having a higher degree of uncertainty; mg/L, milligrams per liter; mm/dd/yyyy; month/day/year; nc, not collected; RL, reporting level or range; *, concentration is greater than the benchmark level; —, not detected; <, less than; >, greater than; °C, degrees Celsius; µS/cm, microsiemens per centimeter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Dissolved oxygen, field (mg/L) (00300)	Water temperature, field (°C) (00010)	pH, laboratory (standard units) (00403)[1]	pH, field (standard units) (00400)	Specific conductance, laboratory (µS/cm at 25 °C) (90095)[1]	Specific conductance, field (µS/cm at 25 °C) (00095)	Alkalinity, laboratory (mg/L as $CaCO_3$) (29801)[1]	Alkalinity, field (mg/L as $CaCO_3$) (29802)	Bicarbonate, calculated from laboratory data[3] (mg/L)	Bicarbonate, field (mg/L) (63786)	Carbonate, calculated from laboratory data[3] (mg/L)	Carbonate, field (mg/L) (63788)
Klamath Mountains study unit													
KLAM-01	10/18/2010	10.1	13.0	8.3	8.2	194	190	104	nc	124	nc	1.1	nc
KLAM-01	10/29/2013	8.8	11.0	8.3	8.3	184	184	105	nc	126	nc	1.2	nc
KLAM-11	11/02/2010	9.4	13.0	7.4	6.9	207	207	112	nc	136	nc	0.2	nc
KLAM-11	10/30/2013	7.9	12.5	7.5	7.0	186	188	96.2	nc	117	nc	0.2	nc
KLAM-20	11/17/2010	7.5	10.0	7.8	7.6	230	226	131	nc	159	nc	0.5	nc
KLAM-20	10/30/2013	8.4	9.5	7.9	7.6	224	224	134	nc	162	nc	0.6	nc
KLAM-30	12/02/2010	0.2	12.0	7.1	6.8	342	340	151	nc	184	nc	0.1	nc
KLAM-30	10/31/2013	0.4	11.5	7.2	7.1	317	357	152	nc	185	nc	0.1	nc

[1]Field measurement is the preferred method of determination (table A–2).

[2]The SMCL-CA for specific conductance has recommended and upper benchmarks. The upper benchmark is shown.

[3]Bicarbonate and carbonate concentrations were calculated from the laboratory alkalinity and pH values using the advanced speciation method (http://or.water.usgs.gov/alk/methods.html) with $pK_1 = 6.35$, $pK_2 = 10.33$, and $pK_W = 14$.

[4]Alkalinity, bicarbonate, and carbonate values were generated by the incremental equivalence titration method (USGS parameter codes 39086, 00453, and 00452, respectively).

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in tables 4*A*, *B*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; MCL-US, U.S. Environmental Protection Agency (EPA) maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, concentration is greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA well identification number	Sample dates (mm/dd/yyyy)	Trihalomethane		Solvent				
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloro-methane (µg/L) (32101)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Tetrahydrofuran (µg/L) (81607)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)
Benchmark type[1]		**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-CA**	**none**	**MCL-CA**
Benchmark level		**[4]80**	**[4]80**	**5**	**5**	**5**	**none**	**6**
LRL, LRL[2]		**0.02, 0.04**	**0.028, 0.04**	**0.026, 0.04**	**0.02, 0.038**	**0.035, 0.06**	**1.2, 1.4**	**0.02, 0.024**
SRL		**none**	**none**	**[3]0.05**	**none**	**none**	**all data reviewed and rejected[4]**	**none**
Number of trend sites with detections during the initial sampling period		15	2	4	3	3	3	1
Detection frequency (percent)		19.7	2.6	5.3	3.9	3.9	3.9	1.3
Number of trend sites with detections during the trend sampling period		14	0	3	4	2	0	3
Detection frequency (percent)		18.4	0	3.9	5.3	2.6	0	3.9
San Francisco Bay study unit								
SF-14	04/25/2007	—	—	—	—	—	—	—
SF-14	03/21/2011	—	—	—	—	—	—	—
SF-20	05/02/2007	0.18	—	—	—	[6]E0.022	—	—
SF-20	03/21/2011	0.09	—	—	—	[6]0.025	—	0.015
SF-42	06/19/2007	—	—	0.206	1.46	—	—	0.188
SF-42	03/22/2011	[6]0.02	—	0.368	2.66	—	—	0.388

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Trihalomethane		Solvent				
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloro-methane (µg/L) (32101)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Tetrahydrofuran (µg/L) (81607)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)
Southern Coast Range–Coastal study unit								
SCRC-B23	07/07/2008	E0.04	—	—	—	—	3.1	—
SCRC-B23	06/07/2012	0.11	—	—	—	—	—	—
SCRC-B24	07/07/2008	—	—	—	—	—	—	—
SCRC-B24	06/06/2012	—	—	—	—	—	—	—
SCRC-H08	06/10/2008	—	—	—	—	—	—	—
SCRC-H08	06/05/2012	—	—	—	—	—	—	—
SCRC-H11	06/26/2008	0.14	—	—	—	—	—	—
SCRC-H11	06/07/2012	[6]0.02	—	—	—	—	—	—
Southern Coast Range–Interior Basins study unit								
LIV-03	08/25/2008	0.15	—	—	—	—	—	—
LIV-03	09/18/2012	0.18	—	—	—	—	—	—
GIL-02	08/12/2008	—	—	—	—	—	—	—
GIL-02	09/18/2012	[6]E0.02	—	—	—	—	—	—
CUY-02	09/15/2008	—	—	—	—	—	—	—
CUY-02	09/20/2012	—	—	—	—	—	—	—
CUY-06	09/17/2008	—	—	—	—	—	—	—
CUY-06	09/20/2012	—	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Trihalomethane		Solvent				
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloro-methane (µg/L) (32101)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Tetrahydrofuran (µg/L) (81607)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)
Northern Coast Ranges study unit								
NOCO-IN-11	06/22/2009	—	—	—	—	E0.031	—	—
NOCO-IN-11	05/02/2012	—	—	—	—	0.029	—	—
NOCO-CO-02	07/30/2009	—	—	—	—	—	—	—
NOCO-CO-02	05/10/2012	0.12	—	—	—	—	—	—
NOCO-CO-03	08/03/2009	—	—	—	—	—	—	—
NOCO-CO-03	05/09/2012	[6]0.02	—	—	—	—	—	—
NOCO-CO-18	08/31/2009	—	—	—	—	—	—	—
NOCO-CO-18	05/09/2012	—	—	—	—	—	—	—
NOCO-CO-23	09/15/2009	E0.03	—	—	—	—	—	—
NOCO-CO-23	05/08/2012	[6]E0.02	[6]0.013	—	—	—	—	—
Santa Barbara study unit								
SB-07	01/26/2011	0.06	—	0.022	—	0.044	—	—
SB-07	12/18/2013	0.08	—	0.053	0.038	0.119	—	—
SB-12	02/07/2011	1.8	0.27	[6]0.012	—	—	—	—
SB-12	12/18/2013	0.41	—	—	—	—	—	—
Central Sierra study unit								
CWISH-04	05/15/2006	0.43	—	—	—	—	—	—
CWISH-04	06/14/2010	0.17	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in tables 4*A*, *B*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; MCL-US, U.S. Environmental Protection Agency (EPA) maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, concentration is greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA well identification number	Sample dates (mm/dd/yyyy)	Trihalomethane		Solvent				
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloro-methane (µg/L) (32101)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Tetrahydrofuran (µg/L) (81607)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)
Tahoe–Martis study unit								
TMART-03	06/26/2007	0.28	0.115	—	—	—	—	—
TMART-03	08/27/2012	—	—	—	—	—	—	—
TMART-06	06/28/2007	E0.07	—	E0.028	—	—	—	—
TMART-06	08/27/2012	0.06	—	≤0.018	—	—	—	—
TTAHO-06	08/02/2007	[6]E0.02	—	*19.5	E0.027	—	—	—
TTAHO-06	08/29/2012	[6]0.01	—	*13.3	0.104	—	—	0.026
TTAHO-10	08/16/2007	—	—	—	—	—	—	—
TTAHO-10	08/29/2012	—	—	—	—	—	—	—
Sierra Nevada Regional study unit								
SIERRA-G-08	07/23/2008	—	—	—	—	—	—	—
SIERRA-G-08	10/03/2012	—	—	0.05	—	—	—	—
SIERRA-G-13	08/21/2008	—	—	—	—	—	—	—
SIERRA-G-13	10/02/2012	—	—	—	—	—	—	—
SIERRA-G-15	09/08/2008	—	—	—	—	E0.032	—	—
SIERRA-G-15	10/01/2012	—	—	—	—	—	—	—
SIERRA-M-06	10/08/2008	[6]E0.02	—	—	—	—	—	—
SIERRA-M-06	09/13/2012	[6]0.02	—	—	—	—	—	—
SIERRA-S-02	08/19/2008	E0.10	—	—	—	—	—	—
SIERRA-S-02	08/30/2012	0.09	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in tables 4*A*, *B*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; MCL-US, U.S. Environmental Protection Agency (EPA) maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, concentration is greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA well identification number	Sample dates (mm/dd/yyyy)	Trihalomethane		Solvent				
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloro-methane (µg/L) (32101)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Tetrahydrofuran (µg/L) (81607)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)
Sierra Nevada Regional study unit—Continued								
SIERRA-S-03	10/20/2008	—	—	[6]E0.008	—	—	—	—
SIERRA-S-03	09/12/2012	—	—	≤0.013	—	—	—	—
SIERRA-V-03	10/21/2008	0.13	—	—	—	—	E0.50	—
SIERRA-V-03	09/20/2012	—	—	—	—	—	—	—
Bear Valley–Lake Arrowhead Watershed study unit								
BEAR-S05	04/28/2010	—	—	—	—	—	—	—
BEAR-S05	06/06/2013	—	—	—	—	—	—	—
BEAR-S12	05/05/2010	—	—	—	0.279	—	—	—
BEAR-S12	06/06/2013	—	—	≤0.016	0.443	—	—	—
Cascade Range–Modoc Plateau study unit								
CAMP-ES-05	09/20/2010	0.06	—	—	—	—	—	—
CAMP-ES-05	08/01/2013	0.23	—	≤0.017	—	—	—	—
CAMP-HL-02	08/11/2010	—	—	—	—	—	—	—
CAMP-HL-02	08/05/2013	0.05	—	≤0.012	—	—	—	—
CAMP-HL-10	08/23/2010	0.03	—	—	—	—	—	—
CAMP-HL-10	08/05/2013	0.03	—	—	—	—	—	—
CAMP-LU-04	07/21/2010	—	—	—	—	—	—	—
CAMP-LU-04	08/06/2013	—	—	—	—	—	—	—
CAMP-LU-15	08/30/2010	—	—	—	—	—	—	—
CAMP-LU-15	07/30/2013	—	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in tables 4*A*, *B*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; MCL-US, U.S. Environmental Protection Agency (EPA) maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, concentration is greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA well identification number	Sample dates (mm/dd/yyyy)	Trihalomethane		Solvent				
		Chloroform (Trichloromethane) (µg/L) (32106)	Bromodichloro-methane (µg/L) (32101)	Perchloroethene (PCE, Tetrachloroethene) (µg/L) (34475)	Trichloroethene (TCE) (µg/L) (39180)	1,1-Dichloroethane (1,1-DCA) (µg/L) (34496)	Tetrahydrofuran (µg/L) (81607)	*cis*-1,2-Dichloro-ethene (µg/L) (77093)
Cascade Range–Modoc Plateau study unit—Continued								
CAMP-QV-04	08/03/2010	—	—	—	—	—	—	—
CAMP-QV-04	08/08/2013	0.08	—	—	—	—	—	—
CAMP-QV-12	09/14/2010	—	—	—	—	—	—	—
CAMP-QV-12	07/31/2013	—	—	—	—	—	—	—
CAMP-SH-07	07/15/2010	—	—	—	—	—	—	—
CAMP-SH-07	07/30/2013	—	—	—	—	—	—	—
CAMP-TV-15	10/13/2010	0.81	—	—	—	—	2.7	—
CAMP-TV-15	07/29/2013	0.03	—	—	—	—	≤2.4	—
Klamath Mountains study unit								
KLAM-30	12/02/2010	—	—	—	—	—	—	—
KLAM-30	10/31/2013	—	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Solvent—Continued						Refrigerant		
		1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,2-Dichloroethane (1,2-DCA) (µg/L) (32103)	Dibromomethane (µg/L) (30217)	Chlorobenzene (µg/L) (34301)	Acetone (µg/L) (81552)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoromethane (CFC-11) (µg/L) (34488)	Dichlorodifluoromethane (CFC-12) (µg/L) (34668)
Benchmark type[1]		**MCL-US**	**MCL-CA**	**MCL-CA**	**none**	**MCL-CA**	**none**	**MCL-CA**	**MCL-CA**	**NL-CA**
Benchmark level		**200**	**0.5**	**0.5**	**none**	**70**	**none**	**1,200**	**150**	**1,000**
LRL, LRL[2]		**0.02, 0.04**	**0.06, 0.08**	**0.13, 0.08**	**0.05**	**0.028, 0.026**	**3.4, 6**	**0.038, 0.04**	**0.06, 0.16**	**0.1, 0.18**
SRL		**none**	**none**	**none**	**none**	**none**	**all data reviewed and rejected[4]**	**none**	**none**	**none**
Number of trend sites with detections during the initial sampling period		1	1	1	1	0	0	3	0	1
Detection frequency (percent)		1.3	1.3	1.3	1.3	0	0	3.9	0	1.3
Number of trend sites with detections during the trend sampling period		1	1	0	0	0	0	3	1	0
Detection frequency (percent)		1.3	1.3	0	0	0	0	3.9	1.3	0
San Francisco Bay study unit—Continued										
SF-14	4/25/2007	—	—	—	—	—	—	0.15	—	—
SF-14	3/21/2011	—	—	—	—	—	—	0.20	—	—
SF-20	5/2/2007	4.3	—	—	—	—	—	0.28	[6]E0.04	—
SF-20	3/21/2011	4.1	—	—	—	—	—	0.28	[6]0.04	—
SF-42	6/19/2007	—	—	—	—	—	—	—	—	—
SF-42	3/22/2011	—	—	—	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Solvent—Continued						Refrigerant		
		1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,2-Dichloroethane (1,2-DCA) (µg/L) (32103)	Dibromomethane (µg/L) (30217)	Chlorobenzene (µg/L) (34301)	Acetone (µg/L) (81552)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoromethane (CFC-11) (µg/L) (34488)	Dichlorodifluoromethane (CFC-12) (µg/L) (34668)
Southern Coast Range–Coastal study unit—Continued										
SCRC-B23	7/7/2008	—	—	—	—	—	—	—	—	—
SCRC-B23	6/7/2012	—	—	—	—	—	—	—	—	—
SCRC-B24	7/7/2008	—	—	—	—	—	—	—	—	—
SCRC-B24	6/6/2012	—	—	—	—	—	—	—	—	—
SCRC-H08	6/10/2008	—	—	—	—	—	—	—	—	—
SCRC-H08	6/5/2012	—	—	—	—	—	—	—	—	—
SCRC-H11	6/26/2008	—	—	—	—	—	—	—	—	—
SCRC-H11	6/7/2012	—	—	—	—	—	—	—	—	—
Southern Coast Range–Interior Basins study unit—Continued										
LIV-03	8/25/2008	—	—	—	—	—	—	—	—	—
LIV-03	9/18/2012	—	—	—	—	—	—	—	—	—
GIL-02	8/12/2008	—	—	—	—	—	—	—	—	E0.10
GIL-02	9/18/2012	—	—	—	—	[6]0.012	—	—	—	—
CUY-02	9/15/2008	—	—	—	—	—	—	—	—	—
CUY-02	9/20/2012	—	—	—	—	—	—	—	—	—
CUY-06	9/17/2008	—	—	—	—	—	—	—	—	—
CUY-06	9/20/2012	—	—	—	—	—	—	—	0.06	—

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Solvent—Continued						Refrigerant		
		1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,2-Dichloroethane (1,2-DCA) (µg/L) (32103)	Dibromomethane (µg/L) (30217)	Chlorobenzene (µg/L) (34301)	Acetone (µg/L) (81552)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoromethane (CFC-11) (µg/L) (34488)	Dichlorodifluoromethane (CFC-12) (µg/L) (34668)
Northern Coast Ranges study unit—Continued										
NOCO-IN-11	6/22/2009	[6]E0.02	—	—	—	—	—	—	—	—
NOCO-IN-11	5/2/2012	[6]E0.02	—	—	—	—	—	—	—	—
NOCO-CO-02	7/30/2009	—	—	—	—	—	—	—	—	—
NOCO-CO-02	5/10/2012	—	—	—	—	—	Q	—	—	—
NOCO-CO-03	8/3/2009	—	—	—	—	—	—	—	—	—
NOCO-CO-03	5/9/2012	—	—	—	—	—	—	—	—	—
NOCO-CO-18	8/31/2009	—	—	—	—	—	—	—	—	—
NOCO-CO-18	5/9/2012	—	—	—	—	—	—	—	—	—
NOCO-CO-23	9/15/2009	—	—	—	—	—	—	—	—	—
NOCO-CO-23	5/8/2012	—	—	—	—	—	—	—	—	—
Santa Barbara study unit—Continued										
SB-07	1/26/2011	—	—	—	—	—	—	1.71	—	—
SB-07	12/18/2013	—	—	—	—	—	—	0.64	—	—
SB-12	2/7/2011	[6]0.01	—	—	0.03	—	—	—	—	—
SB-12	12/18/2013	—	—	—	—	—	—	—	—	—
Central Sierra study unit—Continued										
CWISH-04	5/15/2006	—	—	—	—	—	—	—	—	—
CWISH-04	6/14/2010	—	—	—	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Solvent—Continued						Refrigerant		
		1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,2-Dichloroethane (1,2-DCA) (µg/L) (32103)	Dibromomethane (µg/L) (30217)	Chlorobenzene (µg/L) (34301)	Acetone (µg/L) (81552)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoromethane (CFC-11) (µg/L) (34488)	Dichlorodifluoromethane (CFC-12) (µg/L) (34668)
Tahoe–Martis study unit—Continued										
TMART-03	6/26/2007	—	—	—	—	—	—	—	—	—
TMART-03	8/27/2012	—	—	—	—	—	—	—	—	—
TMART-06	6/28/2007	—	—	—	—	—	—	—	—	—
TMART-06	8/27/2012	—	—	—	—	—	—	—	—	—
TTAHO-06	8/2/2007	—	—	—	—	—	—	—	—	—
TTAHO-06	8/29/2012	—	—	—	—	—	—	—	—	—
TTAHO-10	8/16/2007	—	—	—	—	—	—	—	—	—
TTAHO-10	8/29/2012	—	—	—	—	—	—	—	—	—
Sierra Nevada Regional study unit—Continued										
SIERRA-G-08	7/23/2008	—	—	E0.10	—	—	—	—	—	—
SIERRA-G-08	10/3/2012	—	—	—	—	—	—	—	—	—
SIERRA-G-13	8/21/2008	—	—	—	—	—	—	—	—	—
SIERRA-G-13	10/2/2012	—	—	—	—	—	—	—	—	—
SIERRA-G-15	9/8/2008	—	—	—	—	—	—	—	—	—
SIERRA-G-15	10/1/2012	—	—	—	—	—	—	—	—	—
SIERRA-M-06	10/8/2008	—	—	—	—	—	—	—	—	—
SIERRA-M-06	9/13/2012	—	—	—	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Solvent—Continued						Refrigerant		
		1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,2-Dichloroethane (1,2-DCA) (µg/L) (32103)	Dibromomethane (µg/L) (30217)	Chlorobenzene (µg/L) (34301)	Acetone (µg/L) (81552)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoromethane (CFC-11) (µg/L) (34488)	Dichlorodifluoromethane (CFC-12) (µg/L) (34668)
Sierra Nevada Regional study unit—Continued										
SIERRA-S-02	8/19/2008	—	—	—	—	—	—	—	—	—
SIERRA-S-02	8/30/2012	—	—	—	—	—	—	—	[6]0.03	—
SIERRA-S-03	10/20/2008	—	—	—	—	—	—	—	—	—
SIERRA-S-03	9/12/2012	—	—	—	—	—	—	—	—	—
SIERRA-V-03	10/21/2008	—	—	—	—	—	—	—	—	—
SIERRA-V-03	9/20/2012	—	—	—	—	—	—	—	—	—
Bear Valley–Lake Arrowhead Watershed study unit—Continued										
BEAR-S05	4/28/2010	—	—	—	—	—	—	—	—	—
BEAR-S05	6/6/2013	—	—	—	—	—	—	—	—	—
BEAR-S12	5/5/2010	[6]E0.02	0.18	—	—	—	—	—	—	—
BEAR-S12	6/6/2013	[6]0.02	0.77	—	—	—	—	—	—	—
Cascade Range–Modoc Plateau study unit—Continued										
CAMP-ES-05	9/20/2010	—	—	—	—	—	—	—	—	—
CAMP-ES-05	8/1/2013	—	—	—	—	—	—	—	—	—
CAMP-HL-02	8/11/2010	—	—	—	—	—	—	—	—	—
CAMP-HL-02	8/5/2013	—	—	—	—	—	—	—	—	—
CAMP-HL-10	8/23/2010	—	—	—	—	—	—	—	—	—
CAMP-HL-10	8/5/2013	—	—	—	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in tables 4*A*, *B*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; MCL-US, U.S. Environmental Protection Agency (EPA) maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, concentration is greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA well identification number	Sample dates (mm/dd/yyyy)	Solvent—Continued						Refrigerant		
		1,1,1-Trichloroethane (1,1,1-TCA) (µg/L) (34506)	Carbon tetrachloride (Tetrachloromethane) (µg/L) (32102)	1,2-Dichloroethane (1,2-DCA) (µg/L) (32103)	Dibromomethane (µg/L) (30217)	Chlorobenzene (µg/L) (34301)	Acetone (µg/L) (81552)	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (µg/L) (77652)	Trichlorofluoromethane (CFC-11) (µg/L) (34488)	Dichlorodifluoromethane (CFC-12) (µg/L) (34668)
Cascade Range–Modoc Plateau study unit—Continued										
CAMP-LU-04	7/21/2010	—	—	—	—	—	—	—	—	—
CAMP-LU-04	8/6/2013	—	—	—	—	—	—	—	—	—
CAMP-LU-15	8/30/2010	—	—	—	—	—	—	—	—	—
CAMP-LU-15	7/30/2013	—	—	—	—	—	—	—	—	—
CAMP-QV-04	8/3/2010	—	—	—	—	—	—	—	—	—
CAMP-QV-04	8/8/2013	—	—	—	—	—	—	—	—	—
CAMP-QV-12	9/14/2010	—	—	—	—	—	—	—	—	—
CAMP-QV-12	7/31/2013	—	—	—	—	—	—	—	—	—
CAMP-SH-07	7/15/2010	—	—	—	—	—	—	—	—	—
CAMP-SH-07	7/30/2013	—	—	—	—	—	—	—	—	—
CAMP-TV-15	10/13/2010	—	—	—	—	—	—	—	—	—
CAMP-TV-15	7/29/2013	—	—	—	—	—	—	—	—	—
Klamath Mountains study unit—Continued										
KLAM-30	12/2/2010	—	—	—	—	—	—	—	—	—
KLAM-30	10/31/2013	—	—	—	—	—	—	—	—	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Fumigant	Gasoline component			Organic synthesis		Detections per sample	VOC detection summary (sites with at least one VOC)
		1,4-Dichloro-benzene (µg/L) (34571)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	1,2,4-Trimethyl-benzene (µg/L) (77222)	Toluene (µg/L) (34010)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	Carbon disulfide (µg/L) (77041)		
Benchmark type[1]		**MCL-CA**	**MCL-CA**	**NL-CA**	**MCL-CA**	**MCL-CA**	**NL-CA**	**—**	**—**
Benchmark level		**5**	**13**	**330**	**10**	**6**	**160**	**—**	**—**
LRL, LRL[2]		**0.034, 0.026**	**0.1, 0.17**	**0.032, 0.056**	**0.018, 0.02**	**0.024, 0.022**	**0.038, 0.1**	**—**	**—**
SRL		**none**	**none**	**[4]0.56**	**[4]0.69**	**[3]0.023**	**[3]0.03**	**—**	**—**
Number of trend sites with detections during the initial sampling period		0	8	1	0	2	2	—	52
Detection frequency (percent)		0	10.5	1.3	0	2.6	2.6	—	68.4
Number of trend sites with detections during the trend sampling period		1	3	0	0	2	0	—	38
Detection frequency (percent)		1.3	3.9	0	0	2.6	0	—	50.0
San Francisco Bay study unit—Continued									
SF-14	4/25/2007	—	—	—	—	—	—	1	—
SF-14	3/21/2011	—	—	≤0.02	—	—	—	2	—
SF-20	5/2/2007	—	E0.09	—	—	4.34	—	5	—
SF-20	3/21/2011	—	0.09	≤0.02	—	5.35	—	7	—
SF-42	6/19/2007	—	—	—	—	—	—	3	—
SF-42	3/22/2011	—	—	—	—	—	—	3	—
Southern Coast Range—Coastal study unit—Continued									
SCRC-B23	7/7/2008	—	—	—	—	—	—	2	—
SCRC-B23	6/7/2012	—	—	—	—	—	—	1	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Fumigant	Gasoline component			Organic synthesis		Detections per sample	VOC detection summary (sites with at least one VOC)
		1,4-Dichlorobenzene (µg/L) (34571)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	1,2,4-Trimethylbenzene (µg/L) (77222)	Toluene (µg/L) (34010)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	Carbon disulfide (µg/L) (77041)		
San Francisco Bay study unit—Continued									
SCRC-B24	7/7/2008	—	—	—	—	—	—	0	—
SCRC-B24	6/6/2012	—	—	≤0.02	—	—	—	1	—
SCRC-H08	6/10/2008	—	—	—	—	—	—	0	—
SCRC-H08	6/5/2012	0.028	—	—	—	—	—	1	—
SCRC-H11	6/26/2008	—	—	—	—	—	—	1	—
SCRC-H11	6/7/2012	—	—	—	—	—	—	0	—
Southern Coast Range—Interior Basins study unit—Continued									
LIV-03	8/25/2008	—	—	—	—	—	—	1	—
LIV-03	9/18/2012	—	—	—	—	—	—	1	—`
GIL-02	8/12/2008	—	—	—	—	—	—	1	—
GIL-02	9/18/2012	—	—	—	—	—	—	0	—
CUY-02	9/15/2008	—	—	—	—	—	—	0	—
CUY-02	9/20/2012	—	—	≤0.04	—	—	—	1	—
CUY-06	9/17/2008	—	—	—	—	—	—	0	—
CUY-06	9/20/2012	—	—	—	—	—	—	1	—
Northern Coast Ranges study unit—Continued									
NOCO-IN-11	6/22/2009	—	—	—	—	—	—	2	—
NOCO-IN-11	5/2/2012	—	—	—	—	—	—	2	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA well identification number	Sample dates (mm/dd/yyyy)	Fumigant	Gasoline component			Organic synthesis		Detections per sample	VOC detection summary (sites with at least one VOC)
		1,4-Dichlorobenzene (µg/L) (34571)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	1,2,4-Trimethylbenzene (µg/L) (77222)	Toluene (µg/L) (34010)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	Carbon disulfide (µg/L) (77041)		
Northern Coast Ranges study unit—Continued									
NOCO-CO-02	7/30/2009	—	—	—	—	—	—	0	—
NOCO-CO-02	5/10/2012	—	—	—	—	—	—	1	—
NOCO-CO-03	8/3/2009	—	—	—	—	—	—	0	—
NOCO-CO-03	5/9/2012	—	—	—	—	—	—	0	—
NOCO-CO-18	8/31/2009	—	[6]E0.07	—	—	—	—	0	—
NOCO-CO-18	5/9/2012	—	0.09	—	—	—	—	1	—
NOCO-CO-23	9/15/2009	—	—	—	—	—	—	1	—
NOCO-CO-23	5/8/2012	—	—	—	—	—	—	0	—
Santa Barbara study unit—Continued									
SB-07	1/26/2011	—	—	—	—	—	—	4	—
SB-07	12/18/2013	—	—	—	—	—	—	5	—
SB-12	2/7/2011	—	—	—	—	—	—	3	—
SB-12	12/18/2013	—	—	—	—	—	—	1	—
Central Sierra study unit—Continued									
CWISH-04	5/15/2006	—	[6]E0.06	—	—	—	—	1	—
CWISH-04	6/14/2010	—	[6]E0.07	—	—	—	—	1	—
Tahoe–Martis study unit—Continued									
TMART-03	6/26/2007	—	—	—	—	—	—	2	—
TMART-03	8/27/2012	—	—	—	—	—	—	0	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in tables 4*A*, *B*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; MCL-US, U.S. Environmental Protection Agency (EPA) maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, concentration is greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA well identification number	Sample dates (mm/dd/yyyy)	Fumigant	Gasoline component			Organic synthesis		Detections per sample	VOC detection summary (sites with at least one VOC)
		1,4-Dichlorobenzene (µg/L) (34571)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	1,2,4-Trimethylbenzene (µg/L) (77222)	Toluene (µg/L) (34010)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	Carbon disulfide (µg/L) (77041)		
Tahoe–Martis study unit—Continued									
TMART-06	6/28/2007	—	—	—	—	—	—	2	—
TMART-06	8/27/2012	—	—	—	—	—	—	2	—
TTAHO-06	8/2/2007	—	—	—	—	—	—	2	—
TTAHO-06	8/29/2012	—	—	—	—	—	—	3	—
TTAHO-10	8/16/2007	—	—	—	—	—	—	0	—
TTAHO-10	8/29/2012	—	—	—	≤0.04	—	—	1	—
Sierra Nevada Regional study unit—Continued									
SIERRA-G-08	7/23/2008	—	0.82	—	—	—	—	2	—
SIERRA-G-08	10/3/2012	—	0.20	—	—	—	—	2	—
SIERRA-G-13	8/21/2008	—	—	—	—	—	—	0	—
SIERRA-G-13	10/2/2012	—	—	—	≤0.07	—	—	1	—
SIERRA-G-15	9/8/2008	—	—	—	—	E0.031	—	2	—
SIERRA-G-15	10/1/2012	—	—	—	—	—	—	0	—
SIERRA-M-06	10/8/2008	—	[6]E0.05	—	—	—	—	0	—
SIERRA-M-06	9/13/2012	—	0.13	—	—	—	—	1	—
SIERRA-S-02	8/19/2008	—	0.20	—	—	—	—	2	—
SIERRA-S-02	8/30/2012	—	0.09	—	—	—	—	3	—
SIERRA-S-03	10/20/2008	—	[6]E0.05	—	—	—	—	0	—
SIERRA-S-03	9/12/2012	—	[6]0.03	—	—	—	—	1	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in tables 4*A*, *B*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; MCL-US, U.S. Environmental Protection Agency (EPA) maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, concentration is greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA well identification number	Sample dates (mm/dd/yyyy)	Fumigant	Gasoline component			Organic synthesis		Detections per sample	VOC detection summary (sites with at least one VOC)
		1,4-Dichloro-benzene (µg/L) (34571)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	1,2,4-Trimethyl-benzene (µg/L) (77222)	Toluene (µg/L) (34010)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	Carbon disulfide (µg/L) (77041)		
Sierra Nevada Regional study unit—Continued									
SIERRA-V-03	10/21/2008	—	—	≤0.018	≤0.03	—	—	4	—
SIERRA-V-03	9/20/2012	—	—	—	—	—	—	0	—
Bear Valley–Lake Arrowhead Watershed study unit—Continued									
BEAR-S05	4/28/2010	—	[6]E0.06	—	—	—	—	0	—
BEAR-S05	6/6/2013	—	[6]0.04	—	—	—	—	0	—
BEAR-S12	5/5/2010	—	—	0.705	—	≤0.014	—	3	—
BEAR-S12	6/6/2013	—	—	—	—	0.028	—	4	—
Cascade Range–Modoc Plateau study unit—Continued									
CAMP-ES-05	9/20/2010	—	—	≤0.031	—	—	—	2	—
CAMP-ES-05	8/1/2013	—	—	—	—	—	—	2	—
CAMP-HL-02	8/11/2010	—	—	≤0.138	—	≤0.018	—	2	—
CAMP-HL-02	8/5/2013	—	—	—	—	—	—	2	—
CAMP-HL-10	8/23/2010	—	—	—	—	—	—	1	—
CAMP-HL-10	8/5/2013	—	—	—	—	—	—	1	—
CAMP-LU-04	7/21/2010	—	—	≤0.077	—	—	—	1	—
CAMP-LU-04	8/6/2013	—	—	—	—	—	—	0	—
CAMP-LU-15	8/30/2010	—	—	≤0.091	—	—	—	1	—
CAMP-LU-15	7/30/2013	—	—	—	—	—	—	0	—

Table 6. Volatile organic compounds (VOCs) in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in tables 4*A*, *B*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; MCL-US, U.S. Environmental Protection Agency (EPA) maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, concentration is greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA well identification number	Sample dates (mm/dd/yyyy)	Fumigant	Gasoline component			Organic synthesis		Detections per sample	VOC detection summary (sites with at least one VOC)
		1,4-Dichlorobenzene (µg/L) (34571)	Methyl *tert*-butyl ether (MTBE) (µg/L) (78032)	1,2,4-Trimethylbenzene (µg/L) (77222)	Toluene (µg/L) (34010)	1,1-Dichloroethene (1,1-DCE) (µg/L) (34501)	Carbon disulfide (µg/L) (77041)		
Cascade Range–Modoc Plateau study unit—Continued									
CAMP-QV-04	8/3/2010	—	—	—	—	—	0.10	1	—
CAMP-QV-04	8/8/2013	—	—	—	—	—	—	1	—
CAMP-QV-12	9/14/2010	—	—	≤0.026	—	—	—	1	—
CAMP-QV-12	7/31/2013	—	—	—	—	—	—	1	—
CAMP-SH-07	7/15/2010	—	—	≤0.025	—	—	—	1	—
CAMP-SH-07	7/30/2013	—	—	—	—	—	—	0	—
CAMP-TV-15	10/13/2010	—	—	—	≤0.03	—	—	3	—
CAMP-TV-15	7/29/2013	—	—	—	—	—	—	2	—
Klamath Mountains study unit—Continued									
KLAM-30	12/2/2010	—	—	≤0.04	—	—	0.10	2	—
KLAM-30	10/31/2013	—	—	—	—	—	—	0	—

[1]Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and the MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2]Minimum, maximum, or only LRL used during the initial and trend sampling periods.

[3]The SRL was based on highest concentration in blanks during the trend sampling period. Detected concentrations that were less than or equal to the SRLs were counted as non-detections for the purpose of calculating detection frequencies.

[4]The SRL was based on Fram and others (2012). Detected concentrations during the trend sampling period that were less than or equal to the SRLs are counted as non-detections for the purpose of calculating detection frequencies.

[5]The MCL-US benchmark for trihalomethanes is for the sum of chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

[6]Concentration was less than the maximum LRL and, therefore, was not counted as a detection for the purposes of calculating detection frequency.

Table 7. Pesticides and pesticide degradates in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4C. **GAMA site identification number acronyms**: **Cascade Range–Modoc Plateau study unit**: CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-QV, Quaternary Volcanic Areas study area. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks. **Southern Coast Range–Coastal study unit**: SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Benchmark types**: HAL-US, U.S. Environmental Protection Agency (EPA) lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; nc, not collected; USGS, U.S. Geological Survey; —, not detected; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Herbicide					Herbicide degradate	
		Simazine (µg/L) (04035)	Atrazine (µg/L) (39632)	Prometon (µg/L) (04037)	Hexazinone (µg/L) (04025)	Tebuthiuron (µg/L) (82670)	Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) (µg/L) (04040)	3,4-Dichloro-aniline (µg/L) (61625)
Benchmark type		**MCL–US**	**MCL–CA**	**HAL–US**	**HAL–US**	**HAL–US**	**none**	**none**
Benchmark level		**4**	**1**	**100**	**400**	**500**	**none**	**none**
LRL, LRL[1]		**0.005, 0.010**	**0.007, 0.008**	**0.010, 0.012**	**0.008, 0.026**	**0.016, 0.028**	**0.006, 0.014**	**0.004, 0.006**
Number of trend sites with detections during the initial sampling period		3	3	0	0	0	3	0
Detection frequency (percent)		3.9	3.9	0	0	0	3.9	0
Number of trend sites with detections during the trend sampling period		4	5	0	0	1	3	0
Detection frequency (percent)		5.3	6.6	0	0	1.3	3.9	0
Southern Coast Range–Coastal study unit								
SCRC-H11	6/26/2008	—	—	—	—	—	[2]E0.006	—
SCRC-H11	6/7/2012	—	—	—	—	—	[2]E0.004	—
Southern Coast Range–Interior Basins study unit								
LIV-03	8/25/2008	E0.006	—	—	—	—	[2]E0.005	—
LIV-03	9/18/2012	0.005	0.004	—	—	—	—	—
Northern Coast Ranges study unit								
NOCO-CO-18	8/31/2009	—	—	—	—	—	—	—
NOCO-CO-18	5/9/2012	—	—	—	—	0.018	—	—
NOCO-CO-23	9/15/2009	—	—	—	—	—	—	—
NOCO-CO-23	5/8/2012	0.005	—	—	—	[2]0.003	[2]E0.005	—
Southern Sierra study unit								
SOSA-31	6/29/2006	[2]E0.003	—	—	—	—	—	—
SOSA-31	6/25/2008	E0.005	—	—	—	—	—	—

Table 7. Pesticides and pesticide degradates in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*C*. **GAMA site identification number acronyms**: **Cascade Range–Modoc Plateau study unit**: CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-QV, Quaternary Volcanic Areas study area. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks. **Southern Coast Range–Coastal study unit**: SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Benchmark types**: HAL-US, U.S. Environmental Protection Agency (EPA) lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; LRL, laboratory reporting level; mm/dd/yyyy, month/day/year; nc, not collected; USGS, U.S. Geological Survey; —, not detected; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Herbicide					Herbicide degradate	
		Simazine (µg/L) (04035)	Atrazine (µg/L) (39632)	Prometon (µg/L) (04037)	Hexazinone (µg/L) (04025)	Tebuthiuron (µg/L) (82670)	Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine) (µg/L) (04040)	3,4-Dichloro-aniline (µg/L) (61625)
Sierra Nevada Regional study unit								
SIERRA-G-08	7/23/2008	E0.005	0.010	—	—	—	[2]E0.005	—
SIERRA-G-08	10/3/2012	—	0.008	—	—	—	—	—
Cascade Range–Modoc Plateau study unit								
CAMP-LU-04	7/21/2010	—	—	—	—	—	E0.015	—
CAMP-LU-04	8/6/2013	—	0.004	[2]0.002	—	—	E0.014	—
CAMP-LU-15	8/30/2010	—	0.019	—	—	—	E0.064	[2]E0.0018
CAMP-LU-15	7/30/2013	—	0.025	—	—	—	E0.039	—
CAMP-QV-04	8/3/2010	—	—	—	—	—	—	—
CAMP-QV-04	8/8/2013	—	—	—	—	—	[2]E0.005	—
CAMP-SH-01	7/12/2010	E0.006	0.013	—	—	—	E0.031	—
CAMP-SH-01	7/29/2013	0.005	0.011	—	—	—	E0.019	—
CAMP-SH-07	7/15/2010	—	—	—	—	—	—	—
CAMP-SH-07	7/30/2013	—	—	—	[2]0.012	—	—	—

[1]Minimum and maximum LRL was used during the initial and trend sampling periods.

[2]Concentration was less than the maximum LRL and, therefore, was not counted as a detection for the purposes of calculating detection frequency.

Table 8. Constituents of special interest in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*D*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: HAL-US, U.S. Environmental Protection Agency (EPA) Lifetime Health Advisory level; MCL-CA, State of California maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; USGS, U.S. Geological Survey; —, not detected; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Perchlorate[2] (µg/L) (61209)	Perchlorate[3] (µg/L) (63790)	1,2,3-Trichloropropane (1,2,3-TCP)[4] (µg/L) (77443)
Benchmark type[1]		**MCL–CA**	**MCL–CA**	**HAL–US[5]**
Benchmark level		**6**	**6**	**40**
MRL		**0.5**	**0.1**	**0.005**
San Francisco Bay study unit				
SF-05	05/23/2007	—	nc	nc
SF-05	03/23/2011	nc	0.4	—
SF-10	05/03/2007	0.76	nc	nc
SF-10	03/22/2011	nc	nc	—
SF-14	04/25/2007	1.0	nc	nc
SF-14	03/21/2011	nc	nc	—
SF-20	05/02/2007	—	nc	nc
SF-20	03/21/2011	nc	0.6	—
SF-42	06/19/2007	—	nc	nc
SF-42	03/22/2011	nc	0.5	—
Southern Coast Range–Coastal study unit				
SCRC-B18	06/23/2008	nc	0.2	—
SCRC-B18	06/06/2012	nc	0.3	—
SCRC-B23	07/07/2008	nc	0.3	—
SCRC-B23	06/07/2012	nc	0.5	—
SCRC-B24	07/07/2008	nc	0.6	—
SCRC-B24	06/06/2012	nc	0.7	—
SCRC-B35	07/30/2008	nc	—	—
SCRC-B35	06/05/2012	nc	—	—
SCRC-H08	06/10/2008	nc	0.2	—
SCRC-H08	06/05/2012	nc	0.6	—
SCRC-H11	06/26/2008	nc	—	—
SCRC-H11	06/07/2012	nc	0.2	—
Southern Coast Range–Interior Basins study unit				
CUY-02	09/15/2008	nc	—	nc
CUY-02	09/20/2012	nc	—	—

Table 8. Constituents of special interest in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*D*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: HAL-US, U.S. Environmental Protection Agency (EPA) Lifetime Health Advisory level; MCL-CA, State of California maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; USGS, U.S. Geological Survey; —, not detected; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Perchlorate[2] (µg/L) (61209)	Perchlorate[3] (µg/L) (63790)	1,2,3-Trichloropropane (1,2,3-TCP)[4] (µg/L) (77443)
Southern Coast Range–Interior Basins study unit—Continued				
CUY-06	09/17/2008	nc	0.4	nc
CUY-06	09/20/2012	nc	0.4	—
GIL-02	08/12/2008	nc	2.1	nc
GIL-02	09/18/2012	nc	3.1	—
GIL-12	08/19/2008	nc	—	nc
GIL-12	09/19/2012	nc	—	—
LIV-03	08/25/2008	nc	0.6	nc
LIV-03	09/18/2012	nc	0.5	—
Northern Coast Ranges study unit				
NOCO-IN-10	06/18/2009	nc	—	nc
NOCO-IN-10	05/02/2012	nc	0.1	—
NOCO-IN-11	06/22/2009	nc	0.1	nc
NOCO-IN-11	05/02/2012	nc	—	—
NOCO-IN-27	07/27/2009	nc	—	nc
NOCO-IN-27	05/01/2012	nc	—	—
NOCO-CO-02	07/30/2009	nc	—	nc
NOCO-CO-02	05/10/2012	nc	0.1	—
NOCO-CO-03	08/03/2009	nc	—	nc
NOCO-CO-03	05/09/2012	nc	—	—
NOCO-CO-08	08/11/2009	nc	—	nc
NOCO-CO-08	05/08/2012	nc	—	—
NOCO-CO-18	08/31/2009	nc	—	nc
NOCO-CO-18	05/09/2012	nc	—	—
NOCO-CO-23	09/15/2009	nc	—	nc
NOCO-CO-23	05/08/2012	nc	—	—
Santa Barbara study unit				
SB-07	01/26/2011	nc	1.7	nc
SB-07	12/18/2013	nc	1.9	nc
SB-12	02/07/2011	nc	0.9	nc
SB-12	12/18/2013	nc	0.8	nc

Table 8. Constituents of special interest in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Perchlorate[2] (µg/L) (61209)	Perchlorate[3] (µg/L) (63790)	1,2,3-Trichloropropane (1,2,3-TCP)[4] (µg/L) (77443)
Central Sierra study unit				
CGOLD-13	05/23/2006	—	nc	—
CGOLD-13	06/14/2010	nc	—	nc
CGOLD-16	05/24/2006	—	nc	—
CGOLD-16	05/25/2010	nc	0.1	nc
CWISH-04	05/15/2006	—	nc	—
CWISH-04	06/14/2010	nc	—	nc
Southern Sierra study unit				
SOSA-06	06/07/2006	—	nc	nc
SOSA-06	06/23/2008	nc	—	nc
SOSA-15	06/12/2006	—	nc	—
SOSA-15	07/08/2008	nc	—	nc
SOSA-20	06/14/2006	—	nc	nc
SOSA-20	06/25/2008	nc	0.1	nc
SOSA-31	06/29/2006	0.5	nc	nc
SOSA-31	06/25/2008	nc	0.8	nc
SOSA-32	06/29/2006	0.8	nc	nc
SOSA-32	06/24/2008	nc	0.2	nc
Tahoe–Martis study unit				
TMART-03	06/26/2007	—	nc	nc
TMART-03	08/27/2012	nc	—	nc
TMART-06	06/28/2007	—	nc	nc
TMART-06	08/27/2012	nc	0.1	nc
TROCK-02	07/11/2007	—	nc	nc
TROCK-02	08/28/2012	nc	—	nc
TROCK-05	07/17/2007	—	nc	nc
TROCK-05	08/28/2012	nc	—	nc
TTAHO-06	08/02/2007	—	nc	nc
TTAHO-06	08/29/2012	nc	—	nc
TTAHO-10	08/16/2007	—	nc	nc
TTAHO-10	08/29/2012	nc	—	nc

Table 8. Constituents of special interest in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Perchlorate[2] (µg/L) (61209)	Perchlorate[3] (µg/L) (63790)	1,2,3-Trichloropropane (1,2,3-TCP)[4] (µg/L) (77443)
Sierra Nevada Regional study unit				
SIERRA-G-08	07/23/2008	nc	0.3	nc
SIERRA-G-08	10/03/2012	nc	0.1	nc
SIERRA-G-10	07/28/2008	nc	—	nc
SIERRA-G-10	10/03/2012	nc	—	nc
SIERRA-G-12	08/14/2008	nc	0.2	nc
SIERRA-G-12	10/04/2012	nc	—	nc
SIERRA-G-13	08/21/2008	nc	0.2	nc
SIERRA-G-13	10/02/2012	nc	0.1	nc
SIERRA-G-14	08/26/2008	nc	—	nc
SIERRA-G-14	08/30/2012	nc	—	nc
SIERRA-G-15	09/08/2008	nc	—	nc
SIERRA-G-15	10/01/2012	nc	—	nc
SIERRA-G-16	09/22/2008	nc	—	nc
SIERRA-G-16	09/17/2012	nc	—	nc
SIERRA-G-17	09/23/2008	nc	—	nc
SIERRA-G-17	09/18/2012	nc	—	nc
SIERRA-G-18	09/24/2008	nc	—	nc
SIERRA-G-18	09/19/2012	nc	—	nc
SIERRA-M-03	09/10/2008	nc	—	nc
SIERRA-M-03	09/11/2012	nc	—	nc
SIERRA-M-04	09/17/2008	nc	—	nc
SIERRA-M-04	09/12/2012	nc	—	nc
SIERRA-M-06	10/08/2008	nc	—	nc
SIERRA-M-06	09/13/2012	nc	—	nc
SIERRA-S-02	08/19/2008	nc	—	nc
SIERRA-S-02	08/30/2012	nc	—	nc
SIERRA-S-03	10/20/2008	nc	—	nc
SIERRA-S-03	09/12/2012	nc	—	nc
SIERRA-V-02	10/07/2008	nc	—	nc

Table 8. Constituents of special interest in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*D*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: HAL-US, U.S. Environmental Protection Agency (EPA) Lifetime Health Advisory level; MCL-CA, State of California maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; USGS, U.S. Geological Survey; —, not detected; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Perchlorate[2] (µg/L) (61209)	Perchlorate[3] (µg/L) (63790)	1,2,3-Trichloropropane (1,2,3-TCP)[4] (µg/L) (77443)
Sierra Nevada Regional study unit—Continued				
SIERRA-V-02	09/10/2012	nc	—	nc
SIERRA-V-03	10/21/2008	nc	—	nc
SIERRA-V-03	09/20/2012	nc	—	nc
Bear Valley–Lake Arrowhead Watershed study unit				
BEAR-S05	04/28/2010	nc	0.2	—
BEAR-S05	06/06/2013	nc	0.2	—
BEAR-S12	05/05/2010	nc	0.2	—
BEAR-S12	06/06/2013	nc	0.2	—
BEAR-G07	05/10/2010	nc	—	—
BEAR-G07	06/05/2013	nc	—	—
BEAR-G12	05/19/2010	nc	0.1	—
BEAR-G12	06/05/2013	nc	0.2	—
Cascade Range–Modoc Plateau study unit				
CAMP-ES-05	09/20/2010	nc	0.1	nc
CAMP-ES-05	08/01/2013	nc	0.1	nc
CAMP-ES-09	10/04/2010	nc	0.2	nc
CAMP-ES-09	08/01/2013	nc	0.1	nc
CAMP-HL-02	08/11/2010	nc	—	nc
CAMP-HL-02	08/05/2013	nc	—	nc
CAMP-HL-10	08/23/2010	nc	0.3	nc
CAMP-HL-10	08/05/2013	nc	0.2	nc
CAMP-LU-04	07/21/2010	nc	0.2	nc
CAMP-LU-04	08/06/2013	nc	0.2	nc
CAMP-LU-15	08/30/2010	nc	—	nc
CAMP-LU-15	07/30/2013	nc	—	nc
CAMP-QV-04	08/03/2010	nc	—	nc
CAMP-QV-04	08/08/2013	nc	—	nc
CAMP-QV-12	09/14/2010	nc	—	nc
CAMP-QV-12	07/31/2013	nc	—	nc

Table 8. Constituents of special interest in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*D*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: HAL-US, U.S. Environmental Protection Agency (EPA) Lifetime Health Advisory level; MCL-CA, State of California maximum contaminant level; NL-CA, State of California notification level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; USGS, U.S. Geological Survey; —, not detected; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Perchlorate[2] (µg/L) (61209)	Perchlorate[3] (µg/L) (63790)	1,2,3-Trichloropropane (1,2,3-TCP)[4] (µg/L) (77443)
Cascade Range–Modoc Plateau study unit—Continued				
CAMP-SH-01	07/12/2010	nc	0.1	nc
CAMP-SH-01	07/29/2013	nc	—	nc
CAMP-SH-07	07/15/2010	nc	—	nc
CAMP-SH-07	07/30/2013	nc	—	nc
CAMP-TV-07	08/26/2010	nc	0.1	nc
CAMP-TV-07	08/07/2013	nc	—	nc
CAMP-TV-15	10/13/2010	nc	—	nc
CAMP-TV-15	07/29/2013	nc	—	nc
Klamath Mountains study unit				
KLAM-01	10/18/2010	nc	0.3	nc
KLAM-01	10/29/2013	nc	—	nc
KLAM-11	11/02/2010	nc	0.2	nc
KLAM-11	10/30/2013	nc	—	nc
KLAM-20	11/17/2010	nc	—	nc
KLAM-20	10/30/2013	nc	—	nc
KLAM-30	12/02/2010	nc	—	nc
KLAM-30	10/31/2013	nc	—	nc

[1]Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and the MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2]Prior to October 1, 2007, perchlorate analyses were performed on unfiltered samples by Montgomery Watson Harza (MWH) Laboratories (table A–1).

[3]After August 15, 2007, perchlorate analyses were performed on filtered samples by Weck Laboratories, Inc. (Weck; table A–1).

[4]1,2,3-TCP analyses were performed by MWH prior to October 1, 2007, and by Weck after that date.

[5]In some earlier reports in this series, the NL-CA (0.005 µg/L) was used as the comparison benchmark for 1,2,3-TCP.

Table 9. Nutrients in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*E*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: HAL-US, U.S. Environmental Protection Agency (EPA) lifetime health advisory level; MCL-US, EPA maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mg/L, milligrams per liter; mm/dd/yyyy, month/day/year; nc, not collected; USGS, U.S. Geological Survey; —, not detected; +, plus]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Ammonia, as nitrogen (mg/L) (00608)	Nitrite, as nitrogen (mg/L) (00613)	Nitrate, as nitrogen[1] (mg/L) (00631)	Total nitrogen, as ammonia + nitrate + nitrite + organic nitrogen (mg/L) (62854)	Orthophosphate, as phosphorus (mg/L) (00671)
Benchmark type[2]		**HAL-US**	**MCL-US**	**MCL-US**	**none**	**none**
Benchmark level		**[3]24.7**	**1**	**10**	**none**	**none**
Reporting level type(s)		**IRL/LRL/LT-MDL**	**IRL/LT-MDL**	**IRL/LT-MDL**	**LRL/LT-MDL**	**IRL/LRL/LT-MDL**
Reporting level(s)[4]		**0.010, 0.02**	**0.002**	**0.04, 0.08**	**0.06, 0.1**	**0.006, 0.008**
San Francisco Bay study unit						
SF-05	05/23/2007	nc	nc	nc	nc	nc
SF-05	03/23/2011	0.02	0.007	1.61	1.68	0.098
SF-10	05/03/2007	—	—	3.80	3.79	0.050
SF-10	03/22/2011	—	—	4.06	4.09	0.049
SF-14	04/25/2007	—	—	4.44	4.44	0.052
SF-14	03/21/2011	—	—	4.60	4.42	0.051
SF-20	05/02/2007	—	—	3.06	3.07	0.026
SF-20	03/21/2011	—	—	2.93	2.79	0.025
SF-42	06/19/2007	—	0.203	2.04	2.20	0.027
SF-42	03/22/2011	—	0.056	1.74	1.75	0.044
Southern Coast Range–Coastal study unit						
SCRC-B18	06/23/2008	nc	nc	nc	nc	nc
SCRC-B18	06/06/2012	—	—	10.2	9.94	0.036
SCRC-B23	07/07/2008	nc	nc	nc	nc	nc
SCRC-B23	06/07/2012	—	—	4.03	3.97	0.030
SCRC-B24	07/07/2008	nc	nc	nc	nc	nc
SCRC-B24	06/06/2012	—	—	1.57	1.63	0.033
SCRC-B35	07/30/2008	nc	nc	nc	nc	nc
SCRC-B35	06/05/2012	0.19	—	—	0.28	0.152
SCRC-H08	06/10/2008	E0.02	0.003	0.37	0.40	0.025
SCRC-H08	06/05/2012	—	—	0.33	0.34	0.028
SCRC-H11	06/26/2008	—	—	0.14	0.14	0.028
SCRC-H11	06/07/2012	—	—	0.28	0.30	0.020

Table 9. Nutrients in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Ammonia, as nitrogen (mg/L) (00608)	Nitrite, as nitrogen (mg/L) (00613)	Nitrate, as nitrogen[1] (mg/L) (00631)	Total nitrogen, as ammonia + nitrate + nitrite + organic nitrogen (mg/L) (62854)	Orthophosphate, as phosphorus (mg/L) (00671)
Southern Coast Range–Interior Basins study unit						
LIV-03	08/25/2008	—	—	4.18	4.24	0.031
LIV-03	09/18/2012	—	—	4.19	4.16	0.031
GIL-02	08/12/2008	—	—	8.39	8.68	0.037
GIL-02	09/18/2012	—	—	8.45	8.55	0.031
GIL-12	08/19/2008	E0.02	—	—	—	0.064
GIL-12	09/19/2012	0.02	—	—	—	0.049
CUY-02	09/15/2008	0.41	0.004	E0.02	0.46	0.018
CUY-02	09/20/2012	0.41	0.009	—	0.43	0.022
CUY-06	09/17/2008	—	—	3.99	3.98	0.010
CUY-06	09/20/2012	—	—	4.93	5.21	0.009
Northern Coast Ranges study unit						
NOCO-IN-10	06/18/2009	—	—	0.36	0.40	0.012
NOCO-IN-10	05/02/2012	—	—	0.74	0.70	0.009
NOCO-IN-11	06/22/2009	E0.01	0.002	1.03	1.09	0.187
NOCO-IN-11	05/02/2012	0.02	0.007	0.47	0.43	0.095
NOCO-IN-27	07/27/2009	2.14	0.004	—	2.27	0.304
NOCO-IN-27	05/01/2012	1.83	0.004	0.04	2.03	0.803
NOCO-CO-02	07/30/2009	—	—	8.00	8.41	0.074
NOCO-CO-02	05/10/2012	—	—	8.07	8.78	0.068
NOCO-CO-03	08/03/2009	—	—	0.12	0.12	0.056
NOCO-CO-03	05/09/2012	0.01	—	0.10	0.08	0.051
NOCO-CO-08	08/11/2009	—	—	—	—	0.027
NOCO-CO-08	05/08/2012	0.02	—	—	—	0.028
NOCO-CO-18	08/31/2009	0.21	—	—	0.24	E0.006
NOCO-CO-18	05/09/2012	0.2	—	—	0.25	0.219
NOCO-CO-23	09/15/2009	—	—	0.15	0.15	0.013
NOCO-CO-23	05/08/2012	—	—	0.92	0.98	0.012

Table 9. Nutrients in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Ammonia, as nitrogen (mg/L) (00608)	Nitrite, as nitrogen (mg/L) (00613)	Nitrate, as nitrogen[1] (mg/L) (00631)	Total nitrogen, as ammonia + nitrate + nitrite + organic nitrogen (mg/L) (62854)	Orthophosphate, as phosphorus (mg/L) (00671)
Santa Barbara study unit						
SB-07	01/26/2011	—	0.001	4.29	4.42	0.063
SB-07	12/18/2013	—	—	5.76	6.11	0.057
SB-12	02/07/2011	—	—	3.80	4.03	0.025
SB-12	12/18/2013	0.03	—	3.52	3.77	0.025
Central Sierra study unit						
CGOLD-13	05/23/2006	—	—	—	0.06	—
CGOLD-13	06/14/2010	—	—	—	0.10	0.018
CGOLD-16	05/24/2006	—	—	0.07	E0.04	0.044
CGOLD-16	05/25/2010	—	—	0.04	—	0.044
CWISH-04	05/15/2006	—	—	0.51	0.54	0.023
CWISH-04	06/14/2010	—	—	0.77	0.84	0.041
Southern Sierra study unit						
SOSA-06	06/07/2006	nc	nc	nc	nc	nc
SOSA-06	06/23/2008	—	—	—	—	0.014
SOSA-15	06/12/2006	E0.006	—	0.10	0.11	0.025
SOSA-15	07/08/2008	—	—	0.14	0.14	0.030
SOSA-20	06/14/2006	nc	nc	nc	nc	nc
SOSA-20	06/25/2008	—	—	1.00	0.95	0.016
SOSA-31	06/29/2006	nc	nc	nc	nc	nc
SOSA-31	06/25/2008	—	—	8.32	8.70	0.046
SOSA-32	06/29/2006	nc	nc	nc	nc	nc
SOSA-32	06/24/2008	—	—	3.86	3.86	0.024
Tahoe–Martis study unit						
TMART-03	06/26/2007	0.14	—	0.06	0.14	0.140
TMART-03	08/27/2012	0.18	0.002	—	0.21	0.153
TMART-06	06/28/2007	—	—	0.90	0.89	0.043
TMART-06	08/27/2012	—	—	1.06	1.13	0.036
TROCK-02	07/11/2007	—	—	—	—	0.006
TROCK-02	08/28/2012	—	—	—	—	0.006

Table 9. Nutrients in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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Tahoe–Martis study unit—Continued						
TROCK-05	07/17/2007	—	E0.001	—	E0.04	0.038
TROCK-05	08/28/2012	—	—	—	—	0.037
TTAHO-06	08/02/2007	—	—	0.59	0.61	0.016
TTAHO-06	08/29/2012	—	—	0.46	0.44	0.013
TTAHO-10	8/16/2007	—	—	E0.03	—	0.035
TTAHO-10	8/29/2012	—	—	—	—	0.032
Sierra Nevada Regional study unit						
SIERRA-G-08	07/23/2008	—	—	0.73	0.79	0.031
SIERRA-G-08	10/03/2012	0.02	0.002	0.45	0.50	0.026
SIERRA-G-10	07/28/2008	—	—	0.05	E0.06	0.013
SIERRA-G-10	10/03/2012	0.01	0.001	0.06	—	0.008
SIERRA-G-12	08/14/2008	—	—	0.70	0.69	0.036
SIERRA-G-12	10/04/2012	0.01	0.002	0.31	0.33	0.032
SIERRA-G-13	08/21/2008	—	—	2.85	2.94	0.078
SIERRA-G-13	10/02/2012	0.01	0.002	2.49	2.51	0.084
SIERRA-G-14	08/26/2008	—	—	0.10	0.12	0.024
SIERRA-G-14	08/30/2012	—	—	0.12	0.11	0.022
SIERRA-G-15	09/08/2008	0.27	—	—	0.37	E0.005
SIERRA-G-15	10/01/2012	0.20	0.002	0.04	0.36	0.007
SIERRA-G-16	09/22/2008	—	—	0.17	0.15	—
SIERRA-G-16	09/17/2012	—	—	0.16	0.15	—
SIERRA-G-17	09/23/2008	—	—	0.08	0.06	0.019
SIERRA-G-17	09/18/2012	—	—	0.07	0.06	0.020
SIERRA-G-18	09/24/2008	—	—	0.12	0.13	0.008
SIERRA-G-18	09/19/2012	—	—	0.12	0.11	0.007
SIERRA-M-03	09/10/2008	—	—	E0.02	—	0.010
SIERRA-M-03	09/11/2012	—	—	—	—	0.012
SIERRA-M-04	09/17/2008	—	—	E0.03	—	E0.005
SIERRA-M-04	09/12/2012	—	—	—	—	0.006

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Sierra Nevada Regional study unit—Continued						
SIERRA-M-06	10/08/2008	—	—	E0.03	E0.05	E0.006
SIERRA-M-06	09/13/2012	—	—	0.05	0.05	0.005
SIERRA-S-02	08/19/2008	—	—	0.44	0.44	0.031
SIERRA-S-02	08/30/2012	—	—	0.40	0.42	0.027
SIERRA-S-03	10/20/2008	—	—	0.36	0.37	0.049
SIERRA-S-03	09/12/2012	0.01	—	0.48	0.53	0.065
SIERRA-V-02	10/07/2008	—	—	0.05	E0.07	0.079
SIERRA-V-02	09/10/2012	—	—	0.07	0.07	0.081
SIERRA-V-03	10/21/2008	—	—	E0.03	—	0.090
SIERRA-V-03	09/20/2012	—	—	0.05	—	0.099
Bear Valley–Lake Arrowhead Watershed study unit						
BEAR-S05	04/28/2010	—	—	0.22	0.21	0.013
BEAR-S05	06/06/2013	—	—	0.21	0.20	0.009
BEAR-S12	05/05/2010	—	—	0.31	0.32	0.060
BEAR-S12	06/06/2013	—	—	0.40	0.37	0.056
BEAR-G07	05/10/2010	—	—	E0.04	E0.10	0.016
BEAR-G07	06/05/2013	—	—	—	—	0.013
BEAR-G12	05/19/2010	—	—	0.25	0.25	0.072
BEAR-G12	06/05/2013	—	—	0.05	—	0.075
Cascade Range–Modoc Plateau study unit						
CAMP-ES-05	09/20/2010	—	—	0.06	—	0.097
CAMP-ES-05	08/01/2013	—	—	0.20	0.25	0.083
CAMP-ES-09	10/04/2010	—	—	0.48	0.46	0.116
CAMP-ES-09	08/01/2013	—	—	0.46	0.49	0.106
CAMP-HL-02	08/11/2010	—	—	0.21	0.19	0.032
CAMP-HL-02	08/05/2013	—	—	0.34	0.36	0.036
CAMP-HL-10	08/23/2010	0.06	—	0.94	1.07	0.086
CAMP-HL-10	08/05/2013	0.05	0.001	1.01	1.13	0.083
CAMP-LU-04	07/21/2010	—	—	2.31	2.35	0.048

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Ammonia, as nitrogen (mg/L) (00608)	Nitrite, as nitrogen (mg/L) (00613)	Nitrate, as nitrogen[1] (mg/L) (00631)	Total nitrogen, as ammonia + nitrate + nitrite + organic nitrogen (mg/L) (62854)	Orthophosphate, as phosphorus (mg/L) (00671)
Cascade Range–Modoc Plateau study unit—Continued						
CAMP-LU-04	08/06/2013	—	—	2.30	2.35	0.033
CAMP-LU-15	08/30/2010	—	—	0.43	0.40	0.032
CAMP-LU-15	07/30/2013	—	—	0.47	0.48	0.025
CAMP-QV-04	08/03/2010	0.11	0.011	0.14	0.45	0.194
CAMP-QV-04	08/08/2013	0.11	0.010	0.13	0.51	0.182
CAMP-QV-12	09/14/2010	—	—	0.07	E0.06	0.050
CAMP-QV-12	07/31/2013	—	—	0.08	0.09	0.040
CAMP-SH-01	07/12/2010	E0.02	—	1.70	1.69	0.033
CAMP-SH-01	07/29/2013	—	—	1.71	1.68	0.025
CAMP-SH-07	07/15/2010	—	—	0.07	—	0.037
CAMP-SH-07	07/30/2013	—	—	—	0.05	0.027
CAMP-TV-07	08/26/2010	—	—	0.16	0.15	0.038
CAMP-TV-07	08/07/2013	—	—	0.16	0.17	0.029
CAMP-TV-15	10/13/2010	—	—	—	—	0.011
CAMP-TV-15	07/29/2013	0.01	—	—	—	0.006
Klamath Mountains study unit						
KLAM-01	10/18/2010	—	—	—	—	0.006
KLAM-01	10/29/2013	—	—	0.05	—	—
KLAM-11	11/02/2010	—	—	0.06	0.05	0.016
KLAM-11	10/30/2013	—	—	0.06	0.06	0.010
KLAM-20	11/17/2010	—	—	0.04	—	0.026
KLAM-20	10/30/2013	—	—	0.06	—	0.018
KLAM-30	12/02/2010	0.06	—	—	—	0.025
KLAM-30	10/31/2013	0.05	—	—	0.08	0.004

[1]Nitrite plus nitrate (as nitrogen) is referred to as nitrate because sample concentrations consist nearly entirely of nitrate.

[2]Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and State of California maximum contaminant level (MCL-CA) are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[3]The HAL-US is 30 mg/L "as ammonia." To facilitate comparison to the analytical results, we have converted and reported this HAL-US as 24.7 mg/L "as nitrogen."

[4]Minimum, maximum, or only reporting level used during the initial and trend sampling periods.

Table 10. Major ions and total dissolved solids in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Benchmark type[1]		**none**	**none**	**none**	**none**	**none**	**SMCL-CA[3]**	**MCL-CA**	**none**	**none**	**SMCL-CA[3]**	**SMCL-CA[3]**
Benchmark level		**none**	**none**	**none**	**none**	**none**	**500**	**2**	**none**	**none**	**500**	**1,000**
Reporting level type(s)		**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**MRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**MRL**
Reporting level(s)[2]		**0.02, 0.044**	**0.008, 0.022**	**0.02, 0.16**	**0.06, 0.20**	**0.01, 0.02**	**0.06, 0.20**	**0.04, 0.12**	**0.001, 0.002**	**0.018, 0.058**	**0.09, 0.18**	**10, 20**
San Francisco Bay study unit												
SF-05	05/23/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-05	03/23/2011	30.6	23.0	3.16	42.9	0.22	71.6	0.15	0.003	32.4	25.9	327
SF-10	05/03/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-10	03/22/2011	65.4	19.9	1.17	40.5	0.12	29.5	0.14	0.005	27.6	33.1	381
SF-14	04/25/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-14	03/21/2011	82.4	22.4	1.29	32.5	0.15	42.7	0.13	—	28.4	34.7	416
SF-20	05/02/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-20	03/21/2011	61.8	24.3	1.18	18.9	0.12	38.4	0.13	—	25.9	48.6	337
SF-42	06/19/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-42	03/22/2011	107	40.7	3.11	125	1.11	335	0.08	0.167	31.2	38.3	936
Southern Coast Range–Coastal study unit												
SCRC-B18	06/23/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B18	06/06/2012	125	51.5	3.06	65.1	0.49	29.8	0.42	0.002	24.8	332	850
SCRC-B23	07/07/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B23	06/07/2012	87.6	39.2	2.41	56.8	0.03	42.5	0.24	—	44.1	265	667

Table 10. Major ions and total dissolved solids in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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Southern Coast Range–Coastal study unit—Continued												
SCRC-B24	07/07/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B24	06/06/2012	91.7	38.6	2.47	57.6	0.20	50.0	0.18	—	43.6	220	607
SCRC-B35	07/30/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B35	06/05/2012	219	105	4.05	117	0.42	134	0.20	0.024	40.6	*516	*1,480
SCRC-H08	06/10/2008	30.5	26.2	4.09	150	0.19	49.3	0.19	0.075	48	66	606
SCRC-H08	06/05/2012	32.0	32.4	3.50	129	0.19	53.3	0.19	0.060	52.3	54.1	565
SCRC-H11	06/26/2008	94.7	29.9	1.43	40.0	0.27	89.7	0.49	0.020	37.5	29.6	502
SCRC-H11	06/07/2012	96.5	27.6	1.17	42.5	0.28	99.8	0.53	0.017	37.7	26.0	513
Southern Coast Range–Interior Basins study unit												
LIV-03	08/25/2008	89.5	42.9	2.16	48.6	0.30	79.8	0.13	E0.001	19.9	54.6	569
LIV-03	09/18/2012	94.2	45.1	2.25	50.3	0.29	90.9	0.10	—	21.5	55.9	599
GIL-02	08/12/2008	55.1	26.2	1.45	26.2	0.14	26.7	0.16	—	27.1	34.0	372
GIL-02	09/18/2012	55.2	28.0	1.48	26.7	0.13	28.2	0.11	—	26.7	32.3	351
GIL-12	08/19/2008	32.6	24.2	2.14	56.5	0.12	37.0	0.29	0.016	31.6	37.7	364
GIL-12	09/19/2012	40.6	29.2	2.27	55.6	0.11	41.2	0.24	0.012	33.7	41.5	397
CUY-02	09/15/2008	105	19.3	5.23	173	0.13	17.6	0.18	0.035	34.6	*508	972
CUY-02	09/20/2012	108	19.9	4.79	174	0.11	18.3	0.14	0.026	35.6	*525	977
CUY-06	09/17/2008	226	93.4	3.92	72.4	0.03	11.5	0.92	E0.001	15.5	*911	*1,530
CUY-06	09/20/2012	253	101	3.84	72.4	0.05	12.1	0.82	—	15.6	*951	*1,580

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Northern Coast Ranges study unit												
NOCO-IN-10	06/18/2009	19.8	12.2	0.58	7.73	E0.01	5.51	E0.08	nc	17.5	13.6	134
NOCO-IN-10	05/02/2012	22.3	13.6	0.56	8.47	0.02	5.69	0.13	—	18.3	15.9	148
NOCO-IN-11	06/22/2009	28.1	21.7	0.56	12.0	0.06	5.33	E0.08	nc	22.5	11.5	203
NOCO-IN-11	05/02/2012	27.5	20.7	0.56	12.3	0.05	6.04	0.09	0.016	22.5	9.04	194
NOCO-IN-27	07/27/2009	63.5	70.8	4.66	56.4	—	15.6	0.23	nc	105	E0.11	684
NOCO-IN-27	05/01/2012	64.6	68.8	4.39	58.3	—	15.6	0.25	0.027	101	—	677
NOCO-CO-02	07/30/2009	7.3	3.66	1.28	31.6	0.16	34.9	—	—	27.5	8.24	180
NOCO-CO-02	05/10/2012	7.9	4.12	1.36	37.4	0.05	38.6	0.06	nc	28.2	7.68	169
NOCO-CO-03	08/03/2009	5.7	8.83	1.00	11.1	0.05	13.9	E0.09	0.004	23.3	3.99	104
NOCO-CO-03	05/09/2012	6.5	9.81	1.04	11.8	0.04	14.5	0.13	nc	23.1	3.96	100
NOCO-CO-08	08/11/2009	46.8	8.18	1.02	7.70	0.03	7.71	E0.07	0.006	16.1	7.11	195
NOCO-CO-08	05/08/2012	47.4	9.08	0.99	8.01	0.03	8.30	0.07	nc	16.4	7.65	185
NOCO-CO-18	08/31/2009	41.1	19.2	1.38	15.8	0.16	22.3	0.14	0.020	22.2	10.3	242
NOCO-CO-18	05/09/2012	37.5	19.6	1.47	17.4	0.11	22.5	0.14	nc	24.7	11.3	255
NOCO-CO-23	09/15/2009	4.86	5.41	0.56	4.10	E0.01	5.20	E0.06	—	11.4	2.98	61
NOCO-CO-23	05/08/2012	5.46	6.27	0.55	4.11	0.02	4.84	—	nc	13.2	2.03	58
Santa Barbara study unit												
SB-07	01/26/2011	175	87.3	1.07	147	0.86	344	0.59	0.007	21.8	265	*1,280
SB-07	12/18/2013	174	82.6	1.97	126	0.76	285	0.54	0.005	26.5	245	*1,190

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Santa Barbara study unit—Continued												
SB-12	02/07/2011	162	49.5	0.88	77.9	0.16	122	0.36	0.003	26.9	301	960
SB-12	12/18/2013	132	38.5	0.87	66.5	0.14	78.3	0.56	0.002	29.2	230	751
Central Sierra study unit												
CGOLD-13	05/23/2006	52.1	11.2	4.57	35.7	0.12	54.7	0.43	0.086	34.6	22.7	331
CGOLD-13	06/14/2010	55.7	12.0	4.70	36.4	0.13	58.6	0.38	nc	34.5	26.9	332
CGOLD-16	05/24/2006	14.5	4.20	1.49	5.32	E0.01	0.75	—	—	38.8	3.05	104
CGOLD-16	05/25/2010	13.6	3.69	1.25	5.53	—	0.75	E0.07	nc	36.9	2.58	96
CWISH-04	05/15/2006	20.9	4.85	2.90	13.1	E0.02	5.27	—	0.003	48.4	5.02	158
CWISH-04	06/14/2010	22.7	5.12	3.04	13.8	0.02	7.11	0.08	nc	48.5	4.64	162
Southern Sierra study unit												
SOSA-06	06/07/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-06	06/23/2008	26.1	11	5.84	16.9	0.04	6.95	0.57	0.006	23.5	11.2	175
SOSA-15	06/12/2006	37.2	4.06	1.36	6.89	—	2.05	E0.08	—	33.3	5.29	163
SOSA-15	07/08/2008	36.5	4.12	1.43	6.89	—	1.95	E0.10	—	31.5	5.46	164
SOSA-20	06/14/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-20	06/25/2008	43.0	7.79	1.52	22.7	0.05	10.8	0.48	—	37.4	29.0	252
SOSA-31	06/29/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-31	06/25/2008	99.2	16.9	2.79	56.1	0.16	32.1	0.64	0.002	28.8	111	559

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Southern Sierra study unit—Continued												
SOSA-32	06/29/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-32	06/24/2008	63.4	8.17	1.14	21.3	0.05	7.60	0.14	—	22.6	20.8	293
Tahoe–Martis study unit												
TMART-03	06/26/2007	10.1	7.71	4.62	52.2	E0.01	6.10	0.18	0.018	47.5	12.2	230
TMART-03	08/27/2012	11.9	9.43	5.14	47.6	0.03	6.57	0.11	0.011	48.8	14.3	243
TMART-06	06/28/2007	15.9	11.5	1.32	5.20	—	6.21	—	—	33.0	1.35	127
TMART-06	08/27/2012	17.5	12.6	1.44	4.64	0.02	7.73	—	—	31.9	0.88	145
TROCK-02	07/11/2007	5.19	1.11	1.63	2.32	—	0.24	—	—	16.3	0.47	40
TROCK-02	08/28/2012	5.02	1.09	1.7	2.32	—	0.21	—	—	15.3	0.44	40
TROCK-05	07/17/2007	16.1	5.07	3.30	4.50	—	0.19	—	—	37.2	0.19	117
TROCK-05	08/28/2012	16.2	5.50	2.95	4.22	—	0.20	—	—	36.2	0.20	103
TTAHO-06	08/02/2007	7.91	0.79	0.86	15.6	—	4.70	0.13	—	22.6	3.12	91
TTAHO-06	08/29/2012	9.02	0.84	0.95	18.1	0.03	9.25	0.09	0.001	19.8	4.89	91
TTAHO-10	08/16/2007	3.88	0.54	0.27	13.6	—	1.06	—	—	18.3	2.02	56
TTAHO-10	08/29/2012	4.06	0.65	0.32	13.2	—	0.97	—	—	17.8	2.03	54
Sierra Nevada Regional study unit												
SIERRA-G-08	07/23/2008	25.1	3.84	2.84	28.0	0.03	63.6	—	0.006	30.9	3.57	266
SIERRA-G-08	10/03/2012	18.6	2.86	2.35	24.3	0.04	34.0	—	0.008	31.1	3.72	158

Table 10. Major ions and total dissolved solids in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*F*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; SMCL-CA, State of California secondary maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mg/L, milligrams per liter; mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; USGS, U.S. Geological Survey; — not detected; *, concentration is greater than the benchmark level]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Sierra Nevada Regional study unit—Continued												
SIERRA-G-10	07/28/2008	12.8	3.73	2.24	4.17	—	0.92	—	—	17.9	1.32	86
SIERRA-G-10	10/03/2012	13.3	3.85	2.07	4.24	0.02	0.70	0.05	—	17.7	0.95	90
SIERRA-G-12	08/14/2008	32.8	7.46	2.63	9.64	—	1.79	E0.07	—	40.3	6.83	184
SIERRA-G-12	10/04/2012	36.6	10.0	2.80	9.68	0.02	1.96	0.05	—	38.6	10.3	190
SIERRA-G-13	08/21/2008	12.4	3.70	3.01	9.92	E0.02	2.52	E0.08	—	49.7	1.65	139
SIERRA-G-13	10/02/2012	11.5	3.36	2.82	9.84	0.02	2.02	0.05	—	50.1	0.85	112
SIERRA-G-14	08/26/2008	9.09	1.02	1.50	6.12	—	0.47	0.12	—	22.6	0.40	71
SIERRA-G-14	08/30/2012	9.12	1.06	1.41	6.06	—	0.49	E0.04	—	22.4	0.41	65
SIERRA-G-15	09/08/2008	1.91	0.04	0.82	173	0.24	89.9	*2.01	0.231	15.2	42.9	486
SIERRA-G-15	10/01/2012	2.18	0.05	0.82	182	0.25	90.1	1.89	0.234	15.4	43.0	510
SIERRA-G-16	09/22/2008	6.76	0.52	0.72	2.33	—	1.41	0.14	—	8.60	2.60	35
SIERRA-G-16	09/17/2012	7.47	0.61	0.74	2.65	—	1.60	0.13	—	8.22	2.82	33
SIERRA-G-17	09/23/2008	8.25	0.50	1.02	3.25	0.04	0.16	E0.07	—	14.3	8.24	48
SIERRA-G-17	09/18/2012	8.47	0.55	1.05	3.45	—	0.17	0.06	—	12.8	7.90	52
SIERRA-G-18	09/24/2008	4.09	0.18	0.40	1.04	—	0.12	—	—	7.88	0.33	25
SIERRA-G-18	09/19/2012	4.33	0.20	0.38	1.05	—	0.12	—	—	7.14	0.36	30
SIERRA-M-03	09/10/2008	26.2	10.7	0.36	14.5	—	0.57	E0.08	—	23.6	5.53	159
SIERRA-M-03	09/11/2012	28.4	10.9	0.30	15.1	—	0.53	0.06	—	23.6	5.86	147

Table 10. Major ions and total dissolved solids in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*F*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; SMCL-CA, State of California secondary maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mg/L, milligrams per liter; mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; USGS, U.S. Geological Survey; — not detected; *, concentration is greater than the benchmark level]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Sierra Nevada Regional study unit—Continued												
SIERRA-M-04	09/17/2008	24.8	1.64	0.38	1.57	—	0.17	—	—	8.27	1.68	104
SIERRA-M-04	09/12/2012	26.6	1.78	0.40	1.65	—	0.28	—	—	8.67	1.77	83
SIERRA-M-06	10/08/2008	10.2	2.71	0.09	2.50	—	0.82	—	—	17.8	0.46	54
SIERRA-M-06	09/13/2012	11.0	3.11	0.13	2.58	—	0.83	—	—	17.6	0.46	58
SIERRA-S-02	08/19/2008	15.1	0.90	2.03	17.0	E0.01	11.6	E0.11	E0.001	24.2	3.07	102
SIERRA-S-02	08/30/2012	16.7	1.06	2.12	17.3	0.02	12.6	0.09	—	24.6	3.88	106
SIERRA-S-03	10/20/2008	22.6	6.05	2.55	20.5	E0.01	9.04	—	E0.001	47.6	14.7	180
SIERRA-S-03	09/12/2012	29.0	7.83	2.54	17.5	0.02	8.23	0.06	0.001	59.5	5.90	216
SIERRA-V-02	10/07/2008	19.3	9.48	1.67	7.06	E0.01	1.85	—	—	62.7	1.16	164
SIERRA-V-02	09/10/2012	20.1	10.7	1.68	7.33	0.02	2.03	0.04	—	59.8	1.40	164
SIERRA-V-03	10/21/2008	4.95	5.30	2.49	8.44	E0.01	3.16	0.18	0.003	33.6	0.83	80
SIERRA-V-03	09/20/2012	8.32	8.15	3.78	35.6	0.04	20.0	0.18	0.006	32.8	2.11	157
Bear Valley–Lake Arrowhead Watershed study unit												
BEAR-S05	04/28/2010	18.3	7.97	1.44	21.0	0.03	4.99	0.37	—	13.8	6.01	149
BEAR-S05	06/06/2013	18.0	8.94	1.47	23.5	0.03	4.96	0.38	—	13.3	6.31	147
BEAR-S12	05/05/2010	29.7	10.9	1.12	41.7	0.03	5.64	*2.76	E0.001	22.2	20.6	239
BEAR-S12	06/06/2013	31.7	12.2	0.91	40.8	0.07	6.43	*2.62	—	21.7	30.5	255
BEAR-G07	05/10/2010	42.1	3.29	1.74	24.2	0.05	12.3	0.20	0.013	20.8	3.02	209
BEAR-G07	06/05/2013	33.8	2.85	1.59	28.1	0.05	9.19	0.15	0.008	19.4	2.67	192

Table 10. Major ions and total dissolved solids in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*F*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Selected Hard Rock Areas study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: MCL-CA, State of California maximum contaminant level; SMCL-CA, State of California secondary maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mg/L, milligrams per liter; mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; USGS, U.S. Geological Survey; — not detected; *, concentration is greater than the benchmark level]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Bear Valley–Lake Arrowhead Watershed study unit—Continued												
BEAR-G12	05/19/2010	27.4	2.12	0.91	9.65	E0.02	2.71	0.13	E0.001	42.7	2.61	151
BEAR-G12	06/05/2013	28.0	2.37	0.89	10.7	0.02	2.57	0.12	—	41.0	1.93	151
Cascade Range–Modoc Plateau study unit												
CAMP-ES-05	09/20/2010	15.3	9.35	1.64	5.04	—	0.93	—	—	63.9	0.36	147
CAMP-ES-05	08/01/2013	16.1	8.71	1.67	5.85	0.02	1.02	0.05	—	64.2	0.33	153
CAMP-ES-09	10/04/2010	20.4	17.4	1.66	11.2	—	1.49	0.06	—	64.4	0.64	221
CAMP-ES-09	08/01/2013	21.2	17.9	1.73	11.8	0.01	1.49	0.07	—	65.3	0.94	207
CAMP-HL-02	08/11/2010	16.5	2.96	2.13	20.9	E0.02	1.44	0.24	0.002	19.9	19.8	129
CAMP-HL-02	08/05/2013	17.8	3.59	2.09	20.7	0.02	2.04	0.22	0.003	24.8	17.5	144
CAMP-HL-10	08/23/2010	46.1	18.4	8.42	70.9	0.12	25.9	0.46	—	53.1	143	490
CAMP-HL-10	08/05/2013	49.8	19.9	9.26	78.6	0.12	27.1	0.50	0.007	51.4	149	492
CAMP-LU-04	07/21/2010	33.8	8.72	0.89	13.4	E0.01	5.24	E0.04	—	22.9	9.49	188
CAMP-LU-04	08/06/2013	36.8	9.32	0.91	14.6	0.02	5.40	0.06	—	23.6	10.5	172
CAMP-LU-15	08/30/2010	16.4	6.72	2.12	5.63	E0.02	1.44	—	—	32.7	0.57	108
CAMP-LU-15	07/30/2013	16.6	6.71	2.23	6.02	0.02	1.53	0.02	—	30.9	0.71	117
CAMP-QV-04	08/03/2010	36.1	44.9	11.4	95.1	0.10	20.6	0.37	0.009	23.7	98.8	563
CAMP-QV-04	08/08/2013	37.6	43.7	10.9	94.0	0.11	21.2	0.39	0.010	22.8	102	544
CAMP-QV-12	09/14/2010	15.8	11.0	0.33	4.38	—	1.05	—	—	58.0	0.32	149
CAMP-QV-12	07/31/2013	17.0	12.1	0.38	4.76	—	1.11	0.02	—	59.1	0.33	145

Table 10. Major ions and total dissolved solids in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (TDS) (mg/L) (70300)
Cascade Range–Modoc Plateau study unit—Continued												
CAMP-SH-01	07/12/2010	72.5	9.26	0.63	8.96	E0.02	3.83	0.14	—	25.5	8.44	269
CAMP-SH-01	07/29/2013	70.5	8.98	0.57	8.62	0.02	3.19	0.13	—	22.3	8.09	236
CAMP-SH-07	07/15/2010	5.48	1.02	1.37	2.88	—	0.14	—	—	33.2	E0.16	62
CAMP-SH-07	07/30/2013	5.41	0.97	1.40	2.98	—	0.16	0.04	—	34.6	0.34	37
CAMP-TV-07	08/26/2010	17.3	8.02	3.89	6.92	—	0.48	E0.04	—	33.6	0.22	132
CAMP-TV-07	08/07/2013	17.1	7.84	3.76	6.62	—	0.54	0.04	—	34.5	0.29	119
CAMP-TV-15	10/13/2010	2.01	0.08	0.27	65.9	0.04	14.4	0.60	0.008	11.7	10.3	170
CAMP-TV-15	07/29/2013	4.11	0.20	0.37	86.8	0.12	67.7	0.69	0.026	11.2	8.89	253
Klamath Mountains study unit												
KLAM-01	10/18/2010	1.15	23.2	0.05	1.56	—	2.59	—	—	9.74	1.07	101
KLAM-01	10/29/2013	1.32	25.4	0.08	1.74	—	2.42	—	—	10.5	1.14	89
KLAM-11	11/02/2010	28.9	6.74	0.36	3.55	—	1.00	0.07	—	24.3	9.20	139
KLAM-11	10/30/2013	26.6	6.31	0.37	3.54	—	0.89	0.06	—	23.3	6.83	127
KLAM-20	11/17/2010	6.80	26.3	0.44	2.63	—	0.50	—	—	36.3	0.22	135
KLAM-20	10/30/2013	6.90	27.9	0.43	2.70	—	0.52	0.03	—	35.6	0.23	136
KLAM-30	12/02/2010	26.9	18.3	1.09	17.5	0.057	15.7	0.07	0.007	52.5	9.41	226
KLAM-30	10/31/2013	25.8	18.2	1.08	16.4	0.057	13.3	0.07	0.008	48.9	8.59	229

[1]Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2]Minimum and maximum reporting levels used during the intial and trend sampling periods.

[3]The SMCL-CAs for chloride, sulfate, and total dissolved solids have recommended and upper benchmarks. The upper benchmark is shown.

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*F*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quarternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: AL-US, U.S. Environmental Protection Agency (EPA) action level; HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, California notification level; SMCL-CA, State of California secondary maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mm/dd/yyyy, month/day/year; nc, not collected; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, value greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Aluminum (µg/L) (01106)	Antimony (µg/L) (01095)	Arsenic (µg/L) (01000)	Barium (µg/L) (01005)	Beryllium (µg/L) (01010)	Boron (µg/L) (01020)	Cadmium (µg/L) (01025)	Chromium (µg/L) (01030)	Cobalt (µg/L) (01035)	Copper (µg/L) (01040)	Iron (µg/L) (01046)	Lead (µg/L) (01049)
Benchmark type[1]		**MCL-CA**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-US**	**NL-CA**	**MCL-US**	**MCL-CA**	**none**	**AL-US**	**SMCL-CA**	**AL-US**
Benchmark level		**1,000**	**6**	**10**	**1,000**	**4**	**1,000**	**5**	**50**	**none**	**1,300**	**300**	**15**
Reporting level type(s)		**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**IRL/LRL/ LT-MDL**	**IRL/LRL/ LT-MDL**	**IRL/LRL/ LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**
Reporting level(s)[2]		**1.6, 4.4**	**0.027, 0.2**	**0.022, 0.12**	**0.07, 0.4**	**0.006, 0.06**	**2.8, 8**	**0.016, 0.04**	**0.04, 0.14**	**0.010, 0.046**	**0.4, 1.6**	**3.2, 8**	**0.025, 0.12**
Study reporting level type		**SRL[3]**	**none**	**none**	**SRL[3]**	**none**	**none**	**none**	**SRL[3], SRL[5]**	**SRL[4]**	**SRL[3], SRL[4]**	**SRL[3], SRL[4]**	**SRL[3], SRL[4]**
Study reporting level(s)		**1.6**	**none**	**none**	**0.36**	**none**	**none**	**none**	**0.42, 0.20**	**all data reviewed and rejected**	**1.7, 2.1**	**6, 6**	**0.65, 0.82**
San Francisco Bay study unit													
SF-05	05/23/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-05	03/23/2011	—	—	0.85	37.0	—	38.0	—	2.3	Q	2.5	—	—
SF-10	05/03/2007	nc	nc	nc	nc	nc	nc	nc	—	nc	nc	nc	nc
SF-10	03/22/2011	—	0.03	0.66	146	—	135	—	0.35	Q	3.2	—	—
SF-14	04/25/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-14	03/21/2011	—	—	0.44	135	—	193	—	0.94	Q	—	—	—
SF-20	05/02/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-20	03/21/2011	3.2	—	0.21	69.5	—	82.0	—	0.81	Q	2.2	15	—
SF-42	06/19/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-42	03/22/2011	2.6	0.10	0.63	169	0.007	393	0.059	—	Q	—	153	—

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Southern Coast Range–Coastal study unit													
SCRC-B18	06/23/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B18	06/06/2012	—	0.12	0.84	16.0	—	195	0.115	0.30	Q	4.0	8	0.95
SCRC-B23	07/07/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B23	06/07/2012	—	0.06	1.9	25.4	—	111	0.337	0.90	Q	7.4	≤6	≤0.56
SCRC-B24	07/07/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B24	06/06/2012	—	0.06	0.59	22.4	—	103	0.075	1.5	Q	4.5	—	3.2
SCRC-B35	07/30/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B35	06/05/2012	—	0.04	8.1	49.4	0.008	566	0.063	—	Q	—	*1,340	≤0.09
SCRC-H08	06/10/2008	—	—	6.7	78.9	—	378	0.458	1.3	E0.020	≤0.87	11	≤0.14
SCRC-H08	06/05/2012	—	0.07	7.0	102	—	337	0.698	1.3	Q	≤0.84	14	2.4
SCRC-H11	06/26/2008	—	—	5.6	109	—	31.0	0.273	≤0.23	0.060	2.4	—	≤0.36
SCRC-H11	06/07/2012	—	0.08	3.8	142	—	33.0	0.218	≤0.11	Q	≤1.4	8	≤0.54
Southern Coast Range–Interior Basins study unit													
LIV-03	08/25/2008	—	—	0.33	265	—	304	—	3.8	0.044	11.9	≤6	4.1
LIV-03	09/18/2012	—	0.05	0.38	275	0.012	391	—	3.8	Q	5.9	—	3.2
GIL-02	08/12/2008	—	—	0.26	138	—	90.0	—	1.1	0.023	≤1.2	—	≤0.09
GIL-02	09/18/2012	—	—	0.25	149	—	95.0	—	1.2	Q	≤1.3	—	≤0.29
GIL-12	08/19/2008	≤1.6	—	1.5	73.5	—	166	—	≤0.07	0.026	—	78	≤0.11
GIL-12	09/19/2012	—	—	1.5	102	—	131	—	—	Q	—	118	—

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Southern Coast Range–Interior Basins study unit—Continued													
CUY-02	09/15/2008	E2.9	—	*44.0	19.0	—	207	0.136	—	E0.057	—	102	≤0.61
CUY-02	09/20/2012	—	0.03	*43.9	21.0	—	186	0.214	—	Q	—	68	≤0.53
CUY-06	09/17/2008	—	—	0.32	10.8	—	148	—	≤0.30	0.130	—	34	2.1
CUY-06	09/20/2012	—	0.03	0.35	10.8	—	145	—	≤0.20	Q	—	94	≤0.56
Northern Coast Ranges study unit													
NOCO-IN-10	06/18/2009	—	—	0.07	44.9	—	174	—	≤0.13	0.023	2.9	30	≤0.15
NOCO-IN-10	05/02/2012	—	—	0.04	52.4	—	175	—	≤0.14	Q	2.5	14	≤0.19
NOCO-IN-11	06/22/2009	—	—	7.9	123	—	*1,020	—	—	0.141	—	*745	—
NOCO-IN-11	05/02/2012	—	—	7.4	131	0.023	*1,270	—	—	Q	—	*987	—
NOCO-IN-27	07/27/2009	—	—	*23.2	254	0.026	*2,380	—	0.52	1.6	—	*20,200	—
NOCO-IN-27	05/01/2012	3.0	—	*19.2	237	0.073	*2,270	—	0.36	Q	—	*18,900	≤0.11
NOCO-CO-02	07/30/2009	—	—	0.22	12.0	—	18.0	—	≤0.21	E0.011	≤1.2	9	≤0.14
NOCO-CO-02	05/10/2012	—	—	0.20	12.4	—	22.0	—	0.23	Q	2.4	12	≤0.41
NOCO-CO-03	08/03/2009	4.4	E0.045	6.1	7.2	—	11.0	—	2.0	0.021	—	15	≤0.06
NOCO-CO-03	05/09/2012	—	0.03	4.8	12.6	—	13.0	—	1.7	Q	≤1.1	42	≤0.08
NOCO-CO-08	08/11/2009	—	E0.03	0.17	129	—	61.0	—	—	0.060	—	34	—
NOCO-CO-08	05/08/2012	—	0.03	0.17	148	—	67.0	—	—	Q	—	53	—
NOCO-CO-18	08/31/2009	—	—	1.7	275	—	47.0	—	≤0.21	0.061	—	*5,090	≤0.03
NOCO-CO-18	05/09/2012	—	—	1.6	275	—	61.0	—	≤0.19	Q	—	*5,250	≤0.08

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Northern Coast Ranges study unit—Continued													
NOCO-CO-23	09/15/2009	14.7	E0.02	0.12	17.1	—	8.0	—	1.3	E0.015	≤1.2	≤2	≤0.25
NOCO-CO-23	05/08/2012	4.5	—	0.11	18.5	—	10.0	—	1.5	Q	4.6	6	≤0.49
Santa Barbara study unit													
SB-07	01/26/2011	—	—	0.38	40.5	0.007	181	0.036	0.63	Q	3.7	66	—
SB-07	12/18/2013	—	0.03	0.36	37.4	—	155	—	1.2	Q	5.0	38	≤0.74
SB-12	02/07/2011	—	—	0.09	91.4	0.007	186	0.016	—	Q	5.1	—	—
SB-12	12/18/2013	2.3	—	—	42.9	—	161	—	—	Q	2.6	≤5	≤0.15
Central Sierra study unit													
CGOLD-13	05/23/2006	—	—	1.9	10.1	—	108	0.240	—	0.214	≤0.50	28	≤0.15
CGOLD-13	06/14/2010	—	E0.05	2.7	11.5	0.033	110	0.711	—	Q	—	37	—
CGOLD-16	05/24/2006	—	—	0.15	37.9	—	—	—	0.60	E0.038	9.0	—	5.5
CGOLD-16	05/25/2010	—	—	0.16	29.9	E0.008	E2.0	E0.014	0.59	Q	3.3	25	—
CWISH-04	05/15/2006	—	—	0.27	23.8	—	—	0.044	0.08	0.062	2.2	262	≤0.52
CWISH-04	06/14/2010	11.3	—	0.37	16.7	—	5.0	E0.015	—	Q	≤1.9	24	—
Southern Sierra study unit													
SOSA-06	06/07/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-06	06/23/2008	—	—	0.26	22.3	—	24.0	0.049	—	E0.017	2.4	—	2.3
SOSA-15	06/12/2006	—	—	E0.10	37.9	—	E8	E0.020	≤0.08	0.058	—	—	4.1
SOSA-15	07/08/2008	—	—	0.11	38.4	—	10.0	E0.023	—	E0.02	—	10	—

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Southern Sierra study unit—Continued													
SOSA-20	06/14/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-20	06/25/2008	—	E0.07	8.3	21.6	—	16.0	—	≤0.15	0.022	3.2	—	1.7
SOSA-31	06/29/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-31	06/25/2008	—	—	0.85	163	—	263	E0.022	1.1	0.060	—	—	—
SOSA-32	06/29/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-32	06/24/2008	—	—	0.49	54.6	—	12.0	—	1.8	0.036	—	—	—
Tahoe–Martis study unit													
TMART-03	06/26/2007	—	—	*30.8	53.0	—	401	—	—	—	≤1.6	120	—
TMART-03	08/27/2012	—	—	*31.0	63.4	0.009	336	—	—	Q	—	65	—
TMART-06	06/28/2007	1.7	—	1.6	12.2	—	24.0	—	1.0	—	≤0.89	—	≤0.14
TMART-06	08/27/2012	2.8	—	0.55	15.3	—	8.0	—	0.91	Q	3.9	12	—
TROCK-02	07/11/2007	5.7	E0.05	E0.08	3.5	—	—	—	≤0.17	—	3.1	—	≤0.22
TROCK-02	08/28/2012	2.7	0.05	0.08	2.6	—	—	—	≤0.19	Q	—	27	—
TROCK-05	07/17/2007	≤0.80	—	E0.07	39.5	—	—	—	0.51	—	≤0.59	—	≤0.34
TROCK-05	08/28/2012	—	—	0.09	42.4	—	5.0	—	0.26	Q	—	—	—
TTAHO-06	08/02/2007	4.3	0.26	7.2	3.2	—	35.0	—	0.96	—	—	—	≤0.35
TTAHO-06	08/29/2012	5.3	0.21	9.9	3.5	—	50.0	0.118	0.61	Q	—	—	—
TTAHO-10	08/16/2007	6.6	0.11	7.8	2.9	—	E5.0	—	≤0.42	—	≤0.47	7	≤0.06
TTAHO-10	08/29/2012	6.1	0.11	9.0	2.9	—	5.0	—	0.45	Q	—	—	—

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Aluminum (µg/L) (01106)	Antimony (µg/L) (01095)	Arsenic (µg/L) (01000)	Barium (µg/L) (01005)	Beryllium (µg/L) (01010)	Boron (µg/L) (01020)	Cadmium (µg/L) (01025)	Chromium (µg/L) (01030)	Cobalt (µg/L) (01035)	Copper (µg/L) (01040)	Iron (µg/L) (01046)	Lead (µg/L) (01049)
Sierra Nevada Regional study unit													
SIERRA-G-08	07/23/2008	—	—	E0.03	122	E0.007	11.0	—	—	0.026	2.4	9	2.3
SIERRA-G-08	10/03/2012	—	—	0.06	93.4	0.008	18.0	—	—	Q	45.1	15	1.7
SIERRA-G-10	07/28/2008	2.2	—	0.09	9.0	—	6.0	—	≤0.12	E0.013	≤0.75	E8	≤0.42
SIERRA-G-10	10/03/2012	—	—	0.10	9.3	—	8.0	—	≤0.11	Q	≤0.86	≤6	≤0.32
SIERRA-G-12	08/14/2008	—	—	0.24	5.0	E0.006	—	—	≤0.11	0.02	≤1.5	—	≤0.44
SIERRA-G-12	10/04/2012	—	—	0.11	11.9	—	—	0.027	—	Q	≤1.8	53	≤0.61
SIERRA-G-13	08/21/2008	—	—	0.17	53.3	—	—	—	≤0.21	—	2.5	—	≤0.44
SIERRA-G-13	10/02/2012	2.2	—	0.15	78.8	—	3.0	—	≤0.20	Q	2.6	—	≤0.28
SIERRA-G-14	08/26/2008	—	—	0.59	22.8	—	26.0	—	≤0.18	0.04	≤0.71	≤5	≤0.23
SIERRA-G-14	08/30/2012	—	0.07	0.63	24.6	—	29.0	—	≤0.15	Q	≤0.90	≤3	≤0.16
SIERRA-G-15	09/08/2008	4.6	—	1.5	3.7	0.032	*8,450	—	—	0.03	—	—	≤0.07
SIERRA-G-15	10/01/2012	6	0.03	1.5	4.1	0.226	*7,970	—	—	Q	—	≤4	≤0.13
SIERRA-G-16	09/22/2008	≤1.5	—	0.32	1.08	E0.006	15.0	—	—	E0.013	≤0.80	11	≤0.38
SIERRA-G-16	09/17/2012	—	0.05	0.29	1.26	0.006	22.0	—	—	Q	≤0.95	39	≤0.08
SIERRA-G-17	09/23/2008	2.2	—	7.2	≤0.33	—	E5.0	—	≤0.39	—	—	—	≤0.17
SIERRA-G-17	09/18/2012	3.6	0.04	7.1	0.32	—	6.0	—	0.45	Q	—	—	≤0.09
SIERRA-G-18	09/24/2008	2.1	—	0.09	—	—	—	—	—	—	≤0.72	—	≤0.26
SIERRA-G-18	09/19/2012	4.7	—	0.10	0.20	—	—	—	—	Q	≤1.1	—	≤0.10
SIERRA-M-03	09/10/2008	—	—	0.52	40.8	—	—	—	≤0.19	E0.020	—	28	—
SIERRA-M-03	09/11/2012	4.7	—	0.57	48.7	—	4.0	—	≤0.17	Q	—	8	≤0.14

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Aluminum (µg/L) (01106)	Antimony (µg/L) (01095)	Arsenic (µg/L) (01000)	Barium (µg/L) (01005)	Beryllium (µg/L) (01010)	Boron (µg/L) (01020)	Cadmium (µg/L) (01025)	Chromium (µg/L) (01030)	Cobalt (µg/L) (01035)	Copper (µg/L) (01040)	Iron (µg/L) (01046)	Lead (µg/L) (01049)
Sierra Nevada Regional study unit—Continued													
SIERRA-M-04	09/17/2008	2.8	—	0.20	9.7	—	—	—	≤0.39	0.02	≤0.62	≤5	≤0.16
SIERRA-M-04	09/12/2012	—	—	0.16	10.4	—	—	—	0.24	Q	≤1.1	8	≤0.31
SIERRA-M-06	10/08/2008	—	—	1.1	0.57	—	—	—	≤0.20	—	5.6	≤3	1.1
SIERRA-M-06	09/13/2012	—	—	0.83	0.62	—	3.0	—	≤0.12	Q	6.7	—	1.4
SIERRA-S-02	08/19/2008	9.3	E0.11	7.0	2.7	—	41.0	—	≤0.28	—	—	—	≤0.18
SIERRA-S-02	08/30/2012	10.5	0.12	6.9	3.0	0.007	47.0	0.031	0.27	Q	≤0.98	—	≤0.09
SIERRA-S-03	10/20/2008	—	0.12	3.1	84.1	—	40.0	E0.015	—	E0.013	2.1	≤4	≤0.32
SIERRA-S-03	09/12/2012	—	0.11	2.6	111	0.009	19.0	—	—	Q	2.8	—	≤0.63
SIERRA-V-02	10/07/2008	—	E0.02	0.63	9.0	—	43.0	—	0.76	—	—	≤3	≤0.06
SIERRA-V-02	09/10/2012	2.9	—	0.63	10.0	—	47.0	—	0.76	Q	—	—	≤0.09
SIERRA-V-03	10/21/2008	—	—	*15.8	2.4	—	49.0	—	—	0.297	≤1.1	—	≤0.66
SIERRA-V-03	09/20/2012	3.7	—	*19.7	5.4	0.035	409	—	≤0.11	Q	2.4	18	≤0.56
Bear Valley–Lake Arrowhead Watershed study unit													
BEAR-S05	04/28/2010	—	—	1.5	35.7	—	9.0	—	2.7	Q	—	—	≤0.22
BEAR-S05	06/06/2013	2.3	—	1.5	35.9	—	9.0	—	2.7	Q	—	—	≤0.07
BEAR-S12	05/05/2010	—	—	0.21	21.6	—	32.0	0.027	1.7	Q	—	—	≤0.26
BEAR-S12	06/06/2013	—	—	0.20	21.5	—	32.0	—	1.6	Q	≤1.3	≤6	≤0.18
BEAR-G07	05/10/2010	—	—	0.09	6.6	—	6.0	0.045	—	Q	5.6	—	3.5
BEAR-G07	06/05/2013	—	—	0.10	4.7	—	7.0	0.019	—	Q	5.7	—	1.4

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Bear Valley–Lake Arrowhead Watershed study unit—Continued													
BEAR-G12	05/19/2010	3.7	—	0.25	1.4	0.033	3.0	0.066	—	Q	≤0.7	12	≤0.24
BEAR-G12	06/05/2013	—	—	0.23	0.96	0.026	3.0	—	—	Q	2.7	—	1.9
Cascade Range–Modoc Plateau study unit													
CAMP-ES-05	09/20/2010	E2.9	E0.03	0.33	2.6	—	5.0	—	3.1	Q	≤1.8	—	≤0.60
CAMP-ES-05	08/01/2013	2.8	—	0.35	3.5	—	5.0	—	1.1	Q	≤1.6	27	1.2
CAMP-ES-09	10/04/2010	3.3	—	0.86	19.4	—	19.0	—	0.65	Q	≤1.6	—	≤0.53
CAMP-ES-09	08/01/2013	2.9	0.03	0.95	21.8	—	19.0	—	0.74	Q	≤1.5	—	0.97
CAMP-HL-02	08/11/2010	—	E0.05	2.7	45.3	—	E3.0	—	—	Q	2.5	16	1.3
CAMP-HL-02	08/05/2013	—	0.06	2.6	57.3	—	4.0	—	≤0.09	Q	—	22	≤0.07
CAMP-HL-10	08/23/2010	—	E0.045	3.2	54.0	—	237	E0.015	E0.09	Q	—	*383	≤0.18
CAMP-HL-10	08/05/2013	3.6	0.04	2.9	54.4	0.009	229	—	≤0.11	Q	—	*383	≤0.09
CAMP-LU-04	07/21/2010	E2.3	E0.05	1.3	4.4	—	30.0	—	1.3	Q	≤1.3	≤4	≤0.26
CAMP-LU-04	08/06/2013	—	0.05	1.4	4.8	—	35.0	—	1.5	Q	≤1.3	—	≤0.29
CAMP-LU-15	08/30/2010	E2.8	—	0.75	10.2	—	13.0	—	1.3	Q	—	—	≤0.10
CAMP-LU-15	07/30/2013	2.7	—	0.70	12.1	—	14.0	—	1.2	Q	—	—	≤0.13
CAMP-QV-04	08/03/2010	6.3	—	7.8	3.7	—	110	0.024	0.12	Q	—	72	≤0.02
CAMP-QV-04	08/08/2013	7.1	0.04	8.0	4.0	0.007	110	0.042	≤0.15	Q	≤1.1	74	≤0.08
CAMP-QV-12	09/14/2010	E2.1	—	—	0.78	—	—	—	8.9	Q	≤1.3	≤5	1.1
CAMP-QV-12	07/31/2013	2.7	—	0.05	0.90	—	—	—	9.9	Q	7.5	≤6	≤0.78

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Cascade Range–Modoc Plateau study unit—Continued													
CAMP-SH-01	07/12/2010	—	—	E0.04	25.9	—	10.0	—	0.45	Q	6.4	—	≤0.53
CAMP-SH-01	07/29/2013	—	—	0.06	25.3	—	12.0	—	0.50	Q	6.6	—	2.9
CAMP-SH-07	07/15/2010	E1.8	—	0.05	0.81	—	—	—	E0.10	Q	≤1.4	—	≤0.23
CAMP-SH-07	07/30/2013	—	—	—	0.89	—	—	—	≤0.14	Q	≤1.4	—	≤0.28
CAMP-TV-07	08/26/2010	7.2	—	0.12	10.9	—	E3.0	—	0.20	Q	≤0.57	—	0.69
CAMP-TV-07	08/07/2013	2.3	—	0.11	11.6	—	4.0	—	0.21	Q	—	—	—
CAMP-TV-15	10/13/2010	10.2	—	3.2	11.7	0.034	*1,640	0.033	—	Q	≤0.67	≤4	0.91
CAMP-TV-15	07/29/2013	29.8	—	3.5	25.2	0.061	*1,660	0.038	—	Q	—	≤5	≤0.56
Klamath Mountains study unit													
KLAM-01	10/18/2010	—	—	—	0.47	—	—	—	1.5	Q	≤1.3	7	≤0.23
KLAM-01	10/29/2013	—	—	—	0.50	—	—	—	1.6	Q	≤0.98	≤5	≤0.08
KLAM-11	11/02/2010	2.8	0.06	0.36	1.5	—	44.0	—	0.43	Q	≤0.80	—	≤0.34
KLAM-11	10/30/2013	—	0.06	0.36	1.6	—	44.0	—	0.43	Q	≤1.8	—	≤0.38
KLAM-20	11/17/2010	2.1	—	0.05	8.9	—	—	—	6.9	Q	—	—	≤0.18
KLAM-20	10/30/2013	3.3	—	—	8.6	—	—	—	7.9	Q	2.4	—	≤0.49
KLAM-30	12/02/2010	1.8	—	0.06	18.9	0.030	590	—	—	Q	—	*2,950	—
KLAM-30	10/31/2013	2.7	—	—	23.6	0.033	467	—	—	Q	—	*2,320	—

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*F*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quarternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: AL-US, U.S. Environmental Protection Agency (EPA) action level; HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, California notification level; SMCL-CA, State of California secondary maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mm/dd/yyyy, month/day/year; nc, not collected; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, value greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Benchmark type[1]		**none**	**SMCL-CA**	**HAL-US**	**MCL-CA**	**MCL-US**	**SMCL-CA**	**HAL-US**	**MCL-US**	**none**	**MCL-US**	**NL-CA**	**SMCL-CA**
Benchmark level		**none**	**50**	**40**	**100**	**50**	**100**	**4,000**	**2**	**none**	**30**	**50**	**5,000**
Reporting level type(s)		**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**IRL/LRL/LT-MDL**	**IRL/LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**LRL/LT-MDL**	**IRL/LRL/LT-MDL**	**LRL/LT-MDL**	**IRL/LRL/LT-MDL**	**IRL/LRL/LT-MDL**
Reporting level(s)[2]		**0.22, 1**	**0.13, 0.30**	**0.014, 0.4**	**0.06, 0.2**	**0.03, 0.08**	**0.005, 0.20**	**0.2, 0.8**	**0.01, 0.04**	**0.01, 0.06**	**0.004, 0.04**	**0.04, 0.16**	**0.6, 2.8**
Study reporting level type		**SRL[5]**	**SRL[3], SRL[4]**	**SRL[4]**	**SRL[3], SRL[4]**	**none**	**none**	**SRL[3]**	**none**	**SRL[3], SRL[4]**	**none**	**SRL[3]**	**SRL[3], SRL[4]**
Study reporting level(s)		**0.41**	**0.2, 0.66**	**0.023**	**0.36, 0.21**	**none**	**none**	**0.99**	**none**	**0.11, 0.023**	**none**	**0.1**	**4.8, 6.2**
San Francisco Bay study unit—Continued													
SF-05	05/23/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-05	03/23/2011	25.5	14.1	0.56	0.39	1.2	—	252	—	nc	0.08	9.0	—
SF-10	05/03/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-10	03/22/2011	7.0	1.9	2.0	—	0.96	—	373	—	nc	0.69	4.5	—
SF-14	04/25/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-14	03/21/2011	7.3	—	1.6	—	1.6	—	345	—	nc	1.10	4.1	—
SF-20	05/02/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-20	03/21/2011	4.1	1.2	0.74	—	0.18	—	258	—	nc	0.53	2.3	—
SF-42	06/19/2007	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SF-42	03/22/2011	35.8	*567	10.8	0.55	0.08	—	1,020	—	nc	1.34	2.1	—
Southern Coast Range–Coastal study unit—Continued													
SCRC-B18	06/23/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B18	06/06/2012	19.9	≤0.22	8.4	1.4	1.8	—	1,000	—	nc	4.1	1.3	32.6

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*F*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quarternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: AL-US, U.S. Environmental Protection Agency (EPA) action level; HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, California notification level; SMCL-CA, State of California secondary maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mm/dd/yyyy, month/day/year; nc, not collected; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, value greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Southern Coast Range–Coastal study unit—Continued													
SCRC-B23	07/07/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B23	06/07/2012	10.3	≤0.14	10.7	0.29	2.2	—	508	—	nc	3.7	9.5	≤4.6
SCRC-B24	07/07/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B24	06/06/2012	18.4	≤0.15	5.7	0.26	3.7	—	482	—	nc	2.4	4.4	≤4.6
SCRC-B35	07/30/2008	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SCRC-B35	06/05/2012	26.2	*1,180	14.9	1.7	0.25	—	1,770	—	nc	8.1	0.30	25.5
SCRC-H08	06/10/2008	87.7	17.3	*218	≤0.19	0.94	—	542	—	≤0.06	4.8	6.5	≤3.1
SCRC-H08	06/05/2012	75.1	0.89	*205	≤0.12	1.9	—	519	—	nc	5.3	13.7	22.1
SCRC-H11	06/26/2008	11.2	0.81	*80.9	1.0	2.8	—	337	—	—	16.2	6.0	13.4
SCRC-H11	06/07/2012	12.0	≤0.47	*56.3	0.47	17.4	—	343	—	nc	16.1	7.1	8.5
Southern Coast Interior Basins study unit—Continued													
LIV-03	08/25/2008	8.2	—	0.66	0.48	1.5	—	1,150	—	—	2.0	1.7	≤4.5
LIV-03	09/18/2012	9.3	—	0.85	0.55	2.5	0.006	1,230	—	nc	2.3	1.8	≤5.5
GIL-02	08/12/2008	7.5	—	0.73	≤0.27	0.36	—	499	—	—	0.49	3.8	≤2.8
GIL-02	09/18/2012	9.6	—	0.78	0.25	0.28	—	522	—	nc	0.53	3.9	≤2.1
GIL-12	08/19/2008	8.8	*140	4.7	≤0.25	—	—	270	—	0.12	0.02	≤0.09	≤1.8
GIL-12	09/19/2012	11.3	*183	3.7	—	—	—	342	—	nc	0.02	0.59	—
CUY-02	09/15/2008	55.0	34.8	*95.6	5.4	E0.07	—	1,390	—	—	0.45	≤0.07	—
CUY-02	09/20/2012	46.4	39.5	*98.8	0.38	0.05	—	1,600	0.02	nc	0.46	0.11	—

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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Southern Coast Interior Basins study unit—Continued													
CUY-06	09/17/2008	30.7	4.9	2.1	3.0	1.6	—	1,710	—	E0.18	3.6	0.80	452
CUY-06	09/20/2012	31.2	2.5	2.2	0.83	2.0	—	2,020	—	nc	4.4	0.87	209
Northern Coast Ranges study unit—Continued													
NOCO-IN-10	06/18/2009	1.3	0.57	0.14	0.56	0.07	—	167	—	nc	0.01	0.40	≤3.2
NOCO-IN-10	05/02/2012	1.5	≤0.31	0.12	0.74	0.08	—	206	—	nc	0.01	0.36	≤4.7
NOCO-IN-11	06/22/2009	1.44	*263	1.0	0.83	—	—	286	—	nc	0.02	0.49	13.0
NOCO-IN-11	05/02/2012	1.55	*364	1.2	1.1	—	—	294	—	nc	0.02	0.37	34.9
NOCO-IN-27	07/27/2009	131	*1,010	0.43	2.5	E0.03	—	1,040	—	nc	—	0.65	≤4.6
NOCO-IN-27	05/01/2012	151	*973	0.48	2.2	—	—	1,010	—	nc	—	0.54	—
NOCO-CO-02	07/30/2009	E0.90	0.91	0.07	≤0.14	0.10	—	191	—	nc	—	0.92	≤3.2
NOCO-CO-02	05/10/2012	1.1	1.4	0.06	≤0.19	0.10	—	210	—	nc	—	0.84	15.4
NOCO-CO-03	08/03/2009	8.3	9.5	0.20	≤0.32	0.08	—	36.4	—	nc	0.02	4.1	—
NOCO-CO-03	05/09/2012	8.7	10.8	0.19	—	0.06	—	41.9	—	nc	0.01	3.2	≤1.4
NOCO-CO-08	08/11/2009	E0.80	13.8	0.70	≤0.25	—	—	439	—	nc	0.27	0.98	7.7
NOCO-CO-08	05/08/2012	0.92	19.5	0.72	0.24	—	—	498	—	nc	0.30	0.89	≤2.0
NOCO-CO-18	08/31/2009	3.2	*1,280	0.36	0.60	—	—	334	—	nc	E0.01	0.26	≤4.0
NOCO-CO-18	05/09/2012	3.4	*1,320	0.58	0.27	—	—	342	—	nc	—	0.29	—
NOCO-CO-23	09/15/2009	—	—	0.05	8.0	E0.03	0.01	61.6	—	nc	—	0.27	≤3.3
NOCO-CO-23	05/08/2012	≤0.38	—	0.03	9.1	0.04	—	67.4	—	nc	—	0.14	12.0

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Santa Barbara study unit—Continued													
SB-07	01/26/2011	46.8	3.5	5.8	0.73	5.8	0.005	1,670	—	—	7.7	1.3	32.3
SB-07	12/18/2013	38.4	1.4	6.1	2.8	6.6	—	1,820	—	nc	7.0	1.6	10.1
SB-12	02/07/2011	21.9	—	0.26	1.1	0.77	0.008	1,410	—	—	1.3	0.51	—
SB-12	12/18/2013	20.9	—	0.46	2.5	0.92	—	1,080	—	nc	1.1	0.61	7.1
Central Sierra study unit—Continued													
CGOLD-13	05/23/2006	46.9	*111	*84.7	3.0	E0.04	—	180	—	0.83	2.3	0.33	5.9
CGOLD-13	06/14/2010	58.4	*120	*132	0.37	E0.04	—	188	—	nc	3.1	0.54	7.5
CGOLD-16	05/24/2006	3.3	1.1	2.7	0.67	0.30	—	117	—	—	0.11	2.8	11.0
CGOLD-16	05/25/2010	2.6	1.8	1.8	0.30	0.34	E0.006	104	—	nc	0.06	2.4	21.7
CWISH-04	05/15/2006	48.1	4.9	E0.24	0.97	0.11	—	212	—	—	5.2	4.6	128
CWISH-04	06/14/2010	41.5	4.4	0.28	0.30	0.12	0.012	212	—	nc	6.8	5.3	127
Southern Sierra study unit—Continued													
SOSA-06	06/07/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-06	06/23/2008	31.1	3.5	17.3	—	0.05	—	51.3	—	0.29	0.09	0.46	9.3
SOSA-15	06/12/2006	5.5	—	0.44	—	0.10	—	334	—	0.12	1.2	0.70	13.5
SOSA-15	07/08/2008	5.1	—	0.40	—	0.10	—	310	—	0.11	0.99	0.70	25.9
SOSA-20	06/14/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-20	06/25/2008	17.6	—	1.5	—	0.10	—	199	—	0.40	2.0	7.2	—

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Southern Sierra study unit—Continued													
SOSA-31	06/29/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-31	06/25/2008	11.8	—	6.2	0.65	0.86	—	707	—	0.17	*45.1	4.0	—
SOSA-32	06/29/2006	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
SOSA-32	06/24/2008	E0.80	—	3.8	0.46	0.50	—	189	—	0.27	1.7	6.6	—
Tahoe–Martis study unit—Continued													
TMART-03	06/26/2007	15.3	*124	5.1	—	—	—	134	—	0.56	E0.02	0.11	≤1.4
TMART-03	08/27/2012	20.2	*148	5.0	—	—	—	165	0.01	nc	0.02	—	—
TMART-06	06/28/2007	3.8	—	0.16	≤0.04	—	—	394	—	—	0.13	1.5	≤0.32
TMART-06	08/27/2012	3.3	1.8	0.08	—	0.04	—	412	—	nc	0.10	1.3	—
TROCK-02	07/11/2007	—	0.47	0.17	≤0.09	—	—	30.1	—	—	1.2	1.2	10.4
TROCK-02	08/28/2012	—	1.5	0.19	—	—	—	27.9	—	nc	1.3	1.3	—
TROCK-05	07/17/2007	1.3	—	—	≤0.04	—	—	155	—	—	0.24	0.92	≤1.5
TROCK-05	08/28/2012	1.4	—	0.03	—	—	—	157	—	nc	0.26	1.0	—
TTAHO-06	08/02/2007	2.9	≤0.11	10.5	—	0.09	—	37.2	—	9.3	25.3	3.0	—
TTAHO-06	08/29/2012	4.1	1.3	14.6	—	0.07	—	39.7	—	nc	26.9	6.3	—
TTAHO-10	08/16/2007	—	0.42	3.3	≤0.03	E0.05	—	26.7	—	1.2	2.4	2.3	≤1.5
TTAHO-10	08/29/2012	≤0.26	—	3.3	—	0.06	—	27.2	—	nc	2.6	2.6	—
Sierra Nevada Regional study unit—Continued													
SIERRA-G-08	07/23/2008	8.2	1.3	—	≤0.15	—	—	306	—	—	0.50	0.60	≤1.3
SIERRA-G-08	10/03/2012	7.6	1.5	≤0.02	0.34	—	0.006	230	—	nc	0.50	0.75	21.2

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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GAMA site identification number	Sample dates (mm/dd/yyyy)	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Sierra Nevada Regional study unit—Continued													
SIERRA-G-10	07/28/2008	10.8	0.33	—	0.59	—	—	155	—	—	2.1	0.32	50.2
SIERRA-G-10	10/03/2012	10.5	≤0.25	0.10	≤0.15	—	—	163	—	nc	2.1	0.38	41.8
SIERRA-G-12	08/14/2008	5.0	≤0.14	0.36	0.42	0.42	—	106	—	—	1.1	3.8	16.9
SIERRA-G-12	10/04/2012	4.9	2.5	0.53	≤0.20	1.2	—	150	—	nc	1.6	4.7	59.7
SIERRA-G-13	08/21/2008	8.9	≤0.19	0.63	0.82	0.32	—	142	—	—	0.38	6.1	32.9
SIERRA-G-13	10/02/2012	9.9	—	0.34	0.40	0.08	—	162	—	nc	0.21	6.9	≤3.6
SIERRA-G-14	08/26/2008	4.4	0.40	3.3	≤0.16	E0.02	—	72.9	—	2.9	3.9	0.85	8.4
SIERRA-G-14	08/30/2012	4.2	≤0.39	3.5	≤0.09	0.03	—	70.7	—	nc	5.0	0.85	≤6.1
SIERRA-G-15	09/08/2008	51.1	0.40	6.2	0.72	E0.03	—	36.1	—	74.0	0.16	0.12	—
SIERRA-G-15	10/01/2012	76.4	≤0.52	6.0	0.67	—	—	38.8	—	nc	0.23	0.09	—
SIERRA-G-16	09/22/2008	2.2	0.45	3.6	≤0.12	E0.02	—	45.9	—	0.47	5.3	0.51	90.3
SIERRA-G-16	09/17/2012	2.1	1.6	3.9	≤0.12	0.03	—	52.0	—	nc	6.2	0.50	44.1
SIERRA-G-17	09/23/2008	E0.88	—	4.3	—	0.64	—	19.8	—	3.1	3.3	5.8	—
SIERRA-G-17	09/18/2012	0.81	—	4.5	—	0.65	—	21.2	—	nc	3.5	6.2	≤1.4
SIERRA-G-18	09/24/2008	—	—	E0.15	—	—	—	9.47	E0.02	≤0.10	15.6	0.48	≤2.8
SIERRA-G-18	09/19/2012	≤0.40	—	0.15	—	—	—	10.6	—	nc	17.9	0.50	≤4.8
SIERRA-M-03	09/10/2008	—	1.1	0.23	≤0.11	0.12	—	82.8	—	—	0.13	4.3	≤4.6
SIERRA-M-03	09/11/2012	—	≤0.45	0.28	≤0.11	0.14	—	93.2	—	nc	0.15	4.1	≤3.6
SIERRA-M-04	09/17/2008	—	0.54	—	≤0.14	0.05	—	45.3	—	—	0.09	0.31	56.6
SIERRA-M-04	09/12/2012	—	0.78	0.09	≤0.14	0.09	—	46.6	—	nc	0.09	0.25	50.0

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

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Sierra Nevada Regional study unit—Continued													
SIERRA-M-06	10/08/2008	E0.53	—	0.02	0.47	—	—	26.9	—	≤0.05	—	0.40	≤2.7
SIERRA-M-06	09/13/2012	0.54	≤0.14	0.02	0.32	0.03	—	28.1	—	nc	—	0.44	≤3.3
SIERRA-S-02	08/19/2008	6.5	—	2.9	—	E0.03	—	54.3	—	3.4	14.9	1.8	—
SIERRA-S-02	08/30/2012	7.0	—	3.6	—	—	0.008	55.1	—	nc	15.2	1.7	—
SIERRA-S-03	10/20/2008	7.2	0.56	5.5	≤0.11	0.10	—	230	—	3.4	17.3	4.3	5.0
SIERRA-S-03	09/12/2012	8.3	—	1.2	≤0.18	0.15	—	289	—	nc	10.6	4.2	≤6.0
SIERRA-V-02	10/07/2008	1.9	—	0.11	0.38	E0.04	—	133	—	≤0.02	0.11	14.5	≤1.6
SIERRA-V-02	09/10/2012	1.8	—	0.12	0.31	0.05	—	135	—	nc	0.12	14.5	≤3.4
SIERRA-V-03	10/21/2008	30.7	0.73	0.78	0.47	—	—	83.8	—	0.23	0.16	2.1	14.2
SIERRA-V-03	09/20/2012	94.5	0.84	1.6	0.39	—	—	191	—	nc	0.55	2.8	17.6
Bear Valley–Lake Arrowhead Watershed study unit—Continued													
BEAR-S05	04/28/2010	2.0	≤0.40	0.59	≤0.09	0.09	—	216	—	1.1	1.2	10.4	≤2.6
BEAR-S05	06/06/2013	2.2	≤0.18	0.68	—	0.08	—	229	—	1.2	1.3	10.7	≤2.2
BEAR-S12	05/05/2010	E0.28	—	2.9	0.32	0.14	—	127	—	7.0	2.2	3.9	≤4.1
BEAR-S12	06/06/2013	≤0.29	≤0.21	2.6	≤0.14	0.11	—	137	—	6.2	2.6	3.5	10.2
BEAR-G07	05/10/2010	37.3	2.8	1.8	0.56	0.15	—	444	—	0.05	*57.0	0.92	92.8
BEAR-G07	06/05/2013	37.3	≤0.53	4.0	≤0.19	0.08	—	382	—	0.09	*53.7	0.92	23.1
BEAR-G12	05/19/2010	65.1	2.0	0.03	0.32	E0.03	—	151	—	—	18.6	0.54	33.0
BEAR-G12	06/05/2013	55.0	—	0.02	—	0.05	—	142	—	—	17.8	0.37	40.4

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Cascade Range–Modoc Plateau study unit—Continued													
CAMP-ES-05	09/20/2010	E0.31	—	0.08	0.33	—	—	104	—	≤0.02	0.04	15.9	≤2.5
CAMP-ES-05	08/01/2013	≤0.33	3.2	0.10	0.63	—	—	118	—	nc	0.05	16.5	≤2.6
CAMP-ES-09	10/04/2010	4.1	—	0.25	0.55	0.08	—	127	—	0.07	0.17	28.5	58.7
CAMP-ES-09	08/01/2013	5.6	—	0.30	≤0.17	0.08	—	134	—	nc	0.17	31.8	40.3
CAMP-HL-02	08/11/2010	3.7	1.7	2.4	≤0.11	E0.04	—	136	—	0.04	1.7	5.7	8.8
CAMP-HL-02	08/05/2013	5.9	1.3	2.2	≤0.12	0.1	—	142	—	nc	1.8	5.9	17.3
CAMP-HL-10	08/23/2010	52.0	*182	5.7	≤0.12	0.42	—	386	—	0.95	1.9	1.4	≤6.1
CAMP-HL-10	08/05/2013	48.6	*178	5.9	0.32	0.46	—	412	—	nc	2.6	1.6	9.1
CAMP-LU-04	07/21/2010	—	—	0.39	≤0.07	0.13	—	157	—	0.05	0.86	7.9	—
CAMP-LU-04	08/06/2013	≤0.22	—	0.41	≤0.20	0.13	—	170	—	nc	1.1	8.5	≤1.5
CAMP-LU-15	08/30/2010	1.3	—	0.19	≤0.07	—	—	73.0	—	≤0.02	0.61	2.8	≤2.4
CAMP-LU-15	07/30/2013	1.0	—	0.13	≤0.14	—	—	77.2	—	nc	0.69	2.8	≤2.5
CAMP-QV-04	08/03/2010	5.3	*67.7	13.0	0.48	0.15	—	107	—	0.16	0.45	26.6	24.3
CAMP-QV-04	08/08/2013	5.3	*71.9	12.5	0.68	0.14	—	110	—	nc	0.48	28.7	25.7
CAMP-QV-12	09/14/2010	—	≤0.25	—	≤0.06	—	—	54.7	—	—	E0.01	8.7	—
CAMP-QV-12	07/31/2013	—	≤0.27	—	≤0.20	—	—	61.2	—	nc	0.01	10.3	13.5
CAMP-SH-01	07/12/2010	5.8	≤0.20	0.15	1.0	0.13	—	388	—	—	0.95	0.23	8.7
CAMP-SH-01	07/29/2013	6.3	—	0.16	0.69	0.14	—	377	—	nc	1.03	0.34	≤1.7
CAMP-SH-07	07/15/2010	0.91	—	0.07	—	—	—	42.9	—	—	0.04	7.3	37.9
CAMP-SH-07	07/30/2013	1.0	—	0.07	—	—	—	42.5	—	nc	0.04	8.5	11.9

Table 11. Trace elements in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Information about analytes given in table 4*F*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead Watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quarternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark types**: AL-US, U.S. Environmental Protection Agency (EPA) action level; HAL-US, EPA lifetime health advisory level; MCL-CA, State of California maximum contaminant level; MCL-US, EPA maximum contaminant level; NL-CA, California notification level; SMCL-CA, State of California secondary maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: E, estimated or having a higher degree of uncertainty; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; mm/dd/yyyy, month/day/year; nc, not collected; Q, data reviewed and rejected; SRL, study reporting level; USGS, U.S. Geological Survey; *, value greater than benchmark level; —, not detected; ≤, less than or equal to; µg/L, micrograms per liter]

GAMA site identification number	Sample dates (mm/dd/yyyy)	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Cascade Range–Modoc Plateau study unit—Continued													
CAMP-TV-07	08/26/2010	E0.28	≤0.22	0.09	≤0.07	—	—	163	—	≤0.02	0.33	4.7	≤5.6
CAMP-TV-07	08/07/2013	≤0.29	≤0.41	0.09	≤0.11	—	—	166	—	nc	0.36	4.9	≤4.6
CAMP-TV-15	10/13/2010	2.0	3.2	9.0	—	—	—	12.3	—	1.3	0.02	0.46	—
CAMP-TV-15	07/29/2013	3.6	14.9	16.5	—	—	—	28.9	—	nc	0.02	1.1	—
Klamath Mountains study unit—Continued													
KLAM-01	10/18/2010	—	—	0.04	2.3	0.04	—	3.2	—	—	—	—	9.8
KLAM-01	10/29/2013	—	—	—	2.3	—	—	3.3	—	nc	—	0.09	10.5
KLAM-11	11/02/2010	—	—	0.51	0.33	0.28	—	94.0	—	≤0.01	0.03	3.6	19.0
KLAM-11	10/30/2013	—	—	0.48	1.4	0.23	—	86.9	—	nc	0.03	4.0	67.6
KLAM-20	11/17/2010	0.44	—	—	2.1	—	—	55.7	—	—	0.10	0.90	40.7
KLAM-20	10/30/2013	0.56	—	—	2.2	—	—	55.9	—	nc	0.11	0.96	≤6.2
KLAM-30	12/02/2010	13.0	*104	0.94	5.6	—	—	137	—	0.52	0.01	—	≤2.1
KLAM-30	10/31/2013	12.6	*107	1.1	6.1	—	—	159	—	nc	0.02	—	6.5

[1]Maximum contaminant level benchmarks are listed as MCL-US when the MCL-US and MCL-CA are identical and as MCL-CA when the MCL-CA is lower than the MCL-US or no MCL-US exists.

[2]Minimum and maximum LRL/IRL/LT-MDL used during the intial and trend sampling periods.

[3]The SRL was based on Olsen and others (2010) and was applied to results for samples collected prior to October 2009.

[4]The SRL was based on Davis and others (2014) and was applied to results for samples collected from October 2009 to December 2013.

[5]The SRL was based on highest concentration in blanks during the trend sampling period.

Table 12. Isotopic tracers in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Stable isotope ratios of hydrogen, oxygen, and carbon are reported in delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Tritium values less than the reporting level (MRL or ssL_c) are reported as non-detections (—). Information about analytes given in table 4*G*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark type**: MCL-CA, State of California maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: C, carbon; CSU, 1-sigma combined standard uncertainty; H, hydrogen; mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; O, oxygen; pCi/L, picocuries per liter; ssL_c, sample specific critical level; USGS, U.S. Geological Survey; —, not detected; ±, plus or minus]

GAMA site identification number	Sample dates (mm/dd/yyyy)	$\delta^{2}H$ of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)		$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
				Result ± CSU	Reporting level[1]		
Benchmark type		**none**	**none**	**MCL-CA**		**none**	**none**
Benchmark level		**none**	**none**	**20,000**		**none**	**none**
San Francisco Bay study unit							
SF-05	05/23/2007	–35.4	–5.66	0.60 ± 0.60	1	–17.92	50
SF-05	03/23/2011	–36.2	–5.59	0.70 ± 0.26	0.26	–18.23	73
SF-10	05/03/2007	–41.0	–6.29	1.6 ± 0.60	1	–14.09	54
SF-10	03/22/2011	–42.1	–6.22	1.6 ± 0.35	0.32	–14.15	55
SF-14	04/25/2007	–42.0	–6.50	3.8 ± 0.60	1	–15.02	76
SF-14	03/21/2011	–43.5	–6.38	2.8 ± 0.37	0.32	–15.21	75
SF-20	05/02/2007	–46.8	–6.67	10.2 ± 1.0	1	–14.52	100
SF-20	03/21/2011	–45.9	–6.59	5.8 ± 0.38	0.28	–14.87	100
SF-42	06/19/2007	–42.9	–6.33	—	1	–16.64	2.2
SF-42	03/22/2011	–43.3	–6.44	0.20 ± 0.33	0.32	–17.17	22
Southern Coast Range–Coastal study unit							
SCRC-B18	06/23/2008	–40.7	–5.94	7.3 ± 0.51	0.41	nc	nc
SCRC-B18	06/06/2012	–49.0	–7.08	6.0 ± 0.67	0.57	–12.53	98
SCRC-B23	07/07/2008	–43.3	–6.50	0.60 ± 0.32	0.32	–11.51	65
SCRC-B23	06/07/2012	–43.8	–6.44	0.40 ± 0.57	0.56	–12.01	63
SCRC-B24	07/07/2008	–46.6	–6.83	0.70 ± 0.35	0.35	nc	nc
SCRC-B24	06/06/2012	–46.2	–6.87	—	0.63	–10.46	41
SCRC-B35	07/30/2008	–34.1	–4.92	3.0 ± 0.45	0.41	nc	nc
SCRC-B35	06/05/2012	–32.2	–4.54	3.5 ± 0.53	0.47	–15.70	78
SCRC-H08	06/10/2008	–49.1	–7.02	—	0.32	–11.09	2.2
SCRC-H08	06/05/2012	–46.9	–6.84	—	0.55	–11.16	4.6
SCRC-H11	06/26/2008	–34.6	–5.17	1.2 ± 0.32	0.32	–9.62	24
SCRC-H11	06/07/2012	–34.3	–5.20	0.30 ± 0.34	0.33	–10.29	31
Southern Coast Range–Interior Basins study unit							
LIV-03	08/25/2008	–46.4	–6.13	15.5 ± 0.61	0.32	–11.94	66
LIV-03	09/18/2012	–45.6	–5.89	11.1 ± 0.59	0.36	–16.51	97

Table 12. Isotopic tracers in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Stable isotope ratios of hydrogen, oxygen, and carbon are reported in delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Tritium values less than the reporting level (MRL or ssL_c) are reported as non-detections (—). Information about analytes given in table 4*G*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark type**: MCL-CA, State of California maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: C, carbon; CSU, 1-sigma combined standard uncertainty; H, hydrogen; mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; O, oxygen; pCi/L, picocuries per liter; ssL_c, sample specific critical level; USGS, U.S. Geological Survey; —, not detected; ±, plus or minus]

GAMA site identification number	Sample dates (mm/dd/yyyy)	δ^2H of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)		$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
				Result ± CSU	Reporting level[1]		
Southern Coast Range–Interior Basins study unit—Continued							
GIL-02	08/12/2008	–38.9	–5.84	5.7 ± 0.41	0.35	–15.68	86
GIL-02	09/18/2012	–38.0	–5.75	7.1 ± 0.50	0.36	–15.96	88
GIL-12	08/19/2008	–40.0	–6.00	—	0.35	–16.05	59
GIL-12	09/19/2012	–39.7	–5.91	0.40 ± 0.35	0.34	–15.80	65
CUY-02	09/15/2008	–79.2	–10.51	—	0.32	–7.11	1.6
CUY-02	09/20/2012	–78.5	–10.54	—	0.40	–7.14	1.1
CUY-06	09/17/2008	–66.8	–9.43	6.6 ± 0.38	0.32	–11.07	86
CUY-06	09/20/2012	–69.1	–9.80	4.3 ± 0.46	0.38	–11.61	87
CUY-10	09/23/2008	–80.7	–11.38	2.8 ± 0.32	0.32	nc	nc
CUY-10	03/30/2010	nc	nc	nc	nc	–12.72	84
Northern Coast Ranges study unit							
NOCO-IN-10	06/18/2009	–49.3	–7.19	6.9 ± 0.38	0.32	–16.18	101
NOCO-IN-10	05/02/2012	–51.8	–7.50	6.4 ± 0.59	0.47	–16.77	103
NOCO-IN-11	06/22/2009	–54.8	–8.20	4.4 ± 0.32	0.32	–16.81	82
NOCO-IN-11	05/02/2012	–54.3	–8.02	3.1 ± 0.50	0.45	–17.21	79
NOCO-IN-27	07/27/2009	–60.1	–8.56	3.4 ± 0.32	0.32	–10.85	5.0
NOCO-IN-27	05/01/2012	–60.8	–8.58	3.0 ± 0.53	0.48	–10.92	4.8
NOCO-CO-02	07/30/2009	–34.3	–5.56	4.8 ± 0.32	0.32	–22.49	106
NOCO-CO-02	05/10/2012	–33.9	–5.45	4.9 ± 0.45	0.36	–22.66	106
NOCO-CO-03	08/03/2009	–47.1	–7.10	0.40 ± 0.32	0.32	–20.50	74
NOCO-CO-03	05/09/2012	–46.8	–7.16	—	0.33	–20.81	73
NOCO-CO-08	08/11/2009	–53.2	–7.91	2.2 ± 0.41	0.38	–15.62	69
NOCO-CO-08	05/08/2012	–52.2	–7.81	3.2 ± 0.47	0.41	–16.12	70
NOCO-CO-18	08/31/2009	–46.1	–6.99	5.7 ± 0.41	0.32	–21.46	86
NOCO-CO-18	05/09/2012	–49.5	–7.37	5.1 ± 0.40	0.30	–20.24	80
NOCO-CO-23	09/15/2009	–45.6	–7.18	6.0 ± 0.32	0.32	–17.37	100
NOCO-CO-23	05/08/2012	–44.3	–7.06	4.1 ± 0.38	0.30	–19.38	103

Table 12. Isotopic tracers in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Stable isotope ratios of hydrogen, oxygen, and carbon are reported in delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Tritium values less than the reporting level (MRL or ssL_c) are reported as non-detections (—). Information about analytes given in table 4*G*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark type**: MCL-CA, State of California maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: C, carbon; CSU, 1-sigma combined standard uncertainty; H, hydrogen; mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; O, oxygen; pCi/L, picocuries per liter; ssL_c, sample specific critical level; USGS, U.S. Geological Survey; —, not detected; ±, plus or minus]

GAMA site identification number	Sample dates (mm/dd/yyyy)	δ^2H of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)		$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
				Result ± CSU	Reporting level[1]		
Santa Barbara study unit							
SB-07	01/26/2011	–33.9	–5.67	1.3 ± 0.41	0.34	–14.67	84
SB-07	12/18/2013	–34.5	–5.64	1.6 ± 0.37	0.34	–14.18	84
SB-12	02/07/2011	–34.3	–5.59	5.3 ± 0.43	0.34	–17.45	108
SB-12	12/18/2013	–35.5	–5.86	3.0 ± 0.35	0.29	–15.59	98
Central Sierra study unit							
CGOLD-13	05/23/2006	–61.5	–8.60	5.1 ± 0.60	1	–17.10	97
CGOLD-13	06/14/2010	–61.6	–8.57	4.7 ± 0.41	0.32	nc	nc
CGOLD-16	05/24/2006	–80.2	–11.59	17.9 ± 1.3	1	nc	nc
CGOLD-16	05/25/2010	–79.7	–11.54	12.7 ± 0.61	0.35	nc	nc
CWISH-04	05/15/2006	–73.0	–10.58	11.2 ± 1.0	1	–21.68	109
CWISH-04	06/14/2010	–75.2	–10.58	10.8 ± 0.51	0.32	nc	nc
Southern Sierra study unit							
SOSA-06	06/07/2006	–61.8	–8.92	nc	nc	nc	nc
SOSA-06	06/23/2008	–61.2	–8.89	0.80 ± 0.35	0.32	–14.53	58
SOSA-15	06/12/2006	–75.5	–11.07	14.4 ± 1.0	1	–16.11	91
SOSA-15	07/08/2008	–73.5	–11.12	13.3 ± 0.57	0.38	–16.65	88
SOSA-20	06/14/2006	–77.6	–10.62	nc	nc	nc	nc
SOSA-20	06/25/2008	–76.8	–10.73	7.9 ± 0.41	0.32	–15.25	108
SOSA-31	06/29/2006	–83.6	–11.09	nc	nc	nc	nc
SOSA-31	06/25/2008	–82.1	–11.07	8.0 ± 0.51	0.41	–13.05	120
SOSA-32	06/29/2006	–74.1	–10.56	nc	nc	nc	nc
SOSA-32	06/24/2008	–74.8	–10.56	0.60 ± 0.32	0.32	–12.40	85
Tahoe–Martis study unit							
TMART-03	06/26/2007	–117	–15.53	—	1	–15.29	29
TMART-03	08/27/2012	–117	–15.48	0.30 ± 0.26	0.26	–15.89	31
TMART-06	06/28/2007	–105	–14.36	9.0 ± 1.0	1	–16.88	97
TMART-06	08/27/2012	–105	–14.26	8.7 ± 0.26	0.26	–18.29	103
TROCK-02	07/11/2007	–95.8	–13.33	11.2 ± 1.3	1	–18.05	106

Table 12. Isotopic tracers in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Stable isotope ratios of hydrogen, oxygen, and carbon are reported in delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Tritium values less than the reporting level (MRL or ssL_c) are reported as non-detections (—). Information about analytes given in table 4*G*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark type**: MCL-CA, State of California maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: C, carbon; CSU, 1-sigma combined standard uncertainty; H, hydrogen; mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; O, oxygen; pCi/L, picocuries per liter; ssL_c, sample specific critical level; USGS, U.S. Geological Survey; —, not detected; ±, plus or minus]

GAMA site identification number	Sample dates (mm/dd/yyyy)	$\delta^{2}H$ of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)		$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
				Result ± CSU	Reporting level[1]		
Tahoe–Martis study unit—Continued							
TROCK-02	08/28/2012	–101	–13.79	10.9 ± 0.50	0.29	–17.13	105
TROCK-05	07/17/2007	–101	–14.20	7.0 ± 1.0	1	–18.04	97
TROCK-05	08/28/2012	–102	–14.06	3.6 ± 0.31	0.25	–18.51	98
TTAHO-06	08/02/2007	–109	–14.86	2.9 ± 0.60	1	–19.24	83
TTAHO-06	08/29/2012	–109	–14.81	3.5 ± 0.40	0.35	–19.11	86
TTAHO-10	08/16/2007	–105	–14.64	0.30 ± 0.60	1	–20.37	68
TTAHO-10	08/29/2012	–106	–14.61	—	0.34	–19.80	67
Sierra Nevada Regional study unit							
SIERRA-G-08	07/23/2008	–80.5	–11.77	7.8 ± 0.48	0.35	–20.91	105
SIERRA-G-08	10/03/2012	–81.9	–11.81	9.2 ± 0.57	0.39	–21.40	105
SIERRA-G-10	07/28/2008	–103	–14.08	9.4 ± 0.51	0.38	–16.26	102
SIERRA-G-10	10/03/2012	–108	–14.61	11.6 ± 0.63	0.39	–15.83	102
SIERRA-G-12	08/14/2008	–77.5	–10.90	8.0 ± 0.48	0.35	–17.43	105
SIERRA-G-12	10/04/2012	–77.9	–10.79	7.0 ± 0.53	0.40	–17.46	101
SIERRA-G-13	08/21/2008	–69.2	–9.80	8.3 ± 0.41	0.32	–19.57	109
SIERRA-G-13	10/02/2012	–67.8	–9.75	6.5 ± 0.52	0.40	–20.64	109
SIERRA-G-14	08/26/2008	–97.9	–13.61	8.6 ± 0.41	0.32	–20.80	107
SIERRA-G-14	08/30/2012	–96.3	–13.46	7.8 ± 0.43	0.29	–20.69	105
SIERRA-G-15	09/08/2008	–61.2	–8.13	4.8 ± 0.45	0.38	–17.70	65
SIERRA-G-15	10/01/2012	–58.7	–7.85	3.9 ± 0.48	0.41	–17.76	71
SIERRA-G-16	09/22/2008	–119	–15.82	14.4 ± 0.54	0.32	–18.31	79
SIERRA-G-16	09/17/2012	–123	–16.29	11.6 ± 0.62	0.39	–12.38	80
SIERRA-G-17	09/23/2008	–132	–17.59	11.3 ± 0.51	0.35	–16.43	99
SIERRA-G-17	09/18/2012	–133	–17.60	9.9 ± 0.61	0.42	–11.44	66
SIERRA-G-18	09/24/2008	–120	–16.15	15.2 ± 0.64	0.38	–15.25	86
SIERRA-G-18	09/19/2012	–123	–16.32	15.6 ± 0.77	0.43	–11.31	92
SIERRA-M-03	09/10/2008	–99.7	–13.60	1.8 ± 0.48	0.45	nc	nc
SIERRA-M-03	09/11/2012	–99.0	–13.64	—	0.45	–14.84	68

Table 12. Isotopic tracers in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Stable isotope ratios of hydrogen, oxygen, and carbon are reported in delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Tritium values less than the reporting level (MRL or ssL_c) are reported as non-detections (—). Information about analytes given in table 4*G*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark type**: MCL-CA, State of California maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: C, carbon; CSU, 1-sigma combined standard uncertainty; H, hydrogen; mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; O, oxygen; pCi/L, picocuries per liter; ssL_c, sample specific critical level; USGS, U.S. Geological Survey; —, not detected; ±, plus or minus]

GAMA site identification number	Sample dates (mm/dd/yyyy)	$\delta^{2}H$ of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)		$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
				Result ± CSU	Reporting level[1]		
Sierra Nevada Regional study unit—Continued							
SIERRA-M-04	09/17/2008	–86.1	–12.39	10.3 ± 0.45	0.32	–14.09	64
SIERRA-M-04	09/12/2012	–87.1	–12.40	8.4 ± 0.62	0.47	–14.48	64
SIERRA-M-06	10/08/2008	–68.8	–10.38	10.0 ± 0.51	0.32	–20.42	95
SIERRA-M-06	09/13/2012	–68.3	–10.32	7.0 ± 0.56	0.43	–21.28	95
SIERRA-S-02	08/19/2008	–102	–14.00	8.0 ± 0.48	0.38	–19.90	100
SIERRA-S-02	08/30/2012	–103	–14.09	6.2 ± 0.45	0.34	–20.01	99
SIERRA-S-03	10/20/2008	–102	–13.84	4.4 ± 0.45	0.38	–17.09	92
SIERRA-S-03	09/12/2012	–101	–13.57	5.1 ± 0.55	0.47	–20.79	92
SIERRA-V-02	10/07/2008	–64.9	–9.80	2.9 ± 0.41	0.38	–20.47	91
SIERRA-V-02	09/10/2012	–65.7	–9.72	3.5 ± 0.47	0.41	–20.84	91
SIERRA-V-03	10/21/2008	–102	–14.27	11.9 ± 0.54	0.32	–11.80	59
SIERRA-V-03	09/20/2012	–106	–14.42	12.3 ± 0.66	0.40	–7.48	21
Bear Valley–Lake Arrowhead Watershed study unit							
BEAR-S05	04/28/2010	–83.9	–11.84	—	0.32	–12.16	37
BEAR-S05	06/06/2013	–82.9	–11.83	—	0.30	–11.81	37
BEAR-S12	05/05/2010	–87.6	–12.19	—	0.32	–12.33	68
BEAR-S12	06/06/2013	–86.4	–12.30	0.60 ± 0.33	0.33	–12.39	71
BEAR-G07	05/10/2010	–59.0	–9.04	4.0 ± 0.32	0.32	–17.45	78
BEAR-G07	06/05/2013	–61.8	–9.32	1.7 ± 0.42	0.40	–17.66	73
BEAR-G12	05/19/2010	–71.5	–10.60	8.0 ± 0.51	0.41	nc	nc
BEAR-G12	06/05/2013	–71.1	–10.59	5.2 ± 0.49	0.41	–17.52	93
Cascade Range–Modoc Plateau study unit							
CAMP-ES-05	09/20/2010	–65.1	–9.69	1.2 ± 0.30	0.45	–21.46	91
CAMP-ES-05	08/01/2013	–65.3	–9.61	2.7 ± 0.53	0.50	–21.72	95
CAMP-ES-09	10/04/2010	–65.8	–9.34	1.1 ± 0.43	0.45	–19.29	85
CAMP-ES-09	08/01/2013	–63.9	–9.37	1.3 ± 0.54	0.53	–19.31	85
CAMP-HL-02	08/11/2010	–103	–13.32	1.6 ± 0.45	0.45	–18.27	54
CAMP-HL-02	08/05/2013	–102	–13.30	2.1 ± 0.65	0.62	–18.56	66

Table 12. Isotopic tracers in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[The five-digit USGS parameter code below the constituent name is used to uniquely identify a specific constituent or property. Stable isotope ratios of hydrogen, oxygen, and carbon are reported in delta notation (δ), the ratio of a heavier isotope to more common lighter isotope of that element, relative to a standard reference material. Tritium values less than the reporting level (MRL or ssL_c) are reported as non-detections (—). Information about analytes given in table 4*G*. **GAMA site identification number acronyms**: **Bear Valley–Lake Arrowhead Watershed study unit**: BEAR-G, Lake Arrowhead watershed study area; BEAR-S, Bear Valley study area. **Cascade Range–Modoc Plateau study unit**: CAMP-ES, Sacramento Valley Eastside study area; CAMP-HL, Honey Lake study area; CAMP-LU, Cascade Range and Modoc Plateau Low Use Basins study area; CAMP-QV, Quaternary Volcanic Areas study area; CAMP-SH, Shasta Valley and Mount Shasta Volcanic Area study area; CAMP-TV, Tertiary Volcanic Areas study area. **Central Sierra study unit**: CGOLD, Central Sierra Coarse Gold study area; CWISH, Central Sierra Wishon study area. **Klamath Mountains study unit**: KLAM. **Northern Coast Ranges study unit**: NOCO-CO, Coastal Basins study area; NOCO-IN, Interior Basins study area. **San Francisco Bay study unit**: SF. **Santa Barbara study unit**: SB. **Sierra Nevada Regional study unit**: SIERRA-G, primary grid well in granitic rocks; SIERRA-M, primary grid well in metamorphic rocks; SIERRA-S, primary grid well in sedimentary deposits; SIERRA-V, primary grid well in volcanic rocks. **Southern Coast Range–Coastal study unit**: SCRC-B, Basins study area; SCRC-H, Uplands study area. **Southern Coast Range–Interior Basins study unit**: CUY, Cuyama study area; GIL, Gilroy study area; LIV, Livermore study area. **Southern Sierra study unit**: SOSA. **Tahoe–Martis study unit**: TMART, Martis study area; TROCK, Hard Rock study area; TTAHO, Tahoe study area. **Benchmark type**: MCL-CA, State of California maximum contaminant level. Benchmark type and benchmark level as of August 1, 2013. **Abbreviations**: C, carbon; CSU, 1-sigma combined standard uncertainty; H, hydrogen; mm/dd/yyyy, month/day/year; MRL, minimum reporting level; nc, not collected; O, oxygen; pCi/L, picocuries per liter; ssL_c, sample specific critical level; USGS, U.S. Geological Survey; —, not detected; ±, plus or minus]

GAMA site identification number	Sample dates (mm/dd/yyyy)	$\delta^{2}H$ of water (per mil) (82082)	$\delta^{18}O$ of water (per mil) (82085)	Tritium (pCi/L) (07000)		$\delta^{13}C$ (per mil) (82081)	Carbon-14 (percent modern) (49933)
				Result ± CSU	Reporting level[1]		
Cascade Range–Modoc Plateau study unit—Continued							
CAMP-HL-10	08/23/2010	–108	–13.53	1.0 ± 0.30	0.45	–13.31	68
CAMP-HL-10	08/05/2013	–108	–13.52	1.5 ± 0.51	0.49	–13.34	70
CAMP-LU-04	07/21/2010	–106	–13.72	10.2 ± 0.51	0.35	–12.48	93
CAMP-LU-04	08/06/2013	–103	–13.70	8.7 ± 0.50	0.33	–12.72	91
CAMP-LU-15	08/30/2010	–99.7	–13.62	7.9 ± 0.40	0.45	–17.72	96
CAMP-LU-15	07/30/2013	–98.1	–13.58	7.7 ± 0.68	0.55	–17.73	96
CAMP-QV-04	08/03/2010	–77.8	–8.10	5.9 ± 0.54	0.45	–9.54	83
CAMP-QV-04	08/08/2013	–76.4	–7.96	4.3 ± 0.40	0.32	–9.55	84
CAMP-QV-12	09/14/2010	–77.6	–10.95	8.2 ± 0.42	0.45	–18.69	109
CAMP-QV-12	07/31/2013	–75.7	–10.98	7.8 ± 0.63	0.50	–18.95	109
CAMP-SH-01	07/12/2010	–98.0	–12.56	9.8 ± 0.47	0.31	–13.52	82
CAMP-SH-01	07/29/2013	–97.0	–12.57	3.1 ± 0.55	0.51	–13.42	82
CAMP-SH-07	07/15/2010	–98.0	–13.70	8.1 ± 0.45	0.31	–19.40	109
CAMP-SH-07	07/30/2013	–99.8	–13.89	8.0 ± 0.70	0.57	–19.34	110
CAMP-TV-07	08/26/2010	–114	–15.26	—	0.45	–16.54	86
CAMP-TV-07	08/07/2013	–113	–15.26	—	0.35	–16.29	85
CAMP-TV-15	10/13/2010	–93.8	–11.09	0.80 ± 0.43	0.45	–16.07	53
CAMP-TV-15	07/29/2013	–92.6	–11.28	0.70 ± 0.51	0.50	–18.92	46
Klamath Mountains study unit							
KLAM-01	10/18/2010	–57.8	–8.75	7.0 ± 0.38	0.45	–11.15	90
KLAM-01	10/29/2013	–58.1	–8.81	6.2 ± 0.36	0.24	–9.89	90
KLAM-11	11/02/2010	–69.3	–10.08	8.4 ± 0.44	0.45	–17.84	107
KLAM-11	10/30/2013	–71.4	–10.13	6.3 ± 0.35	0.22	–17.88	104
KLAM-20	11/17/2010	–87.2	–12.15	4.5 ± 0.47	0.45	–21.34	95
KLAM-20	10/30/2013	–86.7	–12.17	3.7 ± 0.29	0.22	–21.35	94
KLAM-30	12/02/2010	–77.8	–11.28	0.80 ± 0.38	0.45	–17.19	56
KLAM-30	10/31/2013	–78.9	–11.32	1.3 ± 0.26	0.24	–17.60	57

[1]Tritium reporting levels were expressed as MRL before August 2007 and as ssL_c after August 2007.

Appendix A

This appendix presents a brief description of the methods used to collected and analyze samples, to report results, and to evaluate quality control (QC) assessment results. Detailed descriptions are given in two previous reports containing data for the Priority Basin Project (PBP) of the Groundwater Ambient Monitoring and Assessment (GAMA) program (GAMA-PBP) triennial trend sites (Kent and others, 2014; Kent, 2015) and in the data series reports for the 12 study units (table 2). Results from QC samples collected during the trend sampling period in the 12 study units of this report are described in detail.

Sample Analysis and Data Reporting

Six laboratories performed chemical analyses on samples collected during the trend sampling period (table A–1), but most of the analyses were performed at the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL). Data for volatile organic compounds (VOCs; table 6) and pesticides (table 7) generally were reported with a laboratory reporting level (LRL). The LRL is set to minimize the reporting of false negatives (not detecting a compound when it actually is present in a sample) to less than 1 percent (Childress and others, 1999). The LRL usually is set at two times the long-term method detection level (LT-MDL). The LT-MDL is derived from results for low-level spikes and laboratory set blanks analyzed over an extended period (Childress and others, 1999). The LT-MDL is the minimum concentration of a substance that can be measured and reported with 99-percent confidence that the concentration is greater than zero; at the MDL there is less than 1 percent chance of a false positive (Childress and others, 1999; U.S. Environmental Protection Agency, 2002). Detections at concentrations less than the LRL are reported with "E" codes preceding the value. Detections of organic constituents at concentrations less than the maximum LRL during the initial and trend sampling periods are reported in tables 6 and 7, but were not counted as detections for the purposes of calculating the detection frequency.

The conventions for reporting data for nutrients (table 9), major ions (table 10), and trace elements (table 11) changed in October 2010. Until October 2010, non-detections of inorganic constituents were reported as less than the LRL, and detections at concentrations between the LRL and LT-MDL were reported with E codes. As of October 2010, non-detections of inorganic constituents are reported as less than the LT-MDL, and E codes are no longer used. Some nutrient (table 9) and trace element (table 11) data for samples from the initial sampling are reported with interim reporting levels because the revised LRL and LT-MDL were still in the process of being established.

Data for special-interest constituents (table 8), total dissolved solids (table 10), and some water-quality indicators (table 5) are reported with a minimum reporting level (MRL). The MRL is the smallest measurable concentration of a constituent that can be reliably reported by using a given analytical method (Timme, 1995).

Tritium activities (table 12) are reported with combined standard uncertainties (CSU) and sample-specific critical levels (ssL_C). The ssL_C is defined as the minimum measured activity that indicates a positive detection of the radionuclide in the sample, with less than a 5-percent probability of a false positive detection (McCurdy and others, 2008). Measured activities less than the ssL_C were reported as non-detections in the data tables. The CSU was reported at the 68 percent confidence level (1-sigma; McCurdy and others, 2008). Tritium reporting levels were expressed as MRLs before August 2007 and as ssL_C after August 2007. Both reporting level types were used for the results from August 2007.

Relative isotope ratios in units of per mil were used to report the stable-isotope compositions of hydrogen, oxygen, and carbon (Coplen, 2011; table 12). Positive values indicate enrichment of the heavier isotope, and negative values indicate depletion of the heavier isotope, compared to the ratios observed in the standard reference material.

The NWQL updates the LRL, LT-MDL, and MRL values regularly, and most often at the beginning of a new water year (October 1). In the cases where a LRL, LT-MDL, or MRL value changed at the NWQL during a sampling period, the lower concentration value was used in this report. During the initial sampling period, the values, or ranges of values from January 2006–June 2010 were used by the NWQL for the analysis of groundwater samples. During the trend sampling period, the values, or range of values from February 2010–April 2013 were used by the NWQL for the analysis of groundwater samples.

Data for sample VOCs (table 6) and trace elements (table 11) are reported with study reporting levels (SRL). The SRLs are derived from assessment of data from QC samples associated with groundwater samples collected as part of the GAMA-PBP (Olsen and others, 2010; Fram and others, 2012; Davis and others, 2014). The SRLs are greater than or equal to the reporting levels used by the NWQL for reporting organic and inorganic constituents. Detections less than the SRL were expressed in the data tables as less than or equal to the reported concentration.

Multiple Analytical Methods and Laboratories

Six constituents targeted in this study were measured by more than one analytical method or by more than one laboratory and the preferred analytical methods are indicated in table A–2 of this report. The preferred methods were generally selected on the basis of better performance or sensitivity for the constituent, and, in all cases, the results are reported in tables 5–12 are for the preferred analytical methods used.

The field water-quality indicators pH, specific conductance, and alkalinity were measured in the field and at the NWQL (Schedule 1948) during both sample periods. The field measurements are the preferred method for these water-quality indicators because field conditions are considered more representative of groundwater conditions (Hem, 1985). Both methods are reported in this report, however.

Three methods were used to analyze for VOCs in this study. Schedule 2020 included 85 constituents. Two of the eighty-five compounds analyzed by Schedule 2020—constituents 1,2-dibromo-3-chloropropane (DBCP) and 1,2-dibromoethane (EDB)—were also analyzed in some trend samples by Schedule 1306, which provided lower detection levels than those provided by Schedule 2020 for these two compounds (table A–2).

Two methods were used to analyze for pesticides and pesticide degradates in this study. Schedule 2003 included a basic set of 63 constituents. Schedule 2033 included constituents on Schedule 2003 and 20 more pesticide compounds, for a total of 83 pesticides. The NWQL Schedules 2003 and 2033 all use the same analytical method (Zaugg and others, 1995; Sandstrom and others, 2001). Trend samples from 9 of the 12 study units were analyzed using Schedule 2003 during the initial sampling period. Trend samples from three of the study units (NOCO, CENSIE, and BEAR) were analyzed using Schedule 2033 during the initial sampling period. Trend samples from all of the study units were analyzed using Schedule 2033 during the trend sampling period.

Some samples from trend sites were submitted to one of two non-USGS laboratories, Montgomery Watson Harza Laboratories (MWH) and Weck Laboratories, Inc., (Weck), for analysis of 1,2,3-Trichloropropane (1,2,3-TCP) and perchlorate (table A–2). Analyses were performed by MWH prior to October 1, 2007, and by Weck as of August 15, 2007. Samples were analyzed by both laboratories for a comparison study from August 15, 2007, to September 30, 2007. As a result, the trend samples collected from 4 of the 12 study units were analyzed for constituents of special interest by MWH during the initial sampling period. Trend samples from the other eight study units were analyzed for these constituents by Weck during both sampling periods. Samples for analysis of 1,2,3-TCP were submitted to MWH and Weck to obtain a lower detection level than that provided by Schedule 2020. The change in laboratories had little effect on 1,2,3-TCP because the field sample processing and the MRL for 1,2,3-TCP were the same for both laboratories. Different methods with different MRLs were used by the two laboratories for perchlorate, however, which could affect trend analyses. The MWH performed analyses for perchlorate on unfiltered samples with a MRL of 0.5 micrograms per liter (µg/L). Weck performed analyses for perchlorate on filtered samples with a lower MRL of 0.1 µg/L.

Quality-Control Methods and Results

Detailed descriptions of the QC methods used in this study can be found in the 12 USGS data series reports referenced at the beginning of this appendix; only brief descriptions are given here. The purpose of QC samples is to help understand and describe the precision and accuracy of the environmental data and to investigate and describe possible sources of bias during sample collection, processing, storage, transportation, or laboratory analysis. Four types of QC measurements were evaluated in this study: (1) blank samples were collected to assess positive bias as a result of contamination during sample handling or analysis; (2) replicate samples were collected to assess variability; (3) matrix-spike tests were done for organic constituents to assess positive or negative bias; and (4) surrogate compounds were added to samples analyzed for organic constituents to assess potential matrix effects from the chemical composition of each groundwater sample, as well as to assess potential bias of laboratory analytical methods.

Blank Samples

Table A–3 summarizes the results of the blank analyses during the trend sampling period. Blanks were analyzed for up to 210 constituents, 15 of which were analyzed for potential SRL application (table A–3). Detections of VOCs at concentrations less than the respective SRLs were reclassified as non-detections in order to reduce the possibility of reporting false positives. The reclassified values were identified as bounded intervals (that is, with a “less than or equal to” symbol [≤]) in the USGS NWIS database and were not used when calculating detection frequencies for VOCs. Detections of inorganic constituents with concentrations less than their respective SRLs were marked as bounded intervals (with a “less than or equal to” symbol) because the concentrations of these constituents could be less than or equal to the reported value.

The SRLs established by Fram and others (2012) were applied to the VOCs acetone, tetrahydrofuran, 1,2,4-trimethylbenzene, and toluene. The SRLs established by Olsen and others (2010) and Davis and others (2014) were applied to the trace metals cobalt, copper, iron, lead, manganese, and zinc. Three VOCs, 1,1-dichloroethene (1,1-DCE), perchloroethene (PCE), and carbon disulfide, and three trace elements, boron, chromium, and lithium, had SRLs established on the basis of blank detections during the trend sampling period (table A–3).

Replicate Samples

Tables A–4*A–B* summarize the results of replicate analyses for constituents that were detected in at least one of the sequential replicate pairs collected during the trend sampling period. In order for two detected concentrations of the samples making up a replicate to be considered within acceptable agreement, one of the following two criteria must be met: 1) for sample concentrations less than 5 times the reporting level for the constituent in question, the standard deviation for the two sample concentrations must be less than one half the reporting level; and 2) for sample concentrations greater than or equal to 5 times the reporting level, the relative standard deviation must be less than 10 percent. Tritium replicates are considered to be within acceptable agreement if the difference between the two sample activities is less than the sample-specific combined standard uncertainty of each sample. One replicate pair for four constituents indicated unacceptable variability (table A–4*B*), including one out of six replicates for iron and tritium and one out of five replicates for vanadium and zinc. Environmental detections were not reclassified on the basis of the replicate analyses.

Matrix Spike Samples

Tables A–5*A–D* present a summary of matrix-spike recoveries of organic constituents analyzed at trend sites during the trend sampling period. Laboratory matrix spikes were performed for the 169 organic constituents sampled in this study, including VOCs, pesticides and pesticide degradates, because the analytical methods for these constituents can be susceptible to matrix interference. Median matrix-spike recoveries were within the acceptable recovery range (between 70 and 130 percent) for 84 of the 85 VOCs on NWQL Schedule 2020 (table A–5*A*). Median matrix-spike recoveries for DBCP on NWQL Schedule 1306 (table A–5*B*) and 21 pesticide compounds on NWQL Schedules 2003 and 2033 were lower than the acceptable limits (table A–5*C*), which could indicate that these constituents were not detected in some samples, even though they were present in the samples. Environmental detections were not reclassified on the basis of the matrix-spike recovery analyses.

Surrogates Compounds

Table A–6 presents a summary of surrogate compound recoveries during the trend sampling period. All median recoveries were within the acceptable recovery range (between 70 and 130 percent) for the surrogate compounds added to samples for the analyses of VOCs and pesticide and pesticide degradates (table A–6). In total, 100 percent of the blank and 92 percent of the groundwater sample surrogate recoveries for VOC analyses were within the acceptable range. In addition, 99 percent of the blank and 89 percent of the groundwater sample surrogate recoveries for pesticide and pesticide degradate analyses were within the acceptable range. One VOC surrogate and one pesticide surrogate had individual recoveries that fell outside the acceptable range in over 20 percent of the groundwater samples. Even though these surrogate compounds had recoveries that fell outside the acceptable ranges, it is unlikely that groundwater matrix interferences caused the recoveries to be outside of the acceptable ranges in most cases. Environmental detections were not reclassified on the basis of the surrogate compound recovery analyses.

Appendix References Cited

American Public Health Association, 1998, Standard methods for the examination of water and wastewater (20th ed.): Washington, D.C., American Public Health Association, American Water Works Association, and Water Environment Federation, p. 3-37–3-43.

Childress, C.J.O., Foreman, W.T., Connor, B.F., and Maloney, T.J., 1999, New reporting procedures based on long-term method detection levels and some considerations for interpretations of water-quality data provided by the U.S. Geological Survey National Water Quality Laboratory: U.S. Geological Survey Open-File Report 99–193, 19 p., https://pubs.er.usgs.gov/publication/ofr99193.

Connor, B.F., Rose, D.L., Noriega, M.C., Murtaugh, L.K., and Abney, S.R., 1998, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of 86 volatile organic compounds in water by gas chromatography/mass spectrometry, including detections less than reporting limits: U.S. Geological Survey Open-File Report 97–829, 78 p., https://pubs.er.usgs.gov/publication/ofr97829.

Coplen, T.B., 1994, Reporting of stable hydrogen, carbon, and oxygen isotopic abundances: Pure and Applied Chemistry, v. 66, no. 2, p. 273–276, http://www.iupac.org/publications/pac/1994/pdf/6602x0273.pdf.

Coplen, T.B., 2011, Guidelines and recommended terms for expression of stable-isotope-ratio and gas-ratio measurement results: Rapid Communications in Mass Spectrometry, v. 25, no. 17, p. 2538–2560, https://doi.org/10.1002/rcm.5129.

Coplen, T.B., Wildman, J.D., and Chen, Julie, 1991, Improvements in the gaseous hydrogen-water equilibration technique for hydrogen isotope-ratio analysis: Analytical Chemistry, v. 63, no. 9, p. 910–912, https://doi.org/10.1021/ac00009a014.

Davis, T.A., Olsen, L.D., Fram, M.S., and Belitz, Kenneth, 2014, Updated study reporting levels (SRLs) for trace-element data collected for the California Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project, October 2009–March 2013: U.S. Geological Survey Scientific Investigations Report 2014–5105, 52 p., https://doi.org/10.3133/sir20145105.

Donahue, D.J., Linick, T.W., and Jull, A.J.T., 1990, Isotope-ratio and background corrections for accelerator mass spectrometry radiocarbon measurements: Radiocarbon, v. 32, no. 2, p. 135–142, https://journals.uair.arizona.edu/index.php/radiocarbon/article/view/1261.

Epstein, S., and Mayeda, T., 1953, Variation of O^{18} content of water from natural sources: Geochimica et Cosmochimica Acta, v. 4, no. 5, p. 213–224, https://doi.org/10.1016/0016-7037(53)90051-9.

Faires, L.M., 1993, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of metals in water by inductively coupled plasma-mass spectrometry: U.S. Geological Survey Open-File Report 92–634, 28 p., https://pubs.er.usgs.gov/publication/ofr92634.

Fishman, M.J., ed., 1993, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of inorganic and organic constituents in water and fluvial sediments: U.S. Geological Survey Open-File Report 93–125, 217 p., https://pubs.er.usgs.gov/publication/ofr93125.

Fishman, M.J., ed., and Friedman, L.C., 1989, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, book 5, chap. A1, 545 p., https://pubs.er.usgs.gov/publication/twri05A1.

Fram, M.S., Olsen, L.D., and Belitz, Kenneth, 2012, Evaluation of volatile organic compound (VOC) blank data and application of study reporting levels to groundwater data collected for the California GAMA Priority Basin Project, May 2004 through September 2010: U.S. Geological Survey Scientific Investigations Report 2012–5139, 94 p., https://pubs.er.usgs.gov/publication/sir20125139.

Gagnon, A.R., and Jones, G.A., 1993, AMS-graphite target production methods at the Woods Hole Oceanographic Institution during 1986–1991: Radiocarbon, v. 35, no. 2, p. 301–310, https://journals.uair.arizona.edu/index.php/radiocarbon/article/view/1572/1576.

Garbarino, J.R., 1999, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of dissolved arsenic, boron, lithium, selenium, strontium, thallium, and vanadium using inductively coupled plasma-mass spectrometry: U.S. Geological Survey Open-File Report 99–93, 31 p., https://pubs.er.usgs.gov/publication/ofr9993.

Garbarino, J.R., Kanagy, L.K., and Cree, M.E., 2006, Determination of elements in natural-water, biota, sediment, and soil samples using collision/reaction cell inductively coupled plasma-mass spectrometry: U.S. Geological Survey Techniques and Methods, book 5, chap. B1, 87 p., https://pubs.er.usgs.gov/publication/tm5B1.

Hautman, D.P., Munch, D.J., Eaton, A.D., and Haghani, A.W., 1999, Method 314.0 Determination of perchlorate in drinking water using ion chromatography, revision 1.0: U.S. Environmental Protection Agency, accessed on July 7, 2016, at https://nepis.epa.gov/Exe/ZyNET.exe/P1008HFE.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1995+Thru+1999&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C95thru99%5CTxt%5C00000027%5CP1008HFE.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL.

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water: U.S. Geological Survey Water Supply Paper 2254, 263 p., 4 pls., https://pubs.er.usgs.gov/publication/wsp2254.

Kent, Robert, 2015, Groundwater quality data in 15 GAMA study units—Results from the 2006–10 initial sampling and the 2009–13 resampling of wells,—California GAMA Priority Basin Project: U.S. Geological Survey Data Series 919, 220 p., https://doi.org/10.3133/ds919.

Kent, Robert, Belitz, Kenneth, and Fram, M.S., 2014, Groundwater-quality data in seven GAMA study units—results from initial sampling, 2004–2005, and resampling, 2007–2008, of wells—California GAMA Program Priority Basin Project: U.S. Geological Survey Data Series 795, 170 p., https://doi.org/10.3133/ds795.

Lindley, C.E., Stewart, J.T., and Sandstrom, M.W., 1996, Determination of low concentrations of acetochlor in water by automated solid-phase extraction and gas chromatography with mass-selective detection: Journal of AOAC International, v. 79, no. 4, p. 962–966.

Madsen, J.E., Sandstrom, M.W., and Zaugg, S.D., 2002, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—A method supplement for the determination of Fipronil and degradates in water by gas chromatography/mass spectrometry: U.S. Geological Survey Open-File Report 2002–462, 11 p., https://pubs.er.usgs.gov/publication/ofr02462.

McCurdy, D.E., Garbarino, J.R., and Mullin, A.H., 2008, Interpreting and reporting radiological water-quality data: U.S. Geological Survey Techniques and Methods, book 5, chap. B6, 33 p., https://pubs.er.usgs.gov/publication/tm5B6.

McLain, B.J., 1993, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of chromium in water by graphite furnace atomic absorption spectrophotometry: U.S. Geological Survey Open-File Report 93–449, 16 p., https://pubs.er.usgs.gov/publication/ofr93449.

McNichol, A.P., Gagnon, A.R., Jones, G.A., and Osborne, E.A., 1992, Illumination of a black box—Analysis of gas composition during graphite target preparation: Radiocarbon, v. 34, no. 3, p. 321–329, https://journals.uair.arizona.edu/index.php/radiocarbon/article/view/1471.

McNichol, A.P., Jones, G.A., Hutton, D.L., and Gagnon, A.R., 1994, The rapid preparation of seawater $\sum CO_2$ for radiocarbon analysis at the National Ocean Sciences AMS Facility: Radiocarbon, v. 36, no. 2, p. 237–246, https://journals.uair.arizona.edu/index.php/radiocarbon/article/view/1621/1625.

Munch, J.W., ed., 1995, U.S. Environmental Protection Agency Method 504.1, 1,2-dibromoethane (EDB), 1,2-dibromo-3-chloro-propane (DBCP), and 1,2,3-trichlororpropane (123TCP) in water by microextraction and gas chromatography, revision 1.1—Methods for determination of organic chemicals in drinking water, supp. III, 20 p., http://www.accustandard.com/assets/504_1.pdf.

Okamoto, H.S., Steeber, W.R., Remoy, J., Hill, P., Perera, S.K., eds., 2002, Determination of 1,2,3-trichloropropane in drinking water by purge and trap gas chromatography/mass spectrometry: California Department of Health Services, Division of Drinking Water and Environmental Management, Sanitation and Radiation Laboratories Branch, accessed December 4, 2014, at http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Drinkingwaterlabs/TCPbyPT-GCMS.pdf.

Olsen, L.D., Fram, M.S., and Belitz, Kenneth, 2010, Review of trace-element field-blank data collected for the California Groundwater Ambient Monitoring and Assessment (GAMA) Program, May 2004–January 2008: U.S. Geological Survey Scientific Investigations Report 2009–5220, 47 p., https://pubs.er.usgs.gov/publication/sir20095220.

Patton, C.J., and Kryskalla, J.R., 2003, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Evaluation of alkaline persulfate digestion as an alternative to Kjeldahl digestion for determination of total and dissolved nitrogen and phosphorous in water: U.S. Geological Survey Water-Resources Investigations Report 2003–4174, 33 p., https://pubs.er.usgs.gov/publication/wri034174.

Ray, M.C., Kulongoski, J.T., and Belitz, Kenneth, 2009, Ground-water quality data in the San Francisco Bay study unit, 2007—Results from the California GAMA program: U.S. Geological Survey Data Series 396, 93 p., https://pubs.er.usgs.gov/publication/ds396.

Sandstrom, M.W., Stroppel, M.E., Foreman, W.T., and Schroeder, M.P., 2001, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of moderate-use pesticides and selected degradates in water by C-18 solid-phase extraction and gas chromatography/mass spectrometry: U.S. Geological Survey Water-Resources Investigations Report 2001–4098, 70 p., https://pubs.er.usgs.gov/publication/wri20014098.

Schneider, R.J., Jones, G.A., McNichol, A.P., von Reden, K.F., Elder, K.A., Huang, K., and Kessel, E.D., 1994, Methods for data screening, flagging, and error analysis at the National Ocean Sciences AMS Facility: Nuclear Instruments and Methods in Physics Research, book 92, p. 172–175.

Thatcher, L.L., Janzer, V.J., and Edwards, K.W., 1977, Methods for the determination of radioactive substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, book 5, chap. A5, 95 p., https://pubs.er.usgs.gov/publication/twri05A5.

Timme, P.J., 1995, National Water Quality Laboratory, 1995 services catalog: U.S. Geological Survey Open-File Report 95–352, 120 p., https://pubs.er.usgs.gov/publication/ofr95352.

U.S. Environmental Protection Agency, 1995, Method 524.2—Measurement of purgeable organic compounds in water by capillary column gas chromatography/mass spectrometry: U.S. Environmental Protection Agency EPA/600/R–95–131, available at http://www.nemi.gov/.

U.S. Environmental Protection Agency, 2002, Guidelines for establishing procedures for the analysis of pollutants: U.S. Code of Federal Regulations, Title 40, 136 p.

U.S. Environmental Protection Agency, 2005, Method 331.0—Determination of perchlorate in drinking water by liquid chromatography electrospray ionization mass spectrometry (Revision 1.0, January 2005): Office of Ground Water and Drinking Water, EPA Document # 815–R–05–007, 34 p., accessed June 3, 2015, at https://nepis.epa.gov/Exe/ZyNET.exe/901U0000.TXT?ZyActionD=ZyDocument&Client=EPA&Index=2000+Thru+2005&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C00thru05%5CTxt%5C00000012%5C901U0000.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL.

U.S. Geological Survey, variously dated, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A1–A9, accessed June 3, 2015, at http://water.usgs.gov/owq/FieldManual/.

Vogel, J.S., Nelson, D.E., and Southon, J.R., 1987, ^{14}C background levels in an accelerator mass spectrometry system: Radiocarbon, v. 29, no. 3, p. 323–333, https://journals.uair.arizona.edu/index.php/radiocarbon/article/view/1055/1060.

Zaugg, S.D., Sandstrom, M.W., Smith, S.G., and Fehlberg, K.M., 1995, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of pesticides in water by C–18 solid-phase extraction and capillary-column gas chromatography/mass spectrometry with selected-ion monitoring: U.S. Geological Survey Open-File Report 95–181, 49 p., https://pubs.er.usgs.gov/publication/ofr95181.

Table A–1. Analytical methods used by the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) and contract laboratories.

[Laboratory entity codes in the USGS National Water Information System (NWIS) for laboratories other than the USGS NWQL are given in parentheses after the laboratory names.
Abbreviations: EPA, U.S. Environmental Protection Agency; VOC, volatile organic compound; δ, delta notation, the ratio of a heavier isotope of an element (^{i}E) to the more common lighter isotope of that element, relative to a standard reference material, expressed as per mil]

Constituent	Analytical method	Laboratory and analytical schedule	Citation(s)
		Water-quality indicators	
Field parameters	Calibrated field meters and test kits	USGS field measurement	U.S. Geological Survey, variously dated
		Organic constituents	
VOCs	Purge and trap capillary gas chromatography/mass spectrometry	NWQL, Schedule 2020	U.S. Environmental Protection Agency, 1995; Connor and others, 1998
Low level 1,2-dibromo-3-chloropropane (DBCP) and 1,2-dibromoethane (EDB)	Microextraction and gas chromatography	NWQL, Schedule 1306	Munch, 1995 (EPA method 504.1)
Pesticides and pesticide degradates	Solid-phase extraction and gas chromatography/mass spectrometry	NWQL, Schedules 2003 and 2033	Zaugg and others, 1995; Lindley and others, 1996; Sandstrom and others, 2001; Madsen and others, 2003
		Constituents of special interest	
Perchlorate (on unfiltered samples)	Chromatography and mass spectrometry	Montgomery Watson Harza Laboratory, Monrovia, California	Hautman and others, 1999
Perchlorate (on filtered samples)	Liquid chromatography with mass spectrometry/mass spectrometry (EPA Method 331.0)	Weck Laboratories, Inc., Industry, California, standard operating procedure ORG099.R01	U.S. Environmental Protection Agency, 2005
1,2,3-Trichloropropane	Purge and trap gas chromatography/ mass spectrometry	Weck Laboratories, Inc., Industry, California, SRL 524M-TCP	Okamato and others, 2002
		Inorganic constituents	
Nutrients	Alkaline persulfate digestion, Kjedahl digestion	NWQL, Schedule 2755	Fishman, 1993; Patton and Kryskalla, 2003
Major ions and trace elements	Atomic absorption spectrometry, colorimetry, ion-exchange chromatography, inductively-coupled plasma atomic-emission spectrometry and mass spectrometry	NWQL, Schedule 1948	Fishman and Friedman, 1989; Faires, 1993; Fishman, 1993; McLain, 1993; American Public Health Association, 1998; Garbarino, 1999; Garbarino and others, 2006
		Isotopic tracers	
Stable isotopes of hydrogen ($\delta^{2}H$) and oxygen ($\delta^{18}O$) of water	Gaseous hydrogen and carbon dioxide–water equilibration and stable-isotope mass spectrometry	USGS Stable Isotope Laboratory, Reston, Virginia (USGSSIVA), NWQL Schedule 1142	Epstein and Mayeda, 1953; Coplen and others, 1991; Coplen, 1994
$\delta^{13}C$ of dissolved inorganic carbon and carbon-14 abundance	Accelerator mass spectrometry	Woods Hole Oceanographic Institution, National Ocean Sciences Accelerator Mass Spectrometry Facility (NOSAMS), Woods Hole, Massachusetts (MA-WHAMS), NWQL Schedule 2255	Vogel and others, 1987; Donahue and others, 1990; McNichol and others, 1992; Gagnon and Jones, 1993; McNichol and others, 1994; Schneider and others, 1994
Tritium	Electrolytic enrichment-liquid scintillation	USGS Stable Isotope and Tritium Laboratory, Menlo Park, California (USGSH3CA)	Thatcher and others, 1977

Table A–2. Preferred analytical methods or laboratories for selected constituents during the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[Preferred analytical schedules are generally the methods of analysis with the greatest accuracy and precision out of the ones used for the constituent in question. U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) analytical schedules are referred to by number. **Abbreviations**: field, analysis performed by field crew upon sample collection; MWH, Montgomery Watson Harza Laboratories; np, no preference; VOC, volatile organic compound; Weck, Weck Laboratories, Inc.]

Constituent	Primary constituent classification	Preferred analytical method	Secondary analytical method
Duplicate analyses performed by two different analytical schedules at the NWQL			
1,2-Dibromo-3-chloropropane (DBCP)	VOC, fumigant	1306	2020
1,2-Dibromoethane (EDB)	VOC, fumigant	1306	2020
Duplicate analyses performed by USGS field personnel and NWQL			
pH	Water-quality indicator	field	1948
Specific conductance	Water-quality indicator	field	1948
Alkalinity	Water-quality indicator	field	1948
Bicarbonate[1]	Major ion	field	1948
Carbonate[1]	Major ion	field	1948
Duplicate analyses performed by Weck and NWQL			
1,2,3-Trichloropropane (1,2,3-TCP)	Constituent of special interest	Weck	2020
Duplicate analyses performed by Weck and MWH			
Perchlorate	Constituent of special interest	np[2]	np[2]

[1]Bicarbonate and carbonate concentrations were calculated from the laboratory alkalinity and pH values using the advanced speciation method (http://or.water.usgs.gov/alk/methods.html) with $pK_1 = 6.35$, $pK_2 = 10.33$, and $pK_w = 14$.

[2]Analyses were performed by MWH prior to October 1, 2007, and by Weck as of August 15, 2007. Samples were analyzed by both laboratories for a comparison study from August 15, 2007, to September 30, 2007.

Table A–3. Constituents detected in blanks collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units and constituents for which study reporting levels were established by the GAMA Program.

[E, estimated or having a high degree of uncertainty; IRL, interim reporting level; LRL, laboratory reporting level; LT-MDL, long-term method detection level; nc, not collected; SRL, study reporting level; —, not detected; µg/L, micrograms per liter]

Constituent	Field blanks (detections/blanks)	Source-solution blanks (detections/blanks)	IRL/LRL/ LT-MDL[1]	Concentrations or range of concentrations detected in blanks during the trend sampling period	SRL	Number of trend samples less than or equal to coded/total number of detections during the trend sampling period
Volatile organic compounds (µg/L)						
Acetone	0/8	0/3	4	—	all data reviewed and rejected[2]	1/1
1,1-Dichloroethene (1,1-DCE)	1/8	0/3	0.022	0.023	[3]0.023	0/2
Perchloroethene (PCE, Tetrachloroethene)	1/8	0/3	0.026	0.05	[3]0.05	5/9
Tetrahydrofuran	0/8	0/3	1.4	—	all data reviewed and rejected[2]	1/1
1,2,4-Trimethylbenzene	0/8	1/3	0.04	E0.04	[2]0.56	4/4
Toluene	0/8	0/3	0.02	—	[2]0.69	2/2
Carbon disulfide	1/8	0/3	0.1	E0.03	[3]0.03	0/0
Trace elements (µg/L)						
Boron[4]	2/7	nc	2.8	31.21–32.46	none[4]	0/67
Chromium	2/7	nc	0.12	0.17–0.20	[3]0.20	16/55
Cobalt	5/7	nc	0.8	0.05–1.1	all data reviewed and rejected[5]	52/52
Copper	1/7	nc	6	1.5	[5]2.1	21/51
Iron	3/7	nc	6	0.04–3.38	[6]6	10/46
Lead	3/7	nc	0.44	0.023–0.11	[5]0.82	59/72
Lithium	2/7	nc	0.44	0.33–0.41	[3]0.41	7/70
Manganese	3/7	nc	0.26	0.193–0.399	[5]0.66	18/53
Zinc	1/7	nc	1.4	3.2	[5]6.2	30/65

[1]Maximum (or only) LRL/IRL/LT–MDL used during the trend sampling period.

[2]The SRL was from Fram and others (2012).

[3]The SRL was based on highest concentration in blanks during the trend sampling period.

[4]Boron was detected in two blanks, but it was determined that the blank water was contaminated, therefore, no SRL was established on the basis of these detections (Davis and others, 2014).

[5]The SRL was from Davis and others (2014).

[6]The SRL was from Olsen and others (2010).

Table A–4*A*. Quality-control summary for replicate analyses of organic constituents and constituents of special interest in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[Constituents for which all replicate pairs were non-detections are not listed. **Abbreviations**: RL, reporting level]

Constituent	Number of replicates performed	Result categories considered to be within acceptable agreement			Result categories not considered to be within acceptable agreement		
		Number of replicate pairs for which both samples were non-detections[1]	Number of replicate pairs for which both samples were detections and their concentrations were within acceptable agreement[4]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration less than RL[2]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration greater than or equal to RL[3]	Number of replicate pairs for which both samples were detections and their concentrations were not within acceptable agreement[4]	Paired concentrations of replicates not within acceptable agreement[3,4]
Volatile organic compounds (VOCs)							
Chloroform (Trichloromethane)	6	4	2	0	0	0	none
cis-1,2-Dichloroethene	6	5	1	0	0	0	none
1,1-Dichloroethene	6	5	0	1	0	0	none
Tetrachloroethene (PCE)	6	5	1	0	0	0	none
Tetrachloromethane	6	5	1	0	0	0	none
Trichloroethene	6	5	1	0	0	0	none
Pesticides and pesticide degradates							
Atrazine	6	5	0	1	0	0	none
Simazine	6	5	1	0	0	0	none
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine)	6	5	1	0	0	0	none
Constituents of special interest							
Perchlorate	7	5	2	0	0	0	none

[1]When the constituent was not detected in either sample of the replicate, agreement was considered acceptable.

[2]When the constituent was not detected in one of the two samples making up the replicate and was detected at a concentration less than the RL in the other sample, agreement was considered acceptable.

[3]When the constituent was not detected in one of the two samples making up the replicate and was detected at a concentration greater than or equal to the RL in the other sample, agreement was considered unacceptable.

[4]In order for two detected concentrations of the samples making up a replicate to be considered within acceptable agreement, one of the following two criteria must be met: (1) for sample concentrations less than 5 times the RL for the constituent in question, the standard deviation for the two sample concentrations must be less than one half of the RL, and (2) for sample concentrations greater than or equal to 5 times the RL, the relative standard deviation must be less than 10 percent.

Table A–4*B*. Quality-control summary for replicate analyses of inorganic constituents in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[Constituents for which all replicate pairs were non-detections are not listed. **Abbreviations**: H, hydrogen; O, oxygen; RL, reporting level; +, plus; <, less than; ≤, less than or equal to; δ, delta]

Constituent	Number of replicate analyses performed	Result categories considered to be within acceptable agreement			Result categories not considered to be within acceptable agreement		
		Number of replicate pairs for which both samples were non-detections[1]	Number of replicate pairs for which both samples were detections and their concentrations were within acceptable agreement[4]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration less than RL[2]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration greater than or equal to RL[3]	Number of replicate pairs for which both samples were detections and their concentrations were not within acceptable agreement[4]	Paired concentrations of replicates not within acceptable agreement[3,4]
Trace elements							
Antimony	6	1	6	0	0	0	none
Arsenic	6	1	6	0	0	0	none
Barium	6	0	6	0	0	0	none
Beryllium	6	4	2	0	0	0	none
Boron	6	0	6	0	0	0	none
Cadmium	6	3	3	0	0	0	none
Chromium	6	0	6	0	0	0	none
Copper	6	5	1	0	0	0	none
Iron	6	3	2	0	1	0	<3.2, ≤3.4
Lead	6	0	6	0	0	0	none
Lithium	6	0	6	0	0	0	none
Manganese	6	2	4	0	0	0	none
Molybdenum	6	0	6	0	0	0	none
Nickel	6	3	3	0	0	0	none
Selenium	6	2	4	0	0	0	none
Silver	6	4	2	0	0	0	none
Strontium	6	2	4	0	0	0	none
Thallium	4	3	0	1	0	0	none
Tungsten	3	1	2	0	0	0	none
Uranium	3	0	3	0	0	0	none
Vanadium	5	0	4	0	1	0	<1.4, 1.43
Zinc	5	1	3	0	1	0	<1.4, 1.45

Table A–4*B*. Quality-control summary for replicate analyses of inorganic constituents in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[Constituents for which all replicate pairs were non-detections are not listed. **Abbreviations**: H, hydrogen; O, oxygen; RL, reporting level; +, plus; <, less than; ≤, less than or equal to; δ, delta]

Constituent	Number of replicate analyses performed	Result categories considered to be within acceptable agreement			Result categories not considered to be within acceptable agreement		
		Number of replicate pairs for which both samples were non-detections[1]	Number of replicate pairs for which both samples were detections and their concentrations were within acceptable agreement[4]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration less than RL[2]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration greater than or equal to RL[3]	Number of replicate pairs for which both samples were detections and their concentrations were not within acceptable agreement[4]	Paired concentrations of replicates not within acceptable agreement[3,4]
Nutrients							
Ammonia (as nitrogen)	7	3	3	1	0	0	none
Nitrate (as nitrogen)[5]	7	2	5	0	0	0	none
Nitrite (as nitrogen)	7	2	4	1	0	0	none
Total nitrogen (ammonia + nitrite + nitrate + organic nitrogen)	6	2	4	0	0	0	none
Phosphate, orthophosphate (as phosphorus)	7	1	5	1	0	0	none
Major ions, silica, and total dissolved solids (TDS)							
Bromide	6	2	4	0	0	0	none
Calcium	6	0	6	0	0	0	none
Chloride	6	1	5	0	0	0	none
Fluoride	6	1	5	0	0	0	none
Iodide	6	3	3	0	0	0	none
Magnesium	6	0	6	0	0	0	none
Potassium	6	0	6	0	0	0	none
Sodium	6	0	6	0	0	0	none
Sulfate	6	0	6	0	0	0	none
Silica (as SiO_2)	6	0	6	0	0	0	none
TDS	6	1	5	0	0	0	none

Table A–4*B*. Quality-control summary for replicate analyses of inorganic constituents in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[Constituents for which all replicate pairs were non-detections are not listed. **Abbreviations**: H, hydrogen; O, oxygen; RL, reporting level; +, plus; <, less than; ≤, less than or equal to; δ, delta]

Constituent	Number of replicate analyses performed	Result categories considered to be within acceptable agreement			Result categories not considered to be within acceptable agreement		
		Number of replicate pairs for which both samples were non-detections[1]	Number of replicate pairs for which both samples were detections and their concentrations were within acceptable agreement[4]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration less than RL[2]	Number of replicate pairs for which one sample was a non-detection and the other sample a detection at a concentration greater than or equal to RL[3]	Number of replicate pairs for which both samples were detections and their concentrations were not within acceptable agreement[4]	Paired concentrations of replicates not within acceptable agreement[3,4]
Isotopic tracers							
δ^2H of water	7	0	7	0	0	0	none
δ^{18}O of water	7	0	7	0	0	0	none
Tritium	6	1	3	1	0	1	–0.01, 0.16
δ^{13}C of dissolved carbonates	5	0	5	0	0	0	none
Carbon-14 (percent modern carbon)	5	0	5	0	0	0	none

[1]When the constituent was not detected in either sample of the replicate, agreement was considered acceptable.

[2]When the constituent was not detected in one of the two samples making up the replicate and was detected at a concentration less than the RL in the other sample, agreement was considered acceptable.

[3]When the constituent was not detected in one of the two samples making up the replicate and was detected at a concentration greater than or equal to the RL in the other sample, agreement was considered unacceptable.

[4]In order for two detected concentrations of the samples of a replicate pair to be considered within acceptable agreement, one of the following two criteria must be met: (1) For sample concentrations less than 5 times the RL for the constituent, the standard deviation for the two sample concentrations must be less than one-half the RL, and (2) for sample concentrations greater than or equal to 5 times the RL, the relative standard deviation must be less than 10 percent. Tritium replicates were considered to be within acceptable agreement if the difference between the two sample activities was less than the sample-specific combined standard uncertainty of each sample.

[5]Nitrite plus nitrate (as nitrogen) was referred to as nitrate because sample concentrations nearly consist entirely of nitrate.

Table A–5*A*. Quality-control summary for U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) volatile organic compound (VOC) Schedule 2020 matrix-spike recoveries in spiked samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[Acceptable recovery range is between 70 and 130 percent.]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Acetone	9	88	11,516	131
Acrylonitrile	9	95	2,482	117
tert-Amyl methyl ether (TAME)	9	81	180	106
Benzene	9	82	116	101
Bromobenzene	9	74	112	92
Bromochloromethane	9	89	184	108
Bromodichloromethane	9	83	131	100
Bromoform (Tribromomethane)	9	84	303	103
Bromomethane (Methyl bromide)	9	90	549	116
n-Butylbenzene	9	75	228	91
sec-Butylbenzene	9	81	114	96
tert-Butylbenzene	9	81	185	101
Carbon disulfide	9	76	101	95
Carbon tetrachloride (Tetrachloromethane)[1]	9	89	150	103
Chlorobenzene[1]	9	76	109	93
Chloroethane	9	91	213	111
Chloroform (Trichloromethane)[1]	9	88	114	97
Chloromethane	9	94	415	115
3-Chloropropene	9	90	242	108
2-Chlorotoluene	9	88	116	102
4-Chlorotoluene	9	84	117	96
Dibromochloromethane	9	88	325	104
1,2-Dibromo-3-chloropropane (DBCP)	9	81	1,031	108
1,2-Dibromoethane (EDB)	9	85	143	102
Dibromomethane	9	86	137	105
1,2-Dichlorobenzene	9	79	126	109
1,3-Dichlorobenzene	9	77	113	99
1,4-Dichlorobenzene[1]	9	80	116	102
trans-1,4-Dichloro-2-butene	9	79	1,632	110
Dichlorodifluoromethane (CFC-12)[1]	9	70	269	115
1,1-Dichloroethane (1,1-DCA)[1]	9	92	122	107
1,2-Dichloroethane (1,2-DCA)	9	96	261	108
1,1-Dichloroethene (1,1-DCE)[1]	9	20	119	103
cis-1,2-Dichloroethene (*cis*-1,2-DCE)[1]	9	94	111	99
trans-1,2-Dichloroethene (*trans*-1,2-DCE)	9	77	115	104
1,2-Dichloropropane	9	89	105	99
1,3-Dichloropropane	9	93	246	104
2,2-Dichloropropane	9	84	157	99
1,1-Dichloropropene	9	78	103	90
cis-1,3-Dichloropropene	9	87	203	103
trans-1,3-Dichloropropene	9	86	297	93
Diethyl ether	9	89	183	111
Diisopropyl ether (DIPE)	9	89	183	111
Ethylbenzene	9	86	107	88
Ethyl *tert*-butyl ether (ETBE)	9	84	145	107
Ethyl methacrylate	9	78	449	99
Ethyl methyl ketone (2-butanone)	9	89	3,561	108
o-Ethyl toluene (2-ethyl toluene)	9	78	113	94
Hexachlorobutadiene	9	74	188	95
Hexachloroethane	9	88	380	101
2-Hexanone (*n*-Butyl methyl ketone)	9	85	1,314	101
Iodomethane (Methyl iodide)	9	99	381	121

Table A–5*A*. Quality-control summary for U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) volatile organic compound (VOC) Schedule 2020 matrix-spike recoveries in spiked samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[Acceptable recovery range is between 70 and 130 percent.]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Isopropylbenzene	9	83	105	87
4-Isopropyl-1-methyl benzene (p-isopropyl-toluene)	9	73	172	92
Methyl acrylate	9	91	1,636	107
Methyl acrylonitrile	9	99	912	115
Methyl *tert*-butyl ether (MTBE)	9	81	317	108
Methyl *iso*-butyl ketone (MIBK)	9	84	990	100
Methylene chloride (Dichloro-methane)[1]	9	92	149	109
Methyl methacrylate	9	85	766	98
Naphthalene	9	72	482	93
n-Propylbenzene	9	78	110	87
Styrene	9	75	106	90
1,1,1,2-Tetrachloro-ethane	9	78	116	100
1,1,2,2-Tetrachloro-ethane	9	102	288	84
Tetrachloroethene (PCE, Perchloro-ethene)[1]	9	73	130	102
Tetrahydrofuran[1]	9	75	3,507	119
1,2,3,4-Tetramethyl-benzene	9	72	242	93
1,2,3,5-Tetramethyl-benzene	9	80	254	96
Toluene	9	82	115	99
1,2,3-Trichloro-benzene	9	76	189	112
1,2,4-Trichloro-benzene	9	71	247	96
1,1,1-Trichloro-ethane (1,1,1-TCA)[1]	9	84	117	101
1,1,2-Trichloro-ethane (1,1,2-TCA)	9	86	142	103
Trichloroethene (TCE)[1]	9	76	107	91
Trichlorofluoro-methane (CFC-11)[1]	9	91	206	118
1,2,3-Trichloro-propane (1,2,3-TCP)	9	85	380	105
Trichlorotrifluoro-ethane (CFC-113)[1]	9	58	155	108
1,2,3-Trimethyl-benzene	9	80	195	102
1,2,4-Trimethyl-benzene	9	87	119	100
1,3,5-Trimethyl-benzene	9	81	112	95
Vinyl bromide (Bromoethene)	9	98	368	122
Vinyl chloride (Chloroethene)	9	96	207	115
m- plus *p*-Xylene	9	83	245	97
o-Xylene	9	82	108	89

[1]Constituent detected in groundwater samples.

Table A–5*B*. Quality-control summary for U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) volatile organic compound (VOC) Schedule 1306 matrix-spike recoveries in spiked samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[Acceptable recovery range is between 70 and 130 percent.]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
1,2-Dibromo-3-chloropropane (DBCP)	2	59	77	68
1,2-Dibromoethane (EDB)	2	91	92	92

Table A–5*C*. Quality-control summary for U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) pesticide Schedules 2003 and 2033 matrix-spike recoveries in spiked samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.

[Acceptable recovery range is between 70 and 130 percent.]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Acetochlor	8	12	181	92
Alachlor	8	11	186	95
Atrazine[1]	8	12	200	99
Azinphos-methyl	8	6	115	93
Azinphos-methyl oxon	8	7	106	56
Benfluralin	8	6	148	70
Carbaryl	8	19	171	103
Carbofuran	8	16	170	102
2-Chloro-2,6-diethylacetanilide	8	13	186	92
4-Chloro-2-methylphenol	8	10	120	71
Chlorpyrifos	8	14	196	89
Chlorpyrifos oxon	8	13	74	19
Cyanazine	8	16	173	93
Cyfluthrin	8	4	100	60
λ-Cyhalothrin	8	2	70	46
Cypermethrin	8	4	80	55
DCPA (Dacthal)	8	9	216	103
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine)[1]	8	13	124	68
Desulfinylfipronil	8	15	195	95
Desulfinylfipronil amide	8	4	136	95
Diazinon	8	11	196	93
3,4-Dichloroaniline	8	9	154	83
3,5-Dichloroaniline[1]	8	10	174	95
Dichlorvos	8	8	76	21
Dicrotophos	8	6	42	24
Dieldrin	8	2	189	87
2,6-Diethylaniline	8	10	184	88
Dimethoate	8	8	73	56
Disulfoton	8	7	165	61
Disulfoton sulfone	8	3	156	85
α-Endosulfan	8	0	195	80
Endosulfan sulfate	8	1	163	89
Ethion	8	3	141	73
Ethion monoxon	8	4	145	77
Ethoprophos	8	14	184	90
S-Ethyl-dipropyl-thiocarbamate (EPTC)	8	10	186	94
2-Ethyl-6-methylaniline	8	10	190	90
Fenamiphos	8	5	144	82
Fenamiphos sulfone	8	51	140	82
Fenamiphos sulfoxide	8	1	75	20
Fipronil	8	13	154	87
Fipronil sulfide	8	12	162	87
Fipronil sulfone	8	4	169	80
Fonofos	8	8	186	87
Hexazinone[1]	8	8	78	50
Iprodione	8	5	133	74
Isofenphos	8	16	172	91
Malaoxon	8	14	128	82
Malathion	8	14	170	84
Metalaxyl	8	14	186	98
Methidathion	8	1	159	81
Metolachlor	8	13	186	84
Metribuzin	8	12	171	90
Molinate	8	12	184	94
Myclobutanil	8	6	160	80
1-Naphthol	8	2	106	30
Oxyfluorfen	8	3	137	83
Paraoxon-methyl	8	12	115	54
Parathion-methyl	8	10	149	87
Pendimethalin	8	9	148	83
cis-Permethrin	8	3	95	62
Phorate	8	6	160	65
Phorate oxon	8	10	150	78
Phosmet	8	3	74	22
Phosmet oxon	8	22	60	48
Prometon[1]	8	10	115	92
Prometryn	8	14	199	92
Pronamide	8	11	183	95
Propanil	8	16	174	97
Propargite	8	3	122	74
cis-Propiconazole	8	7	174	108

Table A–5*C*. Quality-control summary for U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) pesticide Schedules 2003 and 2033 matrix-spike recoveries in spiked samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project study units, California.—Continued

[Acceptable recovery range is between 70 and 130 percent.]

Constituent	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
trans-Propiconazole	8	3	163	88
Simazine[1]	8	13	190	93
Tebuthiuron	8	12	203	129
Tefluthrin	8	8	98	45
Terbufos	8	8	171	77
Terbufos oxon sulfone	8	14	104	69
Terbuthylazine	8	13	203	100
Thiobencarb	8	13	189	96
Tribufos	8	17	115	54
Trifluralin	8	5	149	73

[1]Constituent detected in groundwater samples.

Table A–5*D*. Quality-control summary for 1,2,3-trichloropropane matrix-spike recoveries in spiked samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Projects study units, California.

[Acceptable recovery range is between 70 and 130 percent]

Constituent[1]	Number of spike samples	Minimum recovery (percent)	Maximum recovery (percent)	Average recovery (percent)
1,2,3-Trichloropropane (1,2,3-TCP)[2]	2	116	120	118

[1]Matrix spikes were not collected for perchlorate or *N*-Nitrosodimethylamine during the trend sampling period.

[2]Constituent detected in groundwater samples.

Table A–6. Quality-control summary for U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) volatile organic compound (VOC) Schedule 2020 and pesticide Schedule 2033 surrogate recoveries in samples collected for the trend sampling of 12 Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Projects study units, California.

[VOC, volatile organic compound]

Surrogate compound	NWQL analytical schedule	Constituent class analyzed	Number of blank samples analyzed	Median recovery in blank samples (percent)	Number of surrogate recoveries less than 70 percent in blank samples	Number of surrogate recoveries greater than 130 percent in blank samples	Number of groundwater samples analyzed	Median recovery in groundwater samples (percent)	Number of surrogate recoveries less than 70 percent in groundwater samples	Number of surrogate recoveries greater than 130 percent in groundwater samples
1-Bromo-4-fluorobenzene	2020	VOC	10	89	0	0	75	88	0	0
1,2-Dichloroethane-*d*4	2020	VOC	10	118	0	0	75	123	0	19
Toluene-*d*8	2020	VOC	10	94	0	0	75	95	0	0
Diazinon-*d*10	2033	Pesticide	8	91	1	0	75	79	16	1
α-HCH-*d*6	2033	Pesticide	8	97	0	0	75	96	0	0

Publishing support provided by the U.S. Geological Survey
Science Publishing Network, Sacramento Publishing Service Center

For more information concerning the research in this report, contact the

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ISSN 2327-638X (online)
http://dx.doi.org/10.3133/ds1038