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Ground-Water Quality Data in the Southern Sacramento Valley, California, 2005—Results from the California GAMA Program

Data Series 285

U.S. Department of the Interior
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Top photo: Tower Bridge over the Sacramento River in Sacramento, California. (Photo credit: Cathy Munday, USGS)

Bottom photo: Irrigation well in Solano County, California. (Photo credit: Timothy Mathany, USGS)

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Abbreviations and Acronyms

(Clarification or additional information given in parentheses)

CAS	Chemical Abstracts Service (American Chemical Society)
CFC-12	dichlorodifluoromethane
CSU	combined standard uncertainty
DBCP	1,2-dibromo-3-chloropropane
DD	depth dependent
DO	dissolved oxygen
DOC	dissolved organic carbon
FP	flowpath
GAMA	Ground-Water Ambient Monitoring and Assessment (State Water Board)
GC/MS	gas chromatography/mass spectrometry
GIS	geographic information system
HA-L	lifetime health advisory (USEPA)
ICP-MS	inductively coupled plasma mass spectrometry
ID	identification
LRL	laboratory reporting level
LT-MDL	long-term method detection level
MCL	Maximum Contaminant Level (CADHS and USEPA)
MDL	method detection limit
MRL	Minimum Reporting Level
MU	method uncertainty
NAM	North American (study area)
NAWQA	National Water Quality Assessment (USGS)
NDMA	N-Nitrosodimethylamine
NL	notification level (CADHS)
NRP	National Research Program (USGS)
NWIS	National Water Information System (USGS)
PCE	tetrachloroethylene
QC	quality control
QPC	Uplands (Quaternary Pleistocene semiconsolidated deposits; study area)
RSD	relative standard deviation
RSD5	risk-specific dose at a cancer risk level of 1 in 100,000 or 10E–5 (USEPA)
SAM	South American (study area)
SC	specific conductance
SMCL	Secondary Maximum Contaminant Level (CA and USEPA)
SOL	Solano (study area)
SSMDC	sample-specific minimum detectable concentration
SUI	Suisun–Fairfield (study area)
TCE	trichloroethylene
1,2,3-TCP	1,2,3-trichloropropane
TDS	total dissolved solids
THM	trihalomethane
TIOC	tentatively identified organic compound
UV-VIS	ultraviolet-visible
VOC	volatile organic compound
YOL	Yolo (study area)

Organizations

CADHS	California Department of Health Services (as of July 1, 2007, name changed to California Department of Public Health)
CADWR	California Department of Water Resources
CWSC	California Water Science Center (USGS)
LLNL	Lawrence Livermore National Laboratory
NIST	National Institute of Standards and Technology
NWQL	National Water Quality Laboratory (USGS)
RSIL	Reston Stable Isotope Laboratory (USGS)
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

Note: In this report, the California State Water Resources Control Board is referred to in its abbreviated form as the "State Water Board." The initialism "SWB" is not used in the text.

Units of Measurement

ft	foot (feet)
in.	inch
kg	kilogram (10^3 grams)
km^2	square kilometer
lb	pound
L	liter
mg	milligram (10^{-3} gram)
mg/L	milligram per liter (10^{-3} grams per liter)
mi^2	square miles
mL	milliliter (10^{-3} liter)
µg/L	microgram per liter (10^{-6} grams per liter)
µL	microliter (10^{-6} liter)
µm	micrometer (10^{-6} meter)
pCi/L	picocurie per liter
pCi/µg	picocurie per microgram

Notes

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

$$°F = (1.8 \times °C) + 32$$

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).

Altitude, as used in this report, refers to distance above the vertical datum.

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

Concentrations of chemical constituents in water were given either in milligrams per liter (mg/L) or micrograms per liter (μg/L). One thousand micrograms per liter is equivalent to 1 milligram per liter. Milligrams per liter is equivalent to parts per million (ppm) and micrograms per liter is equivalent to parts per billion (ppb).

In this report, the USEPA designation for "lifetime health advisory" is "HA-L," to avoid possible confusion with USEPA's Health Advisory Level (HAL), which is a nonregulatory health-based reference level of chemical traces (usually in ppm) in drinking water at which there are no adverse health risks when ingested over various periods of time. It is an estimate of acceptable drinking-water concentrations and provides guidance to water-supply managers. HA-L represents the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure. The HA-L assumes consumption of 2 liters of water per day over a 70-year lifetime by a 70-kilogram (154 pound) adult, and that 20 percent of exposure comes from drinking water. Only the HA-L is used in this report.

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Ground-Water Quality Data in the Southern Sacramento Valley, California, 2005—Results from the California GAMA Program

By Barbara J. Milby Dawson, George L. Bennett V, and Kenneth Belitz

Abstract

Ground-water quality in the approximately 2,100 square-mile Southern Sacramento Valley study unit (SSACV) was investigated from March to June 2005 as part of the Statewide Basin Assessment Project of Ground-Water Ambient Monitoring and Assessment (GAMA) Program. This study was designed to provide a spatially unbiased assessment of raw ground-water quality within SSACV, as well as a statistically consistent basis for comparing water quality throughout California. Samples were collected from 83 wells in Placer, Sacramento, Solano, Sutter, and Yolo Counties. Sixty-seven of the wells were selected using a randomized grid-based method to provide statistical representation of the study area. Sixteen of the wells were sampled to evaluate changes in water chemistry along ground-water flow paths. Four additional samples were collected at one of the wells to evaluate water-quality changes with depth.

The GAMA Statewide Basin Assessment project was developed in response to the Ground-Water Quality Monitoring Act of 2001 and is being conducted by the California State Water Resources Control Board (SWRCB) in collaboration with the U.S. Geological Survey (USGS) and the Lawrence Livermore National Laboratory (LLNL).

The ground-water samples were analyzed for a large number of man-made organic constituents (volatile organic compounds [VOCs], pesticides and pesticide degradates, pharmaceutical compounds, and wastewater-indicator constituents), constituents of special interest (perchlorate, *N*-nitrosodimethylamine [NDMA], and 1,2,3-trichloropropane [1,2,3-TCP]), naturally occurring inorganic constituents (nutrients, major and minor ions, and trace elements), radioactive constituents, and microbial indicators. Naturally occurring isotopes (tritium, and carbon-14, and stable isotopes of hydrogen, oxygen, and carbon), and dissolved noble gases also were measured to help identify the source and age of the sampled ground water.

Quality-control samples (blanks, replicates, matrix spikes) were collected at ten percent of the wells, and the results for these samples were used to evaluate the quality of the data for the ground-water samples. Assessment of the quality-control data resulted in censoring of less than 0.03 percent of the analyses of ground-water samples.

This study did not evaluate the quality of water delivered to consumers; after withdrawal from the ground, water typically is treated, disinfected, and (or) blended with other waters to maintain acceptable water quality. Regulatory thresholds apply to treated water that is served to the consumer, not to raw ground water. However, to provide some context for the results, concentrations of constituents measured in the raw ground water were compared with health-based thresholds established by the U.S. Environmental Protection Agency (USEPA) and California Department of Health Services (CADHS) (Maximum Contaminant Levels [MCLs], notification levels [NLs], or lifetime health advisories [HA-Ls]) and thresholds established for aesthetic concerns (Secondary Maximum Contaminant Levels [SMCLs]).

All wells were sampled for organic constituents and selected general water quality parameters; subsets of wells were sampled for inorganic constituents, nutrients, and radioactive constituents. Volatile organic compounds were detected in 49 out of 83 wells sampled and pesticides were detected in 35 out of 82 wells; all detections were below health-based thresholds, with the exception of 1 detection of 1,2,3-trichloropropane above a NL. Of the 43 wells sampled for trace elements, 27 had no detections of a trace element above a health-based threshold and 16 had at least one detection above. Of the 18 trace elements with health-based thresholds, 3 (arsenic, barium, and boron) were detected at concentrations higher an MCL. Of the 43 wells sampled for nitrate, only 1 well had a detection above the MCL. Twenty wells were sampled for radioactive constituents; only 1 (radon-222) was measured at activities higher than the proposed MCL. Radon-222 was detected below the threshold in 7 wells and above the threshold in 13 wells.

SMCLs have been established for nine constituents or parameters analyzed in SSACV. Six were measured at levels higher than an SMCL: chloride, iron, manganese, pH, specific conductance, and total dissolved solids. Chloride, iron, manganese, pH, and total dissolved solids were measured in 43 wells: 27 wells had no measurements above a threshold and 16 wells had a measurement above a threshold. Specific conductance was measured in 83 wells. In 68 wells, specific conductance was measured lower than the threshold and in 15 wells it was measured above the threshold

Introduction

The U.S. Geological Survey (USGS) is collaborating with the California State Water Resources Control Board (hereinafter, referred to in its abbreviated form as the State Water Board), and partnering with the California Department of Health Services (CADHS) and Lawrence Livermore National Laboratory (LLNL), in the implementation of the GAMA Program. The GAMA Program was developed in response to the Ground-Water Quality Monitoring Act of 2001 (Sections 10780-10782.3 of the Water Code) and addresses a growing concern about ground-water quality throughout the state of California. The program has three main objectives: (1) status—assess the current quality of the ground-water resource; (2) trends—detect changes in ground-water quality; and (3) understanding—identify the natural and human factors affecting ground-water quality (Kulongoski and Belitz, 2004).

To achieve the program goals, the USGS developed a systematic approach to sampling (Belitz and others, 2003, http://water.usgs.gov/pubs/wri/wri034166/) that will provide a comprehensive, unbiased, spatially distributed assessment of statewide ground-water quality. This was achieved through the development of a randomized well-selection routine within a grid framework that covers distinct study areas. Samples collected by the GAMA Program must be representative of the wide range of geologic, hydrologic, and climatic conditions found within the state of California (Belitz and others, 2003). On the basis of these conditions, the state has been separated into 10 hydrogeologic provinces (fig. 1), each with its own distinct physical and geographic characteristics. Each province contains ground-water basins primarily composed of unconsolidated deposits of alluvial or volcanic origin (California Department of Water Resources, 2003). Eighty percent of public-supply wells in the state of California were located within ground-water basins, whereas the other 20 percent were located in relatively low permeability hard rock areas. The GAMA Program will provide a full assessment of the quality of ground-water used for drinking-water supply within each area of the state. Analysis of a broad suite of chemical constituents at detection levels lower than those currently required by CADHS will result in a database that can aid in the early identification and understanding of contamination issues throughout the state.

Purpose and Scope

The purpose of this report is to present the analytical results and quality-control (QC) analyses for organic, inorganic, and microbial constituents, and general water-quality parameters for ground-water samples collected from 83 wells in the Southern Sacramento Valley GAMA study unit (figs. 2 and 3). A total of 87 samples were collected from public-supply, domestic, irrigation, and monitoring wells. Sampled wells were located in Placer, Sacramento, Solano, Sutter, and Yolo counties, and water samples were collected between March 2005 and June 2005 (fig. 3). General water-quality parameters measured included alkalinity, dissolved oxygen (DO), pH, specific conductance (SC), and water temperature. Chemical constituents analyzed included 88 volatile organic compounds (VOCs), 118 pesticides, 5 nutrients, dissolved organic carbon (DOC), 9 major ions, 25 trace elements, 4 constituents of special interest (N-nitrosodimethylamine [NDMA], 1,2,3-trichloropropane, chromium(VI), and perchlorate), 8 isotopic constituents, 5 dissolved noble gases, and the microbial constituents coliform and coliphage. Detections of regulated constituents in samples collected for this program do not represent the quality of water delivered to consumers; after withdrawal from the ground, water typically is treated, disinfected, and (or) blended with other waters to maintain water quality. Regulatory thresholds apply to treated water, not to raw ground water.

Acknowledgments

The authors want to thank the State Water Board who funded and supported this study. We thank the following partners for their support: California Department of Health Services, California Department of Water Resources, and Lawrence Livermore National Laboratory. We also thank the well owners and water purveyors for their generosity in allowing the USGS to collect samples from their wells.

Figure 1. Hydrogeologic provinces of California and the location of the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

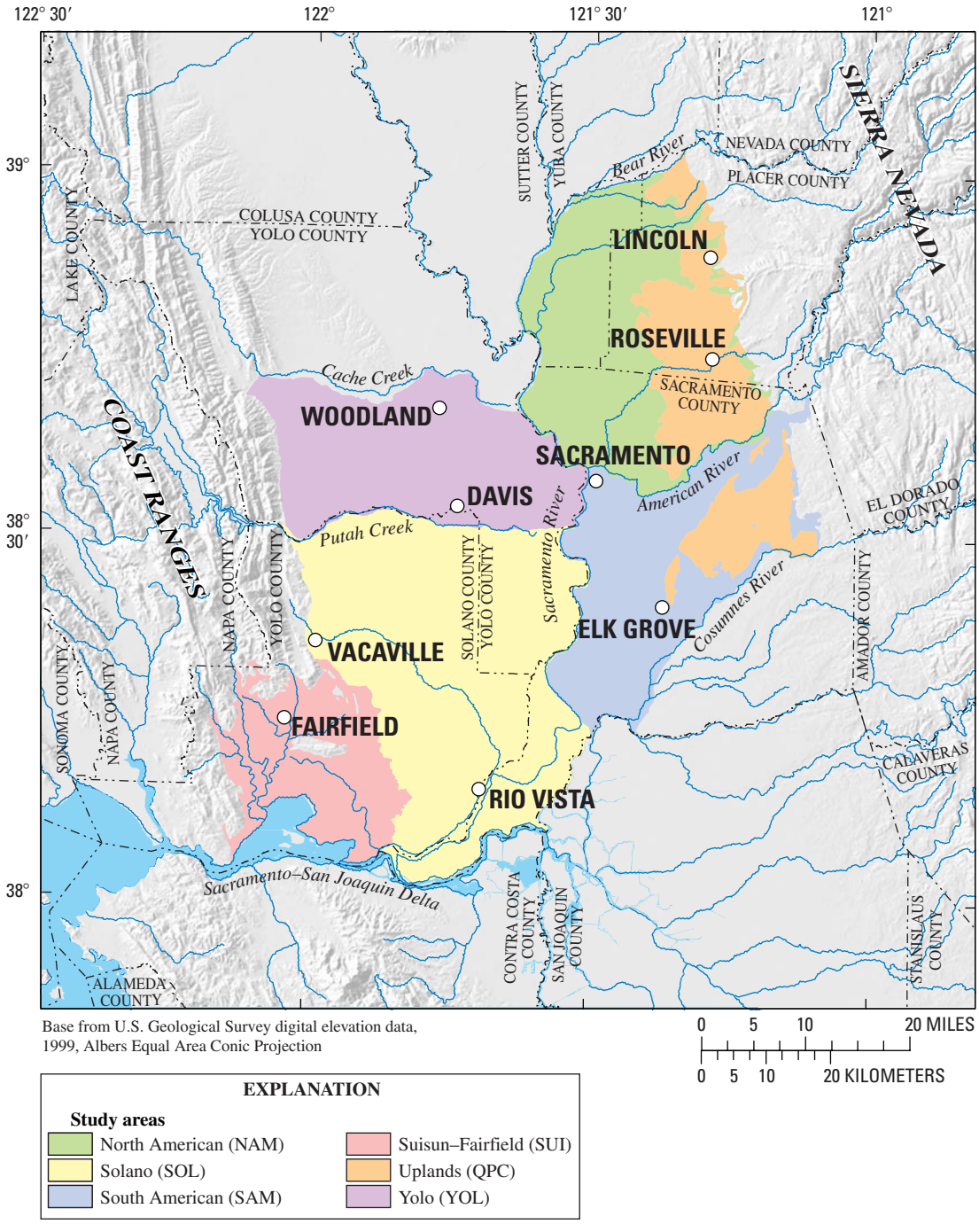

Figure 2. Locations of the six study areas in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

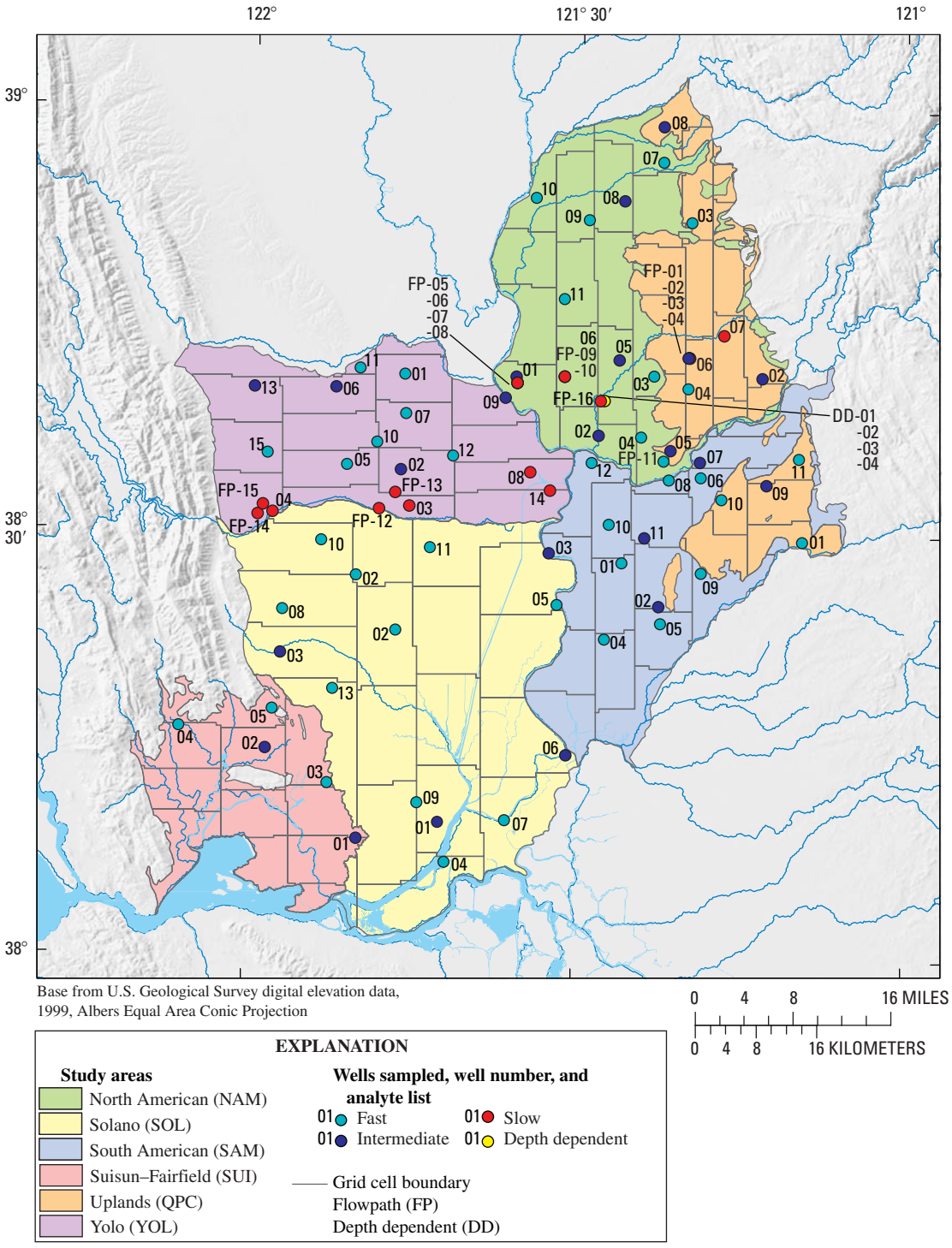

Figure 3. Study areas, location of wells sampled, well numbers, and distribution of study area grid cells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

Hydrogeologic Setting of the Southern Sacramento Valley Study Unit

The Southern Sacramento Valley GAMA study unit lies within the Central Valley and partly within the North Coast Ranges hydrogeologic provinces described by Belitz and others (2003) (fig. 1). The Southern Sacramento Valley GAMA study unit covers an area of approximately 2,100 mi^2 and includes parts of Placer, Sacramento, Solano, Sutter, and Yolo counties (fig. 2). The study unit is bounded to the west by the Northern Coast Ranges, to the east by the Sierra Nevada, to the north by the central Sacramento Valley, and to the south by the Sacramento–San Joaquin Delta and the San Joaquin Valley. For the purposes of this report, the Southern Sacramento Valley GAMA study unit has been divided into six study areas: North American (NAM), South American (SAM), Solano (SOL), Yolo (YOL), Suisun–Fairfield (SUI), and the Uplands (or QPC for "Quaternary Pleistocene Semiconsolidated Deposits), which includes portions of both the NAM and SAM subbasins as defined by the California Department of Water Resources (DWR; fig. 2). Four subbasins within the Sacramento Valley ground-water basin, as defined by DWR, were used to locate four of the study areas: the North American subbasin, the South American subbasin, the Solano subbasin, and the Yolo subbasin. A fifth study area includes the uplands area on the eastern sides of the North and South American subbasins. The sixth study area is the DWR-defined Suisun–Fairfield ground-water basin.

The Southern Sacramento Valley GAMA study unit has a Mediterranean climate with hot, dry summers and wet, mild winters (Blair and Fite, 1957, p. 323). Average annual rainfall across the study unit ranges from 17 to 23 in. (California Department of Water Resources, 2005a, 2005b, 2005c), with higher amounts on the western and eastern sides of the valley and lower amounts in the central region of the valley. The Southern Sacramento Valley GAMA study unit is drained by several creeks and rivers. The Bear, American, and Cosumnes Rivers, as well as their tributaries, drain the eastern portions of the study unit. These rivers drain directly into the Sacramento River, which flows south and empties into the Sacramento–San Joaquin Delta, or directly into the Delta itself, which discharges its waters to the San Francisco Bay. The west side of the study unit is drained by Putah and Cache Creeks and other smaller tributaries, which also drain into the Sacramento River or the Sacramento–San Joaquin Delta.

North American Study Area

The GAMA boundaries of the NAM study area (fig. 2) are based on the DWR-defined "North American Subbasin," which is described as the aerial extent of unconsolidated to semiconsolidated sedimentary deposits north of the American River, east of the Sacramento River, south of the Bear River, and west of the consolidated bedrock of the Sierra Nevada (California Department of Water Resources, 2005a). For the purposes of this report, the GAMA NAM study area is defined as the aerial extent of the unconsolidated Quaternary age deposits north of the American River and west of the older exposed Pliocene and Pleistocene semiconsolidated deposits that border the consolidated bedrock of the Sierra Nevada. This study area includes parts of Placer, Sacramento, and Sutter counties. The study area is drained by the American, Bear, and Sacramento Rivers. The main water-bearing aquifer units within the NAM study area include the Older Alluvial deposits of the Modesto, Riverbank, and Turlock Lake Formations, flood basin deposits, and the deeper Laguna, Mehrten, and Valley Springs Formations (California Department of Water Resources, 2005a). The Mehrten Formation is a Miocene–Pliocene age volcanic deposit considered to be the oldest fresh water-bearing deposit on the east side of the basin because the older underlying Valley Springs Formation produces only minor amounts of water (California Department of Water Resources, 1967).

South American Study Area

The GAMA-defined boundaries of the SAM study area (fig. 2) closely match those defined by DWR for the "South American Subbasin," which are described as the aerial extent of unconsolidated to semiconsolidated sedimentary deposits south of the American River, east of the Sacramento River, north of the Cosumnes River, and west of the consolidated bedrock of the Sierra Nevada (California Department of Water Resources, 2005a). For the purposes of this report, the GAMA SAM study area is defined as the aerial extent of the unconsolidated Quaternary age deposits north of the American River and west of the older exposed Pliocene and Pleistocene semiconsolidated deposits that border the consolidated bedrock of the Sierra Nevada. The study area is located in Sacramento County. The study area is drained by the American, Cosumnes, and Sacramento Rivers. The main water-bearing aquifer units within the SAM study area include the Older Alluvial deposits of the Modesto and Riverbank Formations, flood basin deposits, and the deeper Laguna, Mehrten, and Valley Springs Formations (California Department of Water Resources, 2005a). The Mehrten Formation is a Miocene–Pliocene age volcanic deposit considered to be the oldest fresh-water-bearing deposit on the east side of the basin (California Department of Water Resources, 1967).

Yolo Study Area

The boundaries of the GAMA YOL study area (fig. 2) match those defined by the DWR for the "Yolo Subbasin" and are described as the aerial extent of unconsolidated to semi-consolidated sedimentary deposits that are bounded by the Coast Ranges to the west, Cache Creek to the north, the Sacramento River to the east, and Putah Creek to the south (California Department of Water Resources, 2005b). This study area lies within Yolo County. The main water-bearing units within the YOL study area are the Red Bluff and Tehama Formations, Older Alluvium, flood basin deposits, and Younger Alluvium, which, when combined, range from a few hundred feet thick near the Coast Ranges to more than 3,000-ft thick near the eastern edge of the YOL study area (Bertoldi and others, 1991).

Solano Study Area

The boundaries of the GAMA SOL study area (fig. 2) match those defined by DWR for the "Solano Subbasin" and are described as the aerial extent of unconsolidated to semiconsolidated sedimentary deposits that are bounded by the Coast Ranges to the west, Putah Creek to the north, the Sacramento River to the east, and the Sacramento–San Joaquin Delta to the south (California Department of Water Resources, 2005b). This study area lies within Solano County. It is drained by Putah Creek and the Sacramento River in addition to smaller creeks and sloughs, which all eventually flow into and become part of the Sacramento–San Joaquin Delta (California Department of Water Resources, 2005b). The main water-bearing units within the SOL study area are the Red Bluff and Tehama Formations, Older Alluvium, flood basin deposits, and Younger Alluvium, which, when combined, range from a few hundred feet thick near the Coast Ranges to more than 3,000-ft thick near the eastern edge of the SOL study area (Bertoldi and others, 1991)

Suisun–Fairfield Study Area

The boundaries of the GAMA SUI study area (fig. 2) match those defined by the DWR for the "Suisun–Fairfield Ground-Water Basin" and are described as the aerial extent of unconsolidated to semiconsolidated sedimentary deposits that are bounded by the Coast Ranges to the west and north, the Sacramento ground-water basin to the east, and the Sacramento–San Joaquin Delta and Suisun Bay to the south (California Department of Water Resources, 2005b). This study area lies within Solano County. Surface drainage flows southward to the Sacramento–San Joaquin Delta and Suisun Bay (California Department of Water Resources, 2005b). The main water-bearing units within the SUI study area are the Sonoma Volcanics, Older Alluvium, flood basin and marsh deposits, and Younger Alluvium, which, when combined, are as much as 1,500-ft thick near the Sacramento–San Joaquin Delta (Thomasson and others, 1960).

Uplands Study Area

The GAMA QPC study area (fig. 2) is defined as those portions of the DWR-defined North and South American ground-water subbasins, which include the surficial extent of the semiconsolidated Pliocene and Pleistocene age deposits west of the consolidated bedrock of the Sierra Nevada. The geologic formations identified within this study area include the Modesto, Riverbank, Victor, Laguna, Mehrten, and Valley Springs (Piper and others, 1939; Olmstead and Davis, 1961; California Department of Water Resources, 1974; and Helley and Harwood, 1985).

Methods

This section discusses the methods used in this study to select wells, collect and analyze ground-water samples, and present the data in this report. The methods used were selected to obtain representative samples of the ground water in the study area and to minimize potential biases to the data.

Well Selection

The primary objectives in the selection of wells for study-area assessments were (1) to attain a sampling density of at least one well per 100 km^2, (2) randomly select at least 10 wells per study area whenever possible, and (3) minimize variability in well type (Gilliom and others, 1995). The objectives were intended to assure an adequate and unbiased assessment of the quality of ground-water resources used for public-supply. In the Southern Sacramento Valley GAMA study unit, public-supply wells were the preferred well type, but in cases where public-supply wells were not available, domestic, irrigation, or monitoring wells were substituted in the selection process. Wells that had available construction information, including well depth, depth of perforations, and date constructed, were selected, when possible, for sampling, but this information was not always available.

Well selection within each study area was based on a grid pattern of equal-area cells (fig. 3; Scott, 1990). A geographic information system (GIS) was used to generate 10 cells in the SUI study area, 15 cells in the NAM, SAM, and QPC study areas, 18 cells in the YOL study area, and 20 cells in the SOL study area. In each cell, wells were randomly assigned a rank. The well with the lowest random rank that met selection criteria (having a sampling point before a storage tank and for which permission could be obtained) was chosen for sampling. Using this method, one randomly ranked well was chosen to occupy each grid cell in each study area (referred to as grid wells). A total of 67 grid wells were sampled. Analytical results from grid wells were statistically representative of ground-water quality in that study area. To enhance the understanding of ground-water movement through the study area, 16 additional wells were selected along two approximate, regional flowpaths across the study area (fig. 3) and were referred to as nongrid or flowpath wells.

Wells were sampled for a "fast," "intermediate," "slow," or "depth dependent" list of analytes (table 1; all tables are shown in back of report). The fast-analyte list was collected at all wells sampled in this study and provides an initial assessment of ground-water quality in the area. Slow-analyte-list wells were selected along ground-water flowpaths and were sampled for all analytes, including those on the fast list. Selected grid wells across the study areas had additional analytes added to their fast list (becoming intermediate-list wells) to add to the data available for understanding ground-water flow. Four depth-dependent samples were collected in one public-supply well near a flowpath and were sampled for a subset of the slow list of analytes. Monitoring wells along the flowpaths were sampled for the slow list, with the exclusion of microbial constituents. Additional wells (nongrid wells) that were sampled were located along flowpaths or in specific locations within the basin and were sampled for slow, intermediate, fast, or depth-dependent lists of analytes.

Samples collected in the six study areas of the Southern Sacramento Valley GAMA study unit were assigned a GAMA identification (GAMA-ID) number that was based on study-area designation and sequence number in the order of sample collection (fig. 3). The samples collected at nongrid wells along ground-water flowpaths were identified by the study area acronym followed by the abbreviation "FP" and a sequence number in order of collection; for example, the first flowpath sample collected from the NAM study area was designated NAMFP-01. Depth-dependent samples collected in one well in the NAM study area were identified by the study acronym followed by the abbreviation "DD" as NAMDD and a sequence number in order of collection.

Table 2 provides the GAMA-ID number and the date of collection for each sample in the Southern Sacramento Valley GAMA study unit. The table also provides the constituent list and well-construction information. Eighty-three public-supply, domestic, irrigation, and monitoring wells were sampled for this study from March 2004 to June 2005; 4 depth-dependent samples were collected from one of the public-supply wells in June 2005. Of the wells sampled, 19 were in the NAM study area, 12 located in the SAM study area, 13 located in the SOL study area, 19 located in the YOL study area, 5 located in the SUI study area, 15 located in the QPC study area.

Field Methods

Ground-water samples were collected from the selected wells using USGS protocols (U.S. Geological Survey, 1999) and the protocols described in Shelton and others (2001), Ball and McClesky (2003a and 2003b), and Eaton and others (2004). Public-supply, domestic, and irrigation wells were sampled with Teflon tubing attached to a sampling point on the well discharge pipe as close to the well as possible using brass and stainless-steel fittings. When a site was sampled on a fast or intermediate list, samples were collected at the sampling point using a foot-long section of Teflon tubing. When a site was sampled on the slow list, Teflon tubing with stainless-steel fittings was connected to the sampling point at the well and conveyed the water to a sampling manifold in a water-quality lab vehicle, where the samples were collected. Monitoring wells were sampled using a portable, stainless-steel submersible pump attached to Teflon tubing with stainless-steel fittings. All equipment was cleaned after each use and stored in plastic bags until used at the next site. At slow-list wells and monitoring wells, field parameters (pH, specific conductance, dissolved oxygen, water temperature, and turbidity) were monitored during purging of the well before sample collection as described in U.S. Geological Survey (1999). At fast- and intermediate-list wells, specific conductance and temperature were measured once before sample collection, as most of the wells sampled on this list were regularly pumped and assumed to be purged at the time of sample collection.

For depth-dependent samples, ground water was pumped to the surface using a gas-displacement, small-diameter sample pump to collect samples at discrete depths within the well bore (Izbicki, 2004). This sampling equipment consisted of two 1/8-in. diameter Teflon tubes bundled together side-by-side to form a single line that was mounted on a motorized reel. Once lowered to the desired depth, compressed ultra-high purity (grade 5) nitrogen gas was used to displace water from one tube into the other while one-way flow valves prevent the displaced water from flowing back toward the sample pump at the lower end of the hose (Izbicki, 2004). Repeatedly pressurizing and depressurizing the lines slowly brought the water to the surface where it was collected following the protocol described for the fast and intermediate schedules. The field parameters measured in depth-dependent samples were pH, specific conductance, and water temperature.

When possible, samples were collected before any type of water-system filtration, or chemical treatment, such as chlorination. At two sites, the sampling point was located after the chlorination point; at one site, the chlorinator was shut off, and samples were collected after free chlorine was measured and found to be nondetectable; and at the other site, samples were preserved with a dechlorinating agent (ascorbic acid) to prevent formation of disinfection by-products in the sample after collection.

Laboratory Methods

Tables 3A–J list the chemical and microbial constituents analyzed for in ground-water samples collected as part of the Southern Sacramento Valley GAMA study unit. These tables also list the USGS parameter code (numerical identifiers for constituents stored in the USGS database), the Chemical Abstracts Service (CAS) number, the reporting level, the high threshold and type of threshold (see following section for more explanation), and an indication as to whether that constituent was detected in ground water in this study.

In addition to the 88 target VOCs that were analyzed in this study, nontarget analytes found during analysis were tentatively identified by searching the National Institute for Standards and Technology (NIST) Library. Tentatively identified organic compounds (TIOCs) were reported as approximate concentrations, and actual concentrations may be an order of magnitude higher or lower (Connor and others, 1998, p. 46)

Table 4 lists the analyte, analytical methods, laboratory at which the analyses were conducted, and method references. The analytical methods used include those developed at the USGS's National Water Quality Laboratory (NWQL), the U.S. Environmental Agency's (USEPA) standard analytical methods, and research methods currently under development.

Data Reporting

The following types of data were reported for this study: analytical results, QC analyses, comparisons with selected high threshold values, and detection frequencies for selected constituents in grid wells.

Reporting Levels

Analytical results reported in this report use laboratory reporting levels (LRLs), long-term method detection levels (LT-MDL), method detection limits (MDLs), Minimum Reporting Levels (MRLs), Method Uncertainties (MUs), and Single Sample Minimum Detectable Counts (SSMDCs). These reporting levels minimize the reporting of false positive results.

MDLs — "Minimum concentration of a substance that can be measured and reported with 99-percent confidence that the analyte concentration is greater than zero. It was determined from the analysis of a sample in a given matrix containing the analyte (U.S. Environmental Protection Agency, 1997). At the MDL concentration, the risk of a false positive is predicted to be less than or equal to 1 percent" (Childress and others, 1999).

LT-MDLs — "A detection level derived by determining the standard deviation of a minimum of 24 MDL spike sample measurements over an extended period of time. LT–MDL data are collected on a continuous basis to assess year-to-year variations in the LT–MDL. The LT–MDL controls false positive error. The chance of falsely reporting a concentration at or greater than the LT–MDL for a sample that did not contain the analyte is predicted to be less than or equal to 1 percent" (Childress and others, 1999).

LRLs — "Generally equal to twice the yearly determined LT-MDL. The LRL controls false negative error. The probability of falsely reporting a non-detection for a sample that contained an analyte at a concentration equal to or greater than the LRL is predicted to be less than or equal to 1 percent… These values are re-evaluated annually based on the most current quality-control data and may, therefore, change" (Childress and others, 1999, p. 19).

MRLs — "Smallest measured concentration of a constituent that may be reliably reported by using a given analytical method" (Timme, 1995).

MUs — The method uncertainty generally indicates the precision of a particular analytical measurement, and therefore indicates the range of values wherein the true value will be found (Moran and others, 2002).

The reporting levels for selected radioactive constituents (gross-alpha radioactivity, gross-beta radioactivity, radium-226, and radium-228) are based on an SSMDC, a critical value (also sample specific), and the combined standard uncertainty (CSU; U.S. Environmental Protection Agency and others, 2004a). A result above the critical value represents a greater-than-95-percent certainty that the result is greater than zero (significantly different from the instrument's background response to a blank sample), whereas a result above the SSMDC represents a greater-than-95-percent certainty that the result is greater than the critical value (U.S. Environmental Protection Agency and others, 2004a). Using these reporting level elements, three unique cases were possible when screening the raw analytical data. First, if the analytical result was less than the critical value (case 1), the analyte was considered not detected, and a value is presented in the table as less than the SSMDC. If the analytical result was greater than the critical value, the ratio of the CSU to the analytical result (relative CSU) was calculated as a percent. For those samples with results that have a relative CSU of less than 20 percent, the analytical result is reported unqualified (case 2). For those samples with results that have a relative CSU greater than 20 percent, the analytical results were qualified as estimated values and are preceded in the table below with an "E" (case 3). For clarity, only the screened results are included in this report. The table provided below gives an example of the screening process for each of the three cases described above.

Scenario	Critical Value (pCi/L)	SSMDC (pCi/L)	Combined Standard Uncertainty (pCi/L)	Relative CSU (percent)	Raw Result (pCi/L)	Reported Result (pCi/L)
Case 1—Result less then critical value	1.4	3.2	±1.2	133	0.9	<3.2
Case 2—Relative combined standard uncertainty less than 20 percent	0.4	1.1	±0.5	14	3.2	3.2
Case 3—Relative combined standard uncertainty greater than 20 percent	0.5	1.4	±0.6	32	2.0	[1]E2.0

[1]Estimated

Depth-Dependent Samples

Concentrations reported here for depth-dependent samples have not been corrected for flow values. Because these samples were collected at specific depths in the well and represent only part of the discharge from this well, the concentrations measured in these samples were not equivalent to the concentrations reported for samples collected at the surface sampling point, which represent all of the discharge for this well. The sum of concentrations from individual depth-dependent samples may not equal the concentration in the total discharge collected at the surface sampling point, as the relative contributions from the different depths can vary because of differences in aquifer properties.

Detection Frequency

Detection frequencies were reported only for grid wells, which were representative of ground-water quality in this study unit, and only for those VOC and pesticide compounds that were sampled at all grid wells. Detection frequencies are listed by study area and for the study unit as a whole. The detection frequency is equal to the number of detections divided by the number of samples multiplied by 100 percent. A constituent is considered frequently detected if it was found in more than 10 percent of samples analyzed for that constituent.

Selection of Threshold Values

Constituents detected in sampled ground water were compared with selected threshold values to provide context for these results. These high thresholds were set using the CADHS and USEPA drinking-water standards (California Department of Health Services, 2005a, 2005b, and 2005c; U.S. Environmental Protection Agency, 2005); concentrations detected in this study that were higher than their selected threshold are marked in the tables. The threshold values were selected in the following priority: State and Federal primary Maximum Contaminant Levels (MCLs), CADHS notification levels (NLs), USEPA lifetime health advisories (HA-Ls), the risk-specific dose at a cancer risk level equal to 1 in 100,000 or 10E–5 (RSD5), all of which are health-based standards, and lastly, State and Federal Secondary Maximum Contaminant Levels (SMCLs), which are set for aesthetic concerns. Comparisons of raw ground water to MCLs, SMCLs, NLs, HA-Ls, and RSD5s were made for illustrative purposes only and do not indicate a drinking-water violation or noncompliance with drinking-water regulations. Explanations of the levels used in this report were provided as follows:

MCLs — Legally enforceable standards that apply to public-water systems and were designed to protect public health by limiting the levels of contaminants in drinking water (U.S. Environmental Protection Agency, 1974).

NLs — Health-based advisory level established by CADHS for chemicals in drinking water that lack MCLs. If a chemical was detected above its NL, State law requires timely notification to the local governing bodies and recommends consumer notification (California Department of Health Services, 2005d).

HA-Ls — The concentration of a chemical in drinking water that was not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure. The USEPA lifetime health advisory assumes consumption of 2 L of water per day over a 70-year lifetime by a 70-kg (154 lb) adult and that 20 percent of exposure comes from drinking water (U.S. Environmental Protection Agency, 2004a).

RSD5 — The concentration of a chemical in drinking water corresponding to an excess estimated lifetime cancer risk of 1 in 100,000, hereinafter referred to as the risk specific dose at 10E–5 (U.S. Environmental Protection Agency, 2004b).

SMCLs — Nonenforceable contaminant concentration level that affects the aesthetic qualities of drinking water, such as the taste, odor, and color (U.S. Environmental Protection Agency, 1974).

Constituents Analyzed by Multiple Analytical Methods

Twenty-four constituent samples collected in the Southern Sacramento Valley GAMA study unit were analyzed by more than one analytical method. A preferred analytical method was chosen by NWQL on the basis of lab performance of the available methods. Only the detections determined by the preferred analytical method are listed in this report.

Quality-Control Data Analysis

QC samples were collected with approximately 10 percent of the samples in Southern Sacramento Valley GAMA study unit. QC samples were collected to assess the bias and variability of ground-water data resulting from sample collection, processing, storage, transportation, and laboratory analysis. Three types of QC samples were collected: blanks, sequential replicates, and laboratory matrix spikes. Additionally, surrogate compounds were added to selected samples to assess the general performance of some analytical methods. Assessment of the quality-control data resulted in censoring less than 0.03 percent of the analyses.

Surrogates

Surrogate compounds were added to all ground-water and QC samples that were analyzed for VOCs, gasoline-oxygenates, NDMA, 1,2,3-trichloropropane, and pesticide compounds. Surrogates are compounds not normally found in the environment, but have similar physical and chemical properties to the target analytes. Prior to laboratory analysis, each sample was spiked with one or more surrogates. Surrogate recovery data were used to evaluate the capability of the analytical methods to detect the target analytes in each sample and to assess bias and variability that were due to matrix effects and gross laboratory processing errors. Surrogate data in blanks and samples were used to identify general problems that may arise during sample analysis; surrogate data in ground-water samples were used to evaluate matrix interferences. A 70- to 130-percent recovery of surrogates was considered acceptable in this report. In samples with low surrogate recoveries, target analytes may not have been detected if present in low concentrations; samples with high surrogate recoveries indicate that the target analytes will be detected if present, but the concentrations may be exaggerated. If all surrogates for a sample were outside of the acceptable range, then there may have been a problem with the analytical method. If one or more, but not all, surrogates for a sample were outside of the acceptable range, then the sample chemistry may have interfered with the capability of the methods to detect and quantify the target analytes (matrix interference).

Table 5 summarizes surrogate recoveries for ground-water and QC samples. Median surrogate recoveries for all analyte groups were acceptable. All gasoline oxygenate and 1,2,3-trichloropropane samples had surrogate recoveries within acceptable limits. Some individual samples had low recoveries of VOC, pesticide, or NDMA surrogates; some analytes may not have been detected in these samples if present at low concentrations. Some individual samples had high recoveries of VOC and pesticide surrogates; the concentrations of detected VOCs or pesticide compounds measured in these samples may have been greater than the actual concentration.

Blanks

Two types of blanks were collected for the Southern Sacramento Valley GAMA study unit: field and source-solution blanks. All blanks were collected using nitrogen-purged blank water that was certified to be free of VOCs, pesticide compounds, nutrients, dissolved organic carbon, major ions, and trace elements above their reporting levels. Associated blanks and ground-water samples in this study were defined as samples that were collected at the same site.

Source-solution blanks were collected to verify that the blank water used for the associated field blank had no detectable concentrations of VOCs, gasoline oxygenates, NDMA, 1,2,3-trichloropropane, or perchlorate. Source-solution blanks were collected at the sampling site by pouring blank water directly into sample containers that were then stored, shipped, and analyzed in the same manner as the other blank and ground-water samples.

Field blanks were collected to evaluate potential bias introduced by sampling equipment, processing, shipping, or analysis. Field blanks were collected at selected sampling sites. Depending on the list of analytes (depth-dependent, slow, intermediate, or fast) collected at a particular sampling site, blank water was either pumped or poured through the same sampling equipment (fittings and tubing, and at monitoring wells, sampling pump) used to collect ground water, then processed and transported using the same methods for the ground-water samples.

A constituent was of potential QC concern with reference to blank data when all of the following criteria were met: (1) the constituent was detected in one or more field blanks and in ground-water samples, (2) the concentration detected in the field blank was greater than the concentration in the associated source-solution blank, and (3) the minimum concentration detected in ground-water samples was less than the maximum concentration detected in field blanks plus one half of that constituent's reporting level. If the results for a constituent met the above criteria, the pattern of detections in blanks and ground-water samples was evaluated. If a constituent was detected in at least one associated blank and ground-water sample at similar concentrations, then all detections in ground-water samples were censored. If a constituent was detected in the field blanks, but not in the associated ground-water sample, then the ground-water data were not censored.

Detections in ground-water samples that were determined to be of QC concern were censored and reported as nondetections and flagged with a "V" remark code. The threshold for censoring data was determined by summing the blank concentration and the long-term method detection level (LT-MDL), or half of the method detection level (MDL), for the constituent in question. For example, if the highest concentration of toluene detected in a field blank was 0.02 µg/L, and the LT-MDL for toluene was 0.02 µg/L, then the concentration of toluene in the associated ground-water sample would have to be greater than or equal to 0.04 µg/L to be considered a detection in ground water. This method of censoring was based on the assumption that the concentrations in the field blank and the associated ground-water sample were comparable.

The following constituents were censored with reference to blank data: antimony, benfluralin, cadmium, chromium (total, National Research Program [NRP] method), chromium(VI), DCPA, dissolved organic carbon, fluoride, hexafluoropropene, lead, toluene, trifluralin. Table 6 lists the constituents that did not pass QC blank analysis and were censored in ground-water data, along with the censoring level used, the minimum ground-water concentration, and the maximum field blank concentration. Some constituents were censored only in one or more groups of samples (by equipment and sampling method used) when the analysis of blank data from only that group showed contamination. The lead concentration in the field blank was assumed to come from the fittings used on the sampling point at that well; as other field and ground-water samples had no detections of lead, it was interpreted to affect only the ground-water data at wells sampled on the intermediate and depth-dependent lists of analytes.

Replicates

Replicate samples were collected to assess the variability attributed to processing and analysis of inorganic and organic constituents. All replicates were sequential; the replicate sample was collected after the ground-water sample and analyzed using the same method. The variability in these sequential replicates was assumed to be largely from sample collection and analysis; the variability that was due to changes in ground-water composition with time were assumed to be minimal in the time frame of sample collection (in minutes). The relative standard deviation (RSD) was used to calculate the variability between replicate pairs. The RSD is defined as 100 times the standard deviation divided by the mean concentration for each replicate pair of samples. If one value in a sample pair was reported as a nondetect, and the other value was reported below the reporting level, the RSD was set to zero because the values were analytically identical. If one value in a sample pair was reported as a nondetect, and the other value was greater than the LRL or MRL, then the nondetection value was set equal to one-quarter of the reporting level, and the RSD was calculated. Values of RSD less than 20 percent were considered acceptable in this study.

Table 7 lists the constituents that have RSDs greater than 20 percent. Of 185 replicate pairs that had detections, only 18 pairs had an RSD of greater than 20 percent. The RSDs of most pairs are less than 5 percent. Because most (90 percent) of the replicate analyses had acceptably low variabilities, the ground-water sample data collected for this study are presumed to have had relatively little variability introduced by the sampling and analytical procedures.

Laboratory Matrix Spikes

Laboratory matrix spikes were QC samples used to evaluate the bias and variability of analytical results that were due to interferences from the chemistry of the ground water sampled (matrix interferences). Spike samples were collected and analyzed for VOCs, pesticide compounds, perchlorate, 1,2,3-trichloropropane, NDMA, radium-226, radium-228, gross alpha and beta radiation, and coliphage. Laboratory matrix spikes were prepared by adding solutions containing known concentrations of target analytes to replicate ground-water samples before sample preparation and analysis at the laboratory. The constituents added in matrix spikes were the same as those being analyzed. Constituents with low recoveries were of potential concern because they may not have been detected if present in low concentrations; low recoveries also were a concern if environmental concentrations were close to a threshold level; a concentration less than a threshold could be falsely indicated. Constituents with high recoveries were of potential concern if the environmental concentrations were greater than a threshold level because a high recovery could falsely indicate a concentration greater than a particular threshold. Recoveries between 70 and 130 percent for matrix spikes were considered acceptable in this study.

Constituents that had low recoveries in at least one spiked sample are listed in table 8A. These constituents may not have been detected in some ground-water samples when present in low concentrations. Table 8A also indicates which low-recovery constituents were detected in ground-water samples, showing that, in some samples, these constituents were not missed because of low recoveries. Constituents that had high recoveries in at least one spiked sample are listed in table 8B. Concentrations of these constituents detected in ground-water samples (indicated in table 8B) may have been over-measured; none of these high-recovery constituents were detected at concentrations near an MCL or other high threshold. All VOCs and pesticide compounds not listed in tables 8A and 8B, along with perchlorate, 1,2,3-trichloropropane, NDMA, radium-226, radium-228, gross alpha and beta radiation, and coliphage, had acceptable spike recoveries.

Ground-Water-Quality Results

The Southern Sacramento Valley GAMA study unit ground-water-quality data presented in this report are archived in the USGS's National Water Information System (NWIS) database, except for the following constituents: tritium and noble gases analyzed at the LLNL; chromium, arsenic, and iron speciation analyzed at the USGS's NRP laboratory in Boulder, Colorado; stable isotopes analyzed at the USGS's Reston Stable Isotope Laboratory (RSIL); and perchlorate, NDMA, and 1,2,3-trichloropropane analyzed at Montgomery Watson-Harza laboratory; radium 226, 226 Gross alpha–beta radioactivity analyzed at Eberline Analytical Services. These data are available on request.

Tables 9–19 show the results of water-quality analyses. These tables are limited in presentation only to those constituents that were detected and only to those wells with one or more detections in each constituent group. Concentrations and activities, which were higher than a selected threshold, are denoted by an asterisk in the tables. Additionally, well locations with selected constituent detections above a threshold value are shown in figures 4–10.

Study areas containing nongrid wells in addition to the randomly selected grid wells have had their constituent detections divided into two categories: grid wells and nongrid wells. Nongrid wells were not included in comparisons made of detections between the six study areas because they could have introduced a spatial bias as a result of increased sampling density in a particular area within the study unit.

The chemical and microbial data presented in this report characterize the quality of the untreated ground-water resources within the Southern Sacramento Valley GAMA study unit and do not represent the drinking water delivered to consumers by water purveyors. The samples collected for this study were not regulatory samples, even when collected from public-supply wells, as sampling and analytical methods used in this study differ from those used for regulatory samples. The chemical and microbial composition of drinking water may differ from ground-water in that drinking water may be subjected to disinfection, filtration, mixing with other waters, and exposure to the atmosphere prior to its delivery to the consumer.

General Water Quality

General water-quality parameters are listed in table 9. One well had a pH greater than the USEPA SMCL, and one well had a turbidity measurement greater than the CADHS MCL. Fifteen wells had a specific conductance measurement greater than the lower CADHS SMCL of 900 µS/cm, and one well had a specific conductance measurement greater than the upper CADHS SMCL of 1,600 µS/cm. Ten wells had a total dissolved solids concentration greater than the lower CADHS SMCL of 500 µS/cm.

Volatile Organic Compounds

Table 10A lists the concentrations of VOCs detected in ground water in the Southern Sacramento Valley GAMA study unit. VOCs, including gasoline oxygenates, were collected at all 83 wells sampled, with the exception of 3 gasoline oxygenate constituents, methyl acetate, *tert*-Amyl alcohol, and *tert*-Butyl alcohol, which were analyzed in samples from 21 wells. No VOC concentrations were greater than an MCL or other threshold value. Forty-nine of those 83 wells had one or more detections of a VOC (table 10B). The following VOCs were censored on the basis of QC analysis, and the results were not reported: *m*- and *p*-xylene and toluene.

Some of the VOC detections in well NAMFP-05 were suspect, but passed QC analysis; of the 15 VOCs detected in this well, only 3 were detected in any other well in the study. Additionally, this was a deep-monitoring well near the axis of the Sacramento Valley, a location that is not expected to have any VOC detections. No other wells near this location or upgradient from this well had that many VOC detections.

Thirty-four of the 88 VOC and gasoline oxygenate analytes were detected in at least one ground-water sample; 21 of these VOCs were detected in grid wells. No VOC concentration in this study was greater than an MCL or other threshold value. The most frequently detected VOCs were trichloromethane (chloroform), tetrachloroethylene (PCE), carbon disulfide, and trichlorethylene (TCE); the most frequently detected class of VOCs were disinfection by-products, followed by solvents.

Tentatively Identified Organic Compounds

Five TIOCs were identified and one unknown compound was found in some samples collected in this study (table 11). The TIOC hexafluoropropene was also detected in ground-water samples collected using the depth-dependent method, but all detections were censored because of detections in the field blank. Cyclopentane was found in four grid wells in the SAM and SOL study areas and in one flowpath well in the NAM study area. Sulfur dioxide was identified in two wells, in the SAM and SOL study areas, respectively. Methyl-propanethiol and methyl-naphthalene were found individually in two flowpath wells in the NAM study area. Dichlorofluoroethane was found in one depth-dependent sample, and an unknown compound was found in three of the depth-dependent samples.

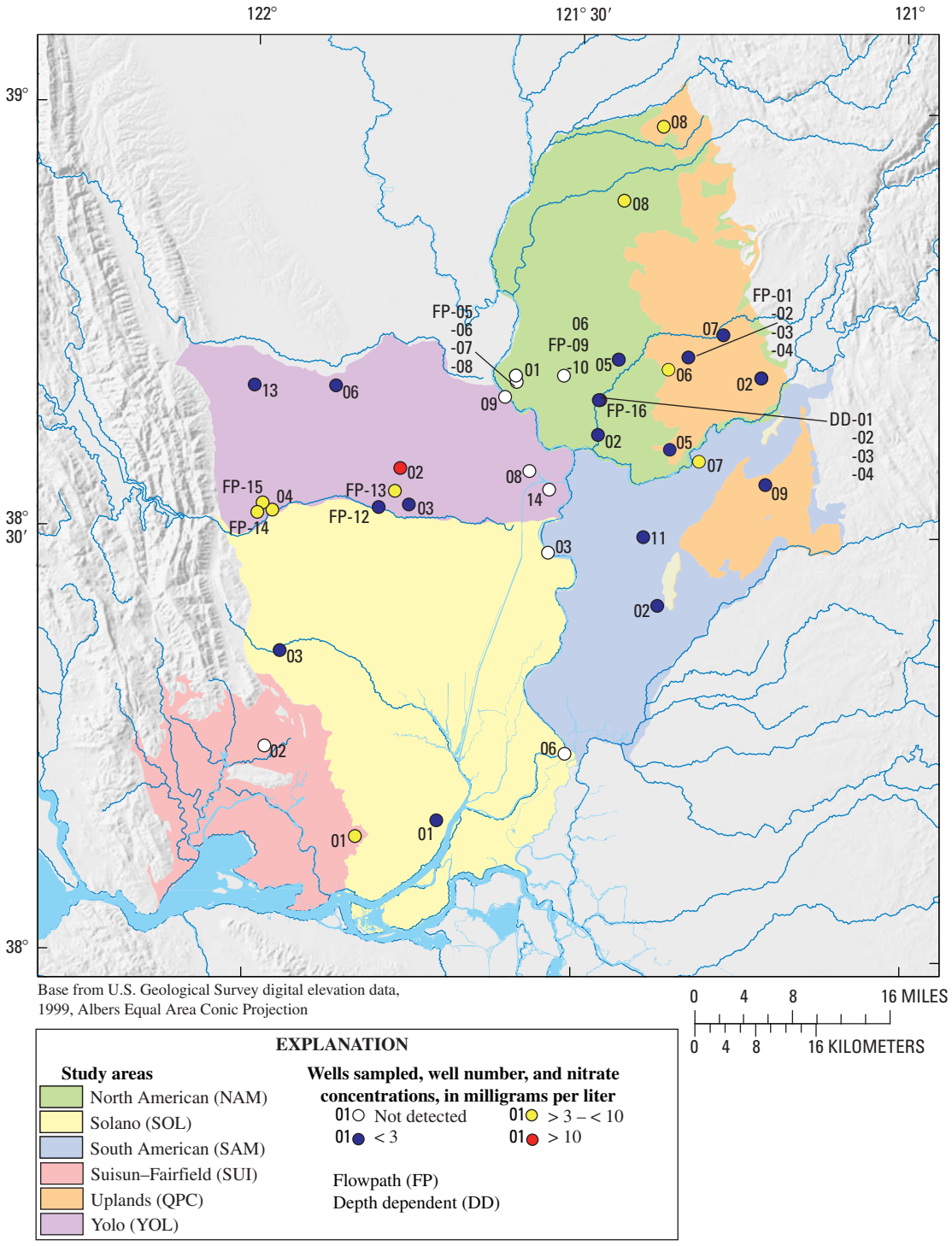

Figure 4. Nitrate concentrations in ground water in the study areas of the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

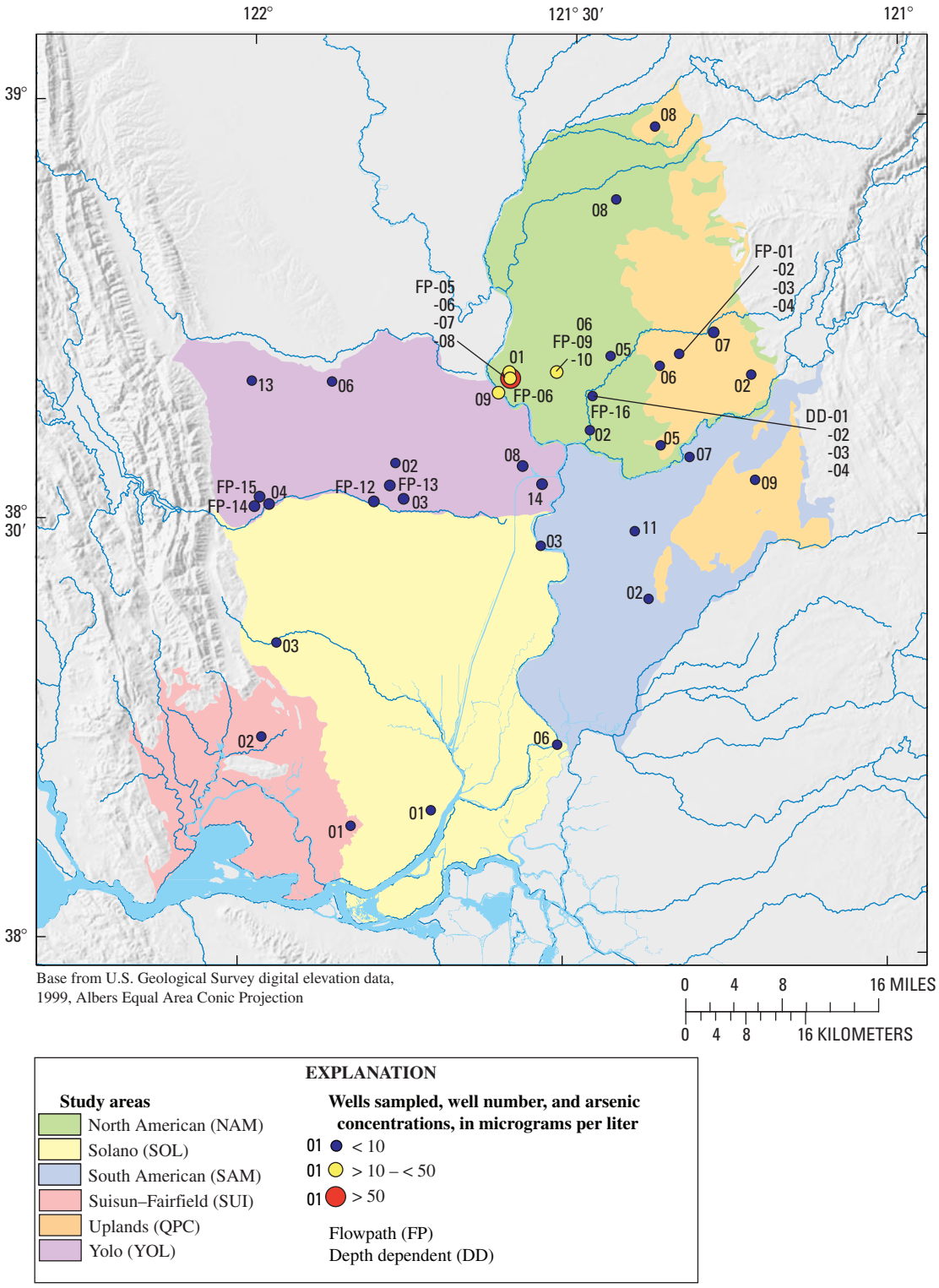

Figure 5. Arsenic concentrations in ground water in the study areas of the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

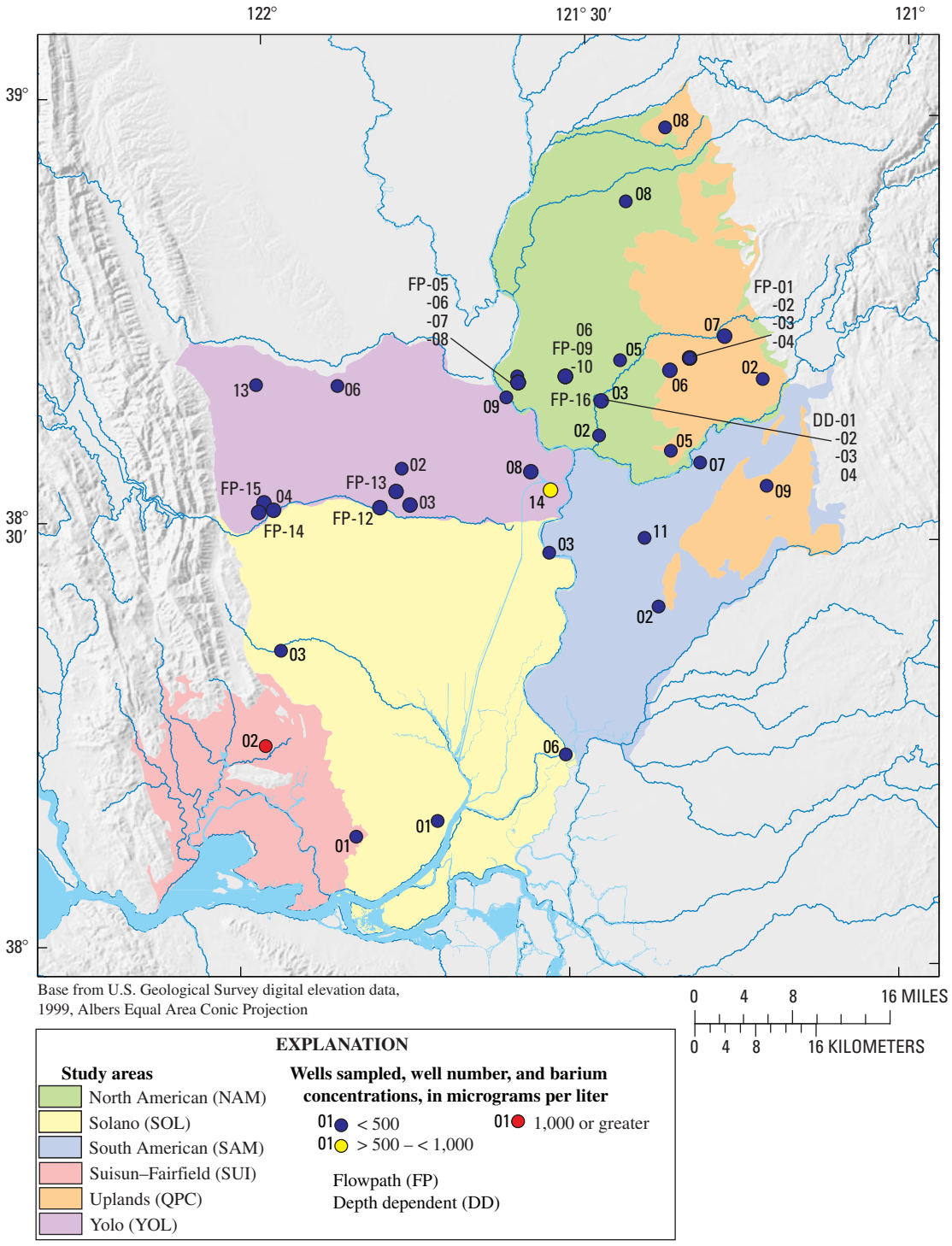

Figure 6. Barium concentrations in ground water in the study areas of the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

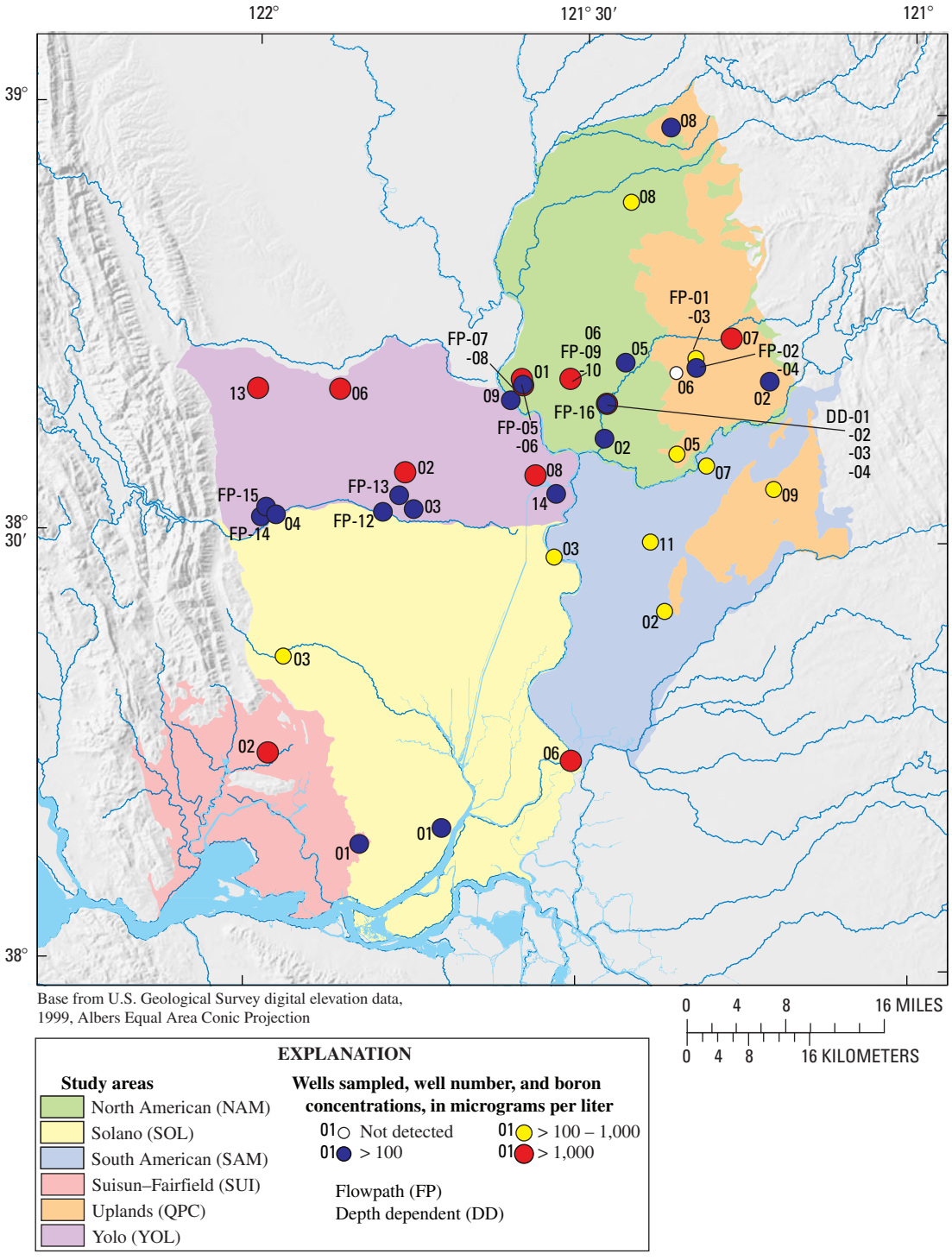

Figure 7. Boron concentrations in ground water in the study areas of the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

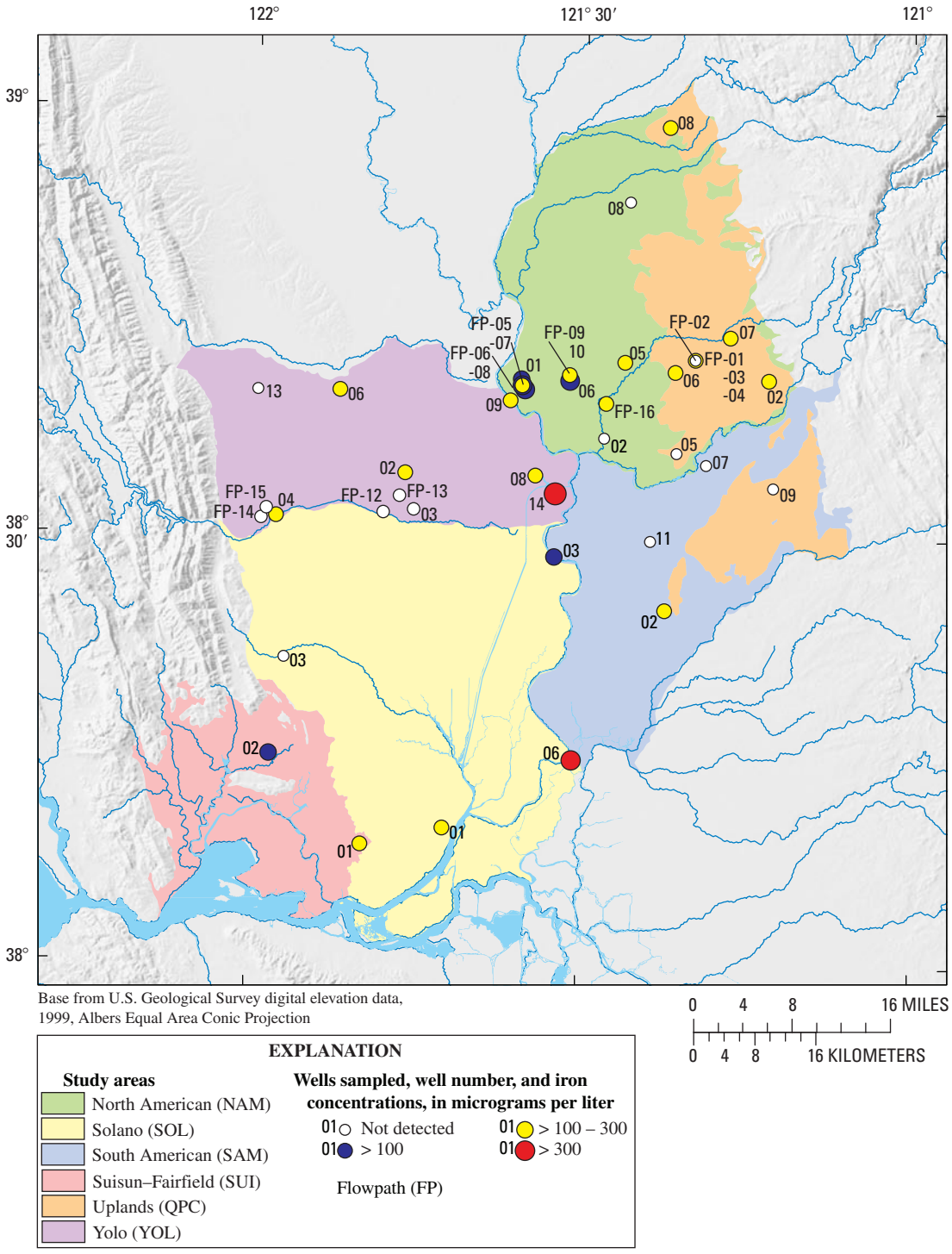

Figure 8. Iron concentrations in ground water in the study areas of the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

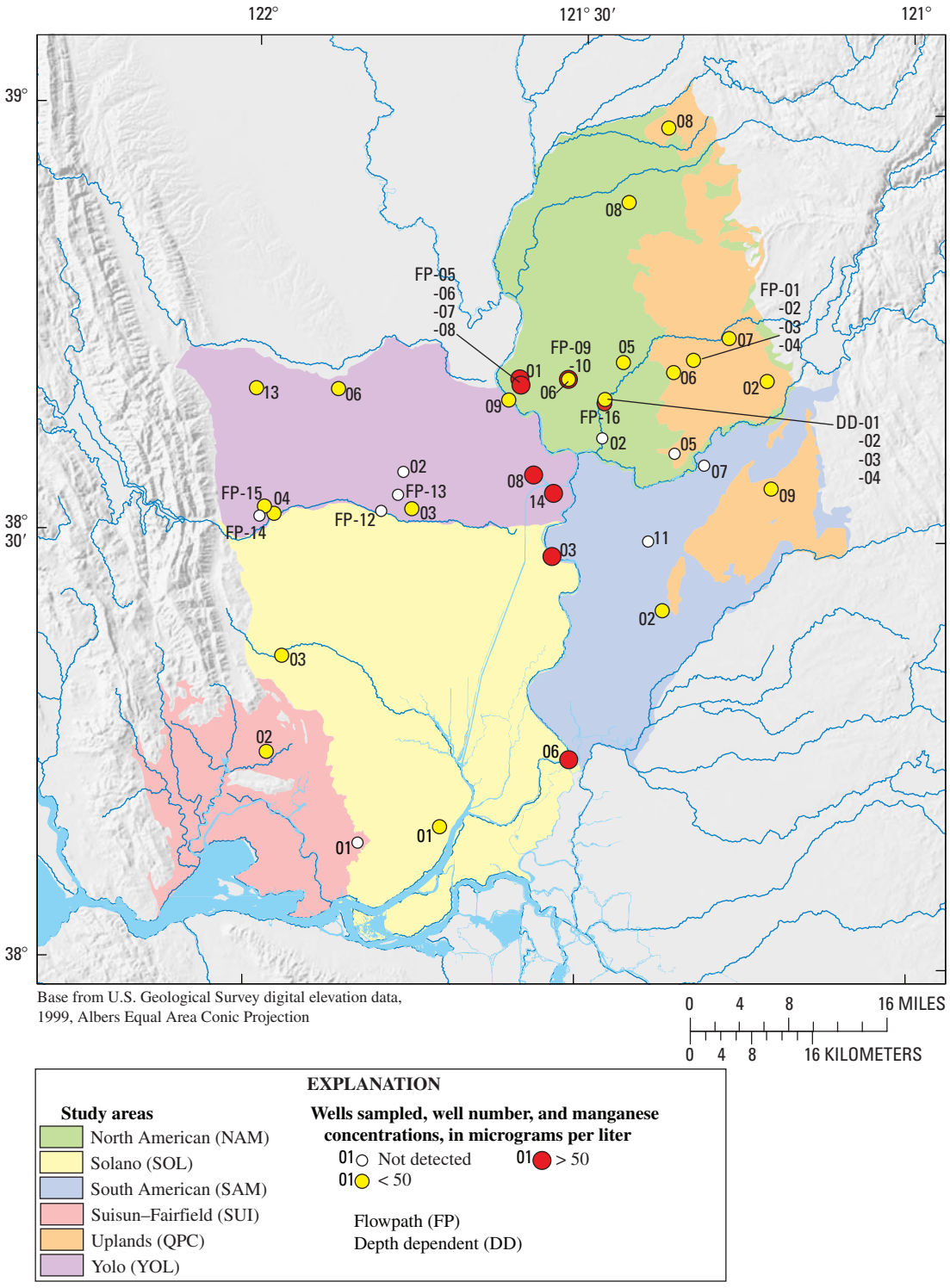

Figure 9. Manganese concentrations in ground water in the study areas of the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

Pesticide Compounds

Tables 12A and 12B list the concentrations of pesticides detected in ground-water in the southern Sacramento Valley GAMA study unit. Of the 70 pesticide compounds that were analyzed in samples from all wells, 12 were detected at least once (table 12A). Of the additional 59 pesticide compounds analyzed in samples from selected wells, 10 were detected at least once (table 12B). No pesticide concentrations were greater than an MCL or other high threshold value.

Pesticide compounds were sampled in two analyte groups; 1 group was analyzed in samples collected at 82 wells; the other group of pesticide compounds and caffeine (analyzed with the pesticide compounds, but not used as a pesticide) were analyzed in samples collected at 43 of the wells sampled. Of the 82 wells sampled, 35 had at least one detection of any pesticide compound (tables 12A and 12B). The following pesticide compounds were censored on the basis of QC analysis and were not reported here: benfluralin, DCPA, and trifluralin.

The most frequently detected pesticide compounds were 2-chloro-4-isopropylamino-6-amino-*s*-triazine (deethylatrazine, a degradate of atrazine), atrazine (general application herbicide), molinate (herbicide used on rice), and simazine (general application herbicide) (table 12C).

Nutrients and Dissolved Organic Carbon

Nutrient samples were collected at 43 wells. Nitrogen compounds were detected at 42 wells, and orthophosphate was detected at 43 wells (table 13). Nitrite was not detected in any well; all nitrate plus nitrite concentrations are reported here as nitrate. Nitrate concentrations (as N) were lower than the CADHS MCL of 10 mg/L in 42 wells and higher than the MCL in one well (fig. 4). Dissolved organic carbon was detected in 11 of 22 wells sampled, but all concentrations were less than the blank censoring level (table 6) and are considered nondetections.

Major Ions

Major ions were analyzed in samples from 43 wells. Table 14 lists the analytical results for major ions. There are no applicable health-based thresholds for the major ions; however, two of the major ions (chloride and sulfate) have SMCLs that are set for aesthetic qualities rather than for health concerns. Concentrations of sulfate were lower than the SMCL in all 43 wells. One well had a chloride concentration above the CADHS SMCL of 250 mg/L.

Trace Elements

Twenty-six trace elements were analyzed in samples from 43 wells (table 15). The following trace element results were censored on the basis of QC analysis: antimony, cadmium, fluoride, and lead (table 6); all values of lead were censored. Only concentrations above the QC censoring level were reported. Of the 18 trace elements with an MCL or other health-based threshold, 3 were detected at concentrations greater than the threshold: arsenic, barium, and boron. Two trace elements, iron and manganese, were detected at concentrations greater than an SMCL (table 15; figs. 5–9).

Constituents of Special Interest and Trace Element Speciation Results

Constituents of special interest and trace element speciation were analyzed in samples from 43 wells (table 16). Concentrations of the special constituents were generally low: NDMA was not detected; perchlorate was detected in 11 wells, but all detections were below the NL; 1,2,3-trichloropropane was detected in a single sample at a concentration above the NL. Note that total arsenic, chromium, and iron results reported here were different in some wells than the results for these constituents reported in table 15. The results for arsenic, chromium, and iron in table 16 were determined using research methods that were under development and that were not the preferred method (see discussion of Field Methods in the Methods section); they were reported here for comparison with the speciation results. Some detections of total chromium and chromium(VI) were censored because of field blank detections; only the concentrations above the censoring level were reported. Comparison of the concentrations of arsenic, chromium, and iron with threshold values were discussed in the section on trace elements.

Isotopes, Radioactivity, and Noble Gases

Tritium, deuterium, and oxygen-18 results that were analyzed by the USGS laboratories in samples from all wells are reported in table 17. Carbon-13/carbon-12, carbon-14, radium-226, gross alpha radiation at 72 hours and 30 days, gross beta radiation at 72 hours and 30 days, and radon-222 results in samples collected from 20 wells are also shown in table 17. Radon-222 concentrations were greater than the proposed Federal (USEPA) MCL of 300 pCi/L in 13 of the 20 samples analyzed (fig. 10); none of the values was greater than the upper proposed value of 4000 pCi/L.

Tritium, helium-3 to helium-4 ratio, helium-4, argon, neon, krypton, and xenon, were analyzed at LLNL in samples collected from 43 wells; the results are listed in table 18.

Microbial Constituents

The microbial constituents total coliform and *Escherichia* coliform and the viruses F-specific coliphage and somatic coliphage were analyzed in 11 ground-water samples collected for the Southern Sacramento Valley GAMA study unit (table 19). One well had a detection of total coliforms (1 colony counted). Another well had a detection of somatic coliphage.

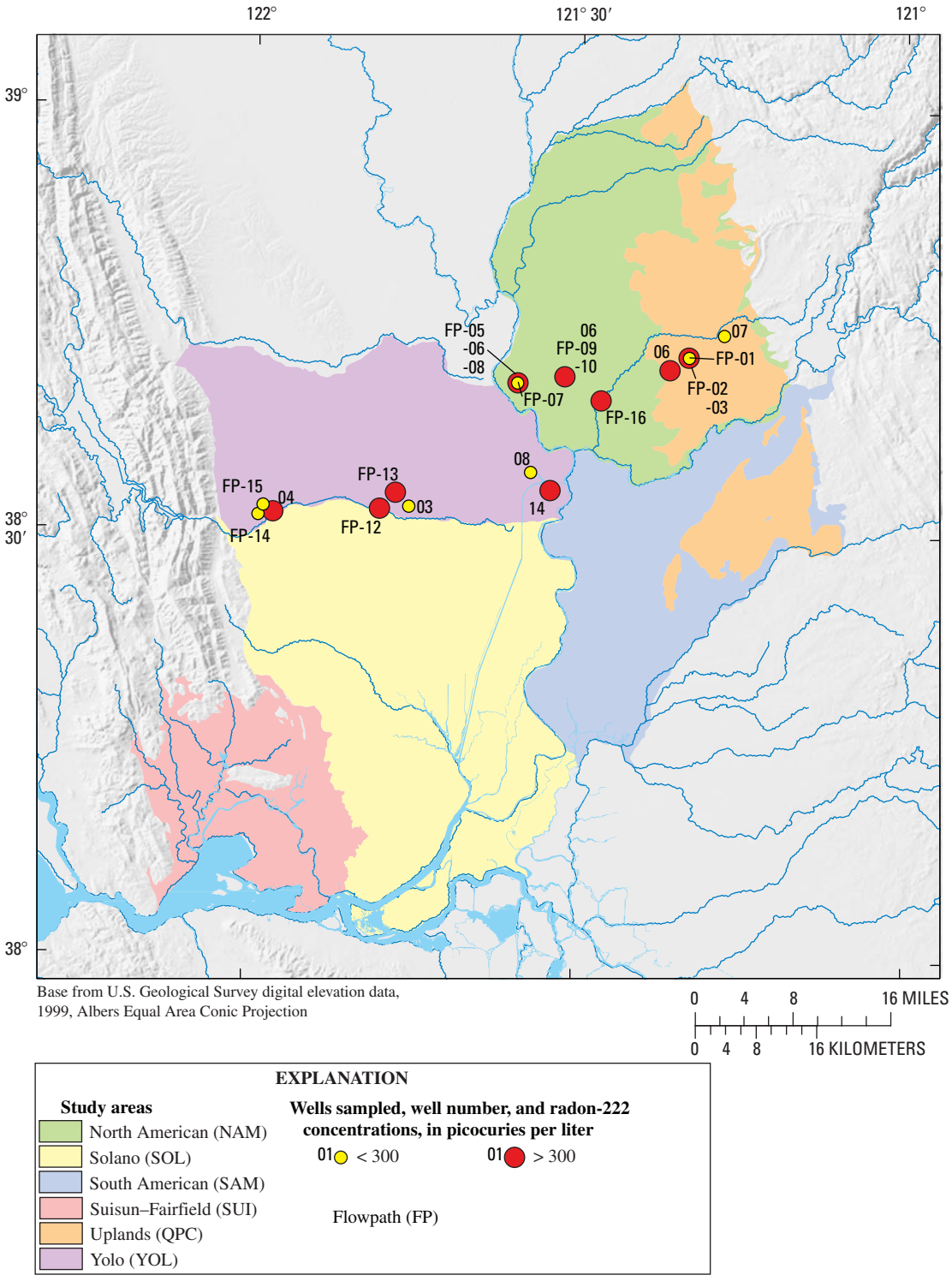

Figure 10. Radon-222 concentrations in ground water in the study areas of the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit.

Summary

The Ground-Water Ambient Monitoring Assessment (GAMA) Program is intended to provide a comprehensive statewide assessment of ground-water quality in areas of California where ground-water is a significant source of drinking water. The Southern Sacramento Valley GAMA study unit is the fourth region in which the GAMA Program has implemented its program objectives. The Southern Sacramento Valley GAMA study unit lies within the Central Valley hydrogeologic province and consists of six study areas: the North American, South American, Solano, Yolo, Suisun–Fairfield, and Uplands Basin. A total of 87 ground-water samples were collected from 83 wells in the study unit: 24 in the North American study area, 12 in the South American study area, 13 in the Solano study area, 19 in the Yolo study area, 5 in the Suisun–Fairfield study area, and 15 in the Uplands study area. The well types sampled included public supply, irrigation, domestic, and monitoring.

This report presents the results of analyses for over 350 chemical and microbial constituents in the 87 samples collected between March 2005 and June 2005. Additionally, results were compared with selected Federal and State drinking-water standards. The chemical and microbial data presented in this report characterize the quality of untreated ground-water resources within the study unit, not the treated drinking water that is delivered to consumers by water purveyors.

VOCs were detected in 49 out of 83 wells sampled; all concentrations were below MCLs or other health-based thresholds. The frequently detected VOCs (found in more than 10 percent of the wells sampled) were trichloromethane (chloroform), tetrachloroethylene (PCE), carbon disulfide, and trichloroethylene (TCE). Pesticides were detected in 35 of the 83 wells sampled; all concentrations were below MCLs or other health-based thresholds. The frequently detected pesticide compounds were 2-chloro-4-isopropylamino-6-amino-s-triazine (deethylatrazine, a degradate of atrazine), atrazine, and oxamyl. Caffeine was detected in 9 out of 43 wells sampled. The following special interest constituents were detected in this study: perchlorate, chromium(VI), and 1,2,3-trichloropropane; only 1,2,3-trichloropropane was detected at a concentration greater than its California Department of Health Services notification level (NL). Of the 43 wells sampled for trace elements, 27 had no detections of a trace element above a health-based threshold and 16 had at least one detection above. Of the 18 trace elements with health-based thresholds, 3 (arsenic, barium, and boron) were detected at concentrations higher an MCL. Of the 43 wells sampled for nitrate, only 1 well had a detection above the MCL. Twenty wells were sampled for radioactive constituents; only 1 (radon-222) was measured at activities higher than the proposed MCL. Radon-222 was detected below the threshold in 7 wells and above the threshold in 13 wells.

SMCLs have been established for nine constituents or parameters analyzed in SSACV. Six were measured at levels higher than an SMCL: chloride, iron, manganese, pH, specific conductance, and total dissolved solids. Chloride, iron, manganese, pH, and total dissolved solids were measured in 43 wells: 27 wells had no measurements above a threshold and 16 wells had a measurement above a threshold. Specific conductance was measured in 83 wells. In 68 wells, specific conductance was measured lower than the threshold and in 15 wells it was measured above the threshold

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APPENDIXES

Table 1. Constituents and water-quality parameters collected for the slow, intermediate, fast, and depth-dependent sampling lists in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

Slow list	Intermediate list	Fast list	Depth-dependent list
Volatile organic compounds	Volatile organic compounds	Volatile organic compounds	Volatile organic compounds
Gasoline oxygenates			
Deuterium and oxygen-18	Deuterium and oxygen-18	Deuterium and oxygen-18	Deuterium and oxygen-18
Tritium[1]	Tritium[1]	Tritium[1]	Tritium[1]
Pesticides	Pesticides	Pesticides (selected)	
Pharmaceuticals	Pharmaceuticals	Pharmaceuticals	
pH, Specific conductance, dissolved oxygen, water temperature, and alkalinity	Specific conductance and water temperature	Specific conductance and water temperature	Specific conductance
Chromium speciation	Chromium speciation		Chromium speciation
Arsenic and iron speciation	Arsenic and iron speciation		Arsenic and iron speciation
Major ions and trace elements	Major ions and trace elements		Major ions and trace elements
Tritium and noble gases[2]	Tritium and noble gases[2]		Nutrients
Constituents of special interest (perchlorate, *N*-nitrosodimethylamine, 1,2,3-trichloropropane)[3]	Constituents of special interest (perchlorate, *N*-nitrosodimethylamine, 1,2,3-trichloropropane)[3]		
Carbon isotopes			
Radium isotopes			
Gross alpha and beta radioactivity			
Dissolved organic carbon			
Nutrients	Nutrients		
Radon-222			
Microbial constituents			

[1]Analyzed at the U.S. Geological Survey's Stable Isotope and Tritium Laboratory, Menlo Park, California.

[2]Analyzed at Lawrence Livermore National Laboratory, Livermore, California.

[3]Analyzed at Montgomery Watson Harza Laboratory, Monrovia, California.

Table 2. Well information for sampled wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

["DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." ft, feet; GAMA, Ground-Water Ambient Monitoring and Assessment; LSD, land surface datum; mm/dd/yyyy, month/day/year; NAM, North American; nd, no data; QPC, Uplands; SAM, South American; SOL, Solano; SUI, Suisun–Fairfield; YOL; Yolo]

GAMA sample identification number	Sample date (mm/dd/yyyy)	California Department of Water Resources ground-water basin	Sampling list	Land surface elevation (ft, above sea level)	Well depth, (ft, below LSD)	Top opening (ft, below LSD)	Bottom opening, (ft, below LSD)
Grid wells							
NAM-01	3/28/2005	Sacramento, North American	Intermediate	19	470	120	250
NAM-02	3/29/2005	Sacramento, North American	Intermediate	25	375	112	352
NAM-03	3/29/2005	Sacramento, North American	Fast	87	660	185	655
NAM-04	3/29/2005	Sacramento, North American	Fast	61	220	nd	nd
NAM-05	4/7/2005	Sacramento, North American	Intermediate	67	520	445	520
NAM-06	4/14/2005	Sacramento, North American	Slow	29	500	470	490
NAM-07	4/25/2005	Sacramento, North American	Fast	96	140	100	135
NAM-08	5/4/2005	Sacramento, North American	Intermediate	77	380	nd	nd
NAM-09	5/5/2005	Sacramento, North American	Fast	55	nd	nd	nd
NAM-10	5/10/2005	Sacramento, North American	Fast	27	84	nd	nd
NAM-11	5/18/2005	Sacramento, North American	Fast	27	700	210	520
QPC-01	3/15/2005	Sacramento, South American	Fast	124	225	180	225
QPC-02	3/16/2005	Sacramento, North American	Intermediate	238	208	nd	nd
QPC-03	3/16/2005	Sacramento, North American	Fast	131	nd	nd	nd
QPC-04	3/22/2005	Sacramento, North American	Fast	104	503	nd	nd
QPC-05	3/22/2005	Sacramento, North American	Intermediate	82	297	198	297
QPC-06	3/22/2005	Sacramento, North American	Slow	122	540	260	530
QPC-07	4/4/2005	Sacramento, North American	Slow	158	303	175	303
QPC-08	4/6/2005	Sacramento, North American	Intermediate	123	219	nd	nd
QPC-09	4/7/2005	Sacramento, South American	Intermediate	16	296	240	285
QPC-10	4/19/2005	Sacramento, South American	Fast	119	499	246	499
QPC-11	5/3/2005	Sacramento, South American	Fast	313	285	197	269
SAM-01	3/15/2005	Sacramento, South American	Fast	22	201	91	nd
SAM-02	3/15/2005	Sacramento, South American	Intermediate	44	512	135	nd
SAM-03	3/22/2005	Sacramento, South American	Intermediate	18	220	140	220
SAM-04	3/31/2005	Sacramento, South American	Fast	18	340	200	340
SAM-05	4/4/2005	Sacramento, South American	Fast	49	264	nd	nd
SAM-06	4/5/2005	Sacramento, South American	Fast	83	448	240	428
SAM-07	4/5/2005	Sacramento, South American	Intermediate	59	308	180	302
SAM-08	4/5/2005	Sacramento, South American	Fast	49	298	220	nd
SAM-09	4/19/2005	Sacramento, South American	Fast	71	nd	nd	nd
SAM-10	4/21/2005	Sacramento, South American	Fast	29	278	162	nd
SAM-11	4/21/2005	Sacramento, South American	Intermediate	37	270	146	268
SAM-12	5/18/2005	Sacramento, South American	Fast	23	nd	nd	nd
SOL-01	3/16/2005	Sacramento, Solano	Intermediate	105	800	230	780
SOL-02	3/17/2005	Sacramento, Solano	Fast	68	540	235	520
SOL-03	3/23/2005	Sacramento, Solano	Intermediate	108	940	420	900
SOL-04	3/23/2005	Sacramento, Solano	Fast	27	416	303	416
SOL-05	3/30/2005	Sacramento, Solano	Fast	12	104	nd	nd
SOL-06	3/30/2005	Sacramento, Solano	Intermediate	6	244	228	240
SOL-07	4/21/2005	Sacramento, Solano	Fast	4	335	95	nd
SOL-08	5/10/2005	Sacramento, Solano	Fast	108	1,780	1,100	1,760
SOL-09	5/11/2005	Sacramento, Solano	Fast	47	112	80	112
SOL-10	5/11/2005	Sacramento, Solano	Fast	97	600	120	600
SOL-11	5/11/2005	Sacramento, Solano	Fast	38	nd	nd	nd
SOL-12	5/12/2005	Sacramento, Solano	Fast	29	230	128	226
SOL-13	5/18/2005	Sacramento, Solano	Fast	46	180	100	180
SUI-01	3/31/2005	Suisun-Fairfield	Intermediate	153	nd	nd	nd

Table 2. Well information for sampled wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

["DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." ft, feet; GAMA, Ground-Water Ambient Monitoring and Assessment; LSD, land surface datum; mm/dd/yyyy, month/day/year; NAM, North American; nd, no data; QPC, Uplands; SAM, South American; SOL, Solano; SUI, Suisun–Fairfield; YOL; Yolo]

GAMA sample identification number	Sample date (mm/dd/yyyy)	California Department of Water Resources ground-water basin	Sampling list	Land surface elevation (ft, above sea level)	Well depth, (ft, below LSD)	Top opening (ft, below LSD)	Bottom opening, (ft, below LSD)
SUI-02	4/20/2005	Suisun-Fairfield	Intermediate	23	nd	nd	nd
SUI-03	5/12/2005	Suisun-Fairfield	Fast	88	225	60	220
SUI-04	5/12/2005	Suisun-Fairfield	Fast	83	390	145	370
SUI-05	5/17/2005	Suisun-Fairfield	Fast	93	nd	nd	nd
YOL-01	4/11/2005	Sacramento, Yolo	Fast	59	470	210	460
YOL-02	4/18/2005	Sacramento, Yolo	Intermediate	53	110	nd	nd
YOL-03	4/19/2005	Sacramento, Yolo	Slow	56	1,450	1,264	1,432
YOL-04	4/26/2005	Sacramento, Yolo	Slow	103	270	160	270
YOL-05	4/27/2005	Sacramento, Yolo	Fast	93	nd	nd	nd
YOL-06	4/27/2005	Sacramento, Yolo	Intermediate	136	395	175	299
YOL-07	5/3/2005	Sacramento, Yolo	Fast	56	157	134	157
YOL-08	5/10/2005	Sacramento, Yolo	Slow	8	393	375	385
YOL-09	5/17/2005	Sacramento, Yolo	Intermediate	26	nd	nd	nd
YOL-10	5/17/2005	Sacramento, Yolo	Fast	65	nd	nd	nd
YOL-11	5/19/2005	Sacramento, Yolo	Fast	95	349	321	349
YOL-12	5/24/2005	Sacramento, Yolo	Fast	27	280	260	270
YOL-13	5/24/2005	Sacramento, Yolo	Intermediate	188	188	nd	nd
YOL-14	5/25/2005	Sacramento, Yolo	Slow	13	1,350	275	560
YOL-15	5/26/2005	Sacramento, Yolo	Fast	173	230	150	230
Nongrid wells							
QPCFP-01	3/29/2005	Sacramento, North American	Slow	148	470	370	460
QPCFP-02	3/30/2005	Sacramento, North American	Slow	148	470	274	310
QPCFP-03	4/1/2005	Sacramento, North American	Intermediate	148	572	365	560
QPCFP-04	4/1/2005	Sacramento, North American	Intermediate	148	332	240	320
NAMFP-05	4/5/2005	Sacramento, North American	Slow	16	1,080	1,060	1,070
NAMFP-06	4/6/2005	Sacramento, North American	Slow	16	815	795	805
NAMFP-07	4/7/2005	Sacramento, North American	Slow	16	410	380	400
NAMFP-08	4/7/2005	Sacramento, North American	Slow	16	200	170	190
NAMFP-09	4/13/2005	Sacramento, North American	Slow	29	995	745	995
NAMFP-10	4/18/2005	Sacramento, North American	Slow	29	220	190	210
NAMFP-11	4/19/2005	Sacramento, North American	Fast	82	264	241	nd
YOLFP-12	4/20/2005	Sacramento, Yolo	Slow	73	857	740	842
YOLFP-13	4/21/2005	Sacramento, Yolo	Slow	58	456	258	446
YOLFP-14	4/27/2005	Sacramento, Yolo	Slow	148	320	204	298
YOLFP-15	4/28/2005	Sacramento, Yolo	Slow	145	480	190	470
NAMFP-16	6/15/2005	Sacramento, North American	Slow	31	635	222	625
Depth-dependent samples							
NAMDD-01	6/14/2005	Sacramento, North American	Depth dependent	31	635	222	625
NAMDD-02	6/14/2005	Sacramento, North American	Depth dependent	31	635	222	625
NAMDD-03	6/14/2005	Sacramento, North American	Depth dependent	31	635	222	625
NAMDD-04	6/14/2005	Sacramento, North American	Depth dependent	31	635	222	625

Table 3A. Volatile organic compounds measured in ground water in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

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Constituent	Detected in ground-water samples in this study	USGS parameter code	Constituent class	CAS number	LRL (µg/L)	Threshold (µg/L)	Threshold type
Acetone	yes	81552	Solvent	67-64-1	6.000	na	na
Acrylonitrile	no	34215	Organic synthesis	107-13-1	0.800	0.6	RSD5
tert-Amyl alcohol	no	77073	Gasoline degradate	75-85-4	1.00	na	na
Benzene	yes	34030	Gasoline component	71-43-2	0.021	1	MCL-CA
Bromobenzene	no	81555	Solvent	108-86-1	0.028	na	na
Bromochloromethane	no	77297	Organic synthesis	74-97-5	0.120	9	HA-L
Bromodichloromethane	yes	32101	Disinfection by-product	75-27-4	0.028	80	MCL-US
Bromoethene	no	50002	Fire retardant	593-60-2	0.100	na	na
Bromomethane	no	34413	Fumigant	74-83-9	0.260	10	HA-L
2-Butanone	no	81595	Solvent	78-93-3	2.000	4,000	HA-L
tert-Butyl alcohol	no	77035	Gasoline degradate	75-65-0	1.00	12	NL
n-Butylbenzene	no	77342	Organic synthesis	104-51-8	0.120	260	NL
sec-Butylbenzene	yes	77350	Organic synthesis	135-98-8	0.060	260	NL
tert-Butylbenzene	yes	77353	Organic synthesis	98-06-6	0.060	260	NL
Chlorobenzene	no	34301	Solvent	108-90-7	0.028	70	MCL-CA
Chloroethane	no	34311	Solvent	75-00-3	0.120	na	na
Chloroethene (vinyl chloride)	no	39175	Organic synthesis	75-01-4	0.080	0.5	MCL-CA
Chloromethane	no	34418	Refrigerant	74-87-3	0.170	30	HA-L
1-Chloro-2-methylbenzene	no	77275	Solvent	95-49-8	0.040	140	NL
1-Chloro-4-methylbenzene	no	77277	Solvent	106-43-4	0.050	140	NL
3-Chloro-1-propene	no	78109	Organic synthesis	107-05-1	0.500	na	na
Dibromochloromethane	yes	32105	Disinfection by-product	124-48-1	0.100	80	MCL-US
1,2-Dibromoethane	no	77651	Solvent/Fumigant	106-93-4	0.036	0.05	MCL-US
Dibromomethane	no	30217	Solvent	74-95-3	0.050	na	na
1,2-Dichlorobenzene	no	34536	Solvent	95-50-1	0.048	600	MCL-CA
1,3-Dichlorobenzene	no	34566	Solvent	541-73-1	0.030	600	HA-L
1,4-Dichlorobenzene	no	34571	Fumigant	106-46-7	0.034	5	MCL-CA
trans-1,4-Dichloro-2-butene	no	73547	Organic synthesis	110-57-6	0.700	na	na
1,2-Dichloroethane	no	32103	Solvent	107-06-2	0.130	0.5	MCL-CA
cis-1,2-Dichloroethene	yes	77093	Solvent	156-59-2	0.024	6	MCL-CA
1,1-Dichloroethane	yes	34496	Solvent	75-34-3	0.035	5	MCL-CA
1,1-Dichloroethylene	yes	34501	Organic synthesis	75-35-4	0.024	6	MCL-CA

Table 3A. Volatile organic compounds measured in ground water in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

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Constituent	Detected in ground-water samples in this study	USGS parameter code	Constituent class	CAS number	LRL (µg/L)	Threshold (µg/L)	Threshold type
trans-1,2-Dichloroethylene	no	34546	Solvent	156-60-5	0.032	10	MCL-CA
Dichloromethane (methylene chloride)	no	34423	Solvent	75-09-2	0.060	5	MCL-US
1,2-Dibromo-3-chloropropane	no	82625	Fumigant	96-12-8	0.510	0.2	MCL-US
1,2-Dichloropropane	yes	34541	Solvent	78-87-5	0.029	5	MCL-US
1,3-Dichloropropane	no	77173	Organic synthesis	142-28-9	0.060	na	na
2,2-Dichloropropane	no	77170	Organic synthesis	594-20-7	0.050	na	na
1,1-Dichloropropene	no	77168	Organic synthesis	563-58-6	0.026	na	na
cis-1,3-Dichloropropene	no	34704	Fumigant	10061-01-5	0.050	na	na
trans-1,3-Dichloropropene	no	34699	Fumigant	10061-02-6	0.090	na	na
Dithiocarbonic anhydride (carbon disulfide)	yes	77041	Organic synthesis	75-15-0	0.038	160	NL
Dichlorodifluoromethane (CFC-12)	yes	34668	Refrigerant	75-71-8	0.180	1,000	NL
Ethenylbenzene (styrene)	no	77128	Organic synthesis	100-42-5	0.042	100	MCL-US
2-Ethoxy-2-methylpropane (ETBE)	no	50004	Gasoline oxygenate	637-92-3	0.030	na	na
Ethyl 2-methyl-2-propanoate	no	73570	Organic synthesis	97-63-2	0.180	na	na
2-Ethyl toluene	yes	77220	Hydrocarbon	611-14-3	0.060	na	na
Ethylbenzene	yes	34371	Gasoline component	100-41-4	0.030	300	MCL-CA
1,1,2,3,4,4-Hexachloro-1,3-butadiene	no	39702	Organic synthesis	87-68-3	0.140	1	HA-L
1,1,1,2,2,2-Hexachloroethane	no	34396	Solvent	67-72-1	0.140	1	HA-L
2-Hexanone	no	77103	Solvent	591-78-6	0.400	na	na
Iodomethane	no	77424	Organic synthesis	74-88-4	0.500	na	na
Isobutyl methyl ketone	yes	78133	Solvent	108-10-1	0.370	120	NL
Isopropylbezene	yes	77223	Organic synthesis	98-82-8	0.038	770	NL
4-Isopropyltoluene	yes	77356	Organic synthesis	99-87-6	0.080	na	na
Methyl acetate	no	77032	Gasoline degradate	79-20-9	0.43	na	na
Methylbenzene (toluene)	v	34010	Gasoline component	108-88-3	0.020	150	MCL-CA
Methyl *tert*-butyl ether (MTBE)	yes	78032	Gasoline oxygenate	1634-04-4	0.100	13	MCL-CA
2-Methoxy-2-methyl butane	no	50005	Gasoline oxygenate	994-05-8	0.040	na	na
2-Methyl-2-propenenitrile	no	81593	Organic synthesis	126-98-7	0.400	na	na
Methyl 2-methyl-2-propenoate	no	81597	Organic synthesis	80-62-6	0.200	na	na
Methyl-2-propenoate	no	49991	Organic synthesis	96-33-3	1.000	na	na
NaphtHA-Lene	yes	34696	Organic synthesis	91-20-3	0.520	17	NL

Table 3A. Volatile organic compounds measured in ground water in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. CAS, Chemical Abstracts Service; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; LRL, laboratory reporting level; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NL, notification level; SMCL, Secondary Maximum Contaminant Level; USGS, U.S. Geological Survey; v, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; µg/L, microgram per liter]

Constituent	Detected in ground-water samples in this study	USGS parameter code	Constituent class	CAS number	LRL (µg/L)	Threshold (µg/L)	Threshold type
1,1′-Oxybisethane	no	81576	Solvent	60-29-7	0.080	na	na
2,2′-Oxybis[propane]	no	81577	Gasoline oxygenate	108-20-3	0.100	na	na
n-Propylbenzene	yes	77224	Solvent	103-65-1	0.042	260	NL
1,1,1,2-Tetrachloroethane	no	77562	Solvent	630-20-6	0.030	na	na
1,1,2,2-Tetrachloroethane	no	34516	Solvent	79-34-5	0.080	1	MCL-CA
Tetrachloroethylene (PCE)	yes	34475	Solvent	127-18-4	0.030	5	MCL-US
Tetrachloromethane (carbon tetrachloride)	yes	32102	Solvent	56-23-5	0.060	0.5	MCL-CA
Tetrahydrofuran	yes	81607	Solvent	109-99-9	1.000	na	na
1,2,3,4-Tetramethylbenzene	yes	49999	Hydrocarbon	488-23-3	0.140	na	na
1,2,3,5-Tetramethylbenzene	yes	50000	Hydrocarbon	527-53-7	0.140	na	na
Tribromomethane (bromoform)	yes	32104	Disinfection by-product	75-25-2	0.100	80	MCL-US
1,2,3-Trichlorobenzene	no	77613	Organic synthesis	87-61-6	0.180	na	na
1,2,4-Trichlorobenzene	no	34551	Solvent	120-82-1	0.120	5	MCL-CA
Trichloroethylene (TCE)	yes	39180	Solvent	79-01-6	0.038	5	MCL-US
1,1,1-Trichloroethane	no	34506	Solvent	71-55-6	0.032	200	MCL-CA
1,1,2-Trichloroethane	no	34511	Solvent	79-00-5	0.040	5	MCL-CA
Trichlorofluoromethane (CFC-11)	yes	34488	Refrigerant	75-69-4	0.080	150	MCL-CA
Trichloromethane (chloroform)	yes	32106	Disinfection by-product	67-66-3	0.024	80	MCL-US
1,2,3-Trimethylbenzene	yes	77221	Gasoline component	526-73-8	0.060	na	na
1,2,3-Trichloropropane	no	77443	Solvent	96-18-4	0.180	0.005	NL
1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113)	yes	77652	Refrigerant	76-13-1	0.038	1,200	MCL-CA
1,2,4-Trimethylbenzene	yes	77222	Organic synthesis	95-63-6	0.056	330	NL
1,3,5-Trimethylbenzene	yes	77226	Gasoline component	108-67-8	0.044	330	NL
o-Xylene	no	77135	Gasoline component	95-47-6	0.038	1.75	MCL-CA
m- and *p*-Xylene	v	85795	Gasoline component	108-38-3/ 106-42-3	0.060	1.75	MCL-CA

Table 3B. Pesticide compounds measured in ground-water samples from all wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

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Constituent	Detected in ground-water samples in this study	USGS parameter Code	Constituent class	CAS number	LRL (µg/L)	Threshold (µg/L)	Threshold type
Acetochlor	no	49260	Herbicide	34256-82-1	0.006	na	na
Alachlor	no	46342	Herbicide	15972-60-8	0.005	2	MCL-US
Atrazine	yes	39632	Herbicide	1912-24-9	0.007	1	MCL-CA
Azinphos-methyl	no	82686	Degradate	86-50-0	0.05	na	na
Azinphos-methyl-oxon	no	61635	Degradate	961-22-8	0.07	na	na
Benfluralin	yes	82673	Degradate	1861-40-1	0.01	na	na
Carbaryl	no	82680	Degradate	63-25-2	0.041	700	HA-L
Carbofuran	no	82674	Herbicide	1563-66-2	0.016	18	MCL-CA
2-Chloro-2,6-diethylacetanilide	no	61618	Degradate	6967-29-9	0.005	na	na
2-Chloro-4-isopropylamino-6-amino-*s*-triazine	yes	04040	Degradate	6190-65-4	0.028	na	na
4-Chloro-2-methylphenol	no	61633	Degradate	1570-64-5	0.0056	na	na
Chlorpyrifos	no	38933	Insecticide	2921-88-2	0.005	20	HA-L
Cyfluthrin	no	61585	Insecticide	68359-37-5	0.0267	na	na
λ-Cyhalothrin	no	61595	Insecticide	91465-08-6	0.0089	na	na
Cypermethrin	no	61586	Insecticide	52315-07-8	0.0086	na	na
Dacthal	yes	82682	Herbicide	1861-32-1	0.003	70	HA-L
Desulfinylfipronil	no	62170	Degradate	na	0.012	na	na
Desulfinylfipronil amide	no	62169	Degradate	na	0.029	na	na
Diazinon	no	39572	Insecticide	333-41-5	0.005	0.6	HA-L
Diazinon, oxygen analog	no	61638	Degradate	962-58-3	0.01	na	na
3,4-Dichloroaniline	yes	61625	Degradate	95-76-1	0.0045	na	na
Dichlorvos	no	38775	Fumigant	62-73-7	0.0118	na	na
Dicrotophos	no	38454	Insecticide	141-66-2	0.0843	na	na
Dieldrin	yes	39381	Insecticide	60-57-1	0.009	0.02	RSD5
2,6-Diethylaniline	no	82660	Degradate	579-66-8	0.006	na	na
Dimethoate	no	82662	Insecticide	60-51-5	0.0061	na	na
Ethion	no	82346	Insecticide	563-12-2	0.004	na	na
Ethion monoxon	no	61644	Degradate	17356-42-2	0.002	na	na
2-Ethyl-6-methylaniline	no	61620	Degradate	24549-06-2	0.0045	na	na
Fenamiphos	no	61591	Insecticide	22224-92-6	0.029	2	HA-L
Fenamiphos sulfone	no	61645	Degradate	31972-44-8	0.0491	na	na
Fenamiphos sulfoxide	no	61646	Degradate	31972-43-7	0.0387	na	na
Fipronil	no	62166	Insecticide	120068-37-3	0.016	na	na
Fipronil sulfide	no	62167	Degradate	120067-83-6	0.013	na	na
Fipronil sulfone	no	62168	Degradate	120068-36-2	0.024	na	na

Table 3B. Pesticide compounds measured in ground-water samples from all wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. CAS, Chemical Abstracts Service; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; LRL, laboratory reporting level; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; RSD5, specific dose at a cancer risk level of 1 in 100,000, or 10E–5; µg/L, microgram per liter]

Constituent	Detected in ground-water samples in this study	USGS parameter Code	Constituent class	CAS number	LRL (µg/L)	Threshold (µg/L)	Threshold type
Fonofos	no	04095	Insecticide	944-22-9	0.003	10	HA-L
Hexazinone	yes	04025	Herbicide	51235-04-2	0.0129	400	HA-L
Iprodione	no	61593	Fungicide	36734-19-7	0.538	na	na
Isofenphos	yes	61594	Insecticide	25311-71-1	0.0034	na	na
Malaoxon	no	61652	Degradate	1634-78-2	0.0298	na	na
Malathion	no	39532	Insecticide	121-75-5	0.027	100	HA-L
Metalaxyl	yes	61596	Fungicide	57837-19-1	0.0051	na	na
Methidathion	no	61598	Insecticide	950-37-8	0.0058	na	na
Metolachlor	yes	39415	Herbicide	51218-45-2	0.006	100	HA-L
Metribuzin	no	82630	Herbicide	21087-64-9	0.006	200	HA-L
Molinate	yes	82671	Herbicide	2212-67-1	0.0016	20	MCL-CA
Myclobutanil	no	61599	Fungicide	88671-89-0	0.008	na	na
1-Naphthol	no	49295	Degradate	90-15-3	0.0882	na	na
Paraoxon-methyl	no	61664	Degradate	950-35-6	0.0299	na	na
Parathion-methyl	no	82667	Insecticide	298-00-0	0.015	na	na
Pendimethalin	no	82683	Herbicide	40487-42-1	0.022	na	na
cis-Permethrin	no	82687	Insecticide	54774-45-7	0.006	na	na
Phorate	no	82664	Insecticide	298-02-2	0.011	na	na
Phorate oxygen analog	no	61666	Degradate	2600-69-3	0.1048	na	na
Phosmet	no	61601	Insecticide	732-11-6	0.0079	na	na
Phosmet oxon	no	61668	Degradate	3735-33-9	0.0511	na	na
Prometon	yes	04037	Herbicide	1610-18-0	0.01	100	HA-L
Prometryn	no	04036	Herbicide	7287-19-6	0.0054	na	na
Propanil	no	82679	Herbicide	709-98-8	0.011	na	na
cis-Propiconazole	no	79846	Fungicide	60207-90-1	0.008	na	na
trans-Propiconazole	no	79847	Fungicide	60207-90-1	0.0133	na	na
Propyzamide	no	82676	Herbicide	23950-58-5	0.004	na	na
Simazine	yes	04035	Herbicide	122-34-9	0.005	4	MCL-US
Tebuthiuron	yes	82670	Herbicide	34014-18-1	0.016	500	HA-L
Terbufos	no	82675	Insecticide	13071-79-9	0.017	0.9	HA-L
Terbufos oxygen analog sulfone	no	61674	Degradate	56070-15-6	0.0676	na	na
Terbuthylazine	no	04022	Herbicide	5915-41-3	0.0102	na	na
Thiobencarb	no	82681	Herbicide	28249-77-6	0.0048	70	MCL-CA
Trifluralin	yes	82661	Herbicide	1582-09-8	0.009	5	HA-L

Table 3C. Pesticide compounds measured in ground-water samples from 43 wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

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Constituent	Detected in ground-water samples in this study	USGS parameter code	Constituent class	CAS number	LRL (µg/L)	Threshold (µg/L)	Threshold type
Acifluorfen	no	49315	Herbicide	50594-66-6	0.028	na	na
Aldicarb	no	49312	Insecticide	116-06-3	0.04	3	MCL-US
Aldicarb sulfone	no	49313	Degradate	1646-88-4	0.018	3	MCL-US
Aldicarb sulfoxide	no	49314	Degradate	1646-87-3	0.022	4	MCL-US
Bendiocarb	no	50299	Insecticide	22781-23-3	0.02	na	na
Benomyl	no	50300	Fungicide	17804-35-2	0.022	na	na
Bensulfuron-methyl	no	61693	Herbicide	83055-99-6	0.018	na	na
Bentazon	yes	38711	Herbicide	25057-89-0	0.012	18	MCL-CA
Bromacil	yes	04029	Herbicide	314-40-9	0.018	90	HA-L
Bromoxynil	no	49311	Herbicide	1689-84-5	0.028	na	na
Caffeine	yes	50305	Beverages	58-08-2	0.018	na	na
Chloramben, methyl ester	no	61188	Herbicide	7286-84-2	0.024	na	na
Chlorimuron-ethyl	no	50306	Herbicide	90982-32-4	0.032	na	na
2-Chloro-6-ethylamino-4-amino-*s*-triazine	yes	04038	Degradate	1007-28-9	0.08	na	na
3(4-Chlorophenyl)-1-methyl urea	no	61692	Degradate	5352-88-5	0.036	na	na
Clopyralid	no	49305	Herbicide	1702-17-6	0.024	na	na
Cycloate	no	04031	Herbicide	1134-23-2	0.014	na	na
2,4-D[1]	yes	39732	Herbicide	94-75-7	0.038	70	MCL-US
Dacthal monoacid	no	49304	Degradate	887-54-7	0.028	na	na
2,4-DB	no	38746	Herbicide	94-82-6	0.02	na	na
Dicamba	no	38442	Herbicide	1918-00-9	0.036	200	HA-L
Dichlorprop	no	49302	Herbicide	120-36-5	0.028	na	na
Dinoseb	no	49301	Herbicide	88-85-7	0.038	7	MCL-US
Diphenamid	yes	04033	Herbicide	957-51-7	0.01	200	HA-L
Diuron	yes	49300	Herbicide	330-54-1	0.014	10	HA-L
2,4-D methyl ester[1]	no	50470	Herbicide	1928-38-7	0.016	na	na
Fenuron	yes	49297	Herbicide	101-42-8	0.018	na	na
Flumetsulam	no	61694	Herbicide	98967-40-9	0.04	na	na
Fluometuron	no	38811	Herbicide	2164-17-2	0.016	90	HA-L
3-Hydroxycarbofuran	no	49308	Degradate	16655-82-6	0.008	na	na
2-Hydroxy-4-isopropylamino-6-ethylamino-*s*-triazine	yes	50355	Degradate	2163-68-0	0.032	na	na
Imazaquin	no	50356	Herbicide	81335-37-7	0.036	na	na
Imazethapyr	no	50407	Herbicide	81335-77-5	0.038	na	na
Imidacloprid	no	61695	Insecticide	138261-41-3	0.02	na	na
Linuron	no	38478	Herbicide	330-55-2	0.014	na	na

Table 3C. Pesticide compounds measured in ground-water samples from 43 wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. CAS, Chemical Abstracts Service; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; LRL, laboratory reporting level; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; RSD5, specific dose at a cancer risk level of 1 in 100,000, or 10E–5; µg/L, microgram per liter]

Constituent	Detected in ground-water samples in this study	USGS parameter code	Constituent class	CAS number	LRL (µg/L)	Threshold (µg/L)	Threshold type
MCPA	no	38482	Herbicide	94-74-6	0.03	4	HA-L
MCPB	no	38487	Herbicide	94-81-5	0.01	na	na
Methiocarb	no	38501	Insecticide	2032-65-7	0.01	na	na
Methomyl	no	49296	Insecticide	16752-77-5	0.02	200	HA-L
Metsulfuron methyl	no	61697	Herbicide	74223-64-6	0.025	na	na
Neburon	no	49294	Herbicide	555-37-3	0.012	na	na
Nicosulfuron	no	50364	Herbicide	111991-09-4	0.04	na	na
Norflurazon	no	49293	Herbicide	27314-13-2	0.02	na	na
Oryzalin	no	49292	Herbicide	19044-88-3	0.012	na	na
Oxamyl	yes	38866	Insecticide	23135-22-0	0.03	50	MCL-CA
Picloram	no	49291	Herbicide	1918-02-1	0.032	500	MCL-US
Propham	no	49236	Herbicide	122-42-9	0.03	100	HA-L
Propiconazole	no	50471	Fungicide	60207-90-1	0.01	na	na
Propoxur	no	38538	Insecticide	114-26-1	0.008	na	na
Siduron	no	38548	Herbicide	1982-49-6	0.02	na	na
Sulfometuron-methyl	no	50337	Herbicide	74222-97-2	0.038	na	na
Terbacil	no	04032	Herbicide	5902-51-2	0.016	90	HA-L
Tribenuron-methyl	no	61159	Herbicide	101200-48-0	0.0088	na	na
Triclopyr	no	49235	Herbicide	55335-06-3	0.026	na	na

[1]The two compounds 2,4-D and 2,4-D methyl ester may chemically transform into each another during analysis.

Table 3D. Constituents of special interest measured in ground-water samples in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. CAS, Chemical Abstracts Service; GAMA, Ground-Water Ambient Monitoring and Assessment; NL, notification level; MDL, method detection level; USGS, U.S. Geological Survey; µg/L, microgram per liter]

Constituent	Primary use/source	Detected in ground-water samples in this study	USGS parameter code	CAS number	MDL (µg/L)	Threshold (µg/L)	Threshold type
Perchlorate	Rocket fuel	yes	61209	14797-73-0	0.5	6	NL
1,2,3-Trichloropropane	Solvent	yes	77443	96-18-4	0.005	0.005	NL
N-Nitrosodimethylamine (NDMA)	Rocket fuel, disinfection by-product	no	64176	62-75-9	0.002	0.01	NL

Table 3E. Nutrient constituents and dissolved organic carbon measured in ground-water samples in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. C, carbon; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; LRL, laboratory reporting level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; mg/L, milligram per liter; N, nitrogen; na, not available; P, phosphorus; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected]

Constituent	Detected in ground-water samples in this study	USGS parameter code	CAS number	LRL (mg/L)	Threshold (mg/L)	Threshold type
Ammonia, as N	yes	00608	7664-41-7	0.04	30	HA-L
Nitrite, as N	no		14797-65-0	0.008	1	MCL-US
Nitrate plus nitrite, N	yes		na	0.06	10	MCL-US
Total nitrogen (ammonia, nitrite, nitrate, organic nitrogen), as N	yes	62854	17778-88-0	0.06	10	MCL-US
Orthophosphorus, as P	yes	00671	14265-44-2	0.006	na	na
Dissolved organic carbon, as C	V		na	0.3	na	na

Table 3F. Major ions and trace inorganic constituents measured in ground-water samples in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. CAS, Chemical Abstracts Service; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; MRL, Minimum Reporting Level; na, not available; NL, notification level; SMCL, Secondary Maximum Contaminant Level; USGS, U.S. Geological Survey; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected]

Constituent	Detected in ground-water samples in this study	USGS parameter code	CAS number	MRL	Threshold	Threshold type
Major ions, reported in milligrams per liter						
Bromide	yes	71870	24959-67-9	0.02	na	na
Calcium	yes	00915	7440-70-2	0.02	na	na
Chloride	yes	00940	16887-00-6	0.2	250	SMCL-CA
Iodide	yes	78165	20461-54-5	0.004	na	na
Magnesium	yes	00925	7439-95-4	0.008	na	na
Potassium	yes	00935	2023695	0.16	na	na
Silica	yes	00955	7631-86-9	0.04	na	na
Sodium	yes	00930	7440-23-5	0.2	na	na
Sulfate	yes	00945	14808-79-8	0.18	250	SMCL-CA
Trace elements, reported in micrograms per liter						
Aluminum	yes	01106	7429-90-5	1.6	1,000	MCL-CA
Antimony	yes	01095	7440-36-0	0.2	6	MCL-US
Arsenic	yes	01000	7440-38-2	0.2	10	MCL-US
Barium	yes	01005	7440-39-3	0.2	1,000	MCL-CA
Beryllium	yes	01010	7440-41-7	0.06	4	MCL-US
Boron	yes	01020	7440-42-8	8	1,000	NL
Cadmium	yes	01025	7440-43-9	0.04	5	MCL-US
Chromium	yes	01030	7440-47-3	0.8	50	MCL-CA
Cobalt	yes	01035	7440-48-4	0.014	na	na
Copper	yes	01040	7440-50-8	0.4	1,300	MCL-US
Fluoride	yes	00950	16984-48-8	0.1	2	MCL-CA
Iron	yes	01046	7439-89-6	6	300	SMCL-US
Lead	V	01049	7439-92-1	0.08	15	MCL-US
Lithium	yes	01130	7439-93-2	0.6	na	na
Manganese	yes	01056	7439-96-5	0.2	50	SMCL-US
Mercury	yes	71890	7439-97-6	0.01	2	MCL-US
Molybdenum	yes	01060	7439-98-7	0.4	40	HA-L
Nickel	yes	01065	7440-02-0	0.06	100	MCL-CA
Selenium	yes	01145	7782-49-2	0.4	50	MCL-US
Silver	yes	01075	7440-22-4	0.2	100	SMCL-US
Strontium	yes	01080	7440-24-6	0.4	4,000	HA-L
Thallium	yes	01057	7440-28-0	0.04	2	MCL-US
Tungsten	yes	01155	7440-33-7	0.5	na	na
Uranium	yes	22703	7440-61-1	0.04	30	MCL-US
Vanadium	yes	01085	7440-62-2	0.14	50	NL
Zinc	yes	01090	7440-66-6	0.6	2,000	HA-L

Table 3G. Isotopic constituents and radioactive parameters measured in ground-water samples in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. CAS, Chemical Abstracts Service; GAMA, Ground-Water Ambient Monitoring and Assessment; LT-MDL, long-term method detection level; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; MRL, Minimum Reporting Level; na, not available; pCi/L, picocuries per liter; SSMDC, sample-specific minimum detectable concentration; USGS, U.S. Geological Survey]

Constituent	Detected in ground-water samples in this study	USGS parameter code	CAS number	Reporting level	Reporting level type	Threshold	Threshold type
Carbon-13/carbon-12, ratio per mil	yes	82081	na/ 7440-44-0	na	MRL	na	na
Carbon-14, percent modern	yes	49933	14762-75-5	na	MRL	na	na
Deuterium/protium, ratio per mil	yes	82082	7782-39-0/ 1333-74-0	na	MRL	na	na
Gross-alpha radioactivity, in pCi/L, 30-day count	yes	62639	12587-46-1	Sample-specific (see table 17)	SSMDC	15	MCL-US
Gross-alpha radioactivity, in pCi/L, 72-hour count	yes	62636	12587-46-1	Sample-specific (see table 17)	SSMDC	15	MCL-US
Gross-beta radioactivity, in pCi/L, 30-day count	yes	62645	12587-47-2	Sample-specific (see table 17)	SSMDC	50	MCL-CA
Gross-beta radioactivity, in pCi/L, 72-hour count	yes	62642	12587-47-2	Sample-specific (see table 17)	SSMDC	50	MCL-CA
Oxygen-18/oxygen-16, ratio per mil	yes	82085	na/ 7782-44-7	na	MRL	na	na
Radium-226, in pCi/L	yes	09511	13982-63-3	Sample-specific (see table 17)	SSMDC	[1]5	MCL-US
Radium-228, in pCi/L	yes	81366	15262-20-1	Sample-specific (see table 17)	SSMDC	[1]5	MCL-US
Radon-222, in pCi/L	yes	82303	14859-67-7	Sample-specific (see table 17)	SSMDC	na	na
Tritium, in pCi/L	yes	07000	10028-17-8	1	MRL	20,000	MCL-US

[1]MCL-US for combined radium-226 and radium-228.

Table 3H. Tritium and noble gases measured in ground-water samples from the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005, and analyzed by the Lawrence Livermore National Laboratory.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. CAS, Chemical Abstracts Service; cm^3STP/g, cubic centimeter of gas at standard temperature and pressure per gram of water; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; MU, method uncertainty; na, not available; pCi/L, picocuries per liter; USGS, U.S. Geological Survey]

Constituent	Detected in ground-water samples in this study	USGS parameter code	CAS number	MU (percent)	Threshold	Threshold type	Reporting units
Argon	yes	85563	7440-37-1	2	na	na	cm^3STP/g
Helium-3/helium-4	yes	61040	na/7440-59-7	0.75	na	na	atom ratio
Helium-4	yes	85561	7440-59-7	2	na	na	cm^3STP/g
Krypton	yes	85565	7439-90-9	2	na	na	cm^3STP/g
Neon	yes	61046	7440-01-09	2	na	na	cm^3STP/g
Tritium	yes	07000	10028-17-8	1	20,000	MCL-US	pCi/L
Xenon	yes	85567	7440-63-3	2	na	na	cm^3STP/g

Table 3I. Iron, arsenic, and chromium speciation results from ground-water samples in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. CAS, Chemical Abstracts Service; DLR, detection level for the purpose of reporting; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; MDL, method detection limit; NL, notification level; SMCL, Secondary Maximum Contaminant Level; USGS, U.S. Geological Survey; µg/L, microgram per liter;]

Constituent	Detected in ground-water samples in this study	USGS parameter code	CAS number	MDL (µg/L)	Threshold (µg/L)	Threshold type
Arsenic	yes	99033	7440-38-2	0.5	10	MCL-US
Arsenic(III)	yes	99034	1327-53-3	2	10	MCL-US
Chromium	yes	01030	7440-47-3	1	50	MCL-CA
Chromium(VI)	yes	01032	11104-59-9	1	50	MCL-CA
Iron	yes	01046	7439-89-6	2	300	MCL-CA
Iron(II)	yes	01047	7439-89-6	2	300	MCL-CA

Table 3J. Microbial constituents measured in ground-water samples in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; MDL, method detection limit; mL, milliliter; na, not available; TT, treatment technique—a required process intended to reduce the level of a contaminant in drinking water (U.S. Environmental Protection Agency, 2004b); USGS, U.S. Geological Survey]

Constituent	Detected in ground-water samples in this study	USGS parameter code	Primary use/source	MDL	Threshold	Threshold type
Escherichia coliform (*E. coli*)	no	90901	Sewage and animal-waste indicator/Intestinal tracts of humans and animals	1 colony/100 mL	No fecal coliforms are allowed.	TT
Total coliform (including fecal coliform and *E. coli*)	yes	90900	Water-quality indicator/Soil, water, and intestinal tracts of animals	1 colony/100 mL	No more then 5.0% samples total coliform-positives in a month. Every sample that has total coloforms must be analyzed for fecal coliforms; no fecal coliforms are allowed.	MCL-US
F-specific coliphage	no	99335	Viral indicator/ Intestinal tracts of warm-blooded animals	na	99.99% killed/inactivated	TT
Somatic coliphage	yes	99332	Viral indicator/ Fecal-contaminated waters	na	99.99% killed/inactivated	TT

Table 4. Analytical methods used for chemical and microbial constituents in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[GAMA, Ground-Water Ambient Monitoring and Assessment; MI agar, supplemented nutrient agar that cause coliforms (total and *Escherichia*) to produce distinctly different fluorescence under ultraviolet lighting, thus aiding in their detection and enumeration; USEPA, U.S. Environmental Protection Agency; USGS, U.S. Geological Survey; UV, ultraviolet; VIS, visible]

Analyte	Method	Laboratory	References
Volatile organic compounds	Purge and trap capillary gas chromatography/mass spectrometry	USGS National Water Quality Laboratory	Connor and others, 1998
Gasoline oxygenates	Heated purge and trap/gas chromatography/mass spectrometry	USGS National Water Quality Laboratory	Rose and Sandstrom, 2003
Pesticides	Solid-phase extraction and chromatography/mass spectrometry	USGS National Water Quality Laboratory	Furlong and others, 2001; Sandstrom and others, 2001
Nutrients	Colorimetry	USGS National Water Quality Laboratory	Patton and Truitt (1992), Fishman (1993)
Dissolved organic carbon	UV-promoted persulfate oxidation and infrared spectrometry	USGS National Water Quality Laboratory	Brenton and Arnett, 1993
Major ions	Atomic absorption spectrometry, colorimetry, ion-exchange chromatography, inductively-coupled plasma atomic emission spectrometry, and mass spectrometry	USGS National Water Quality Laboratory	Fishman and Friedman, 1989; Fishman, 1993; Faires, 1993; McLain, 1993; Garbarino, 1999; Garbarino and Damrau, 2001; Patton and Kryskalla, 2003
Trace elements	Atomic absorption spectrometry and inductively-coupled plasma atomic emission spectrometry	USGS National Water Quality Laboratory	Faires, 1993
N-Nitrosodimethylamine	Chromatography and mass spectrometry; USEPA method 1625, modified	Montgomery Watson Harza Laboratory	U.S. Environmental Protection Agency, 1996; U.S. Environmental Protection Agency, 1999
Percholorate	Chromatography and mass spectrometry; USEPA method 314	Montgomery Watson Harza Laboratory	Hautman and others, 1999
1,2,3-Trichloropropane	Gas chromatography/electron capture detector; USEPA method 524.2, modified	Montgomery Watson Harza Laboratory	U.S. Environmental Protection Agency, 1995
Chromium, arsenic, and iron speciation	Various techniques of UV-VIS spectrophotometery and atomic absorbance spectroscopy	USGS National Research Program Laboratory, Boulder, Colorado	Stookey, 1970; To and others, 1998; Ball and McCleskey, 2003a and 2003b; McCleskey and others, 2003
Carbon isotopes	Accelerator mass spectometry	University of Waterloo Isotope Laboratory and the University of Arizona Accelerated Mass Spectrometry Laboratory	Donahue and others, 1990; Jull and others, 2004
Deuterium/hydrogen	Hydrogen equilibrium and mass spectrometry	USGS Reston Stable Isotope Laboratory	Coplen and others, 1991
Oxygen-18/oxygen-16	Carbon dioxide equilibrium	USGS Reston Stable Isotope Laboratory	Epstein and Mayeda, 1953
Gross alpha and beta radioactivity	USEPA method 900.0, modified	Eberline Analytical Services	U.S. Environmental Protection Agency, 1980
Radium-226	Radon emanation method, USEPA method 903.1	Eberline Analytical Services	U.S. Environmental Protection Agency, 1980
Radium-228	USEPA method 904.0, modified	Eberline Analytical Services	U.S. Environmental Protection Agency, 1980
Radon-222	Liquid scintillation counting	USGS National Water Quality Laboratory	American Society for Testing and Materials, 1992

Table 4. Analytical methods used for chemical and microbial constituents in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[GAMA, Ground-Water Ambient Monitoring and Assessment; MI agar, supplemented nutrient agar that cause coliforms (total and *Escherichia*) to produce distinctly different fluorescence under ultraviolet lighting, thus aiding in their detection and enumeration; USEPA, U.S. Environmental Protection Agency; USGS, U.S. Geological Survey; UV, ultraviolet; VIS, visible]

Analyte	Method	Laboratory	References
Tritium (USGS)	Electrolytic enrichment-liquid scintillation	USGS National Research Program laboratory Menlo Park, California	Thatcher and others, 1977
Tritium and noble gases	Helium in-growth (Tritium) and accelerator mass spectrometry (noble gases)	Lawrence Livermore National Laboratory	Moran and others, 2002
F-specific and somatic coliphage	Single-agar layer and two-step enrichment methods	USGS Ohio Microbiology Laboratory	U.S. Environmental Protection Agency, 2000a
Total and escherichia coliform	MI agar	USGS field personel	U.S. Environmental Protection Agency, 2002b

Table 5. Summary of surrogate compound recoveries for ground-water and quality assurance analyses of volatile organic compounds, gasoline oxygenates, pesticides and pesticide degradates, and special interest compound samples collected for the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[GAMA, Ground-Water Ambient Monitoring and Assessment]

Constituent	Constituent group	Number of analyses	Number of surrogate recoveries below 70 percent	Number of surrogate recoveries above 130 percent	Median recovey (percent)
1-Bromo-4-fluorobenzene	Volatile organic compounds	120	3	0	94
1,2-Dichloroethane-d4	Volatile organic compounds	120	0	6	102
Toluene-d8	Volatile organic compounds	120	0	0	99
1-Bromo-4-fluorobenzene	Gasoline oxygenates	36	0	0	103
1,2-Dichloroethane-d4	Gasoline oxygenates	36	0	0	105
Toluene-d8	Gasoline oxygenates	36	0	0	96
Barban	Pesticide compounds	55	5	1	88
Caffeine-13C	Pesticide compounds	55	1	26	130
Diazinon-d10	Pesticide compounds	101	4	0	92
α-HCH-d6	Pesticide compounds	101	0	0	99
2,4,5-T	Pesticide compounds	55	3	1	96
[1]*N*-Nitrosodimethylamnine D-6	Special interest, *N*-Nitrosodimethylamnine	59	9	0	88
[1]Toluene-d8	Special interest, 1,2,3-trichloropropane	59	0	0	100

[1]Compound analyzed at Montgomery Watson Harza Laboratory

Table 6. Quality-control summary for constituents detected in field blanks and ground-water samples collected for the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. GAMA, Ground-Water Ambient Monitoring and Assessment; GC/MS, gas chromatography/mass spectrometry; mg/L, milligram per liter; N, nitrogen; na, not available; NPR, National Research Program (USGS); USGS, U.S. Geological Survey; µg/L, microgram per liter]

Constituent	USGS parameter code	Reporting level	Censoring level	Censored sample groups	Minimum detection in ground water in this study	Maximum detection in a field blank
Volatile organic compounds and gasoline oxygenates						
1,3- and 1,4-Dimethylbenzene, µg/L	85795	0.060	1.165	slow, depth dependent	0.03	1.15
Toluene, µg/L	34010	0.020	0.695	all	0.02	0.69
Tentatively identified organic compounds[1]						
Hexafluoropropene, µg/L	na	0.1	all	depth dependent	0.3	0.3
Pesticide compounds						
Benfluralin, µg/L	82673	0.01	0.01	all	0.007	0.006
DCPA, µg/L	82682	0.003	0.003	all	0.002	0.002
Trifluralin, µg/L	82661	0.009	0.007	all	0.006	0.005
Trace elements						
Antimony, µg/L	01095	0.2	0.2	depth dependent	0.1	0.1
Cadmium, µg/L	01025	0.04	0.07	slow	0.02	0.05
Chromium(Total), µg/L, NRP	01030	0.1	8.4	all	0.7	8.4
Chromium(VI), µg/L	01032	0.1	8.2	all	0.5	8.2
Fluoride, mg/L	00950	0.1	0.4	depth dependent	0.06	0.35
Lead, µg/L	01049	0.08	15.4	all	0.04	15.4
Nutrients and dissolved organic carbon						
Dissolved organic carbon, mg/L	00681	0.33	0.56	all	0.2	0.4
Nitrogen(Total), mg/L as N	62854	0.06	0.09	depth dependent	0.06	0.06

[1]Tentatively identified organic compounds (TIOCs) are based on comparison with the National Institute for Standards and Technology's (NIST) library spectra and examination by a GC/MS analyst. Reported concentrations are approximate.

Table 7. Constituents with relative standard deviations greater than 20 percent for replicate quality-control samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[GAMA, Ground-Water Ambient Monitoring and Assessment; na, not applicable]

Constituent	Number of replicate pairs, number of replicate pairs with detections	Number of replicate pairs with relative standard deviations greater than 20 percent	Maximum relative standard deviation (percent)	Median relative standard deviation (percent)
Toluene	8,1	1	[1]28	na
Carbon disulfide	8,1	1	[1]72	na
Isofenphos	7,1	1	110	na
Oxamyl	4,1	1	54	na
Copper	4,3	2	54	23
Iron	4,2	1	[1]35	22
Manganese	4,3	1	[1]47	4
Nickel	4,4	2	28	17
Vanadium	4,3	1	[2]46	2
Zinc	4,4	4	[2]56	47
Radium-228	1,1	1	111	na
Alpha radioactivity, 72-hour count	1,1	1	62	na
Beta radioactivity, 72-hour count	1,1	1	100	na

[1]One or both replicate samples had detections below the reporting limit.

[2]One sample had a detection above the reporting limit, and the replicate had no detection.

Table 8A. Laboratory matrix spike results from ground water collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005: constituents with low recoveries.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. GAMA, Ground-Water Ambient Monitoring and Assessment; USGS, U.S. Geological Survey]

Constituent with at least one low recovery in a spiked sample	USGS parameter code	Detected in at least one unspiked ground-water sample
Volatile organic compounds		
Bromomethane (methyl bromide)	34413	no
n-Butylbenzene	77342	no
Dichlorodifluoromethane	34668	yes
Styrene	77128	no
Pesticide compounds		
Aldicarb	49312	no
Azinphos-methyl	82686	no
Azinphos-methyl-oxon	61635	no
Benfluralin	82673	yes
Bentazon	38711	yes
Chlorimuron-ethyl	50306	no
2-Chloro-6-ethylamino-4-amino-*s*-triazine	04038	yes
2-Chloro-4-isopropylamino-6-amino-*s*-triazine {CIAT}	04040	yes
4-Chloro-2-methylphenol	61633	no
Chlorpyrifos oxygen analog	61636	no
Clopyralid	49305	no
Cyfluthrin	61585	no
λ-Cyhalothrin	61595	no
Cypermethrin	61586	no
Desulfinylfipronil amide	62169	no
Diazinon, oxygen analog	61638	no
3,4-Dichloroaniline	61625	yes
Dichlorvos	38775	no
Dicrotophos	38454	no
Dimethoate	82662	no
2-Ethyl-6-methylaniline	61620	no
Ethion	82346	no
Ethion monoxon	61644	no
Fenamiphos	61591	no
Fenamiphos sulfone	61645	no
Fenamiphos sulfoxide	61646	no
Fipronil	62166	no
Fipronil sulfide	62167	no
Fipronil sulfone	62168	no
Hexazinone	04025	yes
Iprodione	61593	no
Malaoxon	61652	no
Metribuzin	82630	no
Metsulfuron methyl	61697	no
Myclobutanil	61599	no
1-Naphthol	49295	no
Paraoxon-methyl	61664	no
Parathion-methyl	82667	no
Pendimethalin	82683	no
cis-Permethrin	82687	no
Phorate	82664	no

Table 8A. Laboratory matrix spike results from ground water collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005: constituents with low recoveries—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. GAMA, Ground-Water Ambient Monitoring and Assessment; USGS, U.S. Geological Survey]

Constituent with at least one low recovery in a spiked sample	USGS parameter code	Detected in at least one unspiked ground-water sample
Phorate oxon	61666	no
Phosmet	61601	no
Phosmet oxon	61668	no
trans-Propiconazole	79847	no
Sulfometuron-methyl	50337	no
Terbufos	82675	no
Terbufos oxygen analog sulfone	61674	no
Tribenuron-methyl	61159	no
Trifluralin	82661	yes

Table 8B. Laboratory matrix spike results from ground water collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005: constituents with high recoveries.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. GAMA, Ground-Water Ambient Monitoring and Assessment; USGS, U.S. Geological Survey]

Constituent with at least one high recovery in a spiked sample	USGS parameter code	Detected in at least one unspiked ground-water sample
Volatile organic compounds		
Acrylonitrile	34215	no
Bromoethene	50002	no
Bromomethane (methyl bromide)	34413	no
tert-Butyl ethyl ether	50004	no
Chloromethane	34418	no
trans-1,4-Dichloro-2-butene	73547	no
Diethyl ether	81576	yes
Iodomethane	77424	no
1,2,3,4-Tetramethylbenzene	49999	yes
Trichloromethane (chloroform)	32106	yes
1,2,4-Trimethylbenzene	77222	yes
Vinyl chloride	39175	no
Pesticide compounds		
Acetochlor	49260	no
Acifluorfen	49315	no
Caffeine	50305	yes
Carbaryl	82680	no
2-Chloro-4-isopropylamino-6-amino-*s*-triazine	04040	yes
2,4-D	39732	yes
Flumetsulam	61694	no
Imazaquin	50356	no
Imazethapyr	50407	no
Imidacloprid	61695	no
Malathion	39532	no
Metolachlor	39415	yes
Propanil	82679	no
Tebuthiuron	82670	yes
Terbacil	04032	no

Table 9. General water-quality parameters measured or calculated in ground-water samples from the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." av, averaged value; C, Celsius; e, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; SMCL-US, U.S. Environmental Protection Agency Secondary Maximum Contaminant Level; SMCL-CA, California Secondary Maximum Contaminant Level; mg/L, milligram per liter; na, not available; NAM, North American; ns, no sample; NTU, nephelometric turbidity units; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; µS/cm, microsiemens per centimeter; —, not detected]

GAMA sample identification number	Dissolved oxygen (mg/L)	pH, Standard units (field)	pH, Standard units (laboratory)	Specific conductance, µS/cm at 25°C (field)	Specific conductance, µS/cm at 25 °C (laboratory)	Total dissolved solids (residue on evaporation) (mg/L)	Total dissolved solids (sum of constituents) (mg/L)	Water temperature, °C	Total hardness, as $CaCO_3$ (mg/L)	Alkalinity, dissolved, as $CaCO_3$ (mg/L)	Bicarbonate, dissolved, as HCO_3 (mg/L)	Carbonate, dissolved, as CO_3 (mg/L)	Turbidity, NTU
USGS parameter code	**00300**	**00400**	**00403**	**00095**	**90095**	**70300**	**70301**	**00010**	**00900**	**29802**	**63786**	**63788**	**63676**
Threshold	**na**	**6.5–8.5**	**6.5–8.5**	**900 (1,600)**	**900 (1,600)**	**500 (1,000)**	**500 (1,000)**	**na**	**na**	**na**	**na**	**na**	**5**
Threshold type	**na**	**SMCL-US**	**SMCL-US**	**SMCL-CA[1]**	**SMCL-CA[1]**	**SMCL-CA[1]**	**SMCL-CA[1]**	**na**	**na**	**na**	**na**	**na**	**MCL-CA**
Grid wells													
NAM-01	ns	ns	8	*1,050	*1,030	*666	*654	18.5	150	ns	ns	ns	ns
NAM-02	ns	ns	7.5	482	443	336	331	19.0	160	ns	ns	ns	ns
NAM-03	ns	ns	ns	382	ns	ns	ns	21.0	ns	ns	ns	ns	ns
NAM-04	ns	ns	ns	243	ns	ns	ns	19.5	ns	ns	ns	ns	ns
NAM-05	ns	ns	7.5	388	370	275	280	22.0	110	ns	ns	ns	ns
NAM-06	—	*8.8	*8.6	367	336	242	241	20.5	75	av144	av165	av5	2.5
NAM-07	ns	ns	ns	264	ns	ns	ns	20.0	ns	ns	ns	ns	ns
NAM-08	ns	ns	7.4	517	484	359	351	19.0	200	ns	ns	ns	ns
NAM-09	ns	ns	ns	616	ns	ns	ns	19.0	ns	ns	ns	ns	ns
NAM-10	ns	ns	ns	441	ns	ns	ns	19.5	ns	ns	ns	ns	ns
NAM-11	ns	ns	ns	369	ns	ns	ns	19.0	ns	ns	ns	ns	ns
QPC-01	ns	ns	ns	135	ns	ns	ns	18.0	ns	ns	ns	ns	ns
QPC-02	ns	ns	E7.1	356	331	259	271	20.0	110	ns	ns	ns	ns
QPC-03	ns	ns	ns	321	ns	ns	ns	20.5	ns	ns	ns	ns	ns
QPC-04	ns	ns	ns	615	ns	ns	ns	19.0	ns	ns	ns	ns	ns
QPC-05	ns	ns	7.7	200	170	159	155	19.5	75	ns	ns	ns	ns
QPC-06	8.6	7	7.2	404	379	289	299	20.0	150	av104	av127	—	0.2
QPC-07	4.7	7	7	604	570	408	408	20.0	150	av136	av165	—	0.4
QPC-08	ns	ns	7.2	383	354	286	293	20.5	74	ns	ns	ns	ns
QPC-09	ns	ns	7.4	152	152	147	155	ns	54	ns	ns	ns	ns
QPC-10	ns	ns	ns	161	ns	ns	ns	20.0	ns	ns	ns	ns	ns
QPC-11	ns	ns	ns	220	ns	ns	ns	17.0	ns	ns	ns	ns	ns

[1]The SMCL-CA has recommended and upper threshold values. The upper value is shown in parentheses.

Table 9. General water-quality parameters measured or calculated in ground-water samples from the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." av, averaged value; C, Celsius; e, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; SMCL-US, U.S. Environmental Protection Agency Secondary Maximum Contaminant Level; SMCL-CA, California Secondary Maximum Contaminant Level; mg/L, milligram per liter; na, not available; NAM, North American; ns, no sample; NTU, nephelometric turbidity units; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; µS/cm, microsiemens per centimeter; —, not detected]

GAMA sample identification number	Dissolved oxygen (mg/L)	pH, Standard units (field)	pH, Standard units (laboratory)	Specific conductance, µS/cm at 25°C (field)	Specific conductance, µS/cm at 25 °C (laboratory)	Total dissolved solids (residue on evaporation) (mg/L)	Total dissolved solids (sum of constituents) (mg/L)	Water temperature, °C	Total hardness, as $CaCO_3$ (mg/L)	Alkalinity, dissolved, as $CaCO_3$ (mg/L)	Bicarbonate, dissolved, as HCO_3 (mg/L)	Carbonate, dissolved, as CO_3 (mg/L)	Turbidity, NTU
USGS parameter code	00300	00400	00403	00095	90095	70300	70301	00010	00900	29802	63786	63788	63676
Threshold	na	6.5–8.5	6.5–8.5	900 (1,600)	900 (1,600)	500 (1,000)	500 (1,000)	na	na	na	na	na	5
Threshold type	na	SMCL-US	SMCL-US	SMCL-CA[1]	SMCL-CA[1]	SMCL-CA[1]	SMCL-CA[1]	na	na	na	na	na	MCL-CA
SAM-01	ns	ns	ns	367	ns	ns	ns	20.0	ns	ns	ns	ns	ns
SAM-02	ns	ns	7.2	433	394	279	301	20.0	190	ns	ns	ns	ns
SAM-03	ns	ns	7.9	276	267	195	195	16.0	130	ns	ns	ns	ns
SAM-04	ns	ns	ns	267	ns	ns	ns	19.5	ns	ns	ns	ns	ns
SAM-05	ns	ns	ns	215	ns	ns	ns	21.0	ns	ns	ns	ns	ns
SAM-06	ns	ns	ns	184	ns	ns	ns	21.0	ns	ns	ns	ns	ns
SAM-07	ns	ns	7.7	441	390	269	283	19.0	190	ns	ns	ns	ns
SAM-08	ns	ns	ns	413	ns	ns	ns	18.0	ns	ns	ns	ns	ns
SAM0-9	ns	ns	ns	236	ns	ns	ns	20.0	ns	ns	ns	ns	ns
SAM-10	ns	ns	ns	590	ns	ns	ns	18.5	ns	ns	ns	ns	ns
SAM-11	ns	ns	7.6	220	206	176	180	19.5	81	ns	ns	ns	ns
SAM-12	ns	ns	ns	521	ns	ns	ns	18.5	ns	ns	ns	ns	ns
SOL-01	ns	ns	8.3	678	647	418	423	19.0	51	ns	ns	ns	ns
SOL-02	ns	ns	ns	677	ns	ns	ns	19.0	ns	ns	ns	ns	ns
SOL-03	ns	ns	7.6	519	507	358	363	19.5	200	ns	ns	ns	ns
SOL-04	ns	ns	ns	692	ns	ns	ns	17.5	ns	ns	ns	ns	ns
SOL-05	ns	ns	ns	343	ns	ns	ns	16.5	ns	ns	ns	ns	ns
SOL-06	ns	ns	7.8	*1,230	*1,130	*707	*682	19.5	150	ns	ns	ns	ns
SOL-07	ns	ns	ns	440	ns	ns	ns	18.0	ns	ns	ns	ns	ns
SOL-08	ns	ns	ns	443	ns	ns	ns	26.0	ns	ns	ns	ns	ns
SOL-09	ns	ns	ns	*965	ns	ns	ns	18.5	ns	ns	ns	ns	ns
SOL-10	ns	ns	ns	578	ns	ns	ns	19.0	ns	ns	ns	ns	ns
SOL-11	ns	ns	ns	*1,230	ns	ns	ns	19.5	ns	ns	ns	ns	ns
SOL-12	ns	ns	ns	723	ns	ns	ns	18.0	ns	ns	ns	ns	ns

[1]The SMCL-CA has recommended and upper threshold values. The upper value is shown in parentheses.

Table 9. General water-quality parameters measured or calculated in ground-water samples from the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." av, averaged value; C, Celsius; e, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; SMCL-US, U.S. Environmental Protection Agency Secondary Maximum Contaminant Level; SMCL-CA, California Secondary Maximum Contaminant Level; mg/L, milligram per liter; na, not available; NAM, North American; ns, no sample; NTU, nephelometric turbidity units; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; µS/cm, microsiemens per centimeter; —, not detected]

GAMA sample identification number	Dissolved oxygen (mg/L)	pH, Standard units (field)	pH, Standard units (laboratory)	Specific conductance, µS/cm at 25°C (field)	Specific conductance, µS/cm at 25 °C (laboratory)	Total dissolved solids (residue on evaporation) (mg/L)	Total dissolved solids (sum of constituents) (mg/L)	Water temperature, °C	Total hardness, as $CaCO_3$ (mg/L)	Alkalinity, dissolved, as $CaCO_3$ (mg/L)	Bicarbonate, dissolved, as HCO_3 (mg/L)	Carbonate, dissolved, as CO_3 (mg/L)	Turbidity, NTU
USGS parameter code	**00300**	**00400**	**00403**	**00095**	**90095**	**70300**	**70301**	**00010**	**00900**	**29802**	**63786**	**63788**	**63676**
Threshold	**na**	**6.5–8.5**	**6.5–8.5**	**900 (1,600)**	**900 (1,600)**	**500 (1,000)**	**500 (1,000)**	**na**	**na**	**na**	**na**	**na**	**5**
Threshold type	**na**	**SMCL-US**	**SMCL-US**	**SMCL-CA[1]**	**SMCL-CA[1]**	**SMCL-CA[1]**	**SMCL-CA[1]**	**na**	**na**	**na**	**na**	**na**	**MCL-CA**
SOL-13	ns	ns	ns	*1,490	ns	ns	ns	18.5	ns	ns	ns	ns	ns
SUI-01	ns	ns	7.6	*1,090	*1,080	*637	*644	17.0	310	ns	ns	ns	ns
SUI-02	ns	ns	8.2	*1,300	*1,300	*759	*706	19.5	57	ns	ns	ns	ns
SUI-03	ns	ns	ns	712	ns	ns	ns	20.0	ns	ns	ns	ns	ns
SUI-04	ns	ns	ns	*994	ns	ns	ns	19.5	ns	ns	ns	ns	ns
SUI-05	ns	ns	ns	859	ns	ns	ns	18.5	ns	ns	ns	ns	ns
YOL-01	ns	ns	ns	883	ns	ns	ns	20.0	ns	ns	ns	ns	ns
YOL-02	ns	ns	7.6	*1,270	*1,280	*808	*809	18.0	530	ns	ns	ns	ns
YOL-03	0.2	8.2	8.2	535	505	326	328	25.0	110	av204	av243	av2	0.3
YOL-04	4.9	7.4	7.5	810	789	490	489	18.5	410	av365	av443	av1	0.1
YOL-05	ns	ns	ns	574	ns	ns	ns	21.0	ns	ns	ns	ns	ns
YOL-06	ns	ns	8	819	701	441	431	20..5	170	ns	ns	ns	ns
YOL-07	ns	ns	ns	*1,340	ns	ns	ns	19.0	ns	ns	ns	ns	ns
YOL-08	0.2	8.2	8.2	696	634	430	434	19.0	60	av234	av279	av3	0.1
YOL-09	ns	ns	8.1	168	156	122	125	15.5	49	ns	ns	ns	ns
YOL-10	ns	ns	ns	*1,010	ns	ns	ns	18.5	ns	ns	ns	ns	ns
YOL-11	ns	ns	ns	692	ns	ns	ns	19.0	ns	ns	ns	ns	ns
YOL-12	ns	ns	ns	*2,360	ns	ns	ns	19.0	ns	ns	ns	ns	ns
YOL-13	ns	ns	7.5	676	627	408	401	20.0	250	ns	ns	ns	ns
YOL-14	—	6.3	7.6	*1,240	*1,400	*888	*788	19.0	320	av169	E204	—	0.5
YOL-15	ns	ns	ns	480	ns	ns	ns	19.0	ns	ns	ns	ns	ns

[1]The SMCL-CA has recommended and upper threshold values. The upper value is shown in parentheses.

Table 9. General water-quality parameters measured or calculated in ground-water samples from the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." av, averaged value; C, Celsius; e, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; SMCL-US, U.S. Environmental Protection Agency Secondary Maximum Contaminant Level; SMCL-CA, California Secondary Maximum Contaminant Level; mg/L, milligram per liter; na, not available; NAM, North American; ns, no sample; NTU, nephelometric turbidity units; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; µS/cm, microsiemens per centimeter; —, not detected

GAMA sample identification number	Dissolved oxygen (mg/L)	pH, Standard units (field)	pH, Standard units (laboratory)	Specific conductance, µS/cm at 25°C (field)	Specific conductance, µS/cm at 25 °C (laboratory)	Total dissolved solids (residue on evaporation) (mg/L)	Total dissolved solids (sum of constituents) (mg/L)	Water temperature, °C	Total hardness, as $CaCO_3$ (mg/L)	Alkalinity, dissolved, as $CaCO_3$ (mg/L)	Bicarbonate, dissolved, as HCO_3 (mg/L)	Carbonate, dissolved, as CO_3 (mg/L)	Turbidity, NTU
USGS parameter code	**00300**	**00400**	**00403**	**00095**	**90095**	**70300**	**70301**	**00010**	**00900**	**29802**	**63786**	**63788**	**63676**
Threshold	**na**	**6.5–8.5**	**6.5–8.5**	**900 (1,600)**	**900 (1,600)**	**500 (1,000)**	**500 (1,000)**	**na**	**na**	**na**	**na**	**na**	**5**
Threshold type	**na**	**SMCL-US**	**SMCL-US**	**SMCL-CA[1]**	**SMCL-CA[1]**	**SMCL-CA[1]**	**SMCL-CA[1]**	**na**	**na**	**na**	**na**	**na**	**MCL-CA**
Nongrid wells													
QPCFP-01	4.9	6.9	E6.1	415	410	313	315	22.0	110	av115	av140	—	2.9
QPCFP-02	7.2	7	7.1	250	234	226	222	23.0	88	av74.0	av90	—	*6.2
QPCFP-03	ns	ns	7.1	429	397	303	306	19.5	110	ns	ns	ns	ns
QPCFP-04	ns	ns	7.2	259	242	209	222	21.0	86	ns	ns	ns	ns
NAMFP-05	—	8.5	8.4	*1,150	*1,100	*632	*641	19.0	100	av139	E164	E3	1.6
NAMFP-06	—	8.3	8.2	725	656	426	431	19.5	46	av185	av220	av3	2.2
NAMFP-07	—	8.2	8.3	800	756	495	*500	18.5	46	av268	av318	av5	1.7
NAMFP-08	—	8	8.1	*1,100	*1,050	*636	*656	19.0	180	av337	av404	av3	0.5
NAMFP-09	—	7.9	8	378	339	246	258	20.5	78	av159	av191	av1	ns
NAMFP-10	—	8	7.9	372	344	226	242	20.5	99	av150	av180	av1	0.7
NAMFP-11	ns	ns	ns	244	ns	ns	ns	19.5	ns	ns	ns	ns	ns
YOLFP-12	0.5	8.1	8.1	537	484	330	336	22.0	140	av226	av271	av2	0.1
YOLFP-13	3.7	7.7	7.8	883	852	*529	*528	19.0	360	av395	av478	av2	0.1
YOLFP-14	6.0	7.4	7.5	686	626	411	412	19.5	320	av262	av319	—	0.1
YOLFP-15	9.3	7.8	7.9	437	404	267	271	21.0	170	av158	av191	—	0.1
NAMFP-16	2.0	7.4	7.7	225	224	198	200	20.0	82	av97.9	E119	—	0.2
Depth-dependent samples													
NAMDD-01	ns	7.6	8	262	225	207	203	ns	86	ns	ns	ns	ns
NAMDD-02	ns	7.6	8.2	262	218	210	203	ns	85	ns	ns	ns	ns
NAMDD-03	ns	7.9	8	260	223	211	198	ns	84	ns	ns	ns	ns
NAMDD-04	ns	7.9	8.1	251	224	206	196	ns	80	ns	ns	ns	ns

[1]The SMCL-CA has recommended and upper threshold values. The upper value is shown in parentheses.

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Disinfection by-product			
GAMA sample identification number	Number of VOC detections	Trichloromethane	Bromodichloro-methane	Tribromomethane	Dibromochloro-methane
USGS parameter code	**na**	**32106**	**32101**	**32104**	**32105**
Reporting level	**na**	**0.024**	**0.028**	**0.1**	**0.1**
Threshold	**na**	**80**	**80**	**80**	**80**
Threshold type	**na**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**
Grid wells					
NAM-01	1	—	—	—	—
NAM-02	2	E0.013	—	—	—
NAM-03	1	—	—	—	—
NAM-09	1	E0.018	—	—	—
NAM-11	1	—	—	—	—
QPC-02	1	E0.084	—	—	—
QPC-03	5	5.580	0.526	0.3	0.3
QPC-04	5	0.447	E0.044	—	—
QPC-05	2	E0.035	—	—	—
QPC-06	1	E0.052	—	—	—
QPC-07	1	E0.023	—	—	—
QPC-08	1	E0.046	—	—	—
QPC-09	1	—	—	—	—
QPC-11	3	1.560	E0.042	—	—
SAM-01	1	0.251	—	—	—
SAM-02	3	E0.038	—	—	—
SAM-03	2	—	—	—	—
SAM-04	2	—	—	—	—
SAM-06	2	—	—	—	—
SAM-07	6	0.194	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Disinfection by-product			
GAMA sample identification number	Number of VOC detections	Trichloromethane	Bromodichloro-methane	Tribromomethane	Dibromochloro-methane
USGS parameter code	**na**	**32106**	**32101**	**32104**	**32105**
Reporting level	**na**	**0.024**	**0.028**	**0.1**	**0.1**
Threshold	**na**	**80**	**80**	**80**	**80**
Threshold type	**na**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**
SAM-08	3	0.221	—	—	—
SAM-09	6	0.651	0.539	0.2	0.6
SAM-10	3	0.272	—	—	—
SAM-11	1	—	—	—	—
SAM-12	4	—	—	—	—
SOL-04	1	—	—	—	—
SOL-05	2	—	—	—	—
SOL-06	4	—	—	—	—
SOL-07	1	—	—	—	—
YOL-01	1	E0.018	—	—	—
YOL-02	1	—	—	—	—
YOL-04	1	0.161	—	—	—
YOL-05	3	1.390	E0.059	E0.1	—
YOL-06	1	E0.013	—	—	—
YOL-07	1	—	—	—	—
YOL-08	1	E0.044	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Disinfection by-product			
GAMA sample identification number	**Number of VOC detections**	**Trichloromethane**	**Bromodichloro-methane**	**Tribromomethane**	**Dibromochloro-methane**
USGS parameter code	**na**	**32106**	**32101**	**32104**	**32105**
Reporting level	**na**	**0.024**	**0.028**	**0.1**	**0.1**
Threshold	**na**	**80**	**80**	**80**	**80**
Threshold type	**na**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**
YOL-12	6	—	—	—	—
YOL-13	1	—	—	—	—
SUI-02	1	—	—	—	—
SUI-05	3	0.504	E0.030	—	—
Nongrid Wells					
QPCFP-01	3	0.201	—	—	—
QPCFP-02	1	0.178	—	—	—
QPCFP-03	3	E0.040	—	—	—
QPCFP-04	1	—	—	—	—
NAMFP-05	15	—	—	—	—
NAMFP-06	1	—	—	—	—
NAMFP-11	1	E0.040	—	—	—
YOLFP-13	2	1.930	—	—	—
NAMFP-16	1	—	—	—	—
Depth-dependent samples					
NAMDD-01	4	0.076	—	—	—
NAMDD-02	2	0.032	—	—	—
NAMDD-03	1	—	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Solvents										
GAMA sample identification number	Number of VOC detections	Tetrachloroethylene	Trichloroethylene	1,1-Dichloroethane	*cis*-1,2-Dichloroethene	Tetrachloromethane	Acetone	1,2-Dichloropropane	Tetrahydrofuran	*n*-Propylbenzene	Isobutyl methyl ketone	Diethyl ether
USGS parameter code	na	34475	39180	34496	77093	32102	81552	34541	81607	77224	78133	81576
Reporting level	na	0.03	0.038	0.035	0.024	0.06	6	0.029	1	0.042	0.37	0.08
Threshold	na	5	5	5	6	0.5	na	5	na	260	120	na
Threshold type	na	MCL-US	MCL-US	MCL-CA	MCL-CA	MCL-CA	na	MCL-US	na	NL	NL	na
Grid wells												
NAM-01	1	—	—	—	—	—	—	—	—	—	—	—
NAM-02	2	—	—	—	—	—	—	—	—	—	—	—
NAM-03	1	E0.02	—	—	—	—	—	—	—	—	—	—
NAM-09	1	—	—	—	—	—	—	—	—	—	—	—
NAM-11	1	—	—	—	—	—	—	—	—	—	—	—
QPC-02	1	—	—	—	—	—	—	—	—	—	—	—
QPC-03	5	—	—	—	—	—	E2	—	—	—	—	—
QPC-04	5	0.11	—	E0.033	—	—	—	—	—	—	—	—
QPC-05	2	—	E0.014	—	—	—	—	—	—	—	—	—
QPC-06	1	—	—	—	—	—	—	—	—	—	—	—
QPC-07	1	—	—	—	—	—	—	—	—	—	—	—
QPC-08	1	—	—	—	—	—	—	—	—	—	—	—
QPC-09	1	—	0.238	—	—	—	—	—	—	—	—	—
QPC-11	3	—	0.482	—	—	—	—	—	—	—	—	—
SAM-01	1	—	—	—	—	—	—	—	—	—	—	—
SAM-02	3	—	—	—	—	—	—	—	—	—	—	—
SAM-03	2	—	—	—	—	—	—	—	—	—	—	—
SAM-04	2	—	—	—	—	—	—	—	2	—	—	—
SAM-06	2	E0.04	E0.020	—	—	—	—	—	—	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Solvents										
GAMA sample identification number	Number of VOC detections	Tetrachloroethylene	Trichloroethylene	1,1-Dichloroethane	*cis*-1,2-Dichloroethene	Tetrachloromethane	Acetone	1,2-Dichloropropane	Tetrahydrofuran	*n*-Propylbenzene	Isobutyl methyl ketone	Diethyl ether
USGS parameter code	**na**	**34475**	**39180**	**34496**	**77093**	**32102**	**81552**	**34541**	**81607**	**77224**	**78133**	**81576**
Reporting level	**na**	**0.03**	**0.038**	**0.035**	**0.024**	**0.06**	**6**	**0.029**	**1**	**0.042**	**0.37**	**0.08**
Threshold	**na**	**5**	**5**	**5**	**6**	**0.5**	**na**	**5**	**na**	**260**	**120**	**na**
Threshold type	**na**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-CA**	**MCL-CA**	**na**	**MCL-US**	**na**	**NL**	**NL**	**na**
SAM-07	6	E0.06	0.278	—	—	—	—	—	—	—	—	—
SAM-08	3	—	0.116	—	—	—	—	—	—	—	—	—
SAM-09	6	—	—	—	—	—	—	—	—	—	E0.23	—
SAM-10	3	—	E0.024	—	—	E0.04	—	—	—	—	—	—
SAM-11	1	E0.08	—	—	—	—	—	—	—	—	—	—
SAM-12	4	0.54	E0.061	E0.058	E0.014	—	—	—	—	—	—	—
SOL-04	1	—	—	—	—	—	—	—	—	—	—	—
SOL-05	2	—	—	E0.012	—	—	—	—	—	—	—	—
SOL-06	4	—	—	E0.034	E0.013	—	—	E0.116	—	—	—	—
SOL-07	1	—	—	—	—	—	—	—	—	—	—	—
YOL-01	1	—	—	—	—	—	—	—	—	—	—	—
YOL-02	1	E0.09	—	—	—	—	—	—	—	—	—	—
YOL-04	1	—	—	—	—	—	—	—	—	—	—	—
YOL-05	3	—	—	—	—	—	—	—	—	—	—	—
YOL-06	1	—	—	—	—	—	—	—	—	—	—	—
YOL-07	1	—	—	—	—	—	—	—	—	—	—	—
YOL-08	1	—	—	—	—	—	—	—	—	—	—	—
YOL-12	6	0.26	0.139	E0.085	E0.078	—	—	—	—	—	—	E0.07
YOL-13	1	—	—	—	—	—	—	—	—	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Solvents										
GAMA sample identification number	Number of VOC detections	Tetrachloroethylene	Trichloroethylene	1,1-Dichloroethane	*cis*-1,2-Dichloroethene	Tetrachloromethane	Acetone	1,2-Dichloropropane	Tetrahydrofuran	*n*-Propylbenzene	Isobutyl methyl ketone	Diethyl ether
USGS parameter code	**na**	**34475**	**39180**	**34496**	**77093**	**32102**	**81552**	**34541**	**81607**	**77224**	**78133**	**81576**
Reporting level	**na**	**0.03**	**0.038**	**0.035**	**0.024**	**0.06**	**6**	**0.029**	**1**	**0.042**	**0.37**	**0.08**
Threshold	**na**	**5**	**5**	**5**	**6**	**0.5**	**na**	**5**	**na**	**260**	**120**	**na**
Threshold type	**na**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-CA**	**MCL-CA**	**na**	**MCL-US**	**na**	**NL**	**NL**	**na**
SUI-02	1	—	—	—	—	—	—	—	—	—	—	—
SUI-05	3	0.20	—	—	—	—	—	—	—	—	—	—
Nongrid wells												
QPCFP-01	3	1.17	E0.030	—	—	—	—	—	—	—	—	—
QPCFP-02	1	—	—	—	—	—	—	—	—	—	—	—
QPCFP-03	3	0.71	E0.022	—	—	—	—	—	—	—	—	—
QPCFP-04	1	E0.07	—	—	—	—	—	—	—	—	—	—
NAMFP-05	15	—	—	—	—	—	—	—	—	E0.045	—	—
NAMFP-06	1	—	—	—	—	—	—	—	—	—	—	—
NAMFP-11	1	—	—	—	—	—	—	—	—	—	—	—
YOLFP-13	2	—	—	—	—	E0.03	—	—	—	—	—	—
NAMFP-16	1	—	—	E0.085	—	—	—	—	—	—	—	—
Depth-dependent samples												
NAMDD-01	4	—	—	E0.058	—	—	—	—	—	—	—	—
NAMDD-02	2	—	—	E0.046	—	—	—	—	—	—	—	—
NAMDD-03	1	—	—	E0.046	—	—	—	—	—	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Organic synthesis							
GAMA sample identification number	Number of VOC detections	Carbon disulfide	Isopropylbenzene	1,1-Dichloroethene	Naphthalene	1,2,4-Trimethylbenzene	*sec*-Butylbenzene	*tert*-Butylbenzene	4-Isopropyltoluene
USGS parameter code	na	77041	77223	34501	34696	77222	77350	77353	77356
Reporting level	na	0.038	0.038	0.024	0.52	0.056	0.06	0.06	0.08
Threshold	na	160	770	6	17	330	260	260	na
Threshold type	na	NL	NL	MCL-CA	NL	NL	NL	NL	na
Grid wells									
NAM-01	1	E0.098	—	—	—	—	—	—	—
NAM-02	2	—	E0.02	—	—	—	—	—	—
NAM-03	1	—	—	—	—	—	—	—	—
NAM-09	1	—	—	—	—	—	—	—	—
NAM-11	1	E0.021	—	—	—	—	—	—	—
QPC-02	1	—	—	—	—	—	—	—	—
QPC-03	5	—	—	—	—	—	—	—	—
QPC-04	5	—	—	—	—	—	—	—	—
QPC-05	2	—	—	—	—	—	—	—	—
QPC-06	1	—	—	—	—	—	—	—	—
QPC-07	1	—	—	—	—	—	—	—	—
QPC-08	1	—	—	—	—	—	—	—	—
QPC-09	1	—	—	—	—	—	—	—	—
QPC-11	3	—	—	—	—	—	—	—	—
SAM-01	1	—	—	—	—	—	—	—	—
SAM-02	3	—	—	E0.016	—	—	—	—	—
SAM-03	2	E0.083	—	—	—	—	—	—	—
SAM-04	2	E0.088	—	—	—	—	—	—	—
SAM-06	2	—	—	—	—	—	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Organic synthesis							
GAMA sample identification number	Number of VOC detections	Carbon disulfide	Isopropylbenzene	1,1-Dichloroethene	Naphthalene	1,2,4-Trimethylbenzene	*sec*-Butylbenzene	*tert*-Butylbenzene	4-Isopropyltoluene
USGS parameter code	na	77041	77223	34501	34696	77222	77350	77353	77356
Reporting level	na	0.038	0.038	0.024	0.52	0.056	0.06	0.06	0.08
Threshold	na	160	770	6	17	330	260	260	na
Threshold type	na	NL	NL	MCL-CA	NL	NL	NL	NL	na
SAM-07	6	—	—	—	—	—	—	—	—
SAM-08	3	—	—	E0.097	—	—	—	—	—
SAM-09	6	E0.018	—	—	—	—	—	—	—
SAM-10	3	—	—	—	—	—	—	—	—
SAM-11	1	—	—	—	—	—	—	—	—
SAM-12	4	—	—	—	—	—	—	—	—
SOL-04	1	E0.024	—	—	—	—	—	—	—
SOL-05	2	E0.037	—	—	—	—	—	—	—
SOL-06	4	E0.093	—	—	—	—	—	—	—
SOL-07	1	—	—	—	—	—	—	—	—
YOL-01	1	—	—	—	—	—	—	—	—
YOL-02	1	—	—	—	—	—	—	—	—
YOL-04	1	—	—	—	—	—	—	—	—
YOL-05	3	—	—	—	—	—	—	—	—
YOL-06	1	—	—	—	—	—	—	—	—
YOL-07	1	—	—	—	—	—	—	—	—
YOL-08	1	—	—	—	—	—	—	—	—
YOL-12	6	—	—	—	—	—	—	—	—
YOL-13	1	—	—	—	—	—	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Organic synthesis							
GAMA sample identification number	Number of VOC detections	Carbon disulfide	Isopropylbenzene	1,1-Dichloroethene	Naphthalene	1,2,4-Trimethylbenzene	*sec*-Butylbenzene	*tert*-Butylbenzene	4-Isopropyltoluene
USGS parameter code	**na**	**77041**	**77223**	**34501**	**34696**	**77222**	**77350**	**77353**	**77356**
Reporting level	**na**	**0.038**	**0.038**	**0.024**	**0.52**	**0.056**	**0.06**	**0.06**	**0.08**
Threshold	**na**	**160**	**770**	**6**	**17**	**330**	**260**	**260**	**na**
Threshold type	**na**	**NL**	**NL**	**MCL-CA**	**NL**	**NL**	**NL**	**NL**	**na**
SUI-02	1	E0.015	—	—	—	—	—	—	—
SUI-05	3	—	—	—	—	—	—	—	—
Nongrid wells									
QPCFP-01	3	—	—	—	—	—	—	—	—
QPCFP-02	1	—	—	—	—	—	—	—	—
QPCFP-03	3	—	—	—	—	—	—	—	—
QPCFP-04	1	—	—	—	—	—	—	—	—
NAMFP-05	15	E0.035	E0.030	—	E0.26	0.110	E0.02	E0.06	E0.02
NAMFP-06	1	E0.017	—	—	—	—	—	—	—
NAMFP-11	1	—	—	—	—	—	—	—	—
YOLFP-13	2	—	—	—	—	—	—	—	—
NAMFP-16	1	—	—	—	—	—	—	—	—
Depth-dependent samples									
NAMDD-01	4	E0.015	—	—	—	—	—	—	—
NAMDD-02	2	—	—	—	—	—	—	—	—
NAMDD-03	1	—	—	—	—	—	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Gasoline compounds					Refrigerents			Hydrocarbons		
GAMA sample identification number	Number of VOC Detections	Methyl *tert*-butyl ether	Benzene	ethylbenzene	1,2,3-Trimethylbenzene	1,3,5-Trimethylbenzene	Dichlorodifluoromethane	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,3,4-Tetramethylbenzene	1,2,3,5-Tetramethylbenzene	2-ethyltoluene
USGS parameter code	na	78032	34030	34371	77221	77226	34668	34488	77652	49999	50000	77220
Reporting level	na	0.1	0.021	0.03	0.06	0.044	0.18	0.08	0.038	0.14	0.14	0.06
Threshold	na	13	1	300	na	330	1,000	150	1,200	na	na	na
Threshold type	na	MCL-CA	MCL-CA	MCL-CA	na	NL	NL	MCL-CA	MCL-CA	na	na	na
Grid wells												
NAM-01	1	—	—	—	—	—	—	—	—	—	—	—
NAM-02	2	—	—	—	—	—	—	—	—	—	—	—
NAM-03	1	—	—	—	—	—	—	—	—	—	—	—
NAM-09	1	—	—	—	—	—	—	—	—	—	—	—
NAM-11	1	—	—	—	—	—	—	—	—	—	—	—
QPC-02	1	—	—	—	—	—	—	—	—	—	—	—
QPC-03	5	—	—	—	—	—	—	—	—	—	—	—
QPC-04	5	—	—	—	—	—	—	0.10	—	—	—	—
QPC-05	2	—	—	—	—	—	—	—	—	—	—	—
QPC-06	1	—	—	—	—	—	—	—	—	—	—	—
QPC-07	1	—	—	—	—	—	—	—	—	—	—	—
QPC-08	1	—	—	—	—	—	—	—	—	—	—	—
QPC-09	1	—	—	—	—	—	—	—	—	—	—	—
QPC-11	3	—	—	—	—	—	—	—	—	—	—	—
SAM-01	1	—	—	—	—	—	—	—	—	—	—	—
SAM-02	3	—	—	—	—	—	E0.07	—	—	—	—	—
SAM-03	2	0.2	—	—	—	—	—	—	—	—	—	—
SAM-04	2	—	—	—	—	—	—	—	—	—	—	—
SAM-06	2	—	—	—	—	—	—	—	—	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Gasoline compounds					Refrigerents			Hydrocarbons		
GAMA sample identification number	Number of VOC Detections	Methyl *tert*-butyl ether	Benzene	ethylbenzene	1,2,3-Trimethylbenzene	1,3,5-Trimethylbenzene	Dichlorodifluoromethane	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,3,4-Tetramethylbenzene	1,2,3,5-Tetramethylbenzene	2-ethyltoluene
USGS parameter code	na	78032	34030	34371	77221	77226	34668	34488	77652	49999	50000	77220
Reporting level	na	0.1	0.021	0.03	0.06	0.044	0.18	0.08	0.038	0.14	0.14	0.06
Threshold	na	13	1	300	na	330	1,000	150	1,200	na	na	na
Threshold type	na	MCL-CA	MCL-CA	MCL-CA	na	NL	NL	MCL-CA	MCL-CA	na	na	na
SAM-07	6	E0.05	—	—	—	—	—	0.10	E0.022	—	—	—
SAM-08	3	—	—	—	—	—	—	—	—	—	—	—
SAM-09	6	—	—	—	—	—	—	—	—	—	—	—
SAM-10	3	—	—	—	—	—	—	—	—	—	—	—
SAM-11	1	—	—	—	—	—	—	—	—	—	—	—
SAM-12	4	—	—	—	—	—	—	—	—	—	—	—
SOL-04	1	—	—	—	—	—	—	—	—	—	—	—
SOL-05	2	—	—	—	—	—	—	—	—	—	—	—
SOL-06	4	—	—	—	—	—	—	—	—	—	—	—
SOL-07	1	0.3	—	—	—	—	—	—	—	—	—	—
YOL-01	1	—	—	—	—	—	—	—	—	—	—	—
YOL-02	1	—	—	—	—	—	—	—	—	—	—	—
YOL-04	1	—	—	—	—	—	—	—	—	—	—	—
YOL-05	3	—	—	—	—	—	—	—	—	—	—	—
YOL-06	1	—	—	—	—	—	—	—	—	—	—	—
YOL-07	1	—	—	—	—	—	E0.22	—	—	—	—	—
YOL-08	1	—	—	—	—	—	—	—	—	—	—	—
YOL-12	6	—	—	—	—	—	E0.08	—	—	—	—	—
YOL-13	1	0.2	—	—	—	—	—	—	—	—	—	—
SUI-02	1	—	—	—	—	—	—	—	—	—	—	—

Table 10A. Volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; VOC, volatile organic compound; YOL, Yolo; —, not detected]

VOC class:		Gasoline compounds					Refrigerents			Hydrocarbons		
GAMA sample identification number	Number of VOC Detections	Methyl *tert*-butyl ether	Benzene	ethylbenzene	1,2,3-Trimethylbenzene	1,3,5-Trimethylbenzene	Dichlorodifluoromethane	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,3,4-Tetramethylbenzene	1,2,3,5-Tetramethylbenzene	2-ethyltoluene
USGS parameter code	**na**	**78032**	**34030**	**34371**	**77221**	**77226**	**34668**	**34488**	**77652**	**49999**	**50000**	**77220**
Reporting level	**na**	**0.1**	**0.021**	**0.03**	**0.06**	**0.044**	**0.18**	**0.08**	**0.038**	**0.14**	**0.14**	**0.06**
Threshold	**na**	**13**	**1**	**300**	**na**	**330**	**1,000**	**150**	**1,200**	**na**	**na**	**na**
Threshold type	**na**	**MCL-CA**	**MCL-CA**	**MCL-CA**	**na**	**NL**	**NL**	**MCL-CA**	**MCL-CA**	**na**	**na**	**na**
SUI-05	3	—	—	—	—	—	—	—	—	—	—	—
Nongrid wells												
QPCFP-01	3	—	—	—	—	—	—	—	—	—	—	—
QPCFP-02	1	—	—	—	—	—	—	—	—	—	—	—
QPCFP-03	3	—	—	—	—	—	—	—	—	—	—	—
QPCFP-04	1	—	—	—	—	—	—	—	—	—	—	—
NAMFP-05	15	—	E0.014	E0.05	E0.07	E0.056	—	—	—	0.20	0.20	E0.03
NAMFP-06	1	—	—	—	—	—	—	—	—	—	—	—
NAMFP-11	1	—	—	—	—	—	—	—	—	—	—	—
YOLFP-13	2	—	—	—	—	—	—	—	—	—	—	—
NAMFP-16	1	—	—	—	—	—	—	—	—	—	—	—
Depth-dependent samples												
NAMDD-01	4	—	E0.020	—	—	—	—	—	—	—	—	—
NAMDD-02	2	—	—	—	—	—	—	—	—	—	—	—
NAMDD-03	1	—	—	—	—	—	—	—	—	—	—	—

Table 10B. Detection frequency of volatile organic compounds detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. Detection frequency is reported in percent. GAMA, Ground-Water Ambient Monitoring and Assessment; na, not available; NAM, North American; QPC, Uplands; SAM, South American; SOL, Solano; SSACV, Southern Sacramento Valley (study unit); SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; VOC, volatile organic compound; YOL, Yolo; —, not detected]

Volatile organic compound	USGS parameter code	SSACV detection frequency	NAM detection frequency	QPC detection frequency	SAM detection frequency	SOL detection frequency	YOL detection frequency	SUI detection frequency
At least one VOC	na	60	45	60	92	31	60	40
Trichloromethane	32106	33	18	53	50	—	33	20
Bromodichloromethane	32101	9	—	20	8	—	7	20
Tribromomethane	32104	4	—	7	8	—	7	—
Dibromochloromethane	32105	3	—	7	8	—	—	—
Tetrachloroethylene	34475	13	9	7	33	—	13	20
Carbon disulfide	77041	13	18	—	25	23	—	20
Trichloroethylene	39180	13	—	20	42	—	7	—
1,1-Dichloroethane	34496	7	—	7	8	15	7	—
Methyl *tert*-butyl ether	78032	6	—	—	17	8	7	—
Dichlorodifluoromethane	34668	4	—	—	8	—	13	—
cis-1,2-Dichloroethene	77093	4	—	—	8	8	7	—
Trichlorofluoromethane	34488	3	—	7	8	—	—	—
Isopropylbenzene	77223	1	9	—	—	—	—	—
1,1-Dichloroethene	34501	3	—	—	17	—	—	—
Tetrachloromethane	32102	1	—	—	8	—	—	—
Acetone	81552	1	—	7	—	—	—	—
1,2-Dichloropropane	34541	1	—	—	—	8	—	—
Tetrahydrofuran	81607	1	—	—	8	—	—	—
1,1,2-Trichloro-1,2,2-trifluoroethane	77652	1	—	—	8	—	—	—
Isobutyl methyl ketone	78133	1	—	—	8	—	—	—
Diethyl ether	81576	1	—	—	—	—	7	—

Table 11. Tentatively identified organic compounds found in ground water samples in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[Tentatively identified compounds are based on comparison with NIST library spectra and examination by GC/MS analysts. Reported concentrations are approximate. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." ap, approximate value; CAS, Chemical Abstracts Service; GAMA, Ground-Water Ambient Monitoring and Assessment; GC/MS, gas chromatography/mass spectrometry; NAM, North American; NIST, National Institute of Standards and Technology; SAM, South American; SOL, Solano; —, not detected]

GAMA sample identification number	Cyclopentane	Propanethiol, methyl-	Napthalene, methyl	Sulfur dioxide	Dichloro-fluoroethane	Unknown
CAS number:	**287-92-3**	**75-66-1**	**97-57-6**	**7446-09-5**	**1717-00-6**	
Grid wells						
SAM-02	ap0.2	—	—	—	—	—
SAM-04	—	—	—	ap2	—	—
SOL-01	—	—	—	ap1	—	—
SOL-02	ap0.2	—	—	—	—	—
SOL-06	ap0.1	—	—	—	—	—
Nongrid Wells						
NAMFP-05	—	—	ap0.1	—	—	—
NAMFP-08	—	ap0.2	—	—	—	—
NAMFP-16	ap0.1	—	—	—	—	—
Depth-dependent samples						
NAMDD-01	—	—	—	—	—	ap0.8
NAMDD-02	—	—	—	—	ap0.1	ap0.6
NAMDD-03	—	—	—	—	—	ap0.3

Table 12A. Pesticide compounds detected in ground-water samples collected from all wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; RSD5, specific dose at a cancer risk level of 1 in 100,000, or 10E–5; SAM, South American; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected]

Pesticide class:		Degradates		Herbicides							Fungicide	Insecticides	
GAMA sample identification number	Number of pesticide compounds detected	2-Chloro-4-isopropylamino-6-amino-*s*-triazine	3,4-Dichloroaniline	Atrazine	Molinate	Simazine	Metolachlor	Hexazinone	Prometon	Tebuthiuron	Metalaxyl	Dieldrin	Isofenphos
USGS parameter code	na	04040	61625	39632	82671	04035	39415	04025	04037	82670	61596	39381	61594
Reporting level	na	0.006	0.0045	0.007	0.003	0.005	0.006	0.0129	0.01	0.016	0.0051	0.009	0.0034
Threshold	na	na	na	1	20	4	100	400	100	500	na	0.02	na
Threshold type	na	na	na	MCL-CA	MCL-CA	MCL-US	HA-L	HA-L	HA-L	HA-L	na	RSD5	na
Grid wells													
NAM-06	2	—	E0.062	—	0.016	—	—	—	—	—	—	—	—
NAM-08	5	E0.005	—	E0.005	—	—	E0.006	—	—	—	E0.004	—	0.006
NAM-11	1	—	—	—	0.066	—	—	—	—	—	—	—	—
QPC-04	2	E0.006	—	—	—	0.012	—	—	—	—	—	—	—
QPC-08	3	E0.010	—	0.011	—	—	—	—	—	—	—	E0.002	—
SAM-01	2	E0.002	—	E0.002	—	—	—	—	—	—	—	—	—
SAM-02	2	E0.009	—	0.011	—	—	—	—	—	—	—	—	—
SAM-06	2	E0.007	—	0.008	—	—	—	—	—	—	—	—	—
SAM-07	1	E0.005	—	—	—	—	—	—	—	—	—	—	—
SAM-08	2	E0.009	—	E0.002	—	—	—	—	—	—	—	—	—
SAM-11	4	E0.007	—	E0.005	—	—	—	—	—	—	0.006	E0.004	—
SOL-02	2	E0.012	—	0.012	—	—	—	—	—	—	—	—	—
SOL-07	2	—	—	—	0.016	—	—	E0.012	—	—	—	—	—
SOL-11	2	E0.006	—	0.01	—	—	—	—	—	—	—	—	—
SOL-13	1	—	—	E0.004	—	—	—	—	—	—	—	—	—
SUI-01	2	E0.024	—	E0.006	—	—	—	—	—	—	—	—	—
SUI-04	2	—	—	E0.005	—	—	E0.004	—	—	—	—	—	—

Table 12A. Pesticide compounds detected in ground-water samples collected from all wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; RSD5, specific dose at a cancer risk level of 1 in 100,000, or 10E–5; SAM, South American; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected]

Pesticide class:		Degradates		Herbicides							Fungicide	Insecticides	
GAMA sample identification number	Number of pesticide compounds detected	2-Chloro-4-isopropylamino-6-amino-*s*-triazine	3,4-Dichloroaniline	Atrazine	Molinate	Simazine	Metolachlor	Hexazinone	Prometon	Tebuthiuron	Metalaxyl	Dieldrin	Isofenphos
USGS parameter code	**na**	**04040**	**61625**	**39632**	**82671**	**04035**	**39415**	**04025**	**04037**	**82670**	**61596**	**39381**	**61594**
Reporting level	**na**	**0.006**	**0.0045**	**0.007**	**0.003**	**0.005**	**0.006**	**0.0129**	**0.01**	**0.016**	**0.0051**	**0.009**	**0.0034**
Threshold	**na**	**na**	**na**	**1**	**20**	**4**	**100**	**400**	**100**	**500**	**na**	**0.02**	**na**
Threshold type	**na**	**na**	**na**	**MCL-CA**	**MCL-CA**	**MCL-US**	**HA-L**	**HA-L**	**HA-L**	**HA-L**	**na**	**RSD5**	**na**
SUI-05	5	E0.029	—	0.038	—	0.013	—	—	E0.007	0.115	—	—	—
YOL-02	3	E0.022	—	E0.005	—	0.008	—	—	—	—	—	—	—
YOL-07	2	E0.005	—	E0.005	—	—	—	—	—	—	—	—	—
YOL-10	1	E0.006	—	—	—	—	—	—	—	—	—	—	—
Nongrid wells													
QPCFP-02	1	E0.009	—	—	—	—	—	—	—	—	—	—	—
QPCFP-04	1	E0.007	—	—	—	—	—	—	—	—	—	—	—
NAMFP-09	1	—	E0.012	—	—	—	—	—	—	—	—	—	—
NAMFP-10	1	—	E0.003	—	—	—	—	—	—	—	—	—	—
NAMFP-16	1	E0.005	—	—	—	—	—	—	—	—	—	—	—

Table 12B. Additional pesticide compounds detected in ground-water samples collected from selected wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[All values reported in micrograms per liter. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected]

	Nonpesticide	Insecticide	Herbicides						Degradates	
GAMA sample identification number	**Caffeine**	**Oxamyl**	**Bentazon**	**Bromacil**	**2,4-D[1]**	**Diuron**	**Fenuron**	**Diphenamid**	**2-Chloro-6-ethylamino-4-amino-s-triazine**	**2-Hydroxy-4-isopropylamino-6-ethylamino-s-triazine**
USGS parameter code	**50305**	**38866**	**38711**	**04029**	**39732**	**49300**	**49297**	**04033**	**04038**	**50355**
Reporting level	**0.018**	**0.03**	**0.012**	**0.018**	**0.038**	**0.015**	**0.032**	**0.01**	**0.08**	**0.032**
Threshold	**na**	**50**	**18**	**90**	**70**	**10**	**na**	**200**	**na**	**na**
	na	**MCL-CA**	**MCL-CA**	**HA-L**	**MCL-US**	**HA-L**	**na**	**HA-L**	**na**	**na**
Grid wells										
NAM-06	E0.003	E0.006	—	—	E0.005	0.029	—	—	—	0.042
NAM-08	—	—	E0.260	—	—	—	—	—	—	—
QPC-07	E0.011	—	—	—	—	—	—	—	—	—
QPC-08	—	—	—	—	—	—	—	—	E0.006	—
SAM-02	—	—	—	E0.004	—	—	0.028	—	—	—
SAM-03	—	—	0.025	—	—	—	—	—	—	—
SAM-07	—	—	—	E0.01	—	—	—	—	—	—
SAM-11	E0.015	—	—	—	—	—	—	—	—	—
SOL-01	0.024	—	—	—	—	—	—	—	—	—
SOL-06	—	—	E0.026	—	—	—	—	E0.01	—	—
SUI-02	E0.014	—	—	—	—	—	—	—	—	—
YOL-02	—	—	—	—	—	—	—	—	E0.01	—
YOL-09	E0.005	—	0.021	—	—	—	—	—	—	—
Nongrid wells										
QPCFP-01	E0.010	0.07	—	—	—	—	—	—	—	—
QPCFP-02	E0.007	E0.03	—	—	—	—	—	—	—	—
NAMFP-05	—	E0.01	—	—	—	—	—	—	—	—
NAMFP-06	—	0.08	—	—	—	—	—	—	—	—
NAMFP-07	—	0.04	—	—	—	—	—	—	—	—
NAMFP-09	—	E0.02	—	—	—	—	—	—	—	0.033
NAMFP-10	—	—	—	—	—	—	—	—	—	—
YOLFP-13	E0.008	—	—	—	—	—	—	—	—	—

[1]The two compounds 2,4-D and 2,4-D methyl ester may chemically transform into one another during anaysis.

Table 12C. Detection frequencies of pesticides detected in ground-water samples collected from grid wells in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. GAMA, Ground-Water Ambient Monitoring and Assessment; na, not available; NAM, North American; NL, notification level; QPC, Uplands; SAM, South American; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected]

Detected pesticide compound	USGS parameter code	Detection frequency in grid wells (percent)	NAM detection frequency (percent)	QPC detection frequency (percent)	SAM detection frequency (percent)	SOL detection frequency (percent)	YOL detection frequency (percent)	SUI detection frequency (percent)
At least one pesticide compound	na	31	27	18	50	31	20	60
2-Chloro-4-isopropylamino-6-amino-*s*-triazine	04040	24	9	18	50	15	20	40
Atrazine	39632	22	9	9	42	23	13	60
Molinate	82671	4	18	—	—	8	—	—
Simazine	04035	4	—	9	—	—	7	20
Metolachlor	39415	3	9	—	—	—	—	20
Metalaxyl	61596	3	9	—	8	—	—	—
Dieldrin	39381	3	—	9	8	—	—	—
3,4-Dichloroaniline	61625	1	9	—	—	—	—	—
Isofenphos	61594	1	9	—	—	—	—	—
Hexazinone	04025	1	—	—	—	8	—	—
Prometon	04037	1	—	—	—	—	—	20
Tebuthiuron	82670	1	—	—	—	—	—	20

Table 13. Nutrient constituents detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; mg/L, milligram per liter; N, nitrogen; na, not available; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; NAM, North American; QPC, Uplands; SAM, South American; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; —, not detected]

GAMA sample identification number	Ammonia, dissolved as nitrogen (mg/L)	Nitrate, dissolved as nitrogen (mg/L)	Orthophosphate, dissolved (mg/L)	Total nitrogen (nitrate + nitrite + ammonia + organic-N), dissolved as nitrogen (mg/L)
USGS parameter code	**00608**		**00671**	**62854**
Reporting level	**0.04**	**0.06**	**0.006**	**0.06**
Threshold	**na**	**10**	**na**	**10**
Threshold type	**na**	**MCL-US**	**na**	**MCL-US**
Grid wells				
NAM-01	0.13	—	0.251	0.15
NAM-02	—	1.35	0.032	1.43
NAM-05	—	1.33	0.025	1.34
NAM-06	0.08	—	0.125	0.11
NAM-08	—	3.27	0.094	3.18
QPC-02	—	2.57	0.058	2.56
QPC-05	—	0.83	0.052	0.94
QPC-06	—	3.71	0.097	3.55
QPC-07	—	1.80	0.084	1.79
QPC-08	—	3.31	0.091	3.13
QPC-09	—	1.67	0.118	1.69
SAM-02	—	2.8	0.064	2.87
SAM-03	0.07	—	0.218	0.12
SAM-07	—	3.54	0.025	3.54
SAM-11	—	1.12	0.050	1.09
SOL-01	—	0.58	0.123	0.58
SOL-03	—	1.57	0.023	1.69
SOL-06	0.07	—	0.225	0.16
SUI-01	—	9.40	0.043	8.99
SUI-02	0.54	—	0.084	0.55
YOL-02	—	*18.6	0.108	19.10
YOL-03	—	0.32	0.052	0.32
YOL-04	—	3.43	0.045	3.23
YOL-06	0.06	0.51	0.169	0.55
YOL-08	0.10	—	0.127	0.12
YOL-09	—	—	0.219	—
YOL-13	—	1.09	0.055	1.11
YOL-14	0.08	—	0.027	0.09

Table 13. Nutrient constituents detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; mg/L, milligram per liter; N, nitrogen; na, not available; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; NAM, North American; QPC, Uplands; SAM, South American; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; v, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; —, not detected]

GAMA sample identification number	Ammonia, dissolved as nitrogen (mg/L)	Nitrate, dissolved as nitrogen (mg/L)	Orthophosphate, dissolved (mg/L)	Total nitrogen (nitrate + nitrite + ammonia + organic-N), dissolved as nitrogen (mg/L)
USGS parameter code	**00608**		**00671**	**62854**
Reporting level	**0.04**	**0.06**	**0.006**	**0.06**
Threshold	**na**	**10**	**na**	**10**
Threshold type	**na**	**MCL-US**	**na**	**MCL-US**
Nongrid wells				
QPCFP-01	—	1.26	0.095	1.32
QPCFP-02	—	2.15	0.108	2.11
QPCFP-03	—	1.14	0.095	1.12
QPCFP-04	—	1.52	0.096	1.51
NAMFP-05	0.09	—	0.049	0.08
NAMFP-06	0.07	—	0.092	0.07
NAMFP-07	0.09	—	0.300	0.1
NAMFP-08	0.09	—	0.291	0.11
NAMFP-09	0.05	—	0.093	E0.05
NAMFP-10	E0.02	—	0.213	—
YOLFP-12	—	1.02	0.059	1.03
YOLFP-13	—	6.97	0.085	7.17
YOLFP-14	—	5.80	0.019	5.87
YOLFP-15	—	3.53	0.018	3.55
NAMFP-16	—	0.34	0.033	0.35
Depth-dependent samples				
NAMDD-01	—	—	0.042	—
NAMDD-02	—	—	—	V
NAMDD-03	E0.02	—	E0.005	1.56
NAMDD-04	—	0.15	0.032	0.27

Table 14. Major ions detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[All values reported in milligrams per liter, dissolved. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; na, not available; NAM, North American; ns, no sample; NWIS, National Water Information System; QPC, Uplands; SAM, South American; SMCL-CA, California Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected]

GAMA sample identification number	Bromide	Calcium	Iodide	Magnesium	Potassium	Sodium	Chloride	Silica	Sulfate
USGS parameter code	**71870**	**915**	**71865**	**925**	**935**	**930**	**940**	**955**	**945**
Reporting level	**0.02**	**0.01**	**0.004**	**0.008**	**0.16**	**0.1**	**0.2**	**0.04**	**0.2**
Threshold	**na**	**na**	**na**	**na**	**na**	**na**	**250 (500)**	**na**	**250 (500)**
Threshold type	**na**	**na**	**na**	**na**	**na**	**na**	**SMCL-CA[1]**	**na**	**SMCL-CA[1]**
Grid wells									
NAM-01	0.23	30.0	0.200	17.00	2.50	182.0	90.5	46.7	65.0
NAM-02	0.13	31.1	0.007	20.80	3.32	36.1	49.1	77.3	18.7
NAM-05	0.17	22.6	0.006	13.40	2.71	34.3	60.8	83.0	10.7
NAM-06	0.08	23.0	0.064	4.12	1.75	47.4	27.4	50.4	1.0
NAM-08	ns	36.3	0.004	27.50	0.72	37.1	17.2	66.5	17.5
QPC-02	0.07	26.2	0.008	10.40	3.85	32.6	25.9	75.2	14.3
QPC-05	E0.02	14.7	—	9.23	2.25	7.5	5.0	60.2	4.5
QPC-06	—	28.5	0.004	19.10	1.21	25.4	43.5	85.2	10.6
QPC-07	0.23	39.4	0.014	13.60	1.80	64.4	82.5	86.5	27.0
QPC-08	0.14	17.8	0.007	7.07	1.03	50.2	48.7	86.2	19.4
QPC-09	0.03	11.3	E0.001	6.20	1.27	12.4	3.8	69.1	2.3
SAM-02	0.04	34.0	0.004	25.40	2.39	20.9	14.3	71.0	6.9
SAM-03	0.04	21.5	0.038	19.50	2.31	11.6	4.6	42.8	2.7
SAM-07	0.06	53.2	E0.001	13.30	2.59	22.4	12.1	39.0	17.2
SAM-11	0.04	17.5	—	8.95	2.62	13.7	8.9	66.6	3.2
SOL-01	0.14	7.9	0.170	7.60	0.99	142.0	34.4	23.9	43.4
SOL-03	0.04	45.7	E0.001	20.60	4.27	40.6	10.5	63.1	36.7
SOL-06	0.45	25.9	0.220	21.10	1.14	199.0	141.0	27.4	14.9
SUI-01	0.40	43.4	0.016	49.20	1.03	123.0	143.0	34.0	25.2
SUI-02	0.85	12.3	0.83	6.08	1.26	275.0	242.0	15.0	4.2
YOL-02	ns	53.5	ns	95.20	0.56	113.0	52.9	37.1	69.9
YOL-03	0.07	16.0	0.055	15.90	1.78	77.8	21.3	34.3	36.3
YOL-04	0.03	55.7	E0.002	66.3	1.36	23.5	21.8	41.4	43.7
YOL-06	0.12	22.4	0.17	27.7	1.48	97	73.4	28.3	36.3
YOL-08	0.21	15.3	0.26	5.16	2.88	134	57	42.7	34.3
YOL-09	—	6.8	0.01	7.73	1.02	17.7	3.94	36.1	6.3
YOL-13	ns	55.8	0.004	26.6	0.40	57.2	23.2	28.2	31.1
YOL-14	0.10	83.3	0.81	25.9	8.14	163.0	*342	57.2	E0.1

[1]The SMCL-CA has recommended and upper threshold values. The upper value is shown in parentheses.

Table 14. Major ions detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in milligrams per liter, dissolved. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; na, not available; NAM, North American; ns, no sample; NWIS, National Water Information System; QPC, Uplands; SAM, South American; SMCL-CA, California Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected]

GAMA sample identification number	Bromide	Calcium	Iodide	Magnesium	Potassium	Sodium	Chloride	Silica	Sulfate
USGS parameter code	**71870**	**915**	**71865**	**925**	**935**	**930**	**940**	**955**	**945**
Reporting level	**0.02**	**0.01**	**0.004**	**0.008**	**0.16**	**0.1**	**0.2**	**0.04**	**0.2**
Threshold	**na**	**na**	**na**	**na**	**na**	**na**	**250 (500)**	**na**	**250 (500)**
Threshold type	**na**	**na**	**na**	**na**	**na**	**na**	**SMCL-CA[1]**	**na**	**SMCL-CA[1]**
Nongrid Wells									
QPCFP-01	0.14	23.0	0.004	12.5	2.05	46.1	51.8	85.8	15.8
QPCFP-02	0.09	16.9	E0.002	11.1	1.23	17.5	23.5	89.8	5.8
QPCFP-03	0.14	22.3	E0.004	12.0	2.10	44.6	49.0	87.1	11.5
QPCFP-04	0.08	15.8	—	11.2	1.17	20.2	22.1	88.9	4.1
NAMFP-05	0.85	26.5	0.670	8.27	4.92	191.0	268.0	50.7	—
NAMFP-06	0.40	12.4	0.280	3.64	1.39	144.0	119.0	33.7	—
NAMFP-07	0.03	11.3	0.320	4.21	2.03	166.0	74.8	44.5	31.5
NAMFP-08	0.31	34.1	0.260	23.8	2.45	176.0	121.0	42.0	47.6
NAMFP-09	0.07	19.3	0.093	7.16	2.51	50.9	21.7	60.0	—
NAMFP-10	0.08	22.9	0.078	10.1	1.64	45.7	25.5	44.2	—
YOLFP-12	0.05	18.9	0.007	22.0	2.61	68.2	14.5	41.6	26.9
YOLFP-13	0.10	37.9	0.010	64.9	1.29	55.0	27.0	37.8	34.0
YOLFP-14	0.04	58.5	E0.001	41.9	1.26	25.2	26.3	37.3	37.5
YOLFP-15	0.05	29.4	0.003	22.8	1.14	28.1	19.1	35.3	24.2
NAMFP-16	0.05	15.5	0.026	10.6	1.78	20.8	14.7	70.8	5.0
Depth-dependent samples									
NAMDD-01	ns	15.7	0.041	11.3	1.65	21.2	14.7	70.7	5.5
NAMDD-02	ns	15.4	0.037	11.1	1.69	21.3	15.2	68.5	5.6
NAMDD-03	0.05	16.1	0.038	10.6	1.72	20.1	15.3	67.2	5.6
NAMDD-04	0.05	15.0	0.029	10.2	1.78	20.3	14.3	68.3	4.8

[1]The SMCL-CA has recommended and upper threshold values. The upper value is shown in parentheses.

Table 15. Trace inorganic elements detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[All values reported in micrograms per liter dissolved. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. An "r" preceding an M dash indicates the result has a raised LRL (laboratory reporting level); "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QC, quality control; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; —, not detected; YOL, Yolo]

GAMA sample identification number	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Fluoride	Iron	Lithium
USGS parameter code	**01106**	**01095**	**01000**	**01005**	**01010**	**01020**	**01025**	**01030**	**01035**	**01040**	**00950**	**01046**	**01130**
Reporting level	**1.6**	**0.2**	**0.12**	**0.2**	**0.06**	**8**	**0.04**	**0.04**	**0.014**	**0.4**	**0.1**	**6**	**0.6**
QC Censoring level	**7.4**	**0.2**	**na**	**na**	**na**	**na**	**0.07**	**na**	**na**	**na**	**0.04**	**na**	**na**
Threshold	**1,000**	**6**	**10**	**1,000**	**4**	**1,000**	**5**	**50**	**na**	**1,300**	**2**	**300**	**na**
Threshold type	**MCL-CA**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-US**	**NL**	**MCL-US**	**MCL-CA**	**na**	**SMCL**	**MCL-CA**	**SMCL**	**na**
Grid wells													
NAM-01	1.7	—	*21.1	226.0	—	*1,530	—	—	0.078	0.5	E0.07	149	2.4
NAM-02	—	—	3.1	102.0	—	323	—	4.2	0.050	1.2	0.2	—	0.9
NAM-05	E1.3	E0.1	4.8	103.0	—	316	—	5.3	0.039	1.2	0.2	10	16.7
NAM-06	161.0	—	*16.9	66.6	—	196	V	2.5	0.160	2.8	0.2	101	—
NAM-08	E1.1	—	1.4	52.1	—	22	—	7.6	0.061	7.3	0.2	—	—
QPC-02	E1.0	—	1.6	58.8	—	379	—	2.7	0.063	1.2	0.1	E5	37.2
QPC-05	E1.2	—	2.7	33.5	—	E6	—	2.0	0.034	0.7	E0.07	—	—
QPC-06	E1.1	—	2.9	100.0	—	—	—	8.1	0.062	1.7	0.3	11	4.3
QPC-07	E1.3	—	1.6	47.1	—	*1,490	—	3.5	0.090	2.3	0.2	21	45.7
QPC-08	—	—	1.7	26.6	—	357	—	4.7	0.050	0.7	0.3	E5	17.6
QPC-09	E1.0	—	1.9	40.1	—	18	—	2.8	0.038	E0.3	0.2	—	1.9
SAM-02	E1.4	—	6.0	76.2	—	32	—	4.8	0.070	2.1	0.1	E5	0.7
SAM-03	2.1	—	4.3	111.0	—	95	—	—	0.086	E0.3	0.1	265	1.8
SAM-07	3.2	—	1.0	136.0	—	E7	—	5.0	0.088	7.5	E0.06	—	—
SAM-11	E1.1	—	4.0	47.8	—	21	—	7.2	0.051	0.5	E0.09	—	—
SOL-01	2.3	E0.1	6.4	41.6	—	986	—	—	0.029	E0.3	0.2	9	9.8
SOL-03	E1.1	—	2.9	89.2	—	97	—	16.0	0.064	4.7	0.2	—	30.5
SOL-06	2.6	—	3.3	169.0	—	*1,160	E0.03	—	0.140	6.0	0.2	*305	1.1

Table 15. Trace inorganic elements detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter dissolved. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. An "r" preceding an M dash indicates the result has a raised LRL (laboratory reporting level); "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QC, quality control; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; —, not detected; YOL, Yolo]

GAMA sample identification number	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Fluoride	Iron	Lithium
USGS parameter code	**01106**	**01095**	**01000**	**01005**	**01010**	**01020**	**01025**	**01030**	**01035**	**01040**	**00950**	**01046**	**01130**
Reporting level	**1.6**	**0.2**	**0.12**	**0.2**	**0.06**	**8**	**0.04**	**0.04**	**0.014**	**0.4**	**0.1**	**6**	**0.6**
QC Censoring level	**7.4**	**0.2**	**na**	**na**	**na**	**na**	**0.07**	**na**	**na**	**na**	**0.04**	**na**	**na**
Threshold	**1,000**	**6**	**10**	**1,000**	**4**	**1,000**	**5**	**50**	**na**	**1,300**	**2**	**300**	**na**
Threshold type	**MCL-CA**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-US**	**NL**	**MCL-US**	**MCL-CA**	**na**	**SMCL**	**MCL-CA**	**SMCL**	**na**
SUI-01	r—	—	1.8	289.0	—	750	E0.03	10.0	0.130	2.0	1.0	E4	45.2
SUI-02	—	—	1.7	*1,000.0	—	*5,420	—	—	0.040	E0.4	0.3	296	89.9
YOL-02	—	—	2.5	160.0	—	*1,060	—	46.0	0.168	4.3	0.5	E4	49.5
YOL-03	4.6	—	5.0	20.5	—	728	—	3.8	0.037	0.7	0.2	—	20.7
YOL-04	—	—	1.3	140.0	—	342	—	18.0	0.098	0.6	0.2	15	15.3
YOL-06	E0.9	—	4.9	109.0	—	*1,800	—	2.1	0.035	0.9	0.2	10	20.2
YOL-08	5.1	—	6.4	29.0	E0.03	*1,790	V	—	0.036	0.6	0.1	46	2.2
YOL-09	1.7	E0.1	*21.5	15.7	—	283	—	—	0.045	0.7	0.2	10	10.2
YOL-13	E0.8	—	0.7	109	—	*1,100	—	1.6	0.163	2.9	0.5	—	25.7
YOL-14	E1.0	—	5.7	731	—	941	—	—	0.163	1.4	E0.07	*413	1.4
Nongrid wells													
QPCFP-01	2.5	—	1.7	78.0	—	648	V	4.0	0.160	5.6	0.26	E6	35.3
QPCFP-02	1.8	—	2.3	46.9	—	58	V	12.0	0.762	1.1	0.32	—	8.2
QPCFP-03	E1.4	—	1.8	65.1	—	563	—	4.6	0.070	1.9	0.27	E4	29.5
QPCFP-04	E1.4	—	2.2	49.5	—	96	—	8.2	0.027	1.6	0.27	8	10.3
NAMFP-05	E1.1	—	*25.3	249.0	—	496	—	—	0.110	—	E0.06	66	1.2
NAMFP-06	r—	—	*78.1	80.2	—	985	V	—	0.094	—	0.15	223	0.8
NAMFP-07	2.7	—	*42.2	45.0	—	*2,200	V	—	E0.050	E0.2	0.15	69	1.5
NAMFP-08	r—	—	*16.9	284.0	—	*1,430	—	—	E0.040	0.4	0.12	254	3.5

Table 15. Trace inorganic elements detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter dissolved. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. An "r" preceding an M dash indicates the result has a raised LRL (laboratory reporting level); "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QC, quality control; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; —, not detected; YOL, Yolo]

GAMA sample identification number	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Fluoride	Iron	Lithium
USGS parameter code	**01106**	**01095**	**01000**	**01005**	**01010**	**01020**	**01025**	**01030**	**01035**	**01040**	**00950**	**01046**	**01130**
Reporting level	**1.6**	**0.2**	**0.12**	**0.2**	**0.06**	**8**	**0.04**	**0.04**	**0.014**	**0.4**	**0.1**	**6**	**0.6**
QC Censoring level	**7.4**	**0.2**	**na**	**na**	**na**	**na**	**0.07**	**na**	**na**	**na**	**0.04**	**na**	**na**
Threshold	**1,000**	**6**	**10**	**1,000**	**4**	**1,000**	**5**	**50**	**na**	**1,300**	**2**	**300**	**na**
Threshold type	**MCL-CA**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-US**	**NL**	**MCL-US**	**MCL-CA**	**na**	**SMCL**	**MCL-CA**	**SMCL**	**na**
NAMFP-09	E1.5	—	*25.3	173.0	—	234	—	0.8	0.089	E0.3	E0.06	293	—
NAMFP-10	14.3	—	*46.5	79.0	—	98	—	—	0.068	—	E0.09	44	E0.3
YOLFP-12	3.6	E0.1	4.8	47.5	—	750	—	13.0	0.052	2.0	0.17	—	30.5
YOLFP-13	E1.2	—	3.7	180.0	—	532	—	38.0	0.131	1.3	0.33	—	54.1
YOLFP-14	—	—	1.0	119.0	—	193	—	24.0	0.089	3.1	0.21	—	16.7
YOLFP-15	E0.8	—	1.2	69.5	—	222	—	22.0	0.078	0.5	0.31	—	11.1
NAMFP-16	—	—	4.2	61.6	—	140	—	4.4	0.024	E0.3	0.21	7	0.8
Depth-dependent samples													
NAMDD-01	E1.6	V	4.6	74.6	—	105	—	—	0.089	0.9	V	—	1.1
NAMDD-02	1.7	V	4.2	70.5	—	109	E0.02	—	0.045	0.7	V	—	0.8
NAMDD-03	E1.3	V	4.2	69.1	—	137	—	—	0.045	1.4	V	—	1.0
NAMDD-04	2.4	V	4.3	64.3	—	161	—	2.1	0.056	1.7	V	—	1.0

Table 15. Trace inorganic elements detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter dissolved. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. An "r" preceding an M dash indicates the result has a raised LRL (laboratory reporting level); "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QC, quality control; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; —, not detected; YOL, Yolo]

GAMA sample identification number	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Tungsten	Uranium	Vanadium	Zinc
USGS parameter code	**01056**	**71890**	**01060**	**01065**	**01145**	**01075**	**01080**	**01057**	**01155**	**22703**	**01085**	**01090**
Reporting level	**0.2**	**0.01**	**0.4**	**0.06**	**0.08**	**0.2**	**0.4**	**0.04**	**0.5**	**0.04**	**0.14**	**0.6**
QC Censoring level	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Threshold	**50**	**2**	**40**	**100**	**50**	**100**	**4,000**	**2**	**na**	**30**	**50**	**2,000**
Threshold type	**SMCL**	**MCL-US**	**HA-L**	**MCL-CA**	**MCL-US**	**SMCL**	**HA-L**	**MCL-US**	**na**	**MCL-US**	**NL**	**HA-L**
Grid wells												
NAM-01	145	—	4.6	1.38	r—	—	313	—	0.6	E0.03	3.1	1.2
NAM-02	—	—	0.7	1.49	1.5	—	371	E0.02	—	1.94	23.2	5.9
NAM-05	0.5	—	0.5	0.59	1.1	—	263	—	—	0.12	42.9	5.7
NAM-06	16.5	—	3.9	5.13	0.4	—	210	—	0.8	0.38	2.1	24.0
NAM-08	E0.1	—	0.4	0.68	—	—	321	—	—	1.00	26.6	23.3
QPC-02	0.6	—	0.6	0.74	—	—	305	—	—	0.37	8.6	8.9
QPC-05	—	—	1.4	0.52	—	—	162	—	—	0.20	14.7	2.9
QPC-06	1.1	—	—	0.62	E0.4	—	312	—	—	0.48	21.0	21.5
QPC-07	1.6	—	0.5	8.43	r—	r—	415	—	—	0.81	13.6	7.5
QPC-08	E0.1	—	0.9	1.36	0.5	—	180	—	—	0.04	21.3	4.1
QPC-09	1	—	1.8	0.77	E0.2	—	144	—	—	E0.04	17.4	3.4
SAM-02	7.8	—	0.8	0.61	—	—	313	—	—	1.80	24.6	5.3
SAM-03	*230	—	3.0	0.78	—	—	228	—	0.5	—	0.3	17.4
SAM-07	—	—	E0.2	2.00	0.5	—	632	—	—	6.26	9.5	6.5
SAM-11	—	—	1.2	1.07	E0.2	—	177	—	—	0.62	22.3	24.1
SOL-01	11.7	—	4.6	0.23	0.9	r—	169	—	—	1.66	5.6	E1.6
SOL-03	E0.1	—	0.9	0.39	3.0	—	556	—	—	2.02	12.7	9.4
SOL-06	*103	—	8.1	2.70	0.4	r—	350	—	—	—	0.6	40.5

Table 15. Trace inorganic elements detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter dissolved. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. An "r" preceding an M dash indicates the result has a raised LRL (laboratory reporting level); "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QC, quality control; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; —, not detected; YOL, Yolo]

GAMA indentification number	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Tungsten	Uranium	Vanadium	Zinc
USGS parameter code	**01056**	**71890**	**01060**	**01065**	**01145**	**01075**	**01080**	**01057**	**01155**	**22703**	**01085**	**01090**
Reporting level	**0.2**	**0.01**	**0.4**	**0.06**	**0.08**	**0.2**	**0.4**	**0.04**	**0.5**	**0.04**	**0.14**	**0.6**
QC Censoring level	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
High threshold	**50**	**2**	**40**	**100**	**50**	**100**	**4,000**	**2**	**na**	**30**	**50**	**2,000**
Threshold type	**SMCL**	**MCL-US**	**HA-L**	**MCL-CA**	**MCL-US**	**SMCL**	**HA-L**	**MCL-US**	**na**	**MCL-US**	**NL**	**HA-L**
SUI-01	—	—	8.7	1.48	2.0	r—	1,250	—	—	7.56	6.3	58.9
SUI-02	21.8	—	1.4	0.51	r—	—	625	—	—	E0.02	1.4	3.3
YOL-02	—	—	1.3	3.73	4.2	—	792	—	—	3.10	10.5	5.8
YOL-03	0.4	—	1.9	1.43	2.1	—	269	—	—	0.66	16.6	0.7
YOL-04	1.3	—	E0.3	0.69	0.7	—	410	—	—	1.61	4.6	0.8
YOL-06	4.7	E0.006	2.9	0.11	0.7	—	425	—	—	0.79	8.0	11.5
YOL-08	*64.1	—	10.3	0.15	E0.4	r—	183	—		—	r—	2.0
YOL-09	2	—	1.1	0.42	—	—	92	—	—	0.04	14.5	5.2
YOL-13	E0.2	—	0.7	0.29	0.8	—	799	—	—	2.22	2.6	10.9
YOL-14	*501.0	—	3.8	1.08	—	—	1,070	—	—	—	—	4.0
Nongrid wells												
QPCFP-01	1.0	—	1.6	4.66	—	—	281	—	—	0.28	16.8	23.2
QPCFP-02	0.5	E0.005	0.8	1.89	E0.3	—	181	—	—	0.05	21.7	3.2
QPCFP-03	1.1	—	0.7	6.49	r—	r—	282	—	—	0.30	15.9	4.3
QPCFP-04	1.4	—	E0.3	0.76	E0.3	—	185	—	—	0.06	22.2	9.7
NAMFP-05	*120.0	—	5.5	2.79	1.1	r—	322	—	0.9	—	E0.1	0.7
NAMFP-06	*82.7	—	11.3	2.84	1.0	—	143	—	0.8	—	r—	1.4
NAMFP-07	*55.6	—	18.3	4.05	0.8	—	117	—	1.3	E0.03	0.4	E0.4

Table 15. Trace inorganic elements detected in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[All values reported in micrograms per liter dissolved. The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. An "r" preceding an M dash indicates the result has a raised LRL (laboratory reporting level); "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated value; GAMA, Ground-Water Ambient Monitoring and Assessment; HA-L, lifetime health advisory; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; QC, quality control; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; —, not detected; YOL, Yolo]

GAMA sample identification number	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Tungsten	Uranium	Vanadium	Zinc
USGS parameter code	**01056**	**71890**	**01060**	**01065**	**01145**	**01075**	**01080**	**01057**	**01155**	**22703**	**01085**	**01090**
Reporting level	**0.2**	**0.01**	**0.4**	**0.06**	**0.08**	**0.2**	**0.4**	**0.04**	**0.5**	**0.04**	**0.14**	**0.6**
QC Censoring level	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Threshold	**50**	**2**	**40**	**100**	**50**	**100**	**4,000**	**2**	**na**	**30**	**50**	**2,000**
Threshold type	**SMCL**	**MCL-US**	**HA-L**	**MCL-CA**	**MCL-US**	**SMCL**	**HA-L**	**MCL-US**	**na**	**MCL-US**	**NL**	**HA-L**
NAMFP-08	*254.0	—	5.0	2.22	0.9	—	359	—	0.6	0.10	r—	2.0
NAMFP-09	*146.0	—	3.4	1.59	E0.3	—	218	—	1.0	E0.02	1.0	1.0
NAMFP-10	*156.0	—	3.1	1.30	—	—	218	—	—	0.14	2.5	0.8
YOLFP-12	—	—	2.1	0.98	1.0	—	332	—	—	1.08	22.9	5.4
YOLFP-13	—	—	1.5	2.48	3.4	—	680	—	—	2.72	13.3	4.9
YOLFP-14	—	—	0.5	1.50	1.2	—	455	—	—	1.45	3.8	2.0
YOLFP-15	E0.2	—	1.2	0.06	0.7	—	287	—	—	0.63	5.7	0.7
NAMFP-16	3.8	—	0.6	0.62	E0.4	—	170	—	—	0.36	38.3	E0.5
Depth-dependent samples												
NAMDD-01	8.6	—	0.6	0.94	E0.2	E0.1	172	—	—	0.30	37.8	140.0
NAMDD-02	3.7	—	0.7	0.74	E0.3	—	168	—	—	0.26	38.5	136.0
NAMDD-03	3.2	—	0.7	0.88	E0.3	—	173	—	—	0.16	37.6	93.0
NAMDD-04	4.2	—	0.7	1.06	E0.3	—	166	—	—	0.36	39.3	19.0

Table 16. Constituents of special interest and chromium, arsenic, and iron speciation results in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; ns, no sample; QC, quality control; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; YOL, Yolo; µg/L, microgram per liter; —, not detected]

GAMA sample identification number	Chromium, dissolved (µg/L)	Chromium(VI), (hexavalent) dissolved (µg/L)	Arsenic, dissolved (µg/L)	Arsenic(III), dissolved (µg/L)	Iron, dissolved (µg/L)	Iron(II), dissolved (µg/L)	Perchlorate (µg/L)	1,2,3-Trichloropropane (µg/L)
USGS parameter code	**01030**	**01032**	**99033**	**99034**	**01046**	**01047**	**61209**	**77443**
Reporting level	**0.1**	**0.1**	**0.5**	**2**	**2**	**2**	**0.5**	**0.005**
QC Censoring level	**8.4**	**8.2**	**na**	**na**	**na**	**na**	**na**	**na**
Threshold	**50**	**na**	**10**	**na**	**300**	**na**	**6**	**0.005**
Threshold type	**MCL-CA**	**na**	**MCL-US**	**na**	**SMCL**	**na**	**NL**	**NL**
Grid Wells								
NAM-01	V	V	20.4	20	138	120	—	—
NAM-02	V	9	2.1	—	—	—	—	—
NAM-05	11	13	4.6	—	4	—	—	—
NAM-06	—	V	15.8	16	68	8	—	—
NAM-08	17	15	1.1	—	—	—	—	—
QPC-02	V	V	0.6	—	3	—	3.7	—
QPC-05	V	V	1.6	—	—	—	—	—
QPC-06	10	V	2.4	—	8	4	1.7	—
QPC-07	14	14	1.4	—	18	9	0.9	—
QPC-08	10	10	1.0	—	—	—	4.2	—
QPC-09	8	10	1.1	—	—	—	—	—
SAM-02	V	V	3.9	—	4	3	0.6	—
SAM-03	V	V	4.0	4	236	125	—	—
SAM-07	10	9	—	—	—	—	2.2	*0.006
SAM-11	14	12	3.6	—	—	—	—	—
SOL-01	V	V	5.3	—	8	7	—	—
SOL-03	22	22	5.2	—	—	—	—	—
SOL-06	V	V	2.9	3	*341	143	—	—
SUI-01	18	19	0.9	—	6	—	—	—
SUI-02	V	V	—	—	262	39	—	—
YOL-02	67	70	1.2	—	—	—	—	—

Table 16. Constituents of special interest and chromium, arsenic, and iron speciation results in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; ns, no sample; QC, quality control; QPC, Uplands; SAM, South American; SMCL, Secondary Maximum Contaminant Level; SOL, Solano; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; V, analyte was detected in both the environmental sample and the associated blanks, and is considered not detected; YOL, Yolo; µg/L, microgram per liter; —, not detected]

GAMA sample identification number	Chromium, dissolved (µg/L)	Chromium(VI), (hexavalent) dissolved (µg/L)	Arsenic, dissolved (µg/L)	Arsenic(III), dissolved (µg/L)	Iron, dissolved (µg/L)	Iron(II), dissolved (µg/L)	Perchlorate (µg/L)	1,2,3-Trichloropropane (µg/L)
USGS parameter code	**01030**	**01032**	**99033**	**99034**	**01046**	**01047**	**61209**	**77443**
Reporting level	**0.1**	**0.1**	**0.5**	**2**	**2**	**2**	**0.5**	**0.005**
QC Censoring level	**8.4**	**8.2**	**na**	**na**	**na**	**na**	**na**	**na**
Threshold	**50**	**na**	**10**	**na**	**300**	**na**	**6**	**0.005**
Threshold type	**MCL-CA**	**na**	**MCL-US**	**na**	**SMCL**	**na**	**NL**	**NL**
YOL-03	—	V	4.3	—	2	—	—	—
YOL-04	32	30	0.8	—	14	—	—	—
YOL-06	10	11	4.2	—	9	3	—	—
YOL-08	11	10	5.8	6	40	31	—	—
YOL-09	11.3	8.3	18.8	—	7	3	—	—
YOL-13	V	V	—	—	—	—	—	—
YOL-14	V	V	5.2	4.9	*384	*374	—	—
Nongrid Wells								
QPCFP-01	11	12	0.9	—	3	—	0.7	—
QPCFP-02	18	20	2.0	—	3	—	1.2	—
QPCFP-03	—	—	1.1	—	2	—	0.8	—
QPCFP-04	16	14	1.7	—	6	3	1.0	—
NAMFP-05	8	9	13.0	13	77	8	—	—
NAMFP-06	V	8	*76.0	*76	200	148	—	—
NAMFP-07	V	V	38.0	38	53	47	—	—
NAMFP-08	8	V	14.0	14	223	84	—	—
NAMFP-09	V	—	23.8	24	263	238	—	—
NAMFP-10	V	V	40.1	38	43	18	—	—
YOLFP-12	13	11	3.8	—	—	—	—	—
YOLFP-13	42	41	2.5	—	—	—	—	—
YOLFP-14	35	30	0.6	—	—	—	1.7	—
YOLFP-15	30	31	0.9	—	—	—	—	—
NAMFP-16	V	V	2.7	—	5	2	—	—
Depth-Dependent Samples								
NAMDD-01	V	V	4.3	—	—	—	ns	ns
NAMDD-02	V	V	3.8	—	—	—	ns	ns
NAMDD-03	V	V	3.7	—	4	2	ns	ns
NAMDD-04	V	V	3.7	—	—	—	ns	ns

Table 17. Analysis of isotopes and radioactivity in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; ns, no sample; pCi/L, picocuries per liter; QPC, Uplands; SAM, South American; SOL, Solano; SSMDC, sample-specific minimum detectable concentration; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected; <, less than]

GAMA sample identification number	Tritium (pCi/L)	Deuterium/ Protium ratio (per mil)	Oxygen-18/ Oxygen-16 ratio (per mil)	Radon-222 (pCi/L)	Radium-226 (pCi/L)	Radium-228 (pCi/L)	Alpha radioactivity, 72-hour count (pCi/L)	Alpha radioactivity, 30-day count (pCi/L)	Beta radioactivity, 72-hour count (pCi/L)	Beta radioactivity, 30-day count (pCi/L)	Carbon-13/ carbon-12, ratio (per mil)	Carbon-14 (percent modern)
USGS parameter code	**07000**	**82082**	**82085**	**82303**	**09511**	**81366**	**62636**	**62639**	**62642**	**62645**	**82081**	**49933**
Reporting level	**1**	**na**	**na**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**na**	**na**
Threshold	**20,000**	**na**	**na**	**300/4,000**	**5**	**5**	**15**	**15**	**50**	**50**	**na**	**na**
Threshold type	**MCL-US**	**na**	**na**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-CA**	**na**	**na**
Grid wells												
NAM-01	10.9	–67.9	–9.09	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAM-02	5.1	–57.6	–7.82	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAM-03	—	–53.0	–7.32	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAM-04	—	–61.4	–8.64	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAM-05	—	–50.3	–6.94	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAM-06	—	–65.3	–8.92	*444	0.06	<0.42	<2.4	<0.9	E1.7	E2.0	–17.0	6.5
NAM–07	9.9	–55.9	–7.56	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAM-08	14.1	–51.0	–6.74	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAM-09	16.3	–50.3	–6.74	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAM-10	4.5	–44.1	–5.44	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAM-11	—	–51.5	–7.00	ns	ns	ns	ns	ns	ns	ns	ns	ns
QPC-01	14.1	–66.6	–9.33	ns	ns	ns	ns	ns	ns	ns	ns	ns
QPC-02	2.2	–56.7	–8.02	ns	ns	ns	ns	ns	ns	ns	ns	ns
QPC-03	2.2	–55.9	–7.65	ns	ns	ns	ns	ns	ns	ns	ns	ns
QPC-04	7.7	–54.8	–7.65	ns	ns	ns	ns	ns	ns	ns	ns	ns
QPC-05	17.0	–67.9	–9.49	ns	ns	ns	ns	ns	ns	ns	ns	ns
QPC-06	1.3	–50.5	–7.03	*483	0.07	<0.51	<1.8	E0.6	<2.3	E1.4	–12.9	93.7
QPC-07	1.3	–52.7	–7.40	194	0.05	<0.50	<1.8	<1.3	E1.7	E2.2	–17.0	76.5
QPC-08	1.3	–53.6	–7.40	ns	ns	ns	ns	ns	ns	ns	ns	ns

Table 17. Analysis of isotopes and radioactivity in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; ns, no sample; pCi/L, picocuries per liter; QPC, Uplands; SAM, South American; SOL, Solano; SSMDC, sample-specific minimum detectable concentration; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected; <, less than]

GAMA sample identification number	Tritium (pCi/L)	Deuterium/ Protium ratio (per mil)	Oxygen-18/ Oxygen-16 ratio (per mil)	Radon-222 (pCi/L)	Radium-226 (pCi/L)	Radium-228 (pCi/L)	Alpha radioactivity, 72-hour count (pCi/L)	Alpha radioactivity, 30-day count (pCi/L)	Beta radioactivity, 72-hour count (pCi/L)	Beta radioactivity, 30-day count (pCi/L)	Carbon-13/ carbon-12, ratio (per mil)	Carbon-14 (percent modern)
USGS parameter code	**07000**	**82082**	**82085**	**82303**	**09511**	**81366**	**62636**	**62639**	**62642**	**62645**	**82081**	**49933**
Reporting level	**1**	**na**	**na**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**na**	**na**
Threshold	**20,000**	**na**	**na**	**300/4,000**	**5**	**5**	**15**	**15**	**50**	**50**	**na**	**na**
Threshold type	**MCL-US**	**na**	**na**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-CA**	**na**	**na**
QPC-09	1.9	–51.5	–7.18	ns	ns	ns	ns	ns	ns	ns	ns	ns
QPC-10	2.2	–51.5	–7.01	ns	ns	ns	ns	ns	ns	ns	ns	ns
QPC-11	12.2	–54.1	–7.20	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-01	—	–51.0	–7.09	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-02	—	–54.8	–7.63	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-03	3.8	–78.0	–10.84	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-04	9.0	–62.6	–8.65	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-05	14.1	–59.9	–8.47	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-06	—	–51.9	–7.22	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-07	4.5	–54.3	–7.70	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-08	—	–65.7	–9.22	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-09	11.5	–63.3	–9.00	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-10	—	–50.1	–6.94	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-11	—	–50.1	–6.9	ns	ns	ns	ns	ns	ns	ns	ns	ns
SAM-12	2.9	–69.0	–9.85	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-01	—	–55.0	–7.86	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-02	9.3	–41.7	–5.74	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-03	—	–48.0	–6.91	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-04	—	–59.8	–8.42	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-05	18.2	–76.3	–10.77	ns	ns	ns	ns	ns	ns	ns	ns	ns

Table 17. Analysis of isotopes and radioactivity in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; ns, no sample; pCi/L, picocuries per liter; QPC, Uplands; SAM, South American; SOL, Solano; SSMDC, sample-specific minimum detectable concentration; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected; <, less than]

GAMA sample identification number	Tritium (pCi/L)	Deuterium/ Protium ratio (per mil)	Oxygen-18/ Oxygen-16 ratio (per mil)	Radon-222 (pCi/L)	Radium-226 (pCi/L)	Radium-228 (pCi/L)	Alpha radioactivity, 72-hour count (pCi/L)	Alpha radioactivity, 30-day count (pCi/L)	Beta radioactivity, 72-hour count (pCi/L)	Beta radioactivity, 30-day count (pCi/L)	Carbon-13/ carbon-12, ratio (per mil)	Carbon-14 (percent modern)
USGS parameter code	**07000**	**82082**	**82085**	**82303**	**09511**	**81366**	**62636**	**62639**	**62642**	**62645**	**82081**	**49933**
Reporting level	**1**	**na**	**na**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**na**	**na**
Threshold	**20,000**	**na**	**na**	**300/4,000**	**5**	**5**	**15**	**15**	**50**	**50**	**na**	**na**
Threshold type	**MCL-US**	**na**	**na**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-CA**	**na**	**na**
SOL-06	13.4	–67.3	–9.48	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-07	9.9	–77.0	–10.65	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-08	—	–48.4	–7.19	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-09	9.6	–42.6	–6.22	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-10	1.9	–43.6	–6.31	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-11	4.8	–49.9	–7.12	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-12	1.6	–47.3	–6.83	ns	ns	ns	ns	ns	ns	ns	ns	ns
SOL-13	1.9	–45.9	–7.02	ns	ns	ns	ns	ns	ns	ns	ns	ns
SUI-01	2.2	–43.1	–6.23	ns	ns	ns	ns	ns	ns	ns	ns	ns
SUI-02	—	–46.4	–6.6	ns	ns	ns	ns	ns	ns	ns	ns	ns
SUI-03	—	–45.2	–6.46	ns	ns	ns	ns	ns	ns	ns	ns	ns
SUI-04	1.0	–43.2	–6.57	ns	ns	ns	ns	ns	ns	ns	ns	ns
SUI-05	10.2	–47.7	–6.86	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-01	7.7	–41.4	–5.29	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-02	7.4	–46.6	–6.69	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-03	—	–56.7	–8.15	267	E0.02	<0.44	E1.3	E1.1	E2.1	E2.5	–14.0	17.8
YOL–04	10.2	–49.1	-6.04	*595	E0.04	<0.50	E1.3	<1.4	E1.6	E1.9	–14.7	112.2
YOL-05	2.2	–52.1	–6.94	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-06	1.3	–54.6	–7.33	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-07	8.3	–46.9	–5.78	ns	ns	ns	ns	ns	ns	ns	ns	ns

Table 17. Analysis of isotopes and radioactivity in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; ns, no sample; pCi/L, picocuries per liter; QPC, Uplands; SAM, South American; SOL, Solano; SSMDC, sample-specific minimum detectable concentration; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected; <, less than]

GAMA sample identification number	Tritium (pCi/L)	Deuterium/ Protium ratio (per mil)	Oxygen-18/ Oxygen-16 ratio (per mil)	Radon-222 (pCi/L)	Radium-226 (pCi/L)	Radium-228 (pCi/L)	Alpha radioactivity, 72-hour count (pCi/L)	Alpha radioactivity, 30-day count (pCi/L)	Beta radioactivity, 72-hour count (pCi/L)	Beta radioactivity, 30-day count (pCi/L)	Carbon-13/ carbon-12, ratio (per mil)	Carbon-14 (percent modern)
USGS parameter code	**07000**	**82082**	**82085**	**82303**	**09511**	**81366**	**62636**	**62639**	**62642**	**62645**	**82081**	**49933**
Reporting level	**1**	**na**	**na**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**na**	**na**
Threshold	**20,000**	**na**	**na**	**300/4,000**	**5**	**5**	**15**	**15**	**50**	**50**	**na**	**na**
Threshold type	**MCL-US**	**na**	**na**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-CA**	**na**	**na**
YOL-08	—	–65.9	–9.34	266	0.06	<0.48	<2.0	<1.9	E2.0	E3.8	–15.1	1.8
YOL-09	9.0	–73.5	–10.81	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-10	11.2	–38.1	–4.33	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-11	8.0	–43.9	–5.69	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-12	2.6	–47.8	–6.35	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-13	11.2	–42.7	–5.32	ns	ns	ns	ns	ns	ns	ns	ns	ns
YOL-14	—	–66.4	–9.08	*487	0.20	0.60	<3.4	<2.8	12.2	11.4	–2.13	7.4
YOL-15	2.6	–47.6	–6.52	ns	ns	ns	ns	ns	ns	ns	ns	ns
Nongrid wells												
QPCFP-01	—	–54.9	–7.69	78	0.05	<0.44	<2.2	<0.9	E2.8	2.6	–16.6	76.3
QPCFP-02	1.3	–52.0	–7.50	*340	0.04	<0.51	<1.7	<0.6	<2.2	E0.9	–17.5	73.0
QPCFP-03	1.0	–54.7	–7.70	ns	ns	ns	ns	ns	ns	ns	ns	ns
QPCFP-04	1.0	–52.7	–7.52	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAMFP-05	—	–67.3	–9.27	*326	0.12	<0.44	E3.3	<2.6	E2.2	4.0	2.5	0.8
NAMFP-06	—	–66.0	–9.14	*433	0.05	<0.50	<1.7	<1.7	E1.3	E1.4	–14.3	0.5
NAMFP-07	—	–69.6	–9.61	229	0.06	<0.54	<2.7	<2.6	E1.5	E2.6	–15.7	0.8
NAMFP-08	—	–67.2	–9.20	*415	0.06	<0.61	<2.5	<3.3	E3.0	E2.9	–17.8	43.0
NAMFP-09	1.3	–68.8	–9.30	*329	0.05	0.43	E2.1	<1.1	E2.7	2.9	–2.4	4.8
NAMFP-10	—	–59.2	–8.31	*746	0.07	<0.46	<2.1	<1.0	E1.2	E0.9	–19.4	11.3
NAMFP-11	20.2	–62.6	–8.68	ns	ns	ns	ns	ns	ns	ns	ns	ns

Table 17. Analysis of isotopes and radioactivity in ground-water samples collected in the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. An asterisk (*) in front of a number in the table indicates a concentration higher than the threshold. "DD" following a site area name in the first column indicates "depth dependent." "FP" following a site area name in the first column indicates "flowpath." E, estimated; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-CA, California Department of Health Services Maximum Contaminant Level; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; NL, notification level; ns, no sample; pCi/L, picocuries per liter; QPC, Uplands; SAM, South American; SOL, Solano; SSMDC, sample-specific minimum detectable concentration; SUI, Suisun–Fairfield; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected; <, less than]

GAMA sample identification number	Tritium (pCi/L)	Deuterium/ Protium ratio (per mil)	Oxygen-18/ Oxygen-16 ratio (per mil)	Radon-222 (pCi/L)	Radium-226 (pCi/L)	Radium-228 (pCi/L)	Alpha radioactivity, 72-hour count (pCi/L)	Alpha radioactivity, 30-day count (pCi/L)	Beta radioactivity, 72-hour count (pCi/L)	Beta radioactivity, 30-day count (pCi/L)	Carbon-13/ carbon-12, ratio (per mil)	Carbon-14 (percent modern)
USGS parameter code	**07000**	**82082**	**82085**	**82303**	**09511**	**81366**	**62636**	**62639**	**62642**	**62645**	**82081**	**49933**
Reporting level	**1**	**na**	**na**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**SSMDC**	**na**	**na**
Threshold	**20,000**	**na**	**na**	**300/4,000**	**5**	**5**	**15**	**15**	**50**	**50**	**na**	**na**
Threshold type	**MCL-US**	**na**	**na**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-CA**	**na**	**na**
YOLFP-12	—	–55.5	–7.87	222	E0.05	<0.41	E2.3	E1.4	E2.5	2.9	–13.6	20.8
YOLFP-13	—	–46.3	–6.36	268	0.07	<0.45	E2.7	E2.2	E1.4	E1.7	–14.7	90.5
YOLFP-14	9.6	–46.1	–6.5	*604	E0.04	<0.49	E1.2	E1.1	<3.6	E1.9	–16.0	98.8
YOLFP-15	9.6	–50.7	–7.43	*728	0.07	<0.44	E0.5	<0.9	<2.4	E1.6	–14.7	73.9
NAMFP–16	2.2	–51.0	–7.24	*669	E0.05	<0.47	<1.3	<0.8	E2.6	2.0	–17.1	55.6
Depth-dependent samples												
NAMDD-01	ns	–50.9	–7.31	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAMDD-02	ns	–50.9	–7.23	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAMDD-03	ns	–50.4	–7.28	ns	ns	ns	ns	ns	ns	ns	ns	ns
NAMDD-04	ns	–49.6	–7.31	ns	ns	ns	ns	ns	ns	ns	ns	ns

Table 18. Tritium and noble gas concentrations in ground-water samples collected from the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005, and analyzed by the Lawrence Livermore National Laboratory.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "FP" following a site area name in the first column indicates "flowpath." cm^3STP/g, cubic centimeter of gas at standard temperature and pressure per gram of water; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; ns, no sample; pCi/L, picocuries per liter; QPC, Uplands; SAM, South American; SOL, Solano; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected]

GAMA sample identification number	Tritium	Helium-3 /helium-4	Helium-4	Neon	Argon	Krypton	Xenon
USGS parameter code	**07000**	**61040**	**85561**	**61046**	**85563**	**85565**	**85567**
	(pCi/L)	**atom ratio**			**cm^3STP/g**		
		x 10^{-6}	**x 10^{-6}**	**x 10^{-7}**	**x 10^{-4}**	**x 10^{-8}**	**x 10^{-8}**
Threshold	**20,000**	**na**	**na**	**na**	**na**	**na**	**na**
Threshold type	**MCL-US**	**na**	**na**	**na**	**na**	**na**	**na**
Grid wells							
NAM-01	11.5	0.55	0.61	2.55	3.89	8.57	1.15
NAM-02	5.5	0.47	1.82	2.11	3.57	7.93	1.05
NAM-05	—	0.42	1.83	1.93	3.16	7.04	0.99
NAM-06	—	0.59	1.74	2.24	3.68	8.32	1.18
NAM-08	21.6	1.30	0.10	3.14	4.24	8.85	1.15
QPC-02	2.1	0.25	1.32	2.46	3.43	7.52	1.02
QPC-05	17.0	1.12	0.28	2.21	3.65	8.35	1.15
QPC-06	1.2	1.30	0.05	1.90	3.12	7.10	0.96
QPC-07	1.4	0.24	2.15	2.01	3.26	7.26	1.02
QPC-08	1.2	0.15	10.13	1.90	3.21	7.26	1.02
QPC-09	—	0.97	0.12	2.48	3.51	7.61	1.03
SAM-02	2.2	1.28	0.08	2.72	4.05	8.91	1.17
SAM-03	11.2	2.04	0.04	1.92	3.59	8.53	1.17
SAM-07	9.1	2.12	0.06	2.42	3.59	7.85	1.06
SAM-11	ns	0.79	0.44	2.09	3.30	7.35	1.03
SOL-01	—	0.44	0.49	4.77	5.17	10.29	1.39
SOL-03	1.3	1.27	0.08	2.97	4.19	9.06	1.18
SOL-06	15.0	1.82	0.09	2.00	3.35	7.81	1.04
SUI-01	2.5	1.34	0.05	2.29	3.60	8.05	1.07
SUI-02	—	ns	ns	ns	ns	ns	ns
YOL-02	10.4	1.43	0.08	3.22	4.32	9.11	1.15
YOL-03	—	1.01	0.12	3.45	4.40	9.12	1.21
YOL-04	13.0	1.47	0.09	3.53	4.32	9.24	1.22
YOL-06	ns	1.15	0.08	2.65	3.92	8.59	1.18

Table 18. Tritium and noble gas concentrations in ground-water samples collected from the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005, and analyzed by the Lawrence Livermore National Laboratory—Continued.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "FP" following a site area name in the first column indicates "flowpath." cm^3STP/g, cubic centimeter of gas at standard temperature and pressure per gram of water; GAMA, Ground-Water Ambient Monitoring and Assessment; MCL-US, U.S. Environmental Protection Agency Maximum Contaminant Level; na, not available; NAM, North American; ns, no sample; pCi/L, picocuries per liter; QPC, Uplands; SAM, South American; SOL, Solano; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected]

GAMA sample identification number	Tritium	Helium-3 /helium-4	Helium-4	Neon	Argon	Krypton	Xenon
USGS parameter code	**07000**	**61040**	**85561**	**61046**	**85563**	**85565**	**85567**
	(pCi/L)	**atom ratio**			**cm^3STP/g**		
		x 10^{-6}	**x 10^{-6}**	**x 10^{-7}**	**x 10^{-4}**	**x 10^{-8}**	**x 10^{-8}**
Threshold	**20,000**	**na**	**na**	**na**	**na**	**na**	**na**
Threshold type	**MCL-US**	**na**	**na**	**na**	**na**	**na**	**na**
YOL-08	ns	0.40	0.66	3.09	4.43	9.84	1.36
YOL-09	ns	1.58	0.05	2.27	3.86	8.90	1.24
YOL-13	ns	1.66	0.07	2.82	3.79	8.11	1.04
YOL-14	ns	ns	ns	ns	ns	ns	ns
Nongrid wells							
QPCFP-01	1.8	0.43	1.15	2.18	3.39	7.71	1.01
QPCFP-02	—	0.52	0.32	2.06	3.22	7.13	0.96
QPCFP-03	1.0	0.41	1.55	2.04	3.31	7.43	1.04
QPCFP-04	—	0.46	0.52	1.96	3.23	7.38	0.97
NAMFP-05	—	ns	ns	ns	ns	ns	ns
NAMFP-06	—	0.40	6.83	2.97	8.90	8.21	1.30
NAMFP-07	—	0.23	0.98	2.91	4.15	9.18	1.25
NAMFP-08	—	0.32	1.07	2.66	3.97	8.75	1.18
NAMFP-09	—	0.43	16.10	5.88	6.39	11.98	1.45
NAMFP-10	ns	0.64	2.05	2.28	3.64	8.14	1.10
YOLFP-12	—	0.95	0.12	3.09	4.32	9.36	1.20
YOLFP-13	13.6	1.70	0.08	3.17	4.22	8.96	1.15
YOLFP-14	ns	1.71	0.07	3.05	4.26	9.32	1.20
YOLFP-15	11.4	1.49	0.07	3.10	4.23	8.87	1.14
NAMFP-16	9.2	0.55	0.36	2.11	3.45	7.64	1.06

Table 19. Microbial constituents detected in ground-water samples collected for the Southern Sacramento Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study unit, California, 2005.

[The five digit USGS parameter code is used in the USGS's computerized data system, the National Water Information System, to uniquely identify a specific constituent or property. "FP" following a site area name in the first column indicates "flowpath." E, estimated; GAMA, Ground-Water Ambient Monitoring and Assessment; mL, milliliter; USGS, U.S. Geological Survey; YOL, Yolo; —, not detected]

GAMA sample identification number	Coliphage F-specific	Coliphage somatic	*E. coli* colonies/100 mL	Total coliforms colonies/100 mL
USGS parameter code	**99335**	**99332**	**90901**	**90900**
YOL-04	—	present	—	—
YOLFP-15	—	—	—	E1

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