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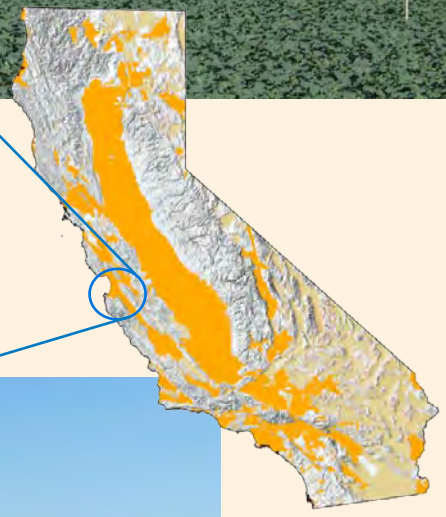
Ground-Water Quality Data in the Monterey Bay and Salinas Valley Basins, California, 2005—Results from the California GAMA Program



Data Series 258
Version 1.1

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

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By Justin T. Kulongoski and Kenneth Belitz

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Abbreviations and Acronyms

AF	atomic fluorescence
AL	California Department of Health Services Advisory Level
CAS	Chemical Abstract Service (American Chemical Society)
CCV	continuing calibration verification
CSU	combined standard uncertainty
DLR	detection level for the purpose of reporting
DO	dissolved oxygen
DOC	dissolved organic carbon
E	estimated value
GAMA	Ground-Water Ambient Monitoring and Assessment program
GFAA	Agraphite furnace atomic absorption
HAL-US	U.S. Environmental Protection Agency Lifetime Health Advisory
HCl	hydrochloric acid
LRL	laboratory reporting level
LSD	land-surface datum
LT-MDL	long-term method detection level
MCL	maximum contaminant level
MCL-CA	California Department of Health Services Maximum Contaminant Level
MCL-US	United States Environmental Protection Agency Maximum Contaminant Level
MD	method detection level
MDL	method detection limit
MRL	minimum reporting level
MS	Monterey Bay and Salinas Valley Study Unit
MSMB	Monterey Bay and Salinas Valley Study Unit: Monterey Bay study area
MSMBFP	Monterey Bay and Salinas Valley Study Unit: Monterey Bay study area flow-path well
MSMBMW	Monterey Bay and Salinas Valley Study Unit: Monterey Bay study area monitoring well
MSPR	Monterey Bay and Salinas Valley Study Unit: Paso Robles study area

MSSC	Monterey Bay and Salinas Valley Study Unit: Santa Cruz study area
MSSV	Monterey Bay and Salinas Valley Study Unit: Salinas Valley study area
MTBE	methyl *tert*-butyl ether
MU	method uncertainty
N	normal (1 gram-equivalent per liter of solution)
na	not available
NAWQA	National Water-Quality Assessment (USGS)
nc	sample not collected
nd	no data
NDMA	*N*-nitrosodimethylamine
NL	California notification level (CADHS)
No.	number
PCE	tetrachloroethene
PMC	percent modern carbon
QC	quality control
RSD	relative standard deviation
SC	specific conductance
SMCL	secondary maximum contaminant level
SMCL-CA	California Department of Health Services secondary maximum contaminant level
SMCL-US	United States Environmental Protection Agency secondary maximum contaminant level
SMOW	Standard Mean Ocean Water
SSMDC	sample specific minimum detectable concentration
TCE	trichloroethene
TCP	1,2,3-trichloropropane
TDS	total dissolved solids
TT	treatment technique
UCMR	unregulated contaminant monitoring regulation
V	value censored due to blank contamination
VE	estimated value censored due to blank contamination
VOC	volatile organic compound

Organizations

CADHS	California Department of Health Services
CAEPA	California Environmental Protection Agency
DWR	California Department of Water Resources
LLNL	Lawrence Livermore National Laboratory
MWH	Montgomery Watson-Harza Laboratory
NCDC	National Climate Data Center
NRP	National Research Program (USGS)
NWIS	National Water Information System (USGS)
NWQL	National Water Quality Laboratory
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

Units of Measure

cm^3 STP	cubic centimeters at standard temperature and pressure (0 degrees Celsius and 1 atmosphere of pressure)
δ	delta notation, expressed as per mil
ft	foot (feet)
in.	inch (inches)
kg	kilogram
L	liter
lb	pound
mg	milligram
mg/L	milligrams per liter
mi	mile
mi^2	square mile
mL	milliliter
µg	microgram
µg/L	micrograms per liter
µL	microliter
µm	micrometer
pCi/L	picocuries per liter
per mil	parts per thousand
ppb	parts per billion (µg/L)
ppm	parts per million (mg/L)
ppt	parts per trillion (µg/mL)
TU	tritium unit

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Ground-Water Quality Data in the Monterey Bay and Salinas Valley Basins, California, 2005—Results from the California GAMA Program

By Justin T. Kulongoski and Kenneth Belitz

Abstract

Ground-water quality in the approximately 1,000-square-mile Monterey Bay and Salinas Valley study unit was investigated from July through October 2005 as part of the California Ground-Water Ambient Monitoring and Assessment (GAMA) program. The study was designed to provide a spatially unbiased assessment of raw ground-water quality, as well as a statistically consistent basis for comparing water quality throughout California. Samples were collected from 94 public-supply wells and 3 monitoring wells in Monterey, Santa Cruz, and San Luis Obispo Counties. Ninety-one of the public-supply wells sampled were selected to provide a spatially distributed, randomized monitoring network for statistical representation of the study area. Six wells were sampled to evaluate changes in water chemistry: three wells along a ground-water flow path were sampled to evaluate lateral changes, and three wells at discrete depths from land surface were sampled to evaluate changes in water chemistry with depth from land surface.

The ground-water samples were analyzed for volatile organic compounds (VOCs), pesticides, pesticide degradates, nutrients, major and minor ions, trace elements, radioactivity, microbial indicators, and dissolved noble gases (the last in collaboration with Lawrence Livermore National Laboratory). Naturally occurring isotopes (tritium, carbon-14, helium-4, and the isotopic composition of oxygen and hydrogen) also were measured to help identify the source and age of the sampled ground water. In total, 270 constituents and water-quality indicators were investigated for this study. This study did not attempt to 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 water quality. In addition, regulatory thresholds apply to treated water that is served to the consumer, not to raw ground water.

In this study, only six constituents, alpha radioactivity, *N*-nitrosodimethylamine, 1,2,3-trichloropropane, nitrate, radon-222, and coliform bacteria were detected at concentrations higher than health-based regulatory thresholds. Six constituents, including total dissolved solids, hexavalent chromium, iron, manganese, molybdenum, and sulfate were detected at concentrations above levels set for aesthetic concerns.

One-third of the randomized wells sampled for the Monterey Bay and Salinas Valley GAMA study had at least a single detection of a VOC or gasoline additive. Twenty-eight of the 88 VOCs and gasoline additives investigated were found in ground-water samples; however, detected concentrations were one-third to one-sixty-thousandth of their respective regulatory thresholds. Compounds detected in 10 percent or more of the wells sampled include chloroform, a compound resulting from the chlorination of water, and tetrachloroethylene (PCE), a common solvent.

Pesticides and pesticide degradates also were detected in one-third of the ground-water samples collected; however, detected concentrations were one-thirtieth to one-fourteen-thousandth of their respective regulatory thresholds. Ten of the 122 pesticides and pesticide degradates investigated were found in ground-water samples. Compounds detected in 10 percent or more of the wells sampled include the herbicide simazine, and the pesticide degradate deethylatrazine.

Ground-water samples had a median total dissolved solids (TDS) concentration of 467 milligrams per liter (mg/L), and 16 of the 34 samples had TDS concentrations above the recommended secondary maximum contaminant level (SMCL—a threshold established for aesthetic qualities: taste, odor, and color) of 500 mg/L, while four samples had concentrations above the upper SMCL of 1,000 mg/L. Concentrations of nitrate plus nitrite ranged from 0.04 to 37.8 mg/L (as nitrogen), and two samples had concentrations above the health-based threshold for nitrate of 10 mg/L (as nitrogen). The median sulfate concentration in ground-water samples was 138 mg/L, and five samples had concentrations above the recommended SMCL of 250 mg/L, while only one sample had a concentration above the upper SMCL of 500 mg/L. Iron concentrations above the SMCL of 300 micrograms per liter (µg/L) were measured in three samples, and manganese concentrations were above the SMCL of 50 µg/L in eight samples. A molybdenum concentration above the Lifetime Health Advisory of 40 µg/L was measured in one sample, and hexavalent chromium (VI) concentrations above the detection level for the purpose of reporting (DLR) of 1 µg/L were measured in 86 samples.

Radon-222 was detected in all 31 ground-water samples collected, with activities ranging from 170 to 1,610 picocuries per liter (pCi/L). Twenty-three radon samples were above 300 pCi/L, a proposed health-based threshold. Alpha radiation was detected above the health-based threshold of 15 pCi/L in one sample.

Microbial constituents were analyzed in 30 ground-water samples. Coliform bacteria was detected in four samples. Counts ranged from an estimated 1 colony per 100 milliliter (mL) to 110 colonies per 100 mL. Thresholds for microbial constituents are based on recurring detection, and these constituents will be monitored during future sampling.

Introduction

To assess the quality of ground water from public-supply wells and establish a program for monitoring trends in ground-water quality, the U.S. Geological Survey (USGS), in collaboration with the California State Water Resource Control Board and Lawrence Livermore National Laboratory (LLNL), implemented a statewide ground-water-quality monitoring and assessment program (http://ca.water.usgs.gov/gama/). The USGS developed a comprehensive approach for this effort (Belitz and others, 2003; http://water.usgs.gov/pubs/wri/wri034166/). The Ground-Water Ambient Monitoring and Assessment (GAMA) program is a comprehensive assessment of Statewide ground-water quality designed to help better understand and identify risks to ground-water resources. The assessment will be based on ground-water samples collected at many locations across California in order to characterize its constituents and identify trends in water quality (for example, Wright and others, 2005; Kulongoski and others, 2006). The results of the sampling and analysis provide information for water agencies to address a variety of issues ranging in scale from local water supply to statewide resource management.

The GAMA program was developed in response to the Ground-Water Quality Monitoring Act of 2001 (CAL. WATER §§ 10780-10782.3): a public mandate to assess and monitor the quality of ground water used as public supply for municipalities in California. The goal of the Ground-Water Quality Monitoring Act of 2001 is to improve statewide ground-water monitoring and facilitate the availability of information about ground-water quality to the public.

The three main objectives of GAMA are (1) status, to assess the current quality of the ground-water resource; (2) trends, to detect changes in ground-water quality; and (3) understanding, to identify the natural and human factors affecting ground-water quality (Kulongoski and Belitz, 2004). This report will present an assessment of the quality of the ground-water resource (objective (1) – status) in the Monterey Bay and Salinas Valley GAMA study unit, while subsequent interpretive reports will address the trends and understanding listed in objectives (2) and (3).

The GAMA program is unique because the data collected during the study include analyses for an extensive number of chemical constituents, analyses that are not normally available. This broader understanding of ground-water composition will be especially useful for providing an early indication of changes in water chemistry. Additionally, the GAMA program will analyze this broader suite of constituents at detection limits that are lower than those currently required by the California Department of Health Services (CADHS). An understanding of the occurrence and distribution of these constituents is important for the long term management and protection of ground-water resources.

The range of hydrologic, geologic, and climatic conditions that exist in California must be considered in an assessment of ground-water quality (Belitz and others, 2003). To accomplish this, the State was partitioned into 10 hydrogeologic provinces, each with distinctive hydrologic, geologic, and climatic characteristics (fig. 1). The ground-water basins within these hydrologic provinces generally consist of relatively permeable, unconsolidated deposits of alluvial or volcanic origin (California Department of Water Resources, 2003). For the purpose of designing the GAMA program, ground-water basins were prioritized (for sampling) on the basis of the number of public-supply wells in the basin (Belitz and others, 2003). Secondary consideration was given to the amount of municipal ground-water use, agricultural pumping, the number of leaking underground fuel tanks, and pesticide application within a basin. Similar adjacent ground-water basins were then combined and designated as GAMA study units. The Monterey Bay and Salinas Valley GAMA study unit, hereafter referred to as the MS study unit, lies in the Southern Coast Ranges Hydrogeologic province (fig. 1), and contains eight ground-water basins that are considered high priority based on the number of public-supply wells, basin location, agricultural use, and pesticide applications within each basin (Belitz and others, 2003).

Purpose and Scope

The purpose of this report is to present the results of analyses for organic and inorganic constituents, microbial constituents, and water-quality indicators from ground-water samples collected in the MS study unit. Discussions of the factors that influence the distribution and occurrence of the compounds and microbial constituents detected in ground-water samples will be the subject of subsequent publications.

Base from U.S. Geological Survey National Elevation Dataset, 2006, Albers Equal-Area Conic Projection

Figure 1. The 10 hydrogeologic provinces identified for the California GAMA study with the Monterey Bay and Salinas Valley GAMA study unit outlined.

This study determined the chemical and biological constituents of untreated aquifer water. In order to provide context for these results, the analytical results reported in this study were compared to state and federal drinking water standards that apply to treated drinking water. Samples collected for this program do not represent the 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 are established by the United States Environmental Protection Agency (USEPA), the California Environmental Protection Agency (CAEPA), and (or) the California Department of Health Services (CADHS). Health-based regulatory thresholds include maximum contaminant levels (MCLs); health-based advisory levels (ALs), notification levels (NLs); or the USEPA Lifetime Health Advisory (HALs).

Non-enforceable thresholds established for aesthetic qualities (taste, odor, and color) include California secondary maximum contaminant levels (SMCLs-CA), and detection limits for the purposes of reporting (DLR) set by the CADHS for the purposes of tracking unregulated chemicals for which monitoring is required. The SMCLs-CA for chloride, sulfate, specific conductance, and total dissolved solids include recommended thresholds (same as the United States SMCLs), upper thresholds, and short term thresholds for each constituent. The data presented in this report are intended to characterize the quality of untreated ground-water resources within the study unit, not the treated drinking water delivered to consumers by water purveyors.

Detection frequencies, or the percentage of ground-water samples in which a constituent is observed, were reported for the VOCs, pesticides, and pesticide degradates. Detection frequencies are useful for determining trends in ground-water quality. Also presented in this report are the results and analyses of quality-control samples collected during the Monterey Bay and Salinas Valley GAMA study. Samples for pharmaceutical compounds were also collected as part of this study; however, the presentation of these results and their associated quality assurance/quality control are beyond the scope of this report and will be presented in a future report.

Acknowledgments

The authors thank the following agencies for their support: California Water Boards, California Department of Health Services (CADHS), California Department of Water Resources (DWR), and Lawrence Livermore National Laboratory (LLNL).

We also thank the cooperating well owners and water purveyors for their generosity in allowing the USGS to collect samples from their wells.

Hydrogeologic Setting of the Monterey Bay and Salinas Valley GAMA Study Unit

The Monterey Bay and Salinas Valley (MS) study unit covers approximately 1,000 mi^2 in Monterey, Santa Cruz, and San Luis Obispo Counties across the central coast region of California (fig.2). It lies within the Southern Coast Ranges hydrogeologic province (Belitz and others, 2003), and includes eight ground-water basins and eight subbasins as defined by the California Department of Water Resources (California Department of Water Resources, 2003) (fig. 2). The wells sampled as part of this study generally are located around the Monterey Bay and along the Salinas River Valley.

The Salinas Valley is the largest of the intermontane valleys of the Southern Coast Ranges, and extends southeastward 120 mi from Monterey Bay to Paso Robles. The Salinas Valley formed, in part, as a result of normal faulting along the King City (Rinconda-Reliz) Fault that runs north along the western margin of the valley from King City in the south to Monterey Bay in the north (California Department of Water Resources, 2003). Normal movement along the fault, valley-side down, allowed the deposition of a westward thickening alluvial wedge (Showalter and others, 1983). The Salinas Valley has been filled up to 10,000 ft on the east, and up to 15,000 ft on the west, with Tertiary and Quaternary marine and terrestrial sediments that include up to 2,000 ft of saturated alluvium (Showalter and others, 1983). Water-bearing units, which lie above mostly non-water-bearing and consolidated granitic basement, include the Miocene-age Monterey Formation and Pliocene- to Pleistocene-age Paso Robles Formation, and Pleistocene to Holocene alluvium.

The climate in the Monterey Bay and Salinas Valley area is characterized by warm, dry summers and cool, moist winters. At the National Climate Data Center (NCDC) station in Monterey, on the basis of a 50-year record, the average annual temperature is 57ºF, and the average annual precipitation is 20 in., occurring as rain during the winter and early spring. However, the distribution of precipitation across the area is dependent on the topography and the prevailing winds, with an increase in precipitation concomitant to an increase in altitude. Precipitation also decreases with latitude from north to south in the study unit. Fifty-year climate records from NCDC stations from Santa Cruz to Paso Robles show that the mean annual precipitation decreases from 31 in. in Santa Cruz in the north, to 13 in. in Paso Robles in the south (fig. 2).

The MS study unit ground-water basins are drained by several rivers and their principal tributaries, including the Salinas Valley drained by the Salinas River; the Pajaro Valley drained by the Pajaro River; the Santa Cruz area drained by the San Lorenzo River; and Carmel Valley drained by the Carmel River (fig. 2).

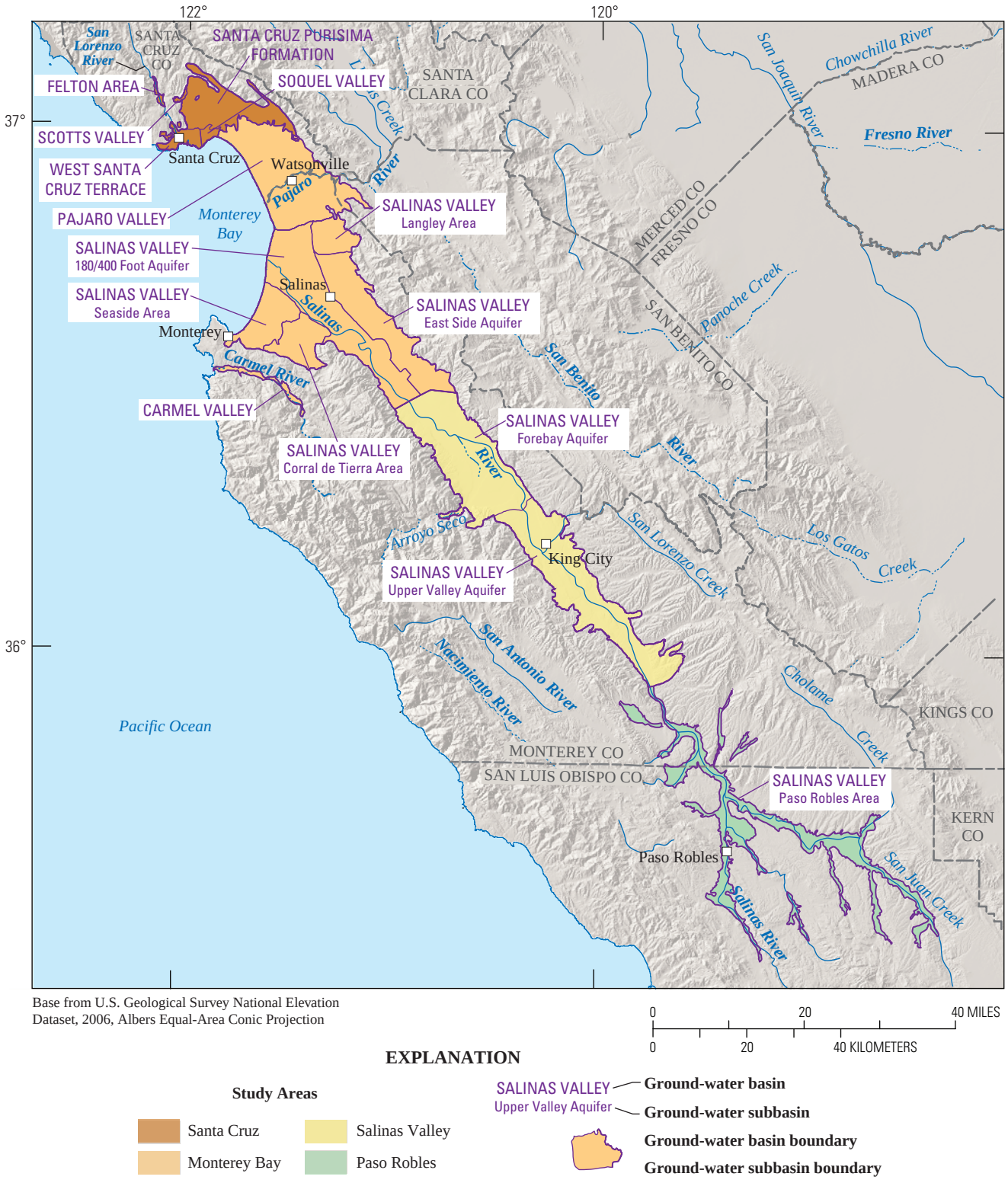

Figure 2. The Monterey Bay and Salinas Valley GAMA study unit, locations of study areas, major cities, rivers, creeks, ground-water basins, and subbasins.

Sources of ground-water recharge include percolation of precipitation, river and stream infiltration, and agricultural irrigation and return flow. Amongst the four study areas, the Santa Cruz study area has the least recharge from irrigation, whereas the Paso Robles study area has the least input from precipitation. The contribution of these inputs is also dependent on the hydrogeologic setting of each area, which is described below from north to south.

Santa Cruz Study Area

The Santa Cruz (MSSC) study area includes the following ground-water basins, the Felton Area; Scotts Valley; Santa Cruz Purisima Formation Highlands; West Santa Cruz Terrace; and Soquel Valley (fig. 2), all as defined by the DWR Bulletin 118 (2003). For the purposes of this study, these basins were grouped into the MSSC study area on the basis of having underlying Purisima Formation geology; however, two wells near the town of Felton were sampled to represent the Felton Ground-Water Basin, which is metamorphic terrain (fig. 2). The MSSC study area is bounded to the north, east, and west by the Santa Cruz Mountains, with altitudes as high as 2,900 ft, and to the south by Monterey Bay and the Pajaro Valley Ground-Water Basin.

Mean annual precipitation at Santa Cruz is 31 in. and mean annual temperature is 57ºF, based on a 50-year record from NCDC. The MSSC study area is drained by the San Lorenzo River and numerous creeks and their tributaries (fig. 3). Sources of ground-water recharge include percolation of rainfall, and river and stream infiltration.

In the north of the MSSC study area, the Santa Cruz Purisima Formation Highlands Ground-Water Basin is defined by the geologic boundary of the Purisima Formation. The upper Pliocene Purisima Formation is the primary water-bearing unit and consists of poorly consolidated, silty to clean, very fine to medium-grained sandstone beds interbedded with siltstone. The formation ranges in thickness from 600 ft in the north to 1,000 ft in the south near Soquel (Muir, 1980).

The West Santa Cruz Terrace and Soquel Valley Ground-Water Basins lie to the south of the Santa Cruz Purisima Formation Highlands Ground-Water Basin. In the Soquel Valley Ground-Water Basin, the water-bearing sediments consist of the Pliocene Purisima Formation, overlain by the Pleistocene Aromas Sands Formation and by Quaternary terrace deposits. The Purisima Formation and Quaternary terrace deposits have been incised locally by streams, and these channels have been filled with Quaternary alluvium (Muir, 1980). The Purisima Formation is a sequence of gray-to-blue, moderately consolidated, silty to clean, fine to medium sandstone containing siltstone and claystone interbeds (Greene, 1970). To the southeast, the Purisima Formation is overlain by hydraulically unconfined Aromas Sands. The Aromas Sands Formation is brown to red, poorly consolidated, fine to coarse-grained sandstone containing lenses of silt and clay (California Department of Water Resources, 2003). The West Santa Cruz Terrace Ground-Water Basin contains water-bearing sediments derived from the Purisima Formation, Quaternary terrace deposits, and alluvium along the San Lorenzo River and other streams (fig. 2). The Purisima Formation, the main water-bearing formation, is a thick sedimentary sequence with a fossiliferous marine rock base that grades to continental deposits in its upper portion. The thin terrace deposits and alluvium are poorly cemented, moderately permeable gravel, sands, silts and silty clays, and yield only minor quantities of ground water to wells (Greene, 1970).

The Scotts Valley and Felton Area Ground-Water Basins are small alluviated valleys located in the Santa Cruz Mountains (fig. 2). The 2-mi^2 Felton Area Ground-Water Basin and the 1.2-mi^2 Scotts Valley Ground-Water Basin contain the following formations, from oldest to youngest: granitic basement, Tertiary Lompico Sandstone, Monterey Shale, Santa Margarita Sandstone, and Quaternary alluvium. The principal water-bearing formation is the unconfined Santa Margarita Sandstone, which is up to 350 ft thick. The underlying Lompico Sandstone also yields water to a lesser extent, and is up to 600 ft thick.

Monterey Bay Study Area

The Monterey Bay (MSMB) study area, as defined for the MS study unit, extends from east of Santa Cruz south along the Monterey Bay to the Forebay of the Salinas Valley. The MSMB study area covers approximately 450 mi^2 and includes most of the Quaternary sediment filled basins in this area (figs. 2 and 4), which include the Pajaro Valley, Carmel Valley, and the following subbasins of the Salinas Valley: 180/400-Foot Aquifer, Eastside Aquifer, Seaside Area, Langley Area, and Corral de Tierra Area, as defined by the DWR Bulletin 118 (2003). For the purposes of this study, these basins and subbasins were grouped together in the MSMB study area because these basins contain similar Quaternary deposits.

Mean annual precipitation at Monterey is 20 in, and mean annual temperature is 57ºF, based on a 50-year record from NCDC. The MSMB study area is drained by the Salinas and Carmel Rivers and their tributaries (fig. 2). Sources of ground-water recharge include percolation of precipitation, agricultural return flow, and river and stream runoff infiltration in the unconfined areas, but surficial recharge does not occur in the confined areas. In the confined areas, recharge is from underflow originating in upper valley areas, and ground water flows north and west towards the discharge zones in the walls of the submarine canyon in Monterey Bay (Greene, 1970; Durbin and others, 1978).

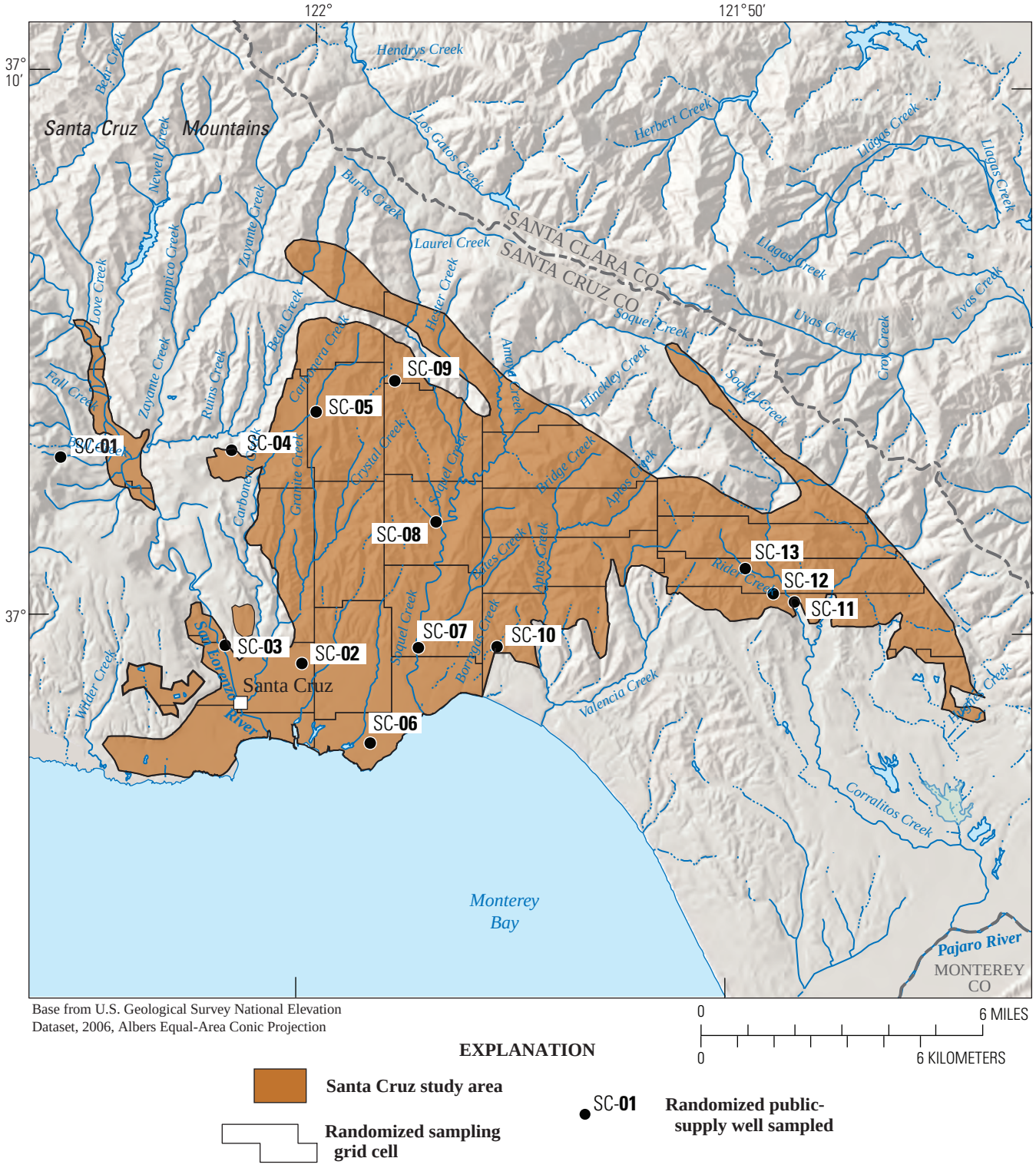

Figure 3. The Santa Cruz study area, the locations of the randomized sampling grid cells, and the randomized public-supply wells sampled in the Monterey Bay and Salinas Valley GAMA study, California.

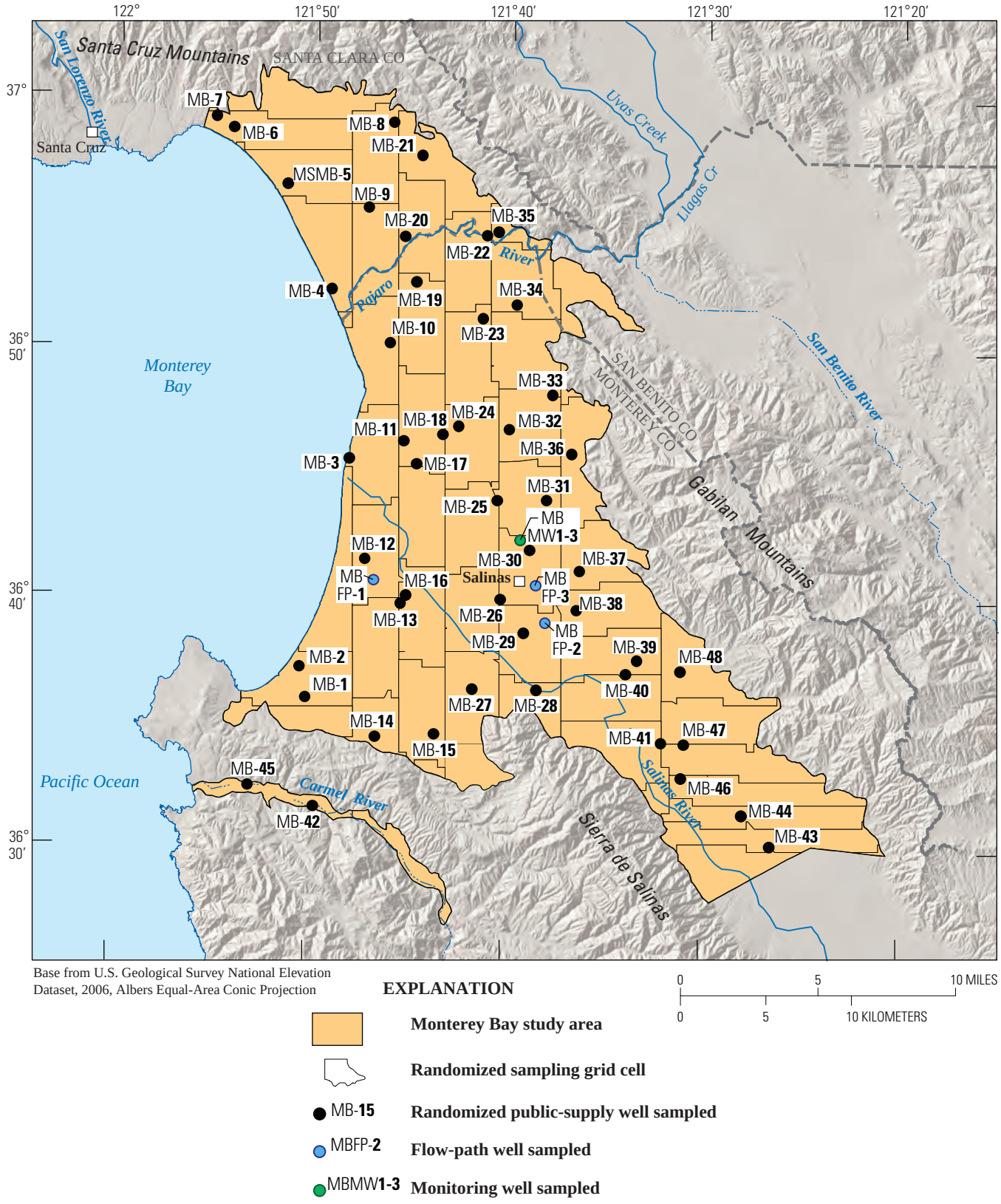

Figure 4. The Monterey Bay study area, the locations of the randomized sampling grid cells, the flow-path and monitoring wells sampled, and the randomized public-supply wells sampled in the Monterey Bay and Salinas Valley GAMA study, California.

The MSMB study area is bounded to the west by Monterey Bay and to the southwest by the Sierra de Salinas Mountains, which have altitudes as high as 4,470 ft. It is bounded to the east by the Santa Cruz Mountains in the north, and the Gabilan Range further south, which have altitudes as high as 3,450 ft. The study area is bounded to the north by the surface expression of the geologic contact between Quaternary alluvium of the Pajaro Valley and marine sedimentary deposits of the Pliocene Purisima Formation (California Department of Water Resources, 2003).

The northern Pajaro Valley Basin of the MSMB study area contains water-bearing geologic units that include, from oldest to youngest, the Purisima Formation, the Aromas Sands, Terrace Deposits, Quaternary alluvium, and Dune Deposits (Johnson and others, 1988). The Purisima Formation mainly is marine in origin, and contains a thick sequence of highly variable sediments ranging from shale beds near its base to continental deposits in its upper portion (Johnson and others, 1988). The sediments primarily are poorly consolidated, moderately permeable gravel, sands, silts, and silty clays (Johnson and others, 1988). The Aromas Sands Formation is composed of friable, quartzose, well-sorted brown to red sands that generally are medium-grained and weakly cemented with iron oxide (Johnson and others, 1988). This unit ranges in thickness from 100 ft above sea level in the foothills, to nearly 900 ft below sea level near the mouth of the Pajaro River (Allen, 1946). The Aromas Sands, considered the primary water-bearing unit of the basin, consists of upper eolian and lower fluvial sand units that are separated by confining layers of interbedded clays and silty clay (Johnson and others, 1988). The Terrace Deposits consist of unconsolidated gravel, sand, silt, and clay overlain by alluvium. The alluvium is composed of Pleistocene terrace materials, which is overlain by Holocene alluvium, consisting of sand, gravel, and clay deposited by the Pajaro River, and dune sands, with an average thickness of 50-300 ft (Johnson and others, 1988). A 400-ft deep, inland-projecting buried paleodrainage of the Salinas River acts as the southern subbasin boundary and restricts flow into the 180/400-Foot Aquifer Subbasin.

South of the Pajaro Valley Basin lay the 180/400-Foot Aquifer and Langley Area Subbasins. The 24-mi^2 Langley Area Subbasin is a series of low hills composed of the following formations, from oldest to youngest: the Pliocene to Pleistocene Paso Robles Formation, the Pleistocene Aromas Sands, Quaternary terrace deposit, Holocene alluvium, and sand dunes (California Department of Water Resources, 1977). Outcrops of the Aromas Sands compose most of the subbasin, but exposures of Quaternary terrace deposits and Holocene alluvium along creeks form a small portion of the southeast subbasin. The lower portion of the Aromas Sands interfingers with the upper portion of the Paso Robles Formation to form the 400-Foot Aquifer to the west in the Salinas Valley 180/400-Foot Aquifer Subbasin.

The 180/400-Foot Aquifer Subbasin contains three water-bearing units, the 180-Foot, the 400-Foot, and the 900-Foot Aquifers, named for the average depth at which they are found. The confined 180-Foot Aquifer occurs only in this subbasin, as its confining blue clay layer thins and disappears east of the subbasin. The 180-Foot Aquifer consists of interconnected sand, gravel, and clay lenses, and ranges in thickness from 50 ft near Salinas, to 150 ft near Monterey Bay (Durbin and others, 1978). The 180-Foot Aquifer is separated from the 400-Foot Aquifer by a zone of lesser aquifers and aquitards that range in thickness from 10 to 70 ft. The 400-Foot Aquifer consists of sands, gravels, and clay lenses, with an average thickness of 200 ft (Durbin and others, 1978). The upper portion of the aquifer may be correlative with the Aromas Sands and the lower portion with the upper part of the Paso Robles Formation (Montgomery-Watson Consulting Engineers, 1994). The 900-Foot Aquifer is present in the lower Salinas Valley. It consists of alternating layers of sand, gravels and clays with a total thickness of up to 900 ft thick and is separated from the 400-Foot Aquifer by a blue marine clay aquitard.

To the east of the 180/400-Foot Aquifer is the Eastside Aquifer Subbasin. This 90-mi^2 subbasin contains the same water-bearing units as the 180/400-Foot Aquifer Subbasin. However, the blue clay layer that confines the 180-Foot Aquifer does not extend into the Eastside Aquifer Subbasin.

To the south of the 180/400-Foot Aquifer Subbasin are the Seaside Area and Corral de Tierra Area Subbasins. These subbasins contain water-bearing units that include, from oldest to youngest: the Miocene and Pliocene Santa Margarita Formation, the Pliocene Paso Robles Formation, the Pleistocene Aromas Formation, and Pleistocene and Holocene age alluvial deposits (Muir, 1982). Although the aggregate maximum thickness of these units is more than 1,000 ft, surface outcrops are limited to alluvial sand and terrace deposits (Muir, 1982). The Santa Margarita Formation has a maximum thickness of 225 ft, and is a poorly consolidated marine sandstone (Muir, 1982). The Paso Robles Formation is the primary water-bearing unit in the area and consists of sand, gravel, and clay interbedded with some minor calcareous beds (Muir, 1982). The Aromas Formation is grouped with the dune sand deposits within this subbasin due to their similarities. These units consist of relatively clean red to yellowish-brown, well sorted sand and are estimated to range in thickness from 30 to 50 ft near the coast to up to 200 ft inland (Muir, 1982).

The Carmel Valley Ground-Water Basin is a small intermontane basin that lies along the Carmel River south of the Seaside Subbasin. The basin contains younger alluvium and river deposits, and older alluvium and terrace deposits, underlain by Monterey Shale and Tertiary sandstone units. The younger alluvium comprises the main water-bearing units and consists of boulders, gravel, sand, silt, and clay, with a thickness between 30 to 180 ft (Kapple and others, 1984).

Salinas Valley Study Area

The Salinas Valley (MSSV) study area (figs. 2 and 5) includes the following ground-water subbasins of the Salinas Valley basin: the Forebay Aquifer and the Upper Valley Aquifer, as defined by the DWR Bulletin 118 (2003). For the purposes of this study, these subbasins were combined into the MSSV study area on the basis of similar geology of the upper and central Salinas Valley. The MSSV study area's northern boundary is shared with the 180/400-Foot Aquifer and Eastside Aquifer Subbasins. To the west, the MSSV study area is bounded by the Sierra de Salinas and Santa Lucia Ranges, with altitudes up to 4,850 ft, and to the east, it is bounded by the Gabilan Range. The southern boundary, at the constriction of the Salinas Valley where Sargent Creek joins the Salinas River, is shared with the Paso Robles Area Subbasin and separates the upper and lower Salinas River drainage basins.

Mean annual precipitation at Salinas is 15 in. and mean annual temperature is 58ºF, based on a 50-year record from NCDC. The MSSV study area is drained by the Salinas River and its tributaries. Sources of ground-water recharge include river and stream runoff infiltration and applied irrigation water.

The MSSV study area covers approximately 300 mi^2 of the central Salinas Valley. The main water-bearing units of this subbasin are unconsolidated to semi-consolidated and interbedded gravel, sand and silt, alluvial-fan, and river deposits (Durbin and others, 1978). These deposits form the 180-Foot and 400-Foot Aquifers that are mentioned previously in the MSMB study area description. The northern boundary of the MSSV study area marks the southern boundary of the confining conditions for the 180-Foot Aquifer, while just south of Arroyo Seco in the center of the MSSV study area (the southern boundary of the Forebay Aquifer subbasin), marks the southern boundary of the confining conditions above the 400-Foot Aquifer. In the Forebay Aquifer Subbasin, ground water is found in the lenses of sand and gravel that are interbedded with massive units of finer grained material (Durbin and others, 1978). In the northern Forebay Aquifer subbasin, the unconfined 180-Foot Aquifer varies in thickness from 50 to 150 ft, with an average of 100 ft, and is separated from the 400-Foot Aquifer by a zone of discontinuous sands and blue clays called the 180/400-Foot Aquiclude. The aquiclude ranges in thickness from 10 to 70 ft, above the 400-Foot Aquifer, which has an average thickness of 200 ft (Durbin and others, 1978). To the south, the Upper Aquifer Subbasin, a lateral equivalent to the 180/400-Foot Aquifers, includes unconsolidated to semi-consolidated and interbedded gravel, sand, and silt of the Paso Robles Formation alluvial fan and river deposits, but the 400-Foot Aquiclude is absent in this portion of the valley.

An additional deeper aquifer consisting of alternating layers of sand-gravel mixtures and clays, the 900-Foot Aquifer, is present in the Forebay Aquifer Subbasin of the Salinas Valley, but does not extend into the Upper Valley Aquifer Subbasin owing to the southward shoaling of the basement complex (Durbin and others, 1978).

Paso Robles Study Area

The Paso Robles (MSPR) study area (figs. 2 and 6) lies within the Paso Robles Area Subbasin of the Salinas Valley Basin, as defined by the DWR Bulletin 118 (2003). For the purposes of this study, the Quaternary alluvium that fills the valleys in this subbasin is designated as the MSPR study area (fig. 6), which excludes the higher altitude Quaternary-Pleistocene deposits. The MSPR study area is bounded to the east by the Temblor Range, to the south by the La Panza Range, to the west by the Santa Lucia Range, and to the north by the Upper Salinas Valley Aquifer Subbasin (California Department of Water Resources, 2003).

Mean annual precipitation at Paso Robles is 13 in. and mean annual temperature is 60ºF, based on a 50-year record from NCDC. Sources of ground-water recharge include infiltration of precipitation, return flow from irrigation, and seepage from rivers and streams.

The MSPR study area covers approximately 300 mi^2 of valley sediments in the low-lying areas along the San Antonio and Nacimiento Rivers in the west, the Salinas River and Huerhuero Creek in the south, the Estrella River in the center, and the San Juan Creek to the southeast (fig. 6). These rivers and their tributaries drain the MSPR study area. Water-bearing formations in this study area include the Quaternary alluvium, which consists of unconsolidated, fine- to coarse-grained sand with pebbles and boulders up to 130 ft thick near the Salinas River (California Department of Water Resources, 1999).

Methods

Methods used for the GAMA program were selected to achieve the following objectives: (1) design a sampling plan suitable for statistical analysis, (2) ensure sample collection in a consistent manner, (3) analyze samples using proven and reliable laboratory methods, (4) assure the quality of the ground-water data, and (5) maintain data securely and with relevant documentation.

Sampling Design

This study utilized the ground-water basins identified by the DWR (2003) for the study area boundaries (fig. 2). Each of the study areas was subdivided into grid cells approximating 10 mi^2 (fig. 7) to provide a spatially unbiased and consistent assessment of ground-water quality (Scott, 1990). For this assessment, the MSSC study area was divided into 21 grid cells, the MSMB study area into 48 grid cells, the MSSV study area into 31 grid cells, and the MSPR study area into 16 grid cells.

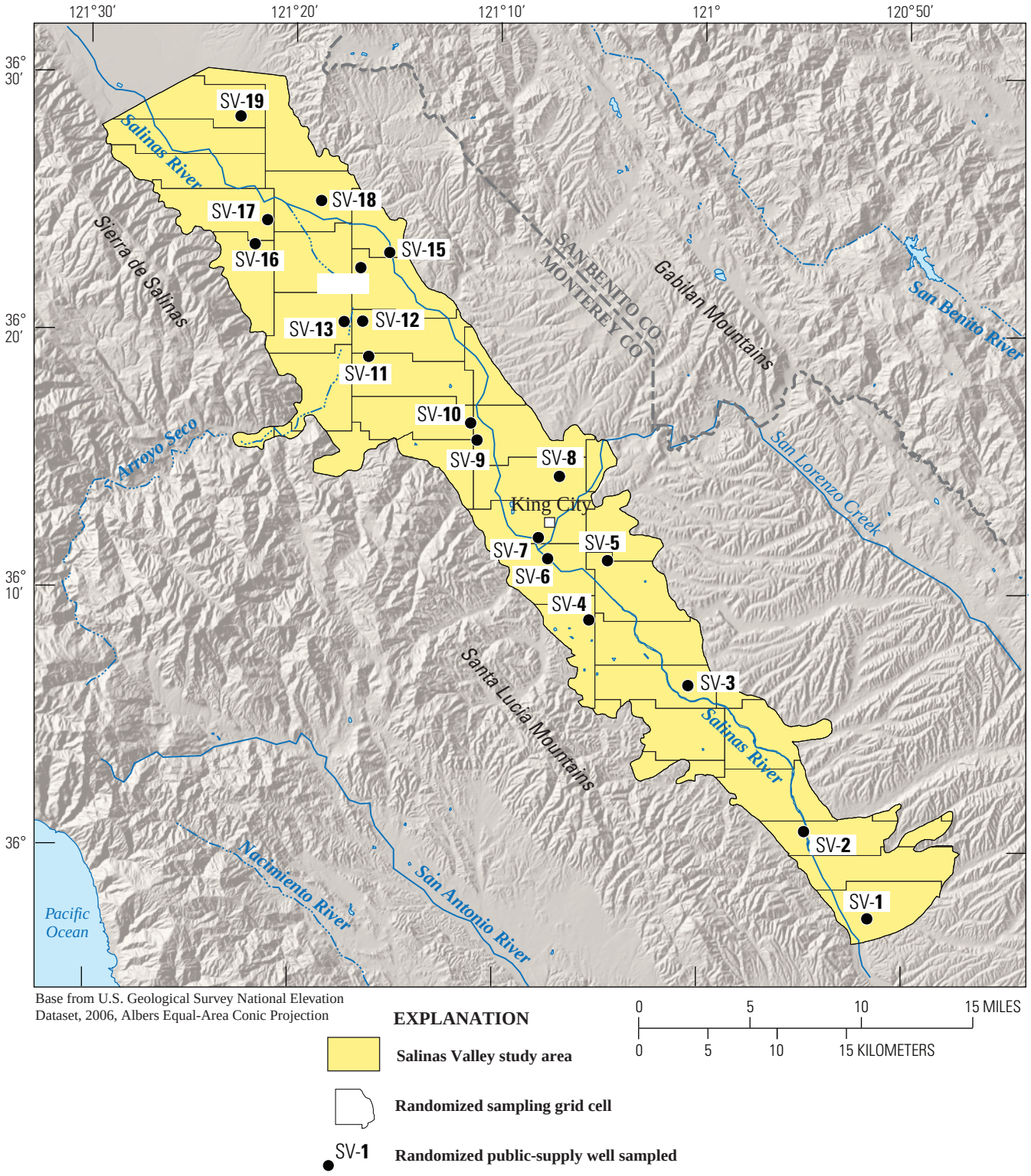

Figure 5. The Salinas Valley study area, the locations of the randomized sampling grid cells, and the randomized public-supply wells sampled in the Monterey Bay and Salinas Valley GAMA study, California.

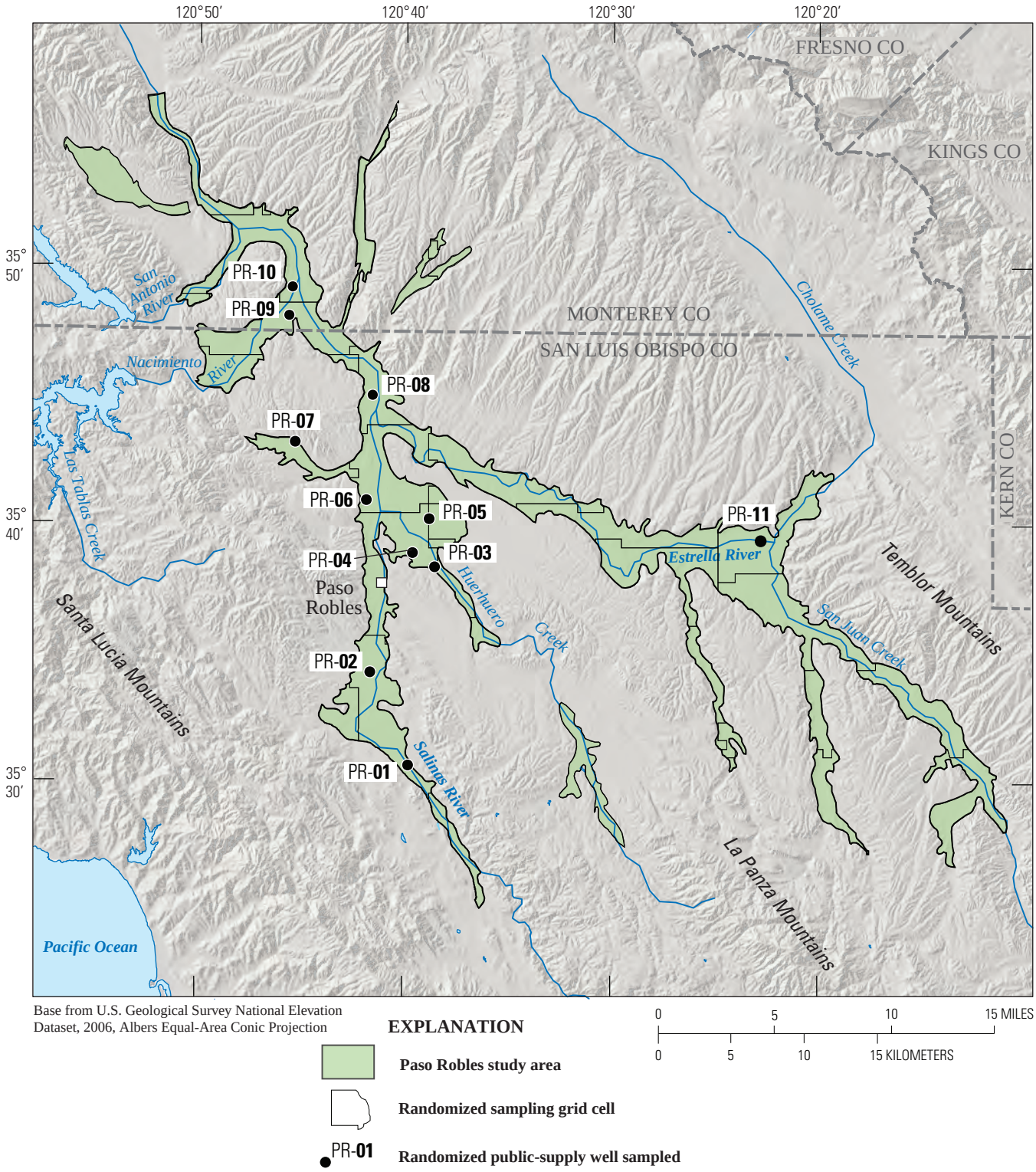

Figure 6. The Paso Robles study area, the locations of the randomized sampling grid cells, and the randomized public-supply wells sampled in the Monterey Bay and Salinas Valley GAMA study, California.

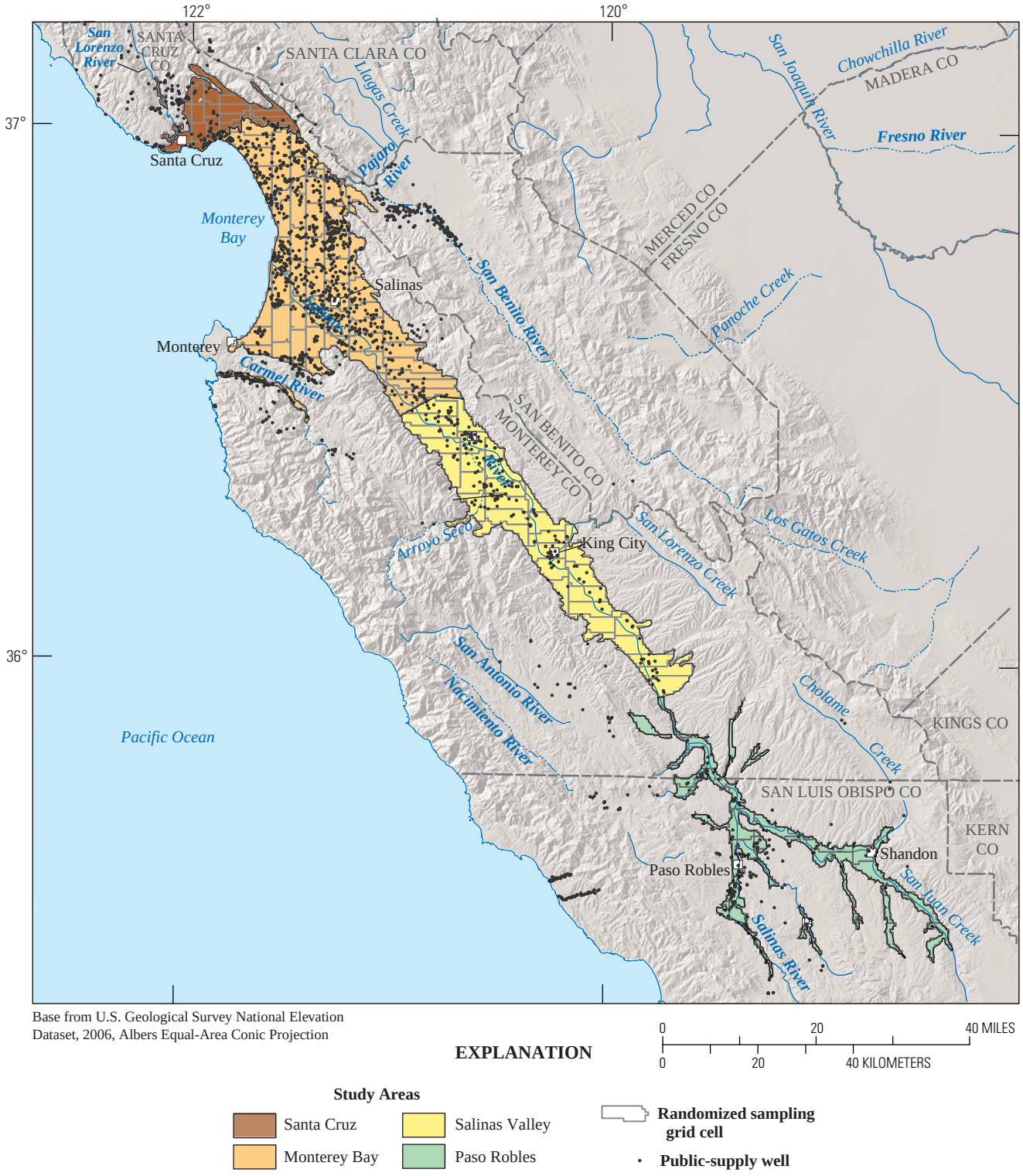

Figure 7. The Monterey Bay and Salinas Valley GAMA study unit, locations of study areas, target wells, and 10-square-mile randomized sampling grid cells.

Initial target wells (public-supply wells, fig. 7) were obtained from statewide databases maintained by the USGS and the CADHS. If a grid cell contained more than one public-supply well, each well in that grid cell was randomly assigned a rank. In each grid cell with multiple wells, the highest ranked well was given priority for sampling. An attempt was made to select one well per grid cell, but some grid cells did not contain accessible wells. Wells from adjacent cells were selected to substitute for grid cells that had no active wells. In this fashion, a public-supply well was selected for each cell to provide a spatially distributed, randomized monitoring network for each study area. Wells sampled as part of the grid-cell network are referred to, hereafter, as randomized wells.

Additional wells were sampled for the better understanding of a specific topic, including the contribution of aquifers of different depths to water supply (depth-dependent sampling of the monitoring wells), and the source and movement of ground water along the Salinas River (flow-path wells). Wells sampled as part of these studies for better understanding were excluded from the overall statistical characterization of water quality in the MS study unit, as the inclusion of the monitoring and flow-path wells would have caused overrepresentation of certain cells.

Randomized wells sampled as part of the MS study unit were numbered with the following prefixes based on study area: the Santa Cruz study area (MSSC), the Monterey Bay study area (MSMB), the Salinas Valley study area (MSSV), and the Paso Robles study area (MSPR). Additional (nonrandomized) wells were sampled in the Monterey Bay study area to ascertain ground-water quality along flow paths (designated MSMBFP), and at monitoring wells (designated MSMBMW).

Table 1 (all tables are shown in back of report) provides the GAMA identification number for each well, along with time and date sampled, sampling schedule, and well-construction information. Ground-water samples were collected from 94 public-supply wells and 3 monitoring wells from July through October 2005. Of the 94 public-supply wells sampled, 51 were in the MSMB study area, 11 in the MSPR study area, 13 in the MSSC study area, and 19 in the MSSV study area. Three monitoring wells located in the MSMB study area also were sampled for the studies for better understanding.

For this study, raw (untreated) ground-water samples were analyzed for 88 VOCs; 122 pesticides and pesticide degradates; 3 constituents of special interest [*N*-nitrosodimethylamine (NDMA), 1,2,3-trichloropropane (TCP), and perchlorate]; 5 nutrients; dissolved organic carbon (DOC); 10 major and minor ions; 25 trace elements; 12 isotopic constituents; 5 noble gases; alpha and beta radioactivity; and the microbial constituents coliform bacteria and coliphage (tables 2A–2K). General water-quality indicators that were determined in the field were pH, specific conductance (SC), dissolved oxygen (DO), temperature, alkalinity, and turbidity.

Sample Collection

Ground-water samples were collected and analyzed for the constituents listed on either the fast, slow, or monitoring-well sampling schedules (table 3). Sixty-three wells were sampled on the fast schedule, 31 wells were sampled on the slow schedule, and 3 wells were sampled on the monitoring-well schedule. All three schedules included the analytes listed on the fast schedule. However, at some wells, additional analytes were added to the fast schedule for special studies for better understanding. For the purposes of this study, this expanded analyte list was named the “slow schedule.” Similarly, at the monitoring wells, additional analytes were added and this schedule was named the “monitoring well schedule.” The fast schedule included analyses for 219 constituents and 2 water-quality indicators, while the slow schedule included analyses of 264 constituents and 6 water-quality indicators. The monitoring well schedule included analyses of 254 constituents and 5 water-quality indicators. In the MS study unit, 65 percent of the ground-water wells were sampled on the fast schedule, 32 percent on the slow schedule, and 3 percent on the monitoring well schedule.

Samples were collected using the USGS National Water-Quality Assessment (NAWQA) program protocols (Koterba and others, 1995; U.S. Geological Survey, 2006). These sampling protocols ensure that a representative sample of ground water was collected at each site and that the samples were collected and handled in a way that minimized the potential for airborne contamination of samples and cross contamination between samples collected at wells. Additional details on sample collection may be found in the analytical method references discussed in the Sample Analysis section of this report.

Prior to sampling, each well was pumped continuously to purge at least three casing-volumes of water from the well. Samples were collected from hose-bibs or access points located ahead of points of filtration or chemical treatment, such as chlorination. If a chlorinating system was attached to the well, the chlorinator was shut off at least 24 hours prior to purging and sampling the well to purge the system of extraneous chlorine. For the fast schedule, samples were collected at the well head using a foot-long length of Teflon tubing. For the slow schedule, the samples were collected inside an enclosed flow-through chamber located inside a mobile laboratory and connected to the well head by a 10-50 ft length of the Teflon tubing.

For the field measurements (water-quality indicators), ground water was pumped through a flow-through chamber fitted with a multi-probe meter that simultaneously measures pH, DO, temperature, SC, and turbidity. Measured temperature, pH, DO, and SC values were recorded at 5-minute intervals, for at least 30 minutes, and when these values remained stable for 20 minutes, samples for laboratory analyses were then collected. For analyses requiring filtered water, ground water was diverted through a 0.45-micrometer (µm) vented capsule filter or disk filter. Prior to sample collection,

polyethylene sample bottles were pre-rinsed three times using native water. Samples for some constituents were acidified to a pH of 2 or less for preservation. Temperature-sensitive samples were stored on ice prior to daily shipping to the various laboratories. The non-temperature-sensitive samples for tritium, noble gases, chromium speciation, and the isotopic composition of oxygen and hydrogen were shipped monthly, whereas volatile organic compounds, pesticides, compounds of special interest, dissolved organic carbon, radium isotopes, gross alpha and beta radioactivity, and radon-222 samples were shipped daily.

Samples for volatile organic compounds (VOCs), and gasoline additives (table 2A, 2B), and 1,2,3-trichloropropane (1,2,3-TCP) (table 2E) were collected in 40-mL sample vials that were purged with three vial volumes of sample water before bottom-filling to eliminate atmospheric contamination. Six normal (6N) hydrochloric acid (HCl) was added as a preservative to the VOC samples, but not to the gasoline additive samples, nor to the 1,2,3-TCP samples. Pesticides, pesticide degradation products (tables 2C, 2D), and NDMA (table 2E) samples were collected in 1-L baked amber bottles. Pesticide samples were filtered with a glass-fiber filter, whereas the NDMA samples were filtered at the Montgomery Watson-Harza laboratory prior to analysis. Perchlorate (table 2E) samples were collected in 125-mL polyethylene bottles. Nutrient (table 2F) samples were filtered into 125-mL brown polyethylene bottles. DOC (table 2F) samples were collected at the well head after rinsing the sampling equipment with universal blank water. Each ground-water sample for DOC was collected using a 50-mL syringe and 0.45-µm disk filter to filter the water into 125-mL baked glass bottles and then preserved with 4.5 N sulfuric acid.

Ground-water samples for major and minor ions, and trace elements, alkalinity, and total dissolved solids (table 2G) each required filling one 250-mL polyethylene bottle with raw ground water, and one 500-mL and one 250-mL polyethylene bottles with filtered ground water. Each 250-mL filtered sample then was preserved with 7.5 N nitric acid. Mercury (table 2G) samples were collected by filtering ground water into 250-mL glass bottles and preserving each with 6 N HCl. Arsenic and iron speciation (table 2H) samples were each filtered into 250-mL polyethylene bottles that were covered with tape to prevent light exposure, and preserved with 6 N HCl.

Chromium, radon-222, tritium, and dissolved gases were collected from the hose bib at the well head, regardless of the sampling schedule (slow, fast, or monitoring well). Chromium speciation (table 2H) samples were collected using a 10-mL syringe with an attached 0.45-µm disk filter. After the syringe was thoroughly rinsed and filled with ground water, 4 mL were forced through the disk filter, and the next 2 mL of the ground water were filtered slowly into a small centrifuge vial for analysis of total chromium. Hexavalent chromium, Cr (VI), then was collected by attaching a small cation exchange column to the syringe filter, and after conditioning the column with 2 mL of sample water, 2 mL were collected in a second centrifuge vial. Both vials were preserved with 10 µL of 7.5 N nitric acid (Ball and McCleskey, 2003).

Tritium (table 2I) samples were collected at the well head by bottom-filling 1-L polyethylene bottles with unfiltered ground water, after first overfilling the bottles with three volumes of water. Samples for the isotopic composition of oxygen and hydrogen (table 2I) were collected in 60-mL clear glass bottles filled with unfiltered water, sealed with conical caps, and secured with electrical tape to prevent leakage and evaporation. Radium isotopes and gross alpha and beta radiation (table 2I) samples were filtered into 1-L polyethylene bottles and then each acidified with nitric acid. Each carbon isotope (table 2I) sample was filtered before bottom-filling two 500-mL glass bottles that were first overfilled with three bottle volumes of ground water. These samples had no headspace, and were sealed with a conical cap to avoid atmospheric contamination. Samples for alkalinity titrations were collected by filtering ground water into 500-mL polyethylene bottles.

For the collection of radon-222 (table 2I), a stainless steel and Teflon valve assembly was attached to the hose bib at the well head. The valve was closed partially to create back pressure, and a 10-mL sample was taken through a Teflon septum on the value assembly using a glass syringe affixed with a stainless-steel needle. The sample then was injected into a 25-mL vial partially filled with scintillation mixture (mineral oil) and shaken. The vial then was placed in a cardboard tube in order to shield it from light during shipping (U.S. Geological Survey, 2006).

Noble gases (table 2J) were collected in 3/8-in. copper tubes using reinforced nylon tubing connected to the hose bib at the wellhead. Ground water was flushed through the tubing to dislodge any bubbles before flow was restricted with a back-pressure valve. Clamps on either side of the copper tube then were tightened, trapping a sample of ground water for analyses of noble gases (Weiss, 1968).

Microbial constituents also were collected at the well head (table 2K). Prior to the collection of samples, the sampling port was sterilized using isopropyl alcohol, and ground water was run through the sampling port for at least 3 minutes to remove any traces of the sterilizing agent. Two sterilized 250-mL bottles then were filled with ground water for coliform bacteria analyses (total and *Escherichia* coliform determinations), and one sterilized 3-L carboy was filled for coliphage analyses (F-specific and somatic-coliphage determinations).

Sample Analysis

Table 4 lists the analytes, the method(s) used for analysis, the laboratory that performed the analyses, and the citations that describe the methods in detail. Nine laboratories performed chemical and microbial analyses for the MS study (see table 4).

In addition to the analytes and their corresponding laboratory methods listed in table 4, selected analyses were done in the field. Alkalinity and the concentrations of bicarbonate (HCO_3^-) and carbonate (CO_3^{2-}) were measured by USGS technicians on filtered samples using the Gran titration method (U.S. Geological Survey, 2006). Turbidity, pH, SC, and temperature were measured in the field with calibrated instruments. Dissolved solids were determined by weighing the sample residue on evaporation at 180°C (Fishman and Friedman, 1989). Total coliform bacteria and Escherichia coliform (E. coli) were counted, following a 22–24-hour incubation time, under an ultraviolet light.

Data Reporting Conventions

Data reporting for the GAMA program addresses two important issues beyond simply presenting the concentrations of the constituents detected. First, it is important to document each laboratory's capability to either detect an analyte, or to report its absence with confidence. This documentation includes the laboratory reporting levels and detection limits for each analyte (tables 2A–2K), and is explained in the Laboratory Reporting Levels and Detection Limits section. Second, for analytes that were analyzed using more than one method, it is important to know which method is the preferred method; to accomplish this, we present reporting conventions for constituents on multiple analytical schedules in the Constituents on Multiple Analytical Schedules section.

The isotopic composition of oxygen and hydrogen of a sample are expressed in standard delta (δ) notation, in units of permil (parts per thousand), as the differences relative to Standard Mean Ocean Water (SMOW) (Craig, 1961). For example,

$$\delta^{18}O = [(^{18}O/^{16}O_{sample} - {}^{18}O/^{16}O_{SMOW})/(^{18}O/^{16}O_{SMOW})] \times 10^3 \text{ (permil)},$$

and

$$\delta^{2}H = [(^{2}H/^{1}H_{sample} - {}^{2}H/^{1}H_{SMOW})/(^{2}H/^{1}H_{SMOW})] \times 10^3 \text{ (permil)}.$$

By convention the value of SMOW is 0 per mil.

Carbon-13 abundance is expressed by means of the standard $\delta^{13}C$ parameter, in units of per mil, which is the difference in the carbon-13/carbon-12 ratio relative to University of Chicago Peedee Formation Standard (PDB) (Friedman and O'Neil, 1977). For example,

$$\delta^{13}C = [(^{13}C/^{12}C_{sample} - {}^{13}C/^{12}C_{PDB})/(^{13}C/^{12}C_{PDB})] \times 10^3 \text{ (permil)}.$$

The concentration of tritium (hydrogen-3) is measured in picocuries per liter of water (pCi/L). A picocurie per liter represents 2.22 disintegrations of hydrogen-3 per minute per liter of water.

Laboratory Reporting Levels and Detection Limits

The USGS NWQL uses the laboratory reporting level (LRL) as a threshold for reporting analytical results. The LRL is set to minimize the reporting of false negatives (not detecting a compound when it actually is present in a sample) to less than 1 percent (Childress and others, 1999). The LRL is set at two times the long-term method detection level (LT-MDL), which is the average method detection limit calculated from multiple analytical measurements (>50) of low-level standard solutions. The method detection limit is the minimum concentration of a substance that can be measured and reported with 99-percent confidence that the concentration is greater than zero (at the method detection limit, there is a less than 1 percent chance of a false positive) (U.S. Environmental Protection Agency, 2002a).

Detections below the LRL are reported as estimated concentrations (designated with an "E" before the value in the tables and text). For information-rich methods (including the VOC method used in this study), detections below LT-MDL also are reported as E-coded values. E-coded values also result from detections outside the range of calibration for detections that did not pass laboratory quality-control criteria, and for samples that were diluted prior to analysis.

Some concentrations in this study are reported using minimum reporting levels (MRLs) or method uncertainties. The MRL is the smallest measurable concentration of a constituent that may be reported reliably using a given analytical method (Timme, 1995). The method uncertainty generally indicates the precision of a particular analytical measurement; it gives a range of values wherein the true value will be found.

The reporting levels for selected radioactive constituents (gross-alpha radioactivity, gross-beta radioactivity, radium-226, and radium-228) are based on a sample-specific minimum detectable concentration (SSMDC), a critical value (also sample specific), and the combined standard uncertainty (CSU) (U.S. Environmental Protection Agency and others, 2004). In this report, a result above the critical value represents a greater-than-95-percent certainty that the result is greater than zero (significantly different from the instruments 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, 2004). Using these reporting level elements, three unique cases were possible when screening the raw analytical data. First, if the analytical result is less than the critical value (case 1), the analyte is considered not detected, and a value is presented in the table as less than the SSMDC. If the analytical result is 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 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 with an "E" (case 3). For table clarity, only the screened results are reported here.

Constituents on Multiple Analytical Schedules

Fourteen constituents targeted in the MS study were measured on more than one analytical schedule, or at more than one laboratory (table 5). Results from certain analytical schedules are preferred over others because the methodology is more accurate or precise, and generally yields a greater sensitivity for a given compound. The preferred method for USGS laboratories was selected by the laboratory on the basis of detection levels (http://wwwnwql.cr.usgs.gov/USGS/Preferred_method_selection_procedure.html). If a VOC, gasoline additive, pesticide, or pesticide degradate appears on multiple USGS analytical schedules, then only the measurement determined by the preferred analytical schedule is reported.

Five constituents also were analyzed by more than one laboratory, in which case both results are reported. The VOC 1,2,3-trichloropropane was analyzed at both the NWQL and at the Montgomery Watson-Harza laboratory (MWH). Since the MWH laboratory had a lower reporting level (0.005 µg/L), it was the preferred method for this constituent. Ground-water samples for arsenic, chromium, and iron also were analyzed at two different laboratories; total concentrations were measured at the NWQL in Denver, Colorado, while elemental speciation was measured at the USGS National Research Program (NRP) laboratory in Boulder, Colorado. For arsenic, chromium, and iron, the standard analytical techniques were preferred to the research laboratory methods.

Quality Control

Quality-control (QC) samples collected in the MS study include source-solution blanks, field blanks, replicates, matrix spikes, and surrogates. QC samples were collected to evaluate bias and variability of the water-quality data that may have resulted from sample collection, processing, storage, transportation, and laboratory analysis. The data handling protocols, and the quality control design and assessment that the USGS field members and laboratories utilized, follow the Quality Assurance plan of the National Water Quality Laboratory (Maloney, 2005).

Blank Samples

Blank samples (blanks) were collected using nitrogen-purged pesticide-grade "Universal" blank water that was certified to contain less than the LRL or MRL of the analytes investigated in the study. Two types of blanks were collected: source-solution blanks, and field blanks. Source-solution blanks were collected to verify that the blank water used for the field blanks was free of analytes. Source-solution blanks and field blanks were collected at 12 percent of the wells sampled, to determine if equipment or procedures used in the field or laboratory introduced contamination.

Source-solution blanks were collected at the sampling site by pouring blank water directly into sample containers that were preserved, stored, shipped, and analyzed in the same manner as the ground-water samples. For field blanks, blank water was either pumped or poured through the sampling equipment (fittings and tubing) used to collect ground water, then processed and transported using the same protocols as for the ground-water samples. Field blanks were analyzed for VOCs, pesticides, nutrients, dissolved organic carbon, major and minor ions, trace elements, and the microbial constituents.

If a constituent was detected in a field blank, the associated source-solution blank results were examined for similar constituent detections. If the field blank and the source-solution blank contained the constituent, then the source-solution water was interpreted as the origin of the contamination in the blanks, and the field-blank detections using the same blank water were disregarded. If a field-blank detection could not be attributed to the source solution, then the ground-water samples collected prior to and following the collection of the blank were evaluated. If the ground-water samples prior to or following the collection of the contaminated field blank had no detections, then carry-over contamination was ruled out. If an analyte was detected in a blank at a concentration greater than the concentration measured in a ground-water sample collected prior to or following the blank sample, then that ground-water value was censored (table 6). Censored values are indicated by a 'V' or 'VE' preceding the value in the tables, and were not considered in the summary statistics. If a compound was detected in multiple field blanks, and the detections could not be attributed to the source-solution water, then any ground-water sample that had a detection of that compound in question was evaluated for possible contamination and censored if necessary.

Replicate Samples

Sequential replicate samples (replicates) were collected to assess variability that may result from the processing and analyses of inorganic and organic constituents. Relative standard deviation (RSD) of the measured values was used to determine the variability within replicate pairs for each constituent (table 7). The RSD is defined as the standard deviation of the replicate pair, divided by the mean concentration for each replicate pair of samples, multiplied by 100, with the result expressed as a percentage. If one value in a sample pair was reported as a nondetection, and the other value was reported as an estimated value below the LRL or MRL, the RSD was set to zero because the values are analytically identical. If one value in a sample pair was reported as a nondetection and the other value was greater than the LRL or MRL, then the nondetection value was set equal to one-quarter of the LRL (Childress and others, 1999) and the RSD was calculated. High RSD values for replicates with low concentrations may indicate higher analytical uncertainty, particularly for concentrations within an order of magnitude of LT-MDL or MDL.

Matrix Spikes

Addition of a known concentration of a constituent ('spike') to a replicate environmental sample enables the analyzing laboratory to determine the effect of the matrix, in this case ground water, on the analytical technique used to measure the constituent. The constituents added (matrix spikes) are the same as those being analyzed in the method. This addition enables an analysis of matrix interferences on a compound-by-compound basis. The following matrix spikes were added to 10 percent of the samples in the MS study: VOCs, gasoline additives, pesticides, and pesticide degradates, at the laboratory performing the analysis. Compounds with low recoveries (<70 percent) are of potential concern if environmental concentrations are close to the MCLs; a concentration below an MCL could be falsely indicated (tables 8A–8B). Conversely, compounds with high recoveries (>130 percent) are of potential concern if the environmental concentrations exceed MCLs: a high recovery could falsely indicate a concentration above the MCL. Recoveries between 70 to 130 percent for matrix spikes were considered acceptable in this study (Fishman and Friedman, 1989).

Surrogate Compounds

Surrogate compounds (surrogates) are added to environmental samples in the laboratory prior to analyses in order to evaluate the recovery of similar constituents. Surrogate compounds were added to all ground-water and quality-control samples that were analyzed for VOCs, gasoline additives, pesticides, pesticide degradates, and constituents of special interest. The compounds selected for use as surrogates normally are not found in environmental samples and are used to identify potential problems associated with laboratory analyses. Potential problems include matrix interferences (such as high levels of dissolved organic carbon) that produce a positive bias, and (or) incomplete laboratory recovery (possibly due to improper maintenance and calibration of analytical equipment) that produces a negative bias. Surrogates are used to identify general problems that may arise during sample analysis that could affect the analytical results for all compounds, whereas matrix spikes are used to indicate problems with specific compound analysis. A 70-130 percent recovery of surrogates generally is considered acceptable; values outside this range indicate possible problems with the processing and analysis of samples (table 9) (Connor and others, 1998; Sandstrom and others, 2001).

Results

Quality-Control Samples

Field blanks were taken for the VOCs, gasoline additives, pesticides, pesticide degradates, nutrients, dissolved organic carbon, major and minor ions, trace elements, microbial indicators, and iron, arsenic and chromium speciation samples. Universal blank water is not available for the following constituents: isotopic composition of oxygen and hydrogen, carbon-14, tritium, noble gases, or radioactivity; as a result, field blanks were not collected for these constituents.

In the MS study unit, replicates were collected for all constituents in order to check to reproducibility (precision) of analytical results. Matrix spikes were only added to the VOCs, gasoline additives, pesticides, pesticide degradates, and constituents of special interest samples because these samples were analyzed by chromatographic techniques, which are more susceptible to matrix interferences. The microbial indicator samples were spiked to confirm that the collection and handling procedures adequately preserved these samples.

Surrogate compounds also were only added to VOCs and gasoline additives, pesticides, pesticide degradates, and constituents of special interest samples in order to verify the analytical techniques.

Detections in Blanks

In the MS study unit, field blanks were collected at approximately 12 percent of the sites sampled. Table 6 presents a summary of compound detections in field blanks. The VOCs observed in field blanks, with their maximum detected concentration in parentheses, include 1,2,4-trimethylbenzene (0.56 µg/L), 2-butanone (ethyl methyl ketone) (30.8 µg/L), acetone (12 µg/L), carbon disulfide (E0.09 µg/L), chloroform (trichloromethane) (0.10 µg/L), ethylbenzene (E0.03 µg/L),

m-xylene plus *p*-xylene (E0.12 µg/L), *o*-xylene (E0.05 µg/L), tetrachloroethene (PCE) (E0.03 µg/L), toluene (0.19 µg/L), and trichlorofluoromethane (0.11 µg/L). All of the environmental samples collected prior to and following these field blanks were free from these constituents (except toluene), hence no ground-water sample detections were censored (besides toluene) as a result of these blank detections. As a result of the high detection frequency for toluene in blanks, all four environmental toluene detections were censored, and will not be considered in the statistical results. Toluene concentrations observed in the environmental samples had a maximum concentration of 0.05 µg/L, which is 3,000 times less than the California regulatory MCL of 150 µg/L.

No detections of pesticide compound were detected in the corresponding blank samples.

Four common ions were detected in field blanks, with their maximum concentrations in parentheses: Ca (0.24 mg/L), Mg (E0.007 mg/L), Na (0.70 mg/L), and Si (3.9 mg/L). All of the environmental samples analyzed had detections of Ca, Mg, Na, or Si at concentrations 6 to 90 times greater than these values, hence no ground-water detections were censored. Fourteen trace elements were detected in field blanks, with maximum concentrations in parentheses: Al (45 µg/L), As (0.52 µg/L), Ba (0.20 µg/L), Cr (0.09 µg/L), Co (0.04 µg/L), Cu (3.1 µg/L), Fe (21 µg/L), Pb (0.14 µg/L), Mn (E0.20 µg/L), Ni (0.36 µg/L), Sr (0.58 µg/L), W (0.36 µg/L), V (0.42 µg/L), and Zn (3.70 µg/L) (table 6). As a result of the blank detections, 12 ground-water detections were censored: one aluminum, arsenic, chromium, manganese; three lead; and five copper. Dissolved organic carbon (DOC) was detected in five out of five blanks, with a maximum concentration of 40 mg/L. As a result, six ground-water detections for DOC were censored. Censored values were all below regulatory thresholds.

Variability in Replicate Samples

The majority of replicate sample pairs collected during the MS study had relative standard deviations (RSDs) of less than 20 percent (table 7). Thirteen replicate sample pairs representing 7 chemical constituents, 3 replicate sample pairs of radionuclides, and 2 replicate sample pairs for radioactivity had RSDs greater than 20 percent (table 7). However, many of the replicate sample pairs with high RSDs had measured concentrations near the LRL for these constituents, and at these low concentrations, small deviations in measured values may account for the large RSDs. Because the variability in measurements occurred at low concentrations, close to the method detection levels and well below regulatory thresholds, this variability was not of QC concern, and no detections were censored as a result of variability in replicate sample samples.

Matrix Spike Recoveries

Tables 8A and 8B present a summary of matrix spike recoveries for the MS study. Addition of a spike or known concentration of a constituent to an environmental sample enables the analyzing laboratory to determine the effect of the matrix, in this case ground water, on the analytical technique used to measure the constituent. Acceptable spike recovery values range between 70 and 130 percent (Friedman and Erdmann, eds., 1982). Nine environmental samples were spiked with VOCs, and 4 environmental samples were spiked with the 3 constituents of special interest—NDMA, perchlorate, and 1,2,3-TCP—in order to calculate matrix spike recoveries (table 8A). Seventy-two of the 88 VOC spike compounds, plus the 3 constituents of special interest, had recoveries within the acceptable range of 70 and 130 percent. Three VOC spike compounds had at least one matrix spike recovery greater than 130 percent; however, these compounds were not detected in ground-water samples. Dichlorodifluoromethane and styrene were the only VOC spike compounds that had a recovery below 70 percent; however, these compounds were not detected in ground-water samples. [NOTE—low recoveries may indicate that this compound might not have been detected in some samples if it was present at very low concentrations.]

Nine environmental samples were spiked with pesticide or pesticide degradate compounds to calculate matrix-spike recoveries. Acceptable spike recovery values ranged between 70 and 130 percent. Twenty-six of the 64 spike compounds had recoveries between the acceptable range of 70 and 130 percent (table 8B). Zero spike compounds had recoveries greater than 130 percent. Thirty-eight spike compounds had recoveries below 70 percent. Of these 38 spike compounds, none were detected in ground-water samples. [NOTE—low recoveries may indicate that this compound might not have been detected in some samples if it was present at very low concentrations.]

Three microbial indicator samples were spiked with F-specific and somatic coliphage. All three samples tested positive for F-specific coliphage and somatic coliphage.

Surrogate Compound Recoveries

Surrogate compounds were added to environmental samples in the laboratory and analyzed to evaluate the recovery of similar constituents. Table 9 lists each surrogate; the analytical schedule on which it was applied; the number of analyses for ground-water samples, blank samples, and sample replicates; and the number of surrogate recoveries below 70 percent, between 70 and 130 percent, and above 130 percent for the ground-water samples, blanks, and replicates. Greater than 95 percent of the ground-water samples, blanks, and replicate samples had recoveries of the surrogates between the acceptable limit of 70 and 130 percent (Fishman and Friedman, 1989). No ground-water sample detections were censored as a result of surrogate recovery data.

Ground-Water Quality

Results from analyses of raw (untreated) ground water for the MS study unit are presented in tables 10–22. Table 10 includes water-quality indicators measured in the field, while tables 11–22 present the results of ground-water analyses organized by the compound types and classes: VOCs and gasoline additives; pesticides and pesticide degradates; constituents of special interest; nutrients; major and minor ions; trace elements; arsenic and iron; chromium; isotopes and radioactivity; and microbial constituents. The summary tables present only the constituents that were detected, and only samples that had at least one compound detected. In each table, the sites are grouped by study area, and the first column lists the GAMA identification number for each well. The remaining columns list the constituents detected, the USGS parameter code used to identify the compound and store the information in a computerized database [National Water Information System (NWIS)], and units of measurement, the laboratory reporting level (LRL) for which the compound may be detected, and the concentrations at which the constituents were detected.

The tables include the measured concentration of each constituent, the number of wells at which it was detected, the frequency at which it was detected (in relation to the total number of randomized wells sampled), and the total number of constituents detected at each well. Results from the flow-path wells are presented in the tables, but these results were not included in statistical compilations because these wells were not part of the randomized well selection. Detections that have concentrations or activities above the established thresholds, MCL, SMCL, HAL, NL, or DLR, are indicated in the tables by an asterisk in the remarks column before the value.

Volatile Organic Compounds and Gasoline Additives

Analytical results of VOCs and gasoline additives from USGS NWQL schedules 2020 and 4024 are presented in table 11, which reports results from the preferred analytical method where more than one method was used. Ground-water samples for analysis of VOCs and gasoline additives were collected at the 94 public-supply wells and the 3 monitoring wells sampled in the MS study unit. Twenty-eight VOCs and gasoline additives were detected in 39 wells in the MS study unit. Forty percent of the 97 wells sampled had at least one detection of a VOC and gasoline additive, but detected concentrations were one-third to one-sixty-thousandth of their respective regulatory thresholds. Three of the 97 wells sampled were flow-path wells, and 3 were monitoring wells, and these 6 wells were not included in the following calculations of detection frequency.

Twenty-seven of the 88 VOCs analyzed were detected in ground-water samples from randomized wells in the MS study unit. VOCs detected in 10 percent or more of the wells include trichloromethane (chloroform), which was detected in 20 of the 91 randomized wells sampled, and tetrachlorethylene (PCE), which was detected in 9 of the 91 randomized wells sampled. In total, 34 wells (of the 91 randomized wells) had 86 detections, for a VOC detection frequency of 37 percent. None of the VOCs and gasoline additive concentrations measured were greater than their respective thresholds established for regulatory purposes.

Pesticides and Pesticide Degradates

Ground-water samples for pesticides and pesticide degradates, using USGS analytical schedules 2003 and 2060, were collected at 97 wells in the MS study unit (table 12). Ten pesticides and pesticide degradates were detected in 28 wells in the total MS study unit; however, detected concentrations were one-thirtieth to one-fourteen-thousandth of their respective regulatory thresholds. Three of the 97 wells sampled were flow-path wells, and 3 were monitoring wells, and these 6 wells were not included in the calculations of detection frequency.

Ten of the 122 pesticides and pesticide degradates investigated were detected in ground-water samples from the 91 randomized wells in the MS study unit. Compounds detected in 10 percent or more of the randomized wells include simazine, an herbicide, which was detected in 16 of the 91 ground-water samples, and deethylatrazine (2-chloro-4-isopropylamino-6-amino-*s*-triazine), a pesticide degradate, which was detected in 10 of the 91 ground-water samples. In total, 43 detections in 27 randomized wells were observed in the MS study unit. None of the pesticide concentrations measured were greater than threshold concentrations established for regulatory purposes.

Constituents of Special Interest

Ground-water samples for the constituents of special interest—perchlorate, *N*-nitrosodimethylamine (NDMA), and 1,2,3-trichloropropane (1,2,3-TCP)—were collected at 34 wells, 31 public-supply wells and 3 monitoring wells (table 13). NDMA was detected in two wells at concentrations above the regulatory threshold of 0.01 µg/L. 1,2,3-TCP was detected in one well above the regulatory threshold of 0.005 µg/L. Perchlorate was not detected in any ground-water samples.

Nutrients and Dissolved Organic Carbon

Samples for the analysis of nutrients and dissolved organic carbon (DOC) were collected at 34 wells, 31 public-supply wells and 3 monitoring wells (table 14) sampled only under the slow schedule in the MS study unit. Ammonia was detected in 9 of the 34 samples, at concentrations ranging from 0.04 to 1.60 mg/L (as nitrogen). Nitrate plus nitrite was detected in 24 of the 34 ground-water samples, whereas nitrite was detected in only 3 of the 34 samples. Concentrations of nitrate plus nitrite ranged from (estimated value) E0.04 mg/L to 37.8 mg/L (as nitrogen), with two samples above the regulatory threshold of 10 mg/L (as nitrogen). Nitrite was detected in 3 wells at concentrations that ranged from E0.004 mg/L to 0.008 mg/L— much below the nitrite MCL of 1 mg/L (as nitrogen). Total dissolved nitrogen (nitrate plus nitrite plus ammonia plus organic-N) was measured in 34 wells at concentrations that ranged from 0.09 to 37.5 mg/L (as nitrogen). Dissolved phosphorus (as orthophosphate) was measured in all 34 wells at concentrations that ranged from E0.005 to 0.106 mg/L (as phosphorus). DOC was measured in 34 wells at concentrations that ranged from E0.2 to 4.4 mg/L. Six samples had DOC detections in the preceding blanks greater than the sample values, and hence were censored and these data were not used for summary statistical calculations. Censored values are preceded by a V or VE in table 14.

Major and Minor Ions and Total Dissolved Solids

Samples for the analysis of major and minor ions and dissolved solids (DS) were collected at 31 public-supply wells and 3 monitoring wells (table 15) in the MS study unit. The following results are for the public-supply wells only. Calcium concentrations ranged from 15.4 to 171 mg/L, with a median value of 56 mg/L. Magnesium concentrations ranged from 0.64 to 73.1 mg/L, with a median value of 21 mg/L. Potassium concentrations ranged from 1.46 to 16.9 mg/L, with a median value of 3.05 mg/L. Sodium concentrations ranged from 20.3 to 209 mg/L, with a median value of 65.2 mg/L. Bromide concentrations ranged from 0.04 mg/L to 0.92 mg/L, with a median value of 0.27 mg/L. Chloride concentrations ranged from 11.2 to 241 mg/L, with a median value of 72.5 mg/L. Fluoride concentrations ranged from 0.10 to 0.50 mg/L, with a median value of 0.30 mg/L. Iodide concentrations ranged from E0.001 mg/L to 0.205 mg/L, with a median value of 0.006 mg/L. Silica concentrations ranged from 24.4 to 71.2 mg/L, with a median value of 39.7 mg/L. Sulfate concentrations ranged from 6.8 to 563 mg/L, with a median value of 138 mg/L. Five samples had sulfate concentrations above the recommended SMCL threshold of 250 mg/L, and one sample had sulfate concentrations greater than the upper SMCL of 500 mg/L. TDS concentrations, measured as residue on evaporation at 180°C, ranged between 281 and 1,330 mg/L, with a median value of 467 mg/L. Sixteen samples had TDS concentrations above the recommended SMCL threshold of 500 mg/L, and 4 samples had concentrations greater than the upper SMCL of 1,000 mg/L.

Trace Elements

Samples for the analysis of trace elements were collected at 31 public-supply wells and 3 monitoring wells (table 16) in the MS study unit. Censored values were not considered as detections for this study. Aluminum was detected in 10 ground-water samples with concentrations ranging from E0.8 to 20 µg/L; one aluminum detection was censored due to the presence of aluminum in the preceding blank. Antimony was detected in 9 ground-water samples, with concentrations ranging from E0.11 to 0.39 µg/L. Arsenic was detected in 29 ground-water samples, with concentrations ranging from 0.2 to 7.3 µg/L; one arsenic detection was censored due to the presence of arsenic in the preceding blank. Barium was detected in 34 ground-water samples, with concentrations ranging from 4.0 to 191 µg/L. Beryllium was detected in 2 ground-water samples, with concentrations ranging from 0.06 to 1.28 µg/L. Boron was detected in 34 ground-water samples, with concentrations ranging from 30 to 753 µg/L. Cadmium was detected in 23 ground-water samples, with concentrations ranging from E0.02 to 0.37 µg/L. Chromium was detected in 24 ground-water samples, with concentrations ranging from E0.04 to 14.2 µg/L; one chromium detection was censored due to the presence of chromium in the preceding blank. Cobalt was detected in 33 ground-water samples, with concentrations ranging from E0.03 to 1.2 µg/L. Copper was detected in 28 ground-water samples, with concentrations ranging from E0.3 to 5.4 µg/L; five copper detections were censored due to the presence of copper in the preceding blank.

Iron was detected in 23 ground-water samples, with concentrations ranging from E4.0 to 2,830 µg/L; three samples had iron concentrations above the non-health-based SMCL threshold of 300 µg/L. Three iron detections were censored due to the presence of iron in the preceding blank. Lead was detected in 27 ground-water samples, with concentrations ranging from E0.06 to 6.62 µg/L. Lithium was detected in 34 ground-water samples, with concentrations ranging from 3.4 to 110 µg/L. Manganese was detected in 31 ground-water samples, with concentrations ranging from E0.1 to 2,410 µg/L; eight of the samples had concentrations of manganese above the non-health-based SMCL threshold of 50 µg/L. One manganese detection was censored owing to the presence of manganese in the preceding blank. Mercury was detected in 3 of the samples, ranging in concentration from E0.01 to 0.05 µg/L.

Molybdenum was detected in 34 ground-water samples, with concentrations ranging from 0.9 to 42.6 µg/L; one of the public-supply wells had concentrations of molybdenum above the HAL threshold of 40 µg/L. Nickel was detected in 34 ground-water samples, with concentrations ranging from 0.42 to 7.24 µg/L. Selenium was detected in 29 ground-water samples, with concentrations ranging from E0.06 to 17.6 µg/L. Silver was not detected in any ground-water samples. Strontium was detected in 34 ground-water samples, with concentrations ranging from 226 to 1,790 µg/L. Thallium was detected in 3 ground-water samples, with concentrations ranging from E0.02 µg/L to 0.05 µg/L. Tungsten was detected in 4 ground-water samples, with concentrations ranging from 0.15 to 0.90 µg/L. Uranium was detected in 31 ground-water samples, with concentrations ranging from E0.03 to 28.9 µg/L. Vanadium was detected in 31 ground-water samples, with concentrations ranging from E0.1 to 20.5 µg/L. Zinc was detected in 33 ground-water samples, with concentrations ranging from E0.38 to 1,470 µg/L.

Table 17 presents the results from the USGS NRP Boulder lab for 38 samples collected for total dissolved inorganic arsenic and iron, as well as for the individual species arsenic (III) and iron (II). Total arsenic and iron results agree well with samples from the same wells identified in table 16, which were analyzed at the USGS NWQL in Denver.

Table 18 presents chromium speciation analyses from the USGS NRP Boulder lab for total dissolved chromium and hexavalent chromium (VI) in all 97 ground-water samples. Values ranged from <1.0 to 36.0 µg/L. None of the total chromium concentrations were above the regulatory threshold of 50 µg/L; however, 86 ground-water samples had chromium (VI) values above 1 µg/L, the DLR threshold. Detection limits for the purposes of reporting (DLR) are set by CADHS for the purposes of tracking unregulated chemicals for which monitoring is required.

Radioactivity, Isotopes, and Dissolved Gases

Gross alpha and beta radioactivity and isotope activities were measured in selected ground-water samples collected for the MS study unit (table 19). Alpha radioactivity (72-hour and 30-day count) and beta radioactivity (72-hour and 30-day count) samples for analysis were collected at 34 wells; samples for radium-226, radium-228, and radon-222 were collected at 31 wells; and samples for carbon isotope samples were collected at 33 wells. Alpha radioactivity in the 34 samples (table 19) ranged from below quantification limits to 17.4 picocuries per liter (pCi/L) for 72-hour counts, and from below quantification limits to 16.3 pCi/L for 30-day counts. One alpha radioactivity sample exceeded the MCL threshold of 15 pCi/L for both the 72-hour and 30-day counts with values of 17.4 and 16.3, respectively. Beta radioactivity in the 34 samples ranged from below quantification limits to 21.2 pCi/L for 72-hour counts, and from below quantification limits to 21.4 pCi/L in 30-day counts. Radium-226 was detected in 30 out of the 31 samples, with a maximum concentration of 0.58 pCi/L. Radium-228 was detected in 15 out of 31 samples, with a maximum concentration of 0.96 pCi/L. Radon-222 was detected in all 31 samples collected, and had activities ranging from 170 to 1,610 pCi/L. Twenty-three samples for radon-222 activities were above the proposed MCL of 300 pCi/L. Ground-water samples for carbon-14, as percent modern carbon (pmc), and delta carbon-13, as per mil, were collected at 33 wells, and results ranged from 5.68 to 100.1 pmc, and from -20.4 to -10.5 per mil, respectively. The isotopic composition of carbon is reported, in delta notation, as per mil (parts per thousand).

Ground-water samples for the isotopic composition of oxygen and hydrogen, analyzed at the USGS Stable Isotope Laboratory, were collected at all 97 wells (table 20). Tritium was detected in 61 out of 97 samples, with activities that ranged from less than 1 to 14 pCi/L.

Tritium and noble gas samples, analyzed at the LLNL, were collected at 97 wells (table 21). Tritium activities, measured by the helium in-growth method, ranged from below 1 to 17 pCi/L. Noble gas concentrations and the helium isotope ratios (helium-3/helium-4) measured in each sample are presented in table 21.

Microbial Constituents

Ground-water samples from 30 wells in the MS study unit were analyzed for microbial constituents (table 22). The following microbial constituents were determined: total coliform bacteria and *Escherichia* coliform, and the viruses F-specific coliphage and somatic coliphage. Coliform bacteria was detected in four wells. Counts ranged from an estimated 1 colony/100 mL to 110 colonies/100 mL. MCLs for microbial constituents are based on recurring detection, and counts will be monitored during future sampling.

Summary

The Monterey Bay and Salinas Valley GAMA study assessed the quality of ground water from 94 public-supply wells and 3 monitoring wells across the approximately 1,000 mi^2 study unit. Ground-water samples were analyzed for volatile organic compounds (VOCs), pesticides, pesticide degradates, nutrients, major and minor ions, trace elements, microbial indicators, and noble gases. Naturally occurring isotopes (tritium, carbon-14, oxygen-18, deuterium, and helium-4) also were measured in these samples to provide a data set that will be used to help interpret the source and age of the sampled ground water. In total, 270 constituents and water-quality indicators were investigated for this study.

Results from 91 randomized wells, statistically representative of the study unit, show that only six constituents—alpha radioactivity, *N*-nitrosodimethylamine, 1,2,3-trichloropropane, nitrate, radon-222, and coliform bacteria—were detected at concentrations higher than those thresholds set for

health-based regulatory purposes. Six constituents—total dissolved solids, hexavalent chromium, iron, manganese, molybdenum, and sulfate—were detected at concentrations above levels set for aesthetic concerns.

In this study, one-third of the randomized wells sampled had at least a single detection of a VOC or gasoline additive. Twenty-seven of the 88 VOCs and gasoline additives investigated were found in ground-water samples; however, detected concentrations were one-third to one-sixty-thousandth of their respective regulatory thresholds. Compounds detected in 10 percent or more of the samples include chloroform, a compound resulting from the chlorination of water, and tetrachloroethene, a common solvent.

Pesticides and pesticide degradates were detected in one-third of the ground-water samples collected; however, detected concentrations were one-thirtieth to one-fourteen-thousandth of their respective regulatory thresholds. Ten of the 122 pesticides and pesticide degradates investigated were found in ground-water samples. Compounds detected in 10 percent or more of the samples included the herbicide simazine, and the pesticide degradate deethylatrazine.

Total dissolved solids (TDS), major and minor ions, nutrients, and trace-element samples were collected at 31 public-supply wells and 3 monitoring wells. The median TDS value was 467 mg/L; 16 samples had TDS concentrations above the recommended SMCL of 500 mg/L; and 4 samples had concentrations greater than the upper SMCL of 1,000 mg/L. Concentrations of nitrate plus nitrite ranged from 0.04 to 37.8 mg/L (as nitrogen), and 2 samples had concentrations above the regulatory threshold of 10 mg/L (as nitrogen). The median sulfate concentration in ground-water samples was 138 mg/L, and 5 samples had concentrations above the recommended SMCL of 250 mg/L, while one sample's concentration was greater than the upper SMCL of 500 mg/L. Iron concentrations above the SMCL of 300 µg/L were measured in 3 samples, and manganese concentrations were above the SMCL of 50 µg/L in 8 samples. A molybdenum concentration above the HAL of 40 µg/L was measured in one sample, and chromium (VI) concentrations above the DLR of 1 µg/L were measured at 86 samples.

Radon-222 was detected in all 31 ground-water samples collected, with activities ranging from 170 to 1,610 pCi/L. Twenty-three radon samples were above the proposed threshold of 300 pCi/L. Alpha radiation was detected above the regulatory threshold of 15 pCi/L in one sample.

Microbial constituents were analyzed in 30 ground-water samples. Coliform bacteria was detected in four samples. Counts ranged from an estimated 1 colony per 100 mL to 110 colonies per 100 mL.

Future work will combine the data presented in this report with various statistical and qualitative approaches to identify the natural and human factors affecting ground-water quality, and to detect changes in ground-water quality.

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TABLES

Table 1. Identification, sampling, and construction information for wells sampled for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

Identification, sampling, and construction information for wells sampled for the Monterey Bay and Salinas Valley Ground-water Ambient Monitoring and Assessment (GAMA) study

[**Sampling schedule:** Well schedules described in table 3. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; ft, feet; LSD, land surface datum; MW, monitoring well schedule; mm/dd/yy, month/day/year; nd, no data]

GAMA identification No.	Sampling information		Construction information		
	Date (mm/dd/yy)	Sampling schedule	Well depth (ft below LSD)	Top of highest perforation (ft below LSD)	Bottom of lowest perforation (ft below LSD)
		Monterey Bay wells			
MSMB-01	08/04/05	Fast	nd	nd	nd
MSMB-02	08/10/05	Fast	288	188	218
MSMB-03	08/31/05	Fast	1,364	1,301	1,361
MSMB-04	08/17/05	Slow	800	200	800
MSMB-05	08/08/05	Fast	nd	nd	nd
MSMB-06	08/08/05	Fast	600	240	585
MSMB-07	08/08/05	Fast	680	470	580
MSMB-08	08/16/05	Fast	550	440	520
MSMB-09	08/15/05	Slow	466	198	446
MSMB-10	08/30/05	Fast	600	500	600
MSMB-11	08/18/05	Fast	590	300	nd
MSMB-12	09/14/05	Slow	nd	nd	nd
MSMB-13	08/17/05	Fast	557	315	535
MSMB-14	08/03/05	Fast	nd	nd	nd
MSMB-15	08/04/05	Fast	nd	nd	nd
MSMB-16	08/17/05	Fast	552	315	535
MSMB-17	08/09/05	Fast	630	370	610
MSMB-18	08/11/05	Slow	nd	nd	nd
MSMB-19	08/16/05	Fast	518	nd	nd
MSMB-20	08/16/05	Slow	177	103	147
MSMB-21	09/20/05	Fast	nd	nd	nd
MSMB-22	09/19/05	Slow	nd	nd	nd
MSMB-23	08/30/05	Fast	nd	nd	nd
MSMB-24	08/09/05	Fast	600	300	600
MSMB-25	09/15/05	Fast	nd	nd	nd
MSMB-26	08/11/05	Fast	650	451	624
MSMB-27	08/03/05	Fast	610	nd	nd
MSMB-28	08/03/05	Fast	nd	nd	nd
MSMB-29	08/30/05	Slow	274	129	256
MSMB-30	08/08/05	Slow	668	475	652
MSMB-31	08/11/05	Fast	619	198	607
MSMB-32	08/31/05	Fast	214	nd	nd
MSMB-33	09/13/05	Slow	nd	nd	nd
MSMB-34	08/16/05	Fast	510	220	490
MSMB-35	09/20/05	Slow	nd	nd	nd
MSMB-36	08/10/05	Fast	640	392	620
MSMB-37	09/01/05	Slow	810	310	810
MSMB-38	08/11/05	Fast	630	360	610
MSMB-39	09/19/05	Fast	nd	nd	nd
MSMB-40	08/29/05	Slow	nd	nd	nd
MSMB-41	09/20/05	Fast	nd	nd	nd
MSMB-42	08/10/05	Fast	105	55	95
MSMB-43	09/23/05	Fast	nd	nd	nd
MSMB-44[1]	09/19/05	Fast	nd	nd	nd
MSMB-44[1]	09/22/05	Slow	nd	nd	nd

Table 1. Identification, sampling, and construction information for wells sampled for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[**Sampling schedule:** Well schedules described in table 3. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; ft, feet; LSD, land surface datum; MW, monitoring well schedule; mm/dd/yy, month/day/year; nd, no data]

GAMA identification No.	Sampling information		Construction information		
	Date (mm/dd/yy)	Sampling schedule	Well depth (ft below LSD)	Top of highest perforation (ft below LSD)	Bottom of lowest perforation (ft below LSD)
		Monterey Bay wells—Continued			
MSMB-45	08/10/05	Slow	148	55	128
MSMB-46	09/20/05	Fast	nd	nd	nd
MSMB-47	08/03/05	Slow	nd	nd	nd
MSMB-48	09/21/05	Fast	nd	nd	nd
MSMBFP-01	08/17/05	Fast	1,650	970	1,100
MSMBFP-02[1]	08/09/05	Fast	524	360	524
MSMBFP-02[1]	08/31/05	Slow	524	360	524
MSMBFP-03	08/09/05	Slow	342	120	340
MSMBMW-01	09/21/05	MW	nd	nd	nd
MSMBMW-02	09/22/05	MW	nd	nd	nd
MSMBMW-03	09/22/05	MW	nd	nd	nd
		Paso Robles wells			
MSPR-01	07/19/05	Slow	500	150	500
MSPR-02	07/27/05	Fast	290	120	290
MSPR-03	07/28/05	Fast	680	260	660
MSPR-04	07/28/05	Fast	775	275	775
MSPR-05	07/27/05	Fast	840	nd	nd
MSPR-06	07/27/05	Fast	166	126	166
MSPR-07	07/21/05	Fast	nd	nd	nd
MSPR-08	07/20/05	Slow	300	100	300
MSPR-09	07/18/05	Fast	502	nd	nd
MSPR-10	07/18/05	Slow	238	nd	nd
MSPR-11	07/21/05	Fast	nd	nd	nd
		Santa Cruz wells			
MSSC-01	08/29/05	Fast	nd	nd	nd
MSSC-02	09/12/05	Fast	nd	nd	nd
MSSC-03	08/29/05	Fast	117	30	100
MSSC-04	08/25/05	Slow	360	155	355
MSSC-05	08/30/05	Fast	1,700	700	1,670
MSSC-06	08/24/05	Slow	230	110	200
MSSC-07	08/23/05	Slow	656	232	644
MSSC-08	09/15/05	Slow	238	204	238
MSSC-09	08/31/05	Fast	nd	nd	nd
MSSC-10	08/29/05	Fast	540	380	520
MSSC-11	09/13/05	Fast	320	255	320
MSSC-12	09/12/05	Fast	nd	nd	nd
MSSC-13	09/13/05	Fast	nd	nd	nd
		Salinas Valley wells			
MSSV-01	07/26/05	Slow	nd	nd	nd
MSSV-02[1]	07/28/05	Fast	130	80	130
MSSV-02[1]	08/04/05	Slow	130	80	130
MSSV-03[1]	08/02/05	Fast	140	90	140
MSSV-03[1]	09/12/05	Slow	140	90	140
MSSV-04	08/02/05	Fast	432	120	424
MSSV-05	07/25/05	Fast	190	110	180
MSSV-06	08/02/05	Fast	220	160	220

Table 1. Identification, sampling, and construction information for wells sampled for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[**Sampling schedule:** Well schedules described in table 3. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; ft, feet; LSD, land surface datum; MW, monitoring well schedule; mm/dd/yy, month/day/year; nd, no data]

GAMA identification No.	Sampling information		Construction information		
	Date (mm/dd/yy)	Sampling schedule	Well depth (ft below LSD)	Top of highest perforation (ft below LSD)	Bottom of lowest perforation (ft below LSD)
		Salinas Valley wells—Continued			
MSSV-07	08/02/05	Slow	212	130	202
MSSV-08	08/04/05	Fast	nd	nd	nd
MSSV-09	09/14/05	Fast	nd	nd	nd
MSSV-10	09/21/05	Fast	nd	nd	nd
MSSV-11	07/25/05	Slow	883	313	863
MSSV-12	08/01/05	Fast	nd	nd	nd
MSSV-13	09/15/05	Fast	300	nd	nd
MSSV-14	08/01/05	Fast	235	106	232
MSSV-15	08/01/05	Fast	200	60	180
MSSV-16	09/14/05	Fast	800	200	790
MSSV-17	09/14/05	Fast	nd	nd	nd
MSSV-18	08/01/05	Slow	nd	nd	nd
MSSV-19	07/27/05	Slow	830	500	816

[1]Wells sampled twice.

Table 2A. Volatile organic compounds and gasoline additives, primary use or source, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory analytical schedule 2020, type of comparison threshold for ground-water detections, and the corresponding threshold value.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; DLR, California Department of Health Services detection limit for the purposes of reporting; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; NL-CA, California Department of Health Services notification level; RSD5-US, U.S. Environmental Protection Agency risk specific dose at a risk factor of 10E-5 µg/L; na, not available; µg/L, micrograms per liter]

Constituent (common name)	Primary use or source	USGS parameter code	CAS number	LRL (µg/L)	Threshold type	Threshold value (µg/L)
Acetone	Solvent	81552	67-64-1	6	na	na
Acrylonitrile	Organic synthesis	34215	107-13-1	0.8	RSD5-US	0.6
Benzene	Gasoline hydrocarbon	34030	71-43-2	0.021	MCL-CA	1
Bromobenzene	Solvent	81555	108-86-1	0.028	na	na
Bromochloromethane	Fire retardant	77297	74-97-5	0.12	HAL-US	90
Bromodichloromethane (THM)	Disinfection by-product	32101	75-27-4	0.028	MCL-US[1]	80
Bromoform (Tribromomethane, THM)	Disinfection by-product	32104	75-25-2	0.1	MCL-US[1]	80
2-butanone (MEK, Methyl ethyl ketone)	Solvent	81595	78-93-3	2	HAL-US	4,000
n-Butylbenzene	Gasoline hydrocarbon	77342	104-51-8	0.12	NL-CA	260
sec-Butylbenzene	Gasoline hydrocarbon	77350	135-98-8	0.06	NL-CA	260
tert-Butylbenzene	Gasoline hydrocarbon	77353	98-06-6	0.06	NL-CA	260
Carbon disulfide	Organic synthesis	77041	75-15-0	0.038	NL-CA	160
Carbon tetrachloride (Tetrachloromethane)	Solvent	32102	56-23-5	0.06	MCL-CA	0.5
Chlorobenzene	Solvent	34301	108-90-7	0.028	MCL-CA	70
Chloroethane	Solvent	34311	75-00-3	0.12	na	na
Chloroform (Trichloromethane, THM))	Disinfection by-product	32106	67-66-3	0.024	MCL-US[1]	80
Chloromethane	Refrigerant/organic synthesis	34418	74-87-3	0.17	HAL-US	30
3-Chloro-1-propene	Organic synthesis	78109	107-05-1	0.5	na	na
2-Chlorotoluene	Solvent	77275	95-49-8	0.04	NL-CA	140
4-Chlorotoluene	Solvent	77277	106-43-4	0.05	NL-CA	140
Dibromochloromethane (THM)	Disinfection by-product	32105	124-48-1	0.10	MCL-US[1]	80
1,2-Dibromo-3-chloropropane (DBCP)	Fumigant	82625	96-12-8	0.51	MCL-US	0.2
1,2-Dibromoethane (EDB)	Fumigant	77651	106-93-4	0.036	MCL-US	0.05
Dibromomethane	Solvent	30217	74-95-3	0.050	na	na
1,2-Dichlorobenzene	Solvent	34536	95-50-1	0.048	MCL-CA	600
1,3-Dichlorobenzene	Solvent	34566	541-73-1	0.03	HAL-US	600
1,4-Dichlorobenzene	Fumigant	34571	106-46-7	0.034	MCL-CA	5
trans-1,4-Dichloro-2-butene	Organic synthesis	73547	110-57-6	0.70	na	na
Dichlorodifluoromethane (CFC-12)	Refrigerant	34668	75-71-8	0.18	NL-CA	1,000
1,1-Dichloroethane	Solvent	34496	75-34-3	0.035	MCL-CA	5
1,2-Dichloroethane	Solvent	32103	107-06-2	0.13	MCL-CA	0.5
1,1-Dichloroethene (DCE)	Organic synthesis	34501	75-35-4	0.024	MCL-CA	6
cis-1,2-Dichloroethene	Solvent	77093	156-59-2	0.024	MCL-CA	6
trans-1,2-Dichloroethene	Solvent	34546	156-60-5	0.032	MCL-CA	10
Dichloromethane (Methylene chloride)	Solvent	34423	75-09-2	0.06	MCL-US	5
1,2-Dichloropropane	Fumigant	34541	78-87-5	0.029	MCL-US	5
1,3-Dichloropropane	Fumigant	77173	142-28-9	0.06	na	na
2,2-Dichloropropane	Fumigant	77170	594-20-7	0.05	na	na
1,1-Dichloropropene	Organic synthesis	77168	563-58-6	0.026	na	na
cis-1,3-Dichloropropene	Fumigant	34704	10061-01-5	0.05	RSD5-US[2]	4
trans-1,3-Dichloropropene	Fumigant	34699	10061-02-6	0.09	RSD5-US[2]	4
Diethyl ether	Solvent	81576	60-29-7	0.08	na	na
Diisopropyl ether (DIPE)	Gasoline oxygenate	81577	108-20-3	0.10	na	na
Ethylbenzene	Gasoline hydrocarbon	34371	100-41-4	0.030	MCL-CA	300
Ethyl *tert*-butyl ether (ETBE)	Gasoline oxygenate	50004	637-92-3	0.030	DLR	3
Ethyl methacrylate	Organic synthesis	73570	97-63-2	0.18	na	na

Table 2A. Volatile organic compounds and gasoline additives, primary use or source, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory analytical schedule 2020, type of comparison threshold for ground-water detections, and the corresponding threshold value—Continued.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; DLR, California Department of Health Services detection limit for the purposes of reporting; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; NL-CA, California Department of Health Services notification level; RSD5-US, U.S. Environmental Protection Agency risk specific dose at a risk factor of 10E-5 µg/L; na, not available; µg/L, micrograms per liter]

Constituent (common name)	Primary use or source	USGS parameter code	CAS number	LRL (µg/L)	Threshold type	Threshold value (µg/L)
1-Ethyl-2-methylbenzene (o-Ethyl toluene)	Gasoline hydrocarbon	77220	611-14-3	0.06	na	na
Hexachlorobutadiene	Organic synthesis	39702	87-68-3	0.14	RSD5-US	9
Hexachloroethane	Solvent	34396	67-72-1	0.14	HAL-US	1
2-Hexanone (*n*-Butyl methyl ketone)	Solvent	77103	591-78-6	0.4	na	na
Isopropylbenzene (Cumene)	Gasoline hydrocarbon	77223	98-82-8	0.038	NL-CA	770
4-Isopropyl-1-methylbenzene	Gasoline hydrocarbon	77356	99-87-6	0.08	na	na
Methyl acrylate	Organic synthesis	49991	96-33-3	1.0	na	na
Methyl acrylonitrile	Organic synthesis	81593	126-98-7	0.40	na	na
Methyl bromide (Bromomethane)	Fumigant	34413	74-83-9	0.33	HAL-US	10
Methyl tert-butyl ether (MTBE)	Gasoline oxygenate	78032	1634-04-4	0.10	MCL-CA	13
Methyl iodide (Iodomethane)	Organic synthesis	77424	74-88-4	0.50	na	na
Methyl isobutyl ketone (MIBK)	Solvent	78133	108-10-1	0.37	NL-CA	120
Methyl methacrylate	Organic synthesis	81597	80-62-6	0.20	na	na
Methyl tert-pentyl ether (*tert*-Amyl methyl ether, TAME)	Gasoline oxygenate	50005	994-05-8	0.04	DLR	3
Naphthalene	Gasoline hydrocarbon	34696	91-20-3	0.52	NL-CA	17
n-Propylbenzene	Solvent	77224	103-65-1	0.042	NL-CA	260
Styrene	Gasoline hydrocarbon	77128	100-42-5	0.042	MCL-US	100
1,1,1,2-Tetrachloroethane	Solvent	77562	630-20-6	0.03	na	na
1,1,2,2-Tetrachloroethane	Solvent	34516	79-34-5	0.08	MCL-CA	1
Tetrachloroethene (PCE)	Solvent	34475	127-18-4	0.030	MCL-US	5
Tetrahydrofuran	Solvent	81607	109-99-9	1.2	na	na
1,2,3,4-Tetramethylbenzene	Gasoline hydrocarbon	49999	488-23-3	0.14	na	na
1,2,3,5-Tetramethylbenzene	Gasoline hydrocarbon	50000	527-53-7	0.18	na	na
Toluene	Gasoline hydrocarbon	34010	108-88-3	0.02	MCL-CA	150
1,2,3-Trichlorobenzene	Organic synthesis	77613	87-61-6	0.18	na	na
1,2,4-Trichlorobenzene	Solvent	34551	120-82-1	0.12	MCL-CA	5
1,1,1-Trichloroethane (TCA)	Solvent	34506	71-55-6	0.032	MCL-CA	200
1,1,2-Trichloroethane	Solvent	34511	79-00-5	0.04	MCL-CA	5
Trichloroethene (TCE)	Solvent	39180	79-01-6	0.038	MCL-US	5
Trichlorofluoromethane (CFC-11)	Refrigerant	34488	75-69-4	0.08	MCL-CA	150
1,2,3-Trichloropropane (1,2,3-TCP)	Solvent/organic synthesis	77443	96-18-4	0.18	NL-CA	0.005
1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113)	Refrigerant	77652	76-13-1	0.038	MCL-CA	1,200
1,2,3-Trimethylbenzene	Gasoline hydrocarbon	77221	526-73-8	0.09	na	na
1,2,4-Trimethylbenzene	Gasoline hydrocarbon	77222	95-63-6	0.056	NL-CA	330
1,3,5-Trimethylbenzene	Organic synthesis	77226	108-67-8	0.044	NL-CA	330
Vinyl bromide (Bromoethene)	Fire retardant	50002	593-60-2	0.10	na	na
Vinyl chloride (Chloroethene)	Organic synthesis	39175	75-01-4	0.08	MCL-CA	0.5
m- and *p*-Xylene	Gasoline hydrocarbon	85795	108-38-3 / 106-42-3	0.06	MCL-CA	1,750
o-Xylene	Gasoline hydrocarbon	77135	95-47-6	0.038	MCL-CA	1,750

[1]The MCL-US, and MCL-CA thresholds for trihalomethanes are the sum of chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

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

Table 2B. Gasoline additives, gasoline oxygenates, and gasoline degradates, primary use or source, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory analytical schedule 4024, type of comparison threshold for ground-water detections, and the corresponding threshold value.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; DLR, California Department of Health Services detection limit for the purposes of reporting; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; NL-CA, California Department of Health Services notification level; na, not available; µg/L, micrograms per liter]

Constituent (common name)	Primary use or source	USGS parameter code	CAS number	LRL (µg/L)	Threshold type	Threshold value (µg/L)
Acetone	Solvent	81552	67-64-1	1.2	na	na
tert-Amyl alcohol	Gasoline oxygenate	77073	75-85-4	1.0	na	na
tert-Butyl alcohol (TBA)	Oxygenate/degradate	77035	75-65-0	1	NL-CA	12
Diisopropyl ether	Gasoline oxygenate	81577	108-20-3	0.06	na	na
Ethyl *tert*-butyl ether (ETBE)	Gasoline oxygenate	50004	637-92-3	0.06	DLR	3
Methyl acetate	Solvent	77032	79-20-9	0.43	na	na
Methyl *tert*-butyl ether (MTBE)	Gasoline oxygenate	78032	1634-04-4	0.05	MCL-US	13
Methyl *tert*-pentyl ether	Gasoline oxygenate	50005	994-05-8	0.05	DLR	3

Table 2C. Pesticides and pesticide degradates, primary use or source, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory analytical schedule 2003, type of comparison threshold for ground-water detections, and the corresponding threshold value.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; RSD5-US, U.S. Environmental Protection Agency risk specific dose at a risk factor of 10E-5 µg/L; na, not available; µg/L, micrograms per liter]

Constituent (common name)	Primary use or source	USGS parameter code	CAS number	LRL (µg/L)	Threshold type	Threshold value (µg/L)
Acetochlor	Herbicide	49260	34256-82-1	0.006	na	na
Alachlor	Herbicide	46342	15972-60-8	0.005	MCL-US	2
Atrazine	Herbicide	39632	1912-24-9	0.007	MCL-CA	1
Azinphos-methyl	Insecticide	82686	86-50-0	0.05	na	na
Azinphos-methyl-oxon	Insecticide degradate	61635	961-22-8	0.042	na	na
Benfluralin	Herbicide	82673	1861-40-1	0.01	na	na
Carbaryl	Insecticide	82680	63-25-2	0.041	RSD5-US	400
2-Chloro-2,6-diethylacetanilide	Herbicide degradate	61618	6967-29-9	0.0065	na	na
4-Chloro-2-methylphenol	Herbicide degradate	61633	1570-64-5	0.0050	na	na
Chlorpyrifos	Insecticide	38933	2921-88-2	0.005	HAL-US	2
Chlorpyrofos, oxygen analog	Insecticide degradate	61636	5598-15-2	0.0562	na	na
Cyfluthrin	Insecticide	61585	68359-37-5	0.053	na	na
Cypermethrin	Insecticide	61586	52315-07-8	0.046	na	na
Dacthal (DCPA)	Herbicide	82682	1861-32-1	0.003	HAL-US	70
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine)	Herbicide degradate	4040	6190-65-4	0.014	na	na
Desulfinylfipronil	Insecticide degradate	62170	na	0.012	na	na
Desulfinylfipronil amide	Insecticide degradate	62169	na	0.029	na	na
Diazinon	Insecticide	39572	333-41-5	0.005	HAL-US	1
Diazinon, oxon	Insecticide degradate	61638	962-58-3	0.006	na	na
3,4-Dichloroaniline	Herbicide degradate	61625	95-76-1	0.0045	na	na
Dichlorvos	Insecticide	38775	62-73-7	0.013	na	na
Dicrotophos	Insecticide	38454	141-66-2	0.0843	na	na
Dieldrin	Insecticide	39381	60-57-1	0.009	RSD5-US	0.02
2,6-Diethylaniline	Herbicide degradate	82660	579-66-8	0.006	na	na
Dimethoate	Insecticide	82662	60-51-5	0.0061	na	na
Ethion	Insecticide	82346	563-12-2	0.016	na	na
Ethion monoxon	Insecticide degradate	61644	17356-42-2	0.021	na	na
2-Ethyl-6-methylaniline	Herbicide degradate	61620	24549-06-2	0.010	na	na
Fenamiphos	Insecticide	61591	22224-92-6	0.029	HAL-US	0.7
Fenamiphos sulfone	Insecticide degradate	61645	31972-44-8	0.053	na	na
Fenamiphos sulfoxide	Insecticide degradate	61646	31972-43-7	0.040	na	na
Fipronil	Insecticide	62166	120068-37-3	0.016	na	na
Fipronil sulfide	Insecticide degradate	62167	120067-83-6	0.013	na	na
Fipronil sulfone	Insecticide degradate	62168	120068-36-2	0.024	na	na
Fonofos	Insecticide	4095	944-22-9	0.0053	HAL-US	10
Hexazinone	Herbicide	4025	51235-04-2	0.026	HAL-US	400
Iprodione	Fungicide	61593	36734-19-7	0.026	na	na
Isofenphos	Insecticide	61594	25311-71-1	0.011	na	na
Malaoxon	Insecticide degradate	61652	1634-78-2	0.039	na	na
Malathion	Insecticide	39532	121-75-5	0.027	HAL-US	100
Metalaxyl	Fungicide	61596	57837-19-1	0.0069	na	na
Methidathion	Insecticide	61598	950-37-8	0.0087	na	na
Metolachlor	Herbicide	39415	51218-45-2	0.006	HAL-US	700
Metribuzin	Herbicide	82630	21087-64-9	0.028	HAL-US	70
Myclobutanil	Fungicide	61599	88671-89-0	0.033	na	na
1-Naphthol	Insecticide degradate	49295	90-15-3	0.0882	na	na
Paraoxon-methyl	Insecticide degradate	61664	950-35-6	0.019	na	na
Parathion-methyl	Insecticide	82667	298-00-0	0.015	HAL-US	1
Pendimethalin	Herbicide	82683	40487-42-1	0.022	na	na
cis-Permethrin	Insecticide	82687	54774-45-7	0.006	na	na

Table 2C. Pesticides and pesticide degradates, primary use or source, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory analytical schedule 2003, type of comparison threshold for ground-water detections, and the corresponding threshold value—Continued.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; RSD5-US, U.S. Environmental Protection Agency risk specific dose at a risk factor of 10E-5 µg/L; na, not available; µg/L, micrograms per liter]

Constituent (common name)	Primary use or source	USGS parameter code	CAS number	LRL (µg/L)	Threshold type	Threshold value (µg/L)
Phorate	Insecticide	82664	298-02-2	0.055	na	na
Phorate oxon	Insecticide degradate	61666	2600-69-3	0.027	na	na
Phosmet	Insecticide	61601	732-11-6	0.0079	na	na
Phosmet oxon	Insecticide degradate	61668	3735-33-9	0.0511	na	na
Prometon	Herbicide	4037	1610-18-0	0.01	HAL-US	100
Prometryn	Herbicide	4036	7287-19-6	0.0059	na	na
Pronamide (Propyzamide)	Herbicide	82676	23950-58-5	0.004	RSD5-US	20
Simazine	Herbicide	4035	122-34-9	0.005	MCL-US	4
Tebuthiuron	Herbicide	82670	34014-18-1	0.016	HAL-US	500
Terbufos	Insecticide	82675	13071-79-9	0.017	HAL-US	0.4
Terbufos oxon sulfone	Insecticide degradate	61674	56070-15-6	0.045	na	na
Terbuthylazine	Herbicide	4022	5915-41-3	0.0083	na	na
Trifluralin	Herbicide	82661	1582-09-8	0.009	HAL-US	10

Table 2D. Pesticides and pesticide degradates, primary use or source, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory analytical schedule 2060, type of comparison threshold for ground-water detections, and the corresponding threshold value.

Pesticides and pesticide degradates, primary use or source, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory analytical schedule 2060, type of comparison threshold for ground-water detections, and the corres

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; HAL-US, U.S. Environmental Protection Agency 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; RSD5, risk specific dose at 10E-5 µg/L; µg/L, micrograms per liter]

Constituent (common name)	Primary use or source	USGS parameter code	CAS number	LRL (µg/L)	Comparison type	Threshold value (µg/L)
Acifluorfen	Herbicide	49315	50594-66-6	0.028	na	na
Aldicarb[1]	Insecticide	49312	116-06-3	0.04	MCL-US	3
Aldicarb sulfone	Insecticide/ degradate	49313	1646-88-4	0.018	MCL-US	3
Aldicarb sulfoxide	Degradate	49314	1646-87-3	0.022	MCL-US	4
Atrazine	Herbicide	39632	1912-24-9	0.008	MCL-CA	1
Bendiocarb	Insecticide	50299	22781-23-3	0.020	na	na
Benomyl	Fungicide	50300	17804-35-2	0.022	na	na
Bensulfuron-methyl	Herbicide	61693	83055-99-6	0.018	na	na
Bentazon	Herbicide	38711	25057-89-0	0.012	MCL-CA	18
Bromacil	Herbicide	04029	314-40-9	0.018	HAL-US	70
Bromoxynil	Herbicide	49311	1689-84-5	0.028	na	na
Caffeine	Beverages	50305	58-08-2	0.018	na	na
Carbaryl	Herbicide	49310	63-25-2	0.018	RSD5-US	400
Carbofuran	Herbicide	49309	1563-66-2	0.016	MCL-CA	18
Chloramben, methyl ester	Herbicide	61188	7286-84-2	0.024	na	na
Chlorimuron-ethyl	Herbicide	50306	90982-32-4	0.032	na	na
3-(4-Chlorophenyl)-1-methyl urea	Degradate	61692	5352-88-5	0.036	na	na
Chlorothalonil	Herbicide	49306	1897-45-6	0.035	RSD5	15
Clopyralid	Herbicide	49305	1702-17-6	0.024	na	na
Cycloate	Herbicide	04031	1134-23-2	0.014	na	na
2,4-D (2,4-Dichlorophenoxyacetic acid)	Herbicide	39732	94-75-7	0.038	MCL-US	70
2,4-D methyl ester (2,4-Dichlorophenoxyacetic acid methyl ester)	Herbicide	50470	1928-38-7	0.016	na	na
2,4-DB (4-(2,4-Dichlorophenoxy)butyric acid)	Herbicide	38746	94-82-6	0.020	na	na
DCPA (Dacthal) monoacid	Degradate	49304	887-54-7	0.028	na	na
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-*s*-triazine; CIAT)	Degradate	04040	6190-65-4	0.028	na	na
Deethyldeisopropyl atrazine (2-Chlor-4,6-diamino-*s*-triazine)	Degradate	04039	3397-62-4	0.04	na	na
Deisopropyl atrazine (2-chloro-6-ethylamino-4-amino-*s*-triazine; CEAT)	Degradate	04038	1007-28-9	0.08	na	na
Dicamba	Herbicide	38442	1918-00-9	0.036	HAL-US	4,000
Dichlorprop	Herbicide	49302	120-36-5	0.028	na	na
Dinoseb	Herbicide	49301	88-85-7	0.038	MCL-CA	7
Diphenamid	Herbicide	04033	957-51-7	0.010	HAL-US	200
Diuron	Herbicide	49300	330-54-1	0.015	HAL-US	10
Fenuron	Herbicide	49297	101-42-8	0.019	na	na
Flumetsulam	Herbicide	61694	98967-40-9	0.040	na	na
Fluometuron	Herbicide	38811	2164-17-2	0.016	HAL-US	90
Hydroxyatrazine (2-Hydroxy-4-isopropylamino-6-ethylamino-*s*-triazine)	Degradate	50355	2163-68-0	0.032	na	na
3-Hydroxycarbofuran	Degradate	49308	16655-82-6	0.008	na	na
Imazaquin	Herbicide	50356	81335-37-7	0.036	na	na
Imazethapyr	Herbicide	50407	81335-77-5	0.038	na	na
Imidacloprid	Insecticide	61695	138261-41-3	0.020	na	na
Linuron	Herbicide	38478	330-55-2	0.014	na	na
MCPA (2-Methyl-4-chlorophenoxyacetic acid)	Herbicide	38482	94-74-6	0.030	HAL-US	30
MCPB (4-(2-Methyl-4-chlorophenoxy) butyric acid)	Herbicide	38487	94-81-5	0.010	na	na
Metalaxyl	Fungicide	50359	57837-19-1	0.012	na	na

Table 2D. Pesticides and pesticide degradates, primary use or source, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory analytical schedule 2060, type of comparison threshold for ground-water detections, and the corresponding threshold value—Continued.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; HAL-US, U.S. Environmental Protection Agency 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; RSD5, risk specific dose at 10E-5 µg/L; µg/L, micrograms per liter]

Constituent (common name)	Primary use or source	USGS parameter code	CAS number	LRL (µg/L)	Comparison type	Threshold value (µg/L)
Methiocarb	Insecticide	38501	2032-65-7	0.010	na	na
Methomyl	Insecticide	49296	16752-77-5	0.020	HAL-US	200
Metsulfuron methyl[1]	Herbicide	61697	74223-64-6	0.025	na	na
Neburon	Herbicide	49294	555-37-3	0.012	na	na
Nicosulfuron	Herbicide	50364	111991-09-4	0.04	na	na
Norflurazon	Herbicide	49293	27314-13-2	0.020	na	na
Oryzalin	Herbicide	49292	19044-88-3	0.012	na	na
Oxamyl	Insecticide	38866	23135-22-0	0.030	MCL-CA	50
Picloram	Herbicide	49291	1918-02-01	0.032	MCL-US	500
Propham	Herbicide	49236	122-42-9	0.030	HAL-US	100
Propiconazole	Fungicide	50471	60207-90-1	0.010	na	na
Propoxur	Insecticide	38538	114-26-1	0.008	na	na
Siduron	Herbicide	38548	1982-49-6	0.020	na	na
Sulfometuron-methyl	Herbicide	50337	74222-97-2	0.038	na	na
Tebuthiuron	Herbicide	82670	34014-18-1	0.026	HAL-US	500
Terbacil	Herbicide	04032	5902-51-2	0.016	HAL-US	90
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	Negative ion surrogate/ herbicide	99958	93-76-5	0.1	na	na
Triclopyr	Herbicide	49235	55335-06-3	0.026	na	na

[1]Although listed as an LRLs, these constitiuents are reported using method reporting levels (MRLs).

Table 2E. Constituents of special interest, primary use or source, Chemical Abstract Service (CAS) number, Montgomery Watson-Harza Laboratory minimum reporting level (MRL), type of comparison threshold for ground-water detections, and the corresponding threshold value.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; NL-CA, California notification level; µg/L, micrograms per liter]

Constituent (common name)	Primary use or source	CAS number	MRL (µg/L)	Comparison type	Threshold value (µg/L)
Perchlorate	Rocket fuel, fireworks, flares	14797-73-0	0.5	NL-CA	6
1,2,3-Trichloropropane (TCP)	Industrial solvent, organic synthesis	96-18-4	0.005	NL-CA	0.005
N-Nitrosodimethylamine (NDMA)	Rocket fuel, plasticizer, disinfection byproduct	62-75-9	0.002	NL-CA	0.010

Table 2F. Nutrients and dissolved organic carbon, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory (NWQL) analytical schedule 2755 and laboratory code 2613, type of comparison threshold for ground-water detections, and the corresponding threshold value.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; HAL-US, U.S. Environmental Protection Agency lifetime health advisory level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; na, not available; mg/L, milligrams per liter]

Constituent (common name)	USGS parameter code	CAS number	LRL (mg/L)	Comparison type	Threshold value (mg/L)
Ammonia	00608	7664-41-7	0.010	HAL-US	30
Nitrite (as nitrogen)	00613	14797-65-0	0.002	MCL-US	1
Nitrate plus nitrite (as nitrogen)	00631	na	0.060	MCL-US	10
Total nitrogen (ammonia, nitrite, nitrate, organic nitrogen)	62854	17778-88-0	0.06	na	na
Phosphorus, phosphate, orthophosphate (as phosphorus)	00671	14265-44-2	0.006	na	na
Dissolved organic carbon (DOC)	00681	na	0.33	na	na

Table 2G. Major and minor ions and trace elements, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, laboratory reporting level (LRL) for the USGS National Water Quality Laboratory analytical schedule 1948, type of comparison threshold for ground-water detections, and the corresponding threshold value.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; AL-US, U.S. Environmental Protection Agency action level; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; NL-CA, California Department of Health Services notification level; SMCL-CA, California Department of Health Services secondary maximum contaminant level; na, not available; mg/L, milligrams per liter; µg/L, micrograms per liter]

Constituent	USGS parameter code	CAS number	LRL	Comparison type	Threshold value
Major and minor ions			(mg/L)		(mg/L)
Bromide	71870	24959-67-9	0.02	na	na
Calcium	00915	7440-70-2	0.02	na	na
Chloride	00940	16887-00-6	0.2	SMCL-CA	[1] 250 (500)
Fluoride	00950	16984-48-8	0.10	MCL-CA	2
Iodide	78165	7553-56-2	0.002	na	na
Magnesium	00925	7439-95-4	0.008	na	na
Potassium	00935	7440-09-7	0.16	na	na
Silica	00955	7631-86-9	0.04	na	na
Sodium	00930	7440-23-5	0.20	na	na
Sulfate	00945	14808-79-8	0.18	SMCL-CA	[1] 250 (500)
Residue on evaporation (total dissolved solids, TDS)	70300	na	10	SMCL-US	[1] 500 (1,000)
Trace elements			(µg/L)		(µg/L)
Aluminum	01106	7429-90-5	1.6	MCL-CA	1,000
Antimony	01095	7440-36-0	0.2	MCL-US	6
Arsenic	01000	7440-38-2	0.12	MCL-US	10
Barium	01005	7440-39-3	0.2	MCL-CA	1,000
Beryllium	01010	7440-41-7	0.06	MCL-US	4
Boron	01020	7440-42-8	8	NL-CA	1,000
Cadmium	01025	7440-43-9	0.04	MCL-US	5
Chromium	01030	7440-47-3	0.04	MCL-CA	50
Cobalt	01035	7440-48-4	0.04	na	na
Copper	01040	7440-50-8	0.4	AL-US	1,300
Iron	01046	7439-89-6	6	SMCL-CA	300
Lead	01049	7439-92-1	0.08	AL-US	15
Lithium	01130	7439-93-2	0.6	na	na
Manganese	01056	7439-96-5	0.2	SMCL-CA	50
Mercury	71890	7439-97-6	0.010	MCL-US	2
Molybdenum	01060	7439-98-7	0.4	HAL-US	40
Nickel	01065	7440-02-0	0.06	MCL-CA	100
Selenium	01145	7782-49-2	0.08	MCL-US	50
Silver	01075	7440-22-4	0.20	SMCL-CA	100
Strontium	01080	7440-24-6	0.4	HAL-US	4,000
Thallium	01057	7440-28-0	0.04	MCL-US	2
Tungsten	01155	7440-33-7	0.06	na	na
Uranium	22703	7440-61-1	0.04	MCL-US	30
Vanadium	01085	7440-62-2	0.10	NL-CA	50
Zinc	01090	7440-66-6	0.6	HAL-US	2,000

[1]The recommended SMCL-CA thresholds for chloride, sulfate, and TDS are listed with the upper SMCL-CA thresholds in parentheses.

Table 2H. Arsenic, chromium, and iron speciation, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, method detection level (MD), for the USGS Trace Metal Laboratory, Boulder, Colorado, type of comparison threshold for ground-water detections, and the corresponding threshold value.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. DLR, California Department of Health Services detection limit for the purposes of reporting; HAL-US, U.S. Environmental Protection Agency 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; µg/L, micrograms per liter]

Constituent (valence state)	USGS parameter code	CAS number	MD (µg/L)	Comparison type	Threshold (µg/L)
Arsenic (III)	99034	22569-72-8	1	na	na
Arsenic (total)	01000	7440-38-2	0.5	MCL-US	10
Chromium (VI), hexavalent	01032	18540-29-9	1	DLR	1
Chromium (total)	01030	7440-47-3	1	MCL-CA	50
Iron (II)	01047	7439-89-6	2	na	na
Iron (total)	01046	7439-89-6	2	HAL-US	300

Table 2I. Isotopic and radioactive constituents, U.S. Geological Survey (USGS) parameter code, Chemical Abstract Service (CAS) number, reporting level type, reporting level or uncertainty, type of comparison threshold for ground-water detections, and the corresponding threshold value.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; δ, notation, in per mil, of the differences in oxygen-18/oxygen-16 and hydrogen-2/hydrogen-1 ratios relative to Standard Mean Ocean Water (SMOW), and the difference in the carbon-13/carbon-12 ratio relative to University of Chicago Peedee Formation Standard; MRL, minimum reporting level; MU, method uncertainty; na, not available; pCi/L, picocuries per liter; SSMDC, sample specific minimum detectable concentration]

Constituent	USGS parameter code	CAS number	Reporting level type	Reporting level or uncertainty	Comparison type	Threshold value	Reporting units
Radon-222	82303	14859-67-7	SSMDC	see Table 19	Proposed MCL-US	300	pCi/L
Tritium[1]	07000	10028-17-8	MRL	1	MCL-CA	20,000	pCi/L
δ^{2}H of water[2]	82082	na	MU	2	na	na	Per mil
δ^{18}O of water[2]	82085	na	MU	0.20	na	na	Per mil
Gross-alpha radioactivity, 72 hr count[3]	62636	12587-46-1	SSMDC	see Table 19	MCL-US	15	pCi/L
Gross-alpha radioactivity, 30 day count[3]	62639	12587-46-1	SSMDC	see Table 19	MCL-US	15	pCi/L
Gross-beta radioactivity, 72 hr count[3]	62642	12587-47-2	SSMDC	see Table 19	MCL-CA	50	pCi/L
Gross-beta radioactivity, 30 day count[3]	62645	12587-47-2	SSMDC	see Table 19	MCL-CA	50	pCi/L
Radium-226[3]	09511	13982-63-3	SSMDC	see Table 19	MCL-US[6]	5	pCi/L
Radium-228[3]	81366	15262-20-1	SSMDC	see Table 19	MCL-US[6]	5	pCi/L
δ^{13}C of dissolved inorganic carbon[4]	82081	na	1 sigma	0.05	na	na	Per mil
Carbon-14[5]	49933	14762-75-5	1 sigma	0.002	na	na	Percent modern carbon

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

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

[3]Eberline Analytical Services, Richmond, California.

[4]University of Waterloo, Ontario, Canada.

[5]University of Arizona, Accelerator Mass Spectrometry Laboratory, Tucson, Arizona.

[6]The MCL-US threshold for radium is the sum of radium-226 and radium-228.

Table 2J. Tritium and noble gases, Chemical Abstract Service (CAS) number, method uncertainty (MU) and reporting units for the Lawrence Livermore National Laboratory, type of comparison threshold for ground-water detections, and the corresponding threshold value.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property. MCL-CA, California Department of Health Services maximum contaminant level; na, not available; cm^3 STP/g, cubic centimeters of gas at standard temperature and pressure per gram of water; pCi/L, picocuries per liter]

Constituent	CAS number	MU (percent)	Reporting units	Threshold type	High threshold (pCi/L)
Argon	7440-37-1	2	cm^3STP/g	na	na
Helium-3 / Helium-4 ratio	na / 7440-59-7	0.75	na	na	na
Helium-4	7440-59-7	2	cm^3STP/g	na	na
Krypton	7439-90-9	2	cm^3STP/g	na	na
Neon	7440-01-09	2	cm^3STP/g	na	na
Tritium	10028-17-8	1	pCi/L	MCL-CA	20,000
Xenon	7440-63-3	2	cm^3STP/g	na	na

Table 2K. Microbial constituents, U.S. Geological Survey (USGS) parameter code, primary use or source, and method detection limit (MDL) for the USGS Ohio Microbiology Laboratory.

[The five-digit USGS parameter code is used to uniquely identify a specific constituent or property; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; na, not available; mL, milliliters; TT, treatment technique - a required process intended to reduce the level of contamination in drinking water]

Microbial constituent	USGS parameter code	Primary use or source	MDL	Comparison type	Threshold value
Escherichia coliform (*E*. coli)	90901	Sewage and animal waste indicator / Intestinal tracts of humans and animals	1 colony / 100 mL	TT	No fecal coliforms are allowed.
Total coliform (including fecal coliform and *E*. coli)	90900	Water-quality indicator / Soil, water, and intestinal tracts of animals	1 colony / 100 mL	MCL-US	No more than 5 percent samples total coliform-positives in a month. Every sample that has total coloforms must be analyzed for fecal coliforms; no fecal coliforms are allowed.
F-specific coliphage	99335	Viral indicator / Intestinal tracts of warm-blooded animals	na	TT	99.99 percent killed / inactivated
Somatic coliphage	99332	Viral indicator / Fecal contaminated waters	na	TT	99.99 percent killed / inactivated

Table 3. Classes of chemical and microbial constituents and water-quality indicators collected for the fast, slow, and monitoring well sampling schedules in the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[DO, dissolved oxygen; NDMA, N-nitrosodimethylamine; SC, specific conductance]

Fast schedule analyte list
Water-quality indicators (SC and temperature)
Volatile organic compounds
Gasoline additives
Pesticides and pesticide degradates
Chromium abundance and speciation
Stable isotopes of hydrogen and oxygen
Tritium[1]
Tritium and noble gases[2]
Slow schedule analyte list
Water-quality indicators (pH, SC, DO, temperature, alkalinity, turbidity)
Volatile organic compounds
Gasoline additives
Pesticides and pesticide degradates
Constituents of special interest (perchlorate, NDMA, 1,2,3-trichloropropane)
Nutrients and dissolved organic carbon
Major and minor ions and trace elements
Chromium abundance and speciation
Arsenic and iron speciation
Stable isotopes of hydrogen and oxygen
Carbon isotopes
Radium isotopes
Radon-222
Tritium[1]
Tritium and noble gases[2]
Gross alpha and beta radiation
Microbial constituents
Monitoring well schedule analyte list
Water-quality indicators (pH, SC, DO, temperature, alkalinity)
Volatile organic compounds
Gasoline additives
Pesticides and pesticide degradates
Constituents of special interest (perchlorate, NDMA, 1,2,3-trichloropropane)
Nutrients and dissolved organic carbon
Major and minor ions and trace elements
Chromium abundance and speciation
Arsenic and iron speciation
Stable isotopes of hydrogen and oxygen
Tritium[1]
Tritium and noble gases[2]
Gross alpha and beta radiation

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

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

Table 4. Analytical methods used for the determination of organic, inorganic, and microbial constituents by the U.S. Geological Survey (USGS) National Water Quality Laboratory (NWQL) and additional contract laboratories.

[MI agar, supplemented nutrient agar in which coliforms (total and *Escherichia*) produce distinctly different fluorescence under ultraviolet lighting; UV, ultraviolet; VOCs, volatile organic compounds; δ, del notation expressed as per mil]

Analyte	Method	Laboratory	Citation(s)
VOCs	Purge and trap capillary gas chromatography-mass spectrometry	NWQL	Connor and others, 1998
Gasoline additives and (or) oxygenates	Heated purge and trap, gas chromatography-mass spectrometry	NWQL	Rose and Sandstrom, 2003
Pesticides and pesticide degradates	Solid-phase extraction and chromatography-mass spectrometry	NWQL	Sandstrom and others, 2001
Major and minor ions, trace elements and nutrients	Inductively coupled plasma mass spectrometry, graphite furnace atomic absorption, atomic fluorescence, and colorimetry	NWQL	Fishman and Friedman, 1989; Fishman, 1993; Garbarino, 1999; Garbarino and Damrau, 2001; Patton and Kryskalla, 2003
Dissolved organic carbon	UV-promoted persulfate oxidation and infrared spectrometry	NWQL	Brenton and Arnett, 1993
Radon-222	Liquid scintillation counting	NWQL	American Society for Testing and Materials, 1998a, b
Stable isotopes of water: δD and $\delta^{18}O$	Gaseous hydrogen and carbon dioxide-water equilibration	USGS Stable Isotope Laboratory, Reston, Virginia	Coplen and others, 1991; Coplen, 1994
Chromium, arsenic, and iron speciation	Ultraviolet visible (UV-VIS) spectrophotometry and atomic absorbance spectroscopy	USGS Trace Metal Laboratory, Boulder, Colorado	To and others, 1998; Ball and McCleskey, 2003; McCleskey and others, 2003
F-specific and somatic coliphage	Single-agar layer (SAL) and two-step enrichment methods	USGS Ohio Water Microbiology Laboratory	U.S. Environmental Protection Agency, 2001
Tritium	Electrolytic enrichment-liquid scintillation	USGS Stable Isotope and Tritium Laboratory, Menlo Park, California	Thatcher and others, 1977
Perchlorate and *N*-nitrosodimethylamine (NDMA)	Chromatography and mass spectrometry	Montgomery Watson-Harza Laboratory	U.S. Environmental Protection Agency, 1996; Hautman and others, 1999
1,2,3-Trichloropropane	Gas chromatography/electron-capture detector	Montgomery Watson-Harza Laboratory	U.S. Environmental Protection Agency, 1995
Tritium and noble gases	Helium-3 in-growth and mass spectrometry	Lawrence Livermore National Laboratory	Clarke and others, 1976; Moran and others, 2002
Radium-226, -228, gross alpha/beta radioactivity	Alpha activity counting	Eberline Analytical Services	U.S. Environmental Protection Agency, 1980
Carbon isotopes: $\delta^{13}C$	Accelerator mass spectrometry	University of Waterloo, Environmental Isotope Laboratory; University of Arizona Accelerator Mass Spectrometry Laboratory	Donahue and others, 1990; Jull and others, 2004
Total and *Escherichia* coliform	Membrane filter technique with “MI agar,” colony counting	USGS field measurement	U.S. Environmental Protection Agency, 2002b

Table 5. Constituents analyzed in ground-water samples collected for the Monterey-Salinas Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005, that appear on multiple analytical schedules, primary constituent classification, analytical schedules each constituent appears on, and preferred analytical schedule.

[The preferred analytical methods had better accuracy, precision, or a lower reporting level for the respective constituent. Abbreviations: MWH, Montgomery Watson-Harza Laboratory; NPR, USGS National Research Program; NWQL, USGS National Water Quality Laboratory; USGS, U.S. Geological Survey; VOC, volatile organic compound]

Constituent	Primary constituent classification	USGS NWQL analytical schedules/ methods	Preferred analytical schedule
1,2,3-Trichloropropane (1,2,3-TCP)	VOC	2020, MHW	MWH
Acetone	VOC	2020, 4024	2020
Atrazine	Pesticide	2003, 2060	2003
Carbaryl	Pesticide	2003, 2060	2003
Deethylatrazine (2-Chloro-4-isopropylamino-6-amino-s-triazine)	Pesticide degradate	2003, 2060	2003
Diisopropyl ether	VOC	2020, 4024	2020
Ethyl *tert*-Butyl ether (ETBE)	VOC	2020, 4024	2020
Metalaxyl	Pesticide	2003, 2060	2060
Methyl *tert*-butyl ether (MTBE)	VOC	2020, 4024	2020
Methyl *tert*-pentyl ether	VOC	2020, 4024	2020
Tebuthiuron	Herbicide	2003, 2060	2003
Total arsenic	Trace element	1948, NRP speciation	1948
Total chromium	Trace element	1948, NRP speciation	1948
Total iron	Trace element	1948, NRP speciation	1948
Tritium	Isotope	ingrowth, counting	ingrowth

Table 6. Quality-control summary for volatile organic compounds, gasoline additives, pesticides, pesticide degradates, major and minor ions, trace elements, nutrients, and dissolved organic carbon detected in source-solution blanks, field blanks, and the minimum concentrations in ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[Data censored due to associated blank contamination are reported but not used in summary statistics; E, estimated value; µg/L, micrograms per liter; —, not detected].

Constituent	Number of field blank detections/ analyses	Maximum concentration detected in field blanks	Minimum concentration detected in environmental samples	Number of environmental samples censored[1]
Volatile organic compounds and gasoline additives and (or) oxygenates (µg/L)				
Acetone	1/20	12	—	0
2-Butanone (methyl ethyl ketone)	2/20	30.8	E0.9	0
Carbon disulfide	[2]2/20	E0.09	E0.02	0
Chloroform (trichloromethane)	[2]1/20	0.10	E0.01	0
Ethylbenzene	2/20	E0.03	E0.07	0
Tetrachloroethylene (PCE)	1/20	E0.03	E0.01	0
Toluene	[2]13/20	0.19	E0.01	4
Trichlorofluoromethane	[2]2/20	0.11	—	0
1,2,4-Trimethylbenzene	1/20	0.56	E0.02	0
m-Xylene plus *p*-xylene	3/20	E0.12	E0.03	0
o-Xylene	2/20	E0.05	—	0
Pesticide and (or) pesticide degradates (µg/L)				
none				
Nutrients and dissolved organic carbon (mg/L)				
Dissolved organic carbon (DOC)	5/5	40	E0.20	6
Phosphorus, phosphate, orthophosphate (as phosphorus)		E0.005	E0.005	0
Major and minor ions (mg/L)				
Calcium	3/5	0.24	15.4	0
Magnesium		E0.007	0.64	0
Silica	5/5	3.90	24.4	0
Sodium	3/5	0.70	20.3	0
Trace elements (µg/L)				
Aluminum	4/5	45	E1.0	1
Arsenic	1/5	0.52	0.20	1
Barium	2/5	0.20	4.00	0
Chromium	2/5	0.09	E0.03	1
Cobalt	1/5	0.04	E0.03	0
Copper	1/5	3.10	E0.20	5
Iron	2/5	21	E3.00	3
Lead	2/5	0.14	E0.06	0
Manganese	1/5	E0.20	E0.10	1
Nickel	1/5	0.36	0.42	0
Strontium	1/5	0.58	226	0
Tungsten	1/5	0.36	0.15	0
Vanadium	1/5	0.42	E0.10	0
Zinc	2/5	3.70	0.38	0

[1]Environmental samples were not censored as a result of detections in the corresponding blank samples if the environmental samples taken prior to, and following the blank sample detections were free from the constituent observed in the blank sample.

[2]Constituents also detected in associated source-solution blanks.

Table 7. Quality-control summary of replicate samples for constituents collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[E, estimated value; mg/L, milligram per liter; µg/L, microgram per liter; na, not available; pCi/L, picocurie per liter; TU, tritium unit; <, less than]

Constitutent	Number of relative standard deviations greater than 20 percent/ number of replicate pairs	Maximum relative standard deviation (percent)	Environmental value; replicate value
Volatile organic compounds, gasoline oxygenates and additives from schedules 2020 and 4204			
Carbon disulfide (µg/L)	1/8	121	< 0.04; 0.13
All additional VOCs from schedule 2020 and 4024	0/8	< 20	na
Pesticides and pesticide degradates from schedules 2003 and 2060			
Caffeine (µg/L)	1/3	66	E 0.004; E 0.011
All additional pesticides and pesticide degradates from schedule 2003	0/8	< 20	na
All additional pesticides and pesticide degradates from schedule 2060	0/3	< 20	na
Constituents of special interest[1]			
Perchlorate, 1,2,3-Trichloropropane, and *N*-Nitrosodimethylamine	0/1	< 20	na
Major ions, minor ions, trace elements, and nutrients			
Dissolved organic carbon (mg/L)	1/3	28	E 0.2; E 0.3
Arsenic (µg/L)	1/3	28	0.2; 0.3
Iron (µg/L)	1/3	70	18; E 6
Manganese (µg/L)	1/3	28	0.6; 0.4
Zinc (µg/L)	1/3	110	6.5; 0.8
All additional major ions, minor ions, trace elements, and nutrients from schedules 1948 and 2755	0/3	< 20	na
Isotopes, radioactivity, and noble gases			
Radium-226[2] (pCi/L)	1/2	75	0.02; 0.064
Radium-228[2] (pCi/L)	1/2	25	0.158; 0.110
Tritium[3] (TU)	1/6	32	1.5; 2.3
Tritium[4] (TU)	1/8	44	1.0; 1.9
Alpha radioactivity, 72-hour count[2] (pCi/L)	1/2	141	0.02; 0.00
Beta radioactivity, 72-hour count[2] (pCi/L)	1/2	22	3.7; 5.0
All additional isotopes, radioactivity, and (noble gases)[3]	0/2 (0/9)	< 20	na
Microbial indicators			
F-specific and somatic coliphage	0/2	< 20	na
E. Coli, and total coliforms	0/30	< 20	na

[1]Analyses performed at Montgomery Watson-Harza Laboratories, Monrovia, California.

[2]Analyses performed at Eberline Analytical Services, Richmond, California.

[3]Analyses performed at Lawrence Livermore National Laboratory, Livermore, California.

[4]Analyses performed at U.S. Geological Survey, Menlo Park, California.

Table 8A. Quality-control summary of matrix spike recoveries of volatile organic compounds, gasoline additives, NDMA, perchlorate, and 1,2,3-trichloropropane in samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[Acceptable recovery range is between 70 and 130 percent]

Constituent (common name)	Number of spiked samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
1,1,1,2-Tetrachloroethane	9	88	98	96
1,1,1-Trichloroethane (TCA)[1]	9	96	104	98
1,1,2,2-Tetrachloroethane	9	89	107	98
1,1,2-Trichloroethane	9	79	100	89
1,1,2-Trichlorotrifluoroethane (CFC-113)	9	84	105	96
1,1-Dichloroethane[1]	9	94	103	98
1,1-Dichloroethylene (DCE)	9	88	102	94
1,1-Dichloropropene	9	95	138	102
1,2,3,4-Tetramethylbenzene	9	97	121	106
1,2,3,5-Tetramethylbenzene (isodurene)	9	111	124	115
1,2,3-Trichlorobenzene[1]	9	94	118	102
1,2,3-Trichloropropane	9	87	107	97
1,2,3-Trimethylbenzene[1]	9	97	106	97
1,2,4-Trichlorobenzene	9	88	106	97
1,2,4-Trimethylbenzene	9	102	121	111
1,2-Dibromo-3-chloropropane (DBCP)	9	91	113	102
1,2-Dibromoethane	9	88	102	92
1,2-Dichlorobenzene	9	87	109	100
1,2-Dichloroethane	9	98	107	107
1,2-Dichloropropane	9	89	96	94
1,3,5-Trimethylbenzene	9	98	109	104
1,3-Dichlorobenzene	9	89	104	98
1,3-Dichloropropane	9	98	107	98
1,4-Dichlorobenzene	9	87	104	98
1,2,3-Tricholorpropane (TCP)[2]	4	88	103	90
2,2-Dichloropropane	9	83	91	87
2-Chlorotoluene	9	91	106	100
2-Hexanone	9	93	108	98
3-Chloropropene	9	100	110	103
4-Chlorotoluene	9	91	104	100
4-Isopropyl-1-methylbenzene	9	94	107	99
4-Methyl-2-pentanone	9	88	103	92
Acetone1,3	9	97	128	107
Acrylonitrile	9	97	106	106
Benzene	9	100	113	104
Bromobenzene	9	88	98	94
Bromochloromethane[1]	9	94	111	103
Bromodichloromethane	9	96	106	100
Bromoethene	9	96	128	112
Bromoform (tribromomethane)[1]	9	82	100	93
Bromomethane	9	86	139	118
Butylbenzene	9	83	94	88
Carbon disulfide[1]	9	71	95	88
Chlorobenzene	9	88	104	94
Chloroethane	9	88	106	88
Chloroform (trichloromethane)[1]	9	94	126	100
Chloromethane	9	88	119	100
cis-1,2-Dichloroethylene[1]	9	94	106	102
cis-1,3-Dichloropropene	9	82	92	86
Dibromochloromethane[1]	9	89	107	95
Dibromomethane	9	91	111	100
Dichlorodifluoromethane (CFC-12)	9	59	91	88

Table 8A. Quality-control summary of matrix spike recoveries of volatile organic compounds, gasoline additives, NDMA, perchlorate, and 1,2,3-trichloropropane in samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[Acceptable recovery range is between 70 and 130 percent]

Constituent (common name)	Number of spiked samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Dichloromethane (methylene chloride)	9	95	107	101
Diethyl ether	9	100	113	100
Diisopropyl ether[1]	9	90	105	97
Ethyl methacrylate	9	86	98	90
2-Butanone (Ethyl methyl ketone)	9	98	119	104
Ethylbenzene	9	91	113	102
Hexachlorobutadiene	9	84	99	92
Hexachloroethane	9	89	106	95
Isopropylbenzene	9	96	115	104
m- and *p*-Xylene[1]	9	95	118	107
Methyl acetate	4	96	106	102
Methyl acrylate	9	94	108	102
Methyl acrylonitrile	9	97	115	106
Methyl iodide	9	80	152	124
Methyl methacrylate	9	78	90	84
Methyl *tert*-butyl ether (MTBE)[1,3]	9	94	110	94
Naphthalene	9	89	128	104
Nitrosodimethylamine (NDMA)[2]	4	81	95	91
n-Propylbenzene	9	91	109	98
o-Ethyl toluene	9	93	107	102
o-Xylene[1]	9	93	105	100
Perchlorate[2]	4	40	84	78
sec-Butylbenzene	9	94	109	96
Styrene	9	64	109	100
Methyl *tert*-pentyl ether[1]	9	91	109	97
tert-Amyl alcohol	4	83	97	94
tert-Butyl alcohol	4	84	95	92
tert-Butyl ethyl ether (ETBE)[1]	9	87	115	102
tert-Butylbenzene	9	104	117	110
Tetrachloroethylene (PCE)[1]	9	88	121	96
Tetrachloromethane (carbon tetrachloride)[1]	9	91	104	98
Tetrahydrofuran[1]	9	107	128	112
Toluene[1]	9	91	100	96
trans-1,2-Dichloroethylene	9	96	106	104
trans-1,3-Dichloropropene	9	84	99	92
trans-1,4-Dichloro-2-butene	9	91	121	108
Trichloroethylene (TCE)[1]	9	90	100	94
Trichlorofluoromethane (CFC-11)	9	85	101	96
Vinyl chloride	9	96	125	106

[1]Constituents detected in ground-water samples.

[2]Constituents analyzed by Montgomery Watson-Harza Laboratory, Monrovia, California, on the Constitutents of Special Interest Schedule.

[3]Constituents on schedules 2020 and 4024; only values from schedule 2020 are reported because it is the preferred analytical schedule.

Table 8B. Quality-control summary of matrix spike recoveries of pesticides and pesticide degradates in samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

Quality-control summary of matrix spike recoveries of pesticides and pesticide degradates in samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study

[Acceptable recovery range is between 70 and 130 percent]

Constituent (common name)	Number of spiked samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
1-Naphthol	9	9	51	19
2,6-Diethylaniline	9	85	103	92
2-Chloro-2′,6′-diethylacetanilide	9	82	109	101
2-Ethyl-6-methylaniline	9	82	100	87
3,4-Dichloroaniline	9	61	88	83
4-Chloro-2-methylphenol	9	35	68	59
Acetochlor	9	82	101	96
Alachlor	9	86	106	102
Atrazine[1]	9	87	119	99
Azinphos-methyl	9	50	109	81
Azinphos-methyl oxygen analog	9	30	98	69
Benfluralin, water	9	45	67	57
Carbaryl	9	79	162	121
Chlorpyrifos	9	75	100	92
Chlorpyrifos oxygen analog	9	10	92	49
cis-Permethrin	9	43	81	55
Cyfluthrin	9	34	59	53
Cypermethrin	9	34	55	52
Dacthal (DCPA)[1]	9	87	111	105
Deethylatrazine (2-chloro-4-isopropylamino-6-amino-s-triazine)[1]	13	17	115	59
Deisopropyl atrazine (2-chloro-6-ethylamino-4-amino-s-triazine)[1]	4	44	90	71
Desulfinyl fipronil	9	86	102	95
Desulfinylfipronil amide	9	18	97	79
Diazinon	9	80	97	93
Diazinon oxygen analog	9	50	100	92
Dichlorvos	9	20	71	46
Dicrotophos	9	10	49	29
Dieldrin[1]	9	74	112	84
Dimethoate	9	13	40	28
Ethion	9	48	83	76
Ethion monoxon	9	50	98	84
Fenamiphos	9	70	120	80
Fenamiphos sulfone	9	37	94	77
Fenamiphos sulfoxide	9	20	69	40
Fipronil	9	62	101	91
Fipronil sulfide	9	80	100	91
Fipronil sulfone	9	64	87	75
Fonofos	9	77	96	91
Fonofos oxygen analog	0	0	0	0
Hexazinone	9	23	86	73
Iprodione	0	0	0	0
Isofenphos	9	87	119	101
Malaoxon	9	54	116	96
Malathion	9	82	128	114
Metalaxyl	9	79	107	98
Methidathion	9	74	110	91
Methyl paraoxon	9	30	71	65
Methyl parathion	9	53	83	74
Metolachlor[1]	9	98	123	114
Metribuzin	9	42	93	75
Myclobutanil	9	67	90	82
Pendimethalin	9	54	109	87

Table 8B. Quality-control summary of matrix spike recoveries of pesticides and pesticide degradates in samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[Acceptable recovery range is between 70 and 130 percent]

Constituent (common name)	Number of spiked samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
Phorate	9	34	89	74
Phorate oxygen analog	9	59	121	91
Phosmet	9	0	25	12
Phosmet oxygen analog	9	0	29	10
Prometon[1]	9	80	102	95
Prometryn	9	90	108	103
Pronamide	9	78	101	93
Simazine[1]	9	71	110	95
Tebuthiuron	9	60	139	105
Terbufos	9	59	101	86
Terbufos oxygen analog sulfone	9	40	131	102
Terbuthylazine[1]	9	91	111	102
Trifluralin	9	47	75	65
2,4-D (2,4-dichlorophenoxyacetic acid)	4	104	130	120
2,4-D methyl ester	4	88	107	99
2,4-DB (4-(2,4-dichlorophenoxy)butanoic acid)	4	84	101	90
2-Hydroxy-4-isopropylamino-6-ethylamino-s-triazine (hydroxyatrazine)	4	103	115	112
3-Hydroxy carbofuran	4	74	106	101
3-Ketocarbofuran[1]	4	37	90	74
Acifluorfen	4	107	162	127
Aldicarb	4	32	75	63
Aldicarb sulfone	4	40	94	63
Aldicarb sulfoxide	4	71	105	96
Atrazine[1]	4	64	117	99
Bendiocarb	4	84	98	87
Benomyl	4	69	105	77
Bensulfuron	4	88	122	106
Bentazon	4	92	142	110
Bromacil	4	64	110	91
Bromoxynil	4	72	97	90
Caffeine[1]	4	74	130	106
Carbaryl	4	84	110	102
Carbofuran	4	82	110	103
Chloramben methyl ester	4	68	106	97
Chlorimuron	4	55	81	74
Chlorodiamino-s-triazine	4	68	146	109
Chlorothalonil	4	16	69	42
Clopyralid	4	61	85	75
Cycloate	4	80	114	96
Dacthal monoacid	4	108	138	126
Dicamba	4	84	106	102
Dichlorprop	4	84	118	106
Dinoseb	4	100	142	121
Diphenamid[1]	4	84	114	110
Diuron	4	80	118	108
Fenuron[1]	4	76	110	106
Flumetsulam	4	92	191	121
Fluometuron	4	84	118	110
Imazaquin	4	85	170	115
Imazethapyr[1]	4	112	158	122
Imidacloprid	4	100	167	119
Linuron	4	84	114	108

Table 8B. Quality-control summary of matrix spike recoveries of pesticides and pesticide degradates in samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[Acceptable recovery range is between 70 and 130 percent]

Constituent (common name)	Number of spiked samples	Minimum recovery (percent)	Maximum recovery (percent)	Median recovery (percent)
MCPA (2-Methyl-4-chlorophenoxyacetic acid)	4	88	105	100
MCPB (4-(2-Methyl-4-chlorophenoxy) butyric acid)	4	84	105	94
Metalaxyl	4	84	118	108
Methiocarb	4	88	110	102
Methomyl	4	38	115	94
Metsulfuron[1]	4	44	93	60
3-(4-Chlorophenyl)-1-methyl urea	4	64	114	85
Neburon	4	84	118	110
Nicosulfuron	4	65	183	117
Norflurazon	4	84	129	114
Oryzalin	4	80	110	97
Oxamyl	4	80	110	93
Picloram	4	94	105	97
Propham	4	90	115	109
Propiconazole	4	80	114	100
Propoxur	4	75	108	102
Siduron	4	88	122	114
Sulfometuron-methyl	4	86	131	103
Tebuthiuron	4	79	124	108
Terbacil	4	71	117	106
Triclopyr	4	100	126	110

[1]Constituents detected in ground-water samples.

Table 9. Quality-control summary of surrogate recoveries in environmental, blank, and replicate samples for volatile organic compounds, gasoline additives, pesticides, pesticide degradates, and constituents of special interest, collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

Surrogate	Analytical schedule	Constitutent class	Number of analyses (environmental, blank, replicate)	Number of surrogate recoveries below 70 percent (environmental, blank, replicate)	Number of surrogate recoveries between 70 and 130 percent (environmental, blank, replicate)	Number of surrogate recoveries above 130 percent (environmental, blank, replicate)
1,2-Dichloroethane-d4	2020, 4024	Volatile organic compound	100, 20, 16	0, 0, 0	82, 17, 14	18, 3, 2
1-Bromo-4-fluorobenzene	2020, 4024	Volatile organic compound	100, 20, 16	16, 3, 3	84, 17, 13	0, 0, 0
Toluene-d8	2020, 4024	Volatile organic compound	100, 20, 16	0, 0, 0	100, 20, 16	0, 0, 0
Isobutyl alcohol-d6	4024	Gasoline additive	34, 6, 6	1, 0, 0	33, 6, 6	0, 0, 0
alpha-HCH-d6	2003	Pesticide or degradate	97, 11, 16	3, 0, 0	94, 11, 16	0, 0, 0
Diazinon-d10	2003	Pesticide or degradate	97, 11, 16	16, 2, 3	81, 5, 13	0, 0, 0
2,4,5-T (2,4,5-trichlorophenoxyacetic acid)	2060	Pesticide or degradate	34, 5, 6	2, 0, 2	26, 3, 4	6, 2, 0
Barban	2060	Pesticide or degradate	34, 5, 6	1, 0, 0	32, 5, 6	1, 0, 0
Caffeine-13C	2060	Pesticide or degradate	34, 5, 6	0, 0, 0	25, 2, 3	9, 3, 3
Toluene-d8	MWH[1]	Constituent of special interest	34, 7, 4	0, 0, 0	34, 7, 4	0, 0, 0
NDMA-d6	MWH[1]	Constituent of special interest	33, 7, 4	3, 0, 0	30, 7, 4	0, 0, 0

[1]Constituent analyzed at Montgomery Watson-Harza Laboratory (MWH), Monrovia, California.

Table 10. Water-quality indicators determined in the field for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; SMCL-CA, California Department of Health Services secondary maximum contaminant level; SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; C, celsius; mg/L, milligrams per liter; mm, millimeter; na, not available; nc, sample not collected; NTU, nephelometric turbidity unit; µS/cm, microsiemens per centimeter; <, less than; >, greater than; *, value exceeds regulatory threshold]

GAMA identification No.	Turbidity (NTU) (63676)	Barometric Pressure (mm of mercury) (00025)	Dissolved oxygen (mg/L) (00300)	pH, field (standard units) (00400)	Specific conductance, field (µS/cm at 25 degrees C) (00095)	Water temperature (degrees C) (00010)	Alkalinity (mg/L as $CaCO_3$) (29802)	Bicarbonate (mg/L as HCO_3) (63786)	Carbonate (mg/L as CO_3) (63788)
Threshold type	**na**	**na**	**na**	**SMCL-US**	**SMCL-CA[1]**	**na**	**na**	**na**	**na**
Threshold	**na**	**na**	**na**	**<6.5 or >8.5**	**900**	**na**	**na**	**na**	**na**
MSMB-01	nc	nc	8.6	nc	*907	20.1	nc	nc	nc
MSMB-02	nc	nc	2.2	nc	885	21.7	nc	nc	nc
MSMB-03	nc	nc	1.9	nc	338	33.2	nc	nc	nc
MSMB-04	0.1	761	0.1	8.1	*1,210	23.0	163	199	2
MSMB-05	nc	nc	7.8	nc	397	18.5	nc	nc	nc
MSMB-06	nc	nc	1.2	nc	615	19.5	nc	nc	nc
MSMB-07	nc	nc	4.3	nc	708	24.7	nc	nc	nc
MSMB-08	nc	nc	2.5	nc	469	14.5	nc	nc	nc
MSMB-09	0.1	760	2.9	7.3	435	17.5	173	211	0
MSMB-10	nc	nc	4.3	nc	*1,080	20.1	nc	nc	nc
MSMB-11	nc	nc	1.3	nc	591	22.0	nc	nc	nc
MSMB-12	0.2	762	0.2	8.8	538	31.7	135	161	2
MSMB-13	nc	nc	3.9	nc	648	19.2	nc	nc	nc
MSMB-14	nc	nc	4.1	nc	*1,180	21.9	nc	nc	nc
MSMB-15	nc	nc	0.6	nc	*1,240	20.9	nc	nc	nc
MSMB-16	nc	nc	4.1	nc	651	19.7	nc	nc	nc
MSMB-17	nc	nc	1.8	nc	*953	22.0	nc	nc	nc
MSMB-18	0.1	763	3.5	7.3	499	20.6	138	168	0
MSMB-19	nc	nc	2.9	nc	622	20.4	nc	nc	nc
MSMB-20	0.2	763	0.9	7.3	753	19.0	300	366	0.5
MSMB-21	nc	nc	0.2	nc	534	16.2	nc	nc	nc
MSMB-22	0.1	761	0.1	7.4	*985	18.2	311	378	0.8
MSMB-23	nc	nc	2.7	nc	693	20.6	nc	nc	nc
MSMB-24	nc	nc	7.5	nc	555	18.7	nc	nc	nc
MSMB-25	nc	nc	4.5	nc	562	23.1	nc	nc	nc
MSMB-26	nc	nc	2.7	nc	777	22.0	nc	nc	nc
MSMB-27	nc	nc	nc	nc	*1,050	21.9	nc	nc	nc
MSMB-28	nc	nc	nc	nc	719	20.2	nc	nc	nc
MSMB-29	0.1	759	3.5	7.3	*1,580	16.4	374	454	0.9
MSMB-30	0.2	757	4.0	6.7	894	22.3	180	219	0
MSMB-31	nc	nc	5.2	nc	594	16.4	nc	nc	nc
MSMB-32	nc	nc	8.4	nc	353	18.4	nc	nc	nc
MSMB-33	0.3	753	1.4	7.2	567	19.0	148	180	0.2
MSMB-34	nc	nc	0.2	nc	711	23.4	nc	nc	nc
MSMB-35	0.2	762	nc	7.3	*1,260	16.0	330	401	0.5
MSMB-36	nc	nc	0.4	nc	568	20.7	nc	nc	nc
MSMB-37	0.1	757	5.4	7.0	711	23.1	152	184	0.2
MSMB-38	nc	nc	4.3	nc	756	21.2	nc	nc	nc
MSMB-39	nc	nc	nc	nc	801	20.0	nc	nc	nc
MSMB-40	0.1	nc	4.3	7.2	694	21.7	157	191	0.3
MSMB-41	nc	nc	0.7	nc	572	18.3	nc	nc	nc
MSMB-42	nc	nc	9.4	nc	438	17.6	nc	nc	nc
MSMB-43	nc	nc	1.8	nc	*1,440	16.3	nc	nc	nc
MSMB-44	0.1	759	4.9	7.2	*1,820	18.0	306	372	0.7

Table 10. Water-quality indicators determined in the field for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; SMCL-CA, California Department of Health Services secondary maximum contaminant level; SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; C, celsius; mg/L, milligrams per liter; mm, millimeter; na, not available; nc, sample not collected; NTU, nephelometric turbidity unit; µS/cm, microsiemens per centimeter; <, less than; >, greater than; *, value exceeds regulatory threshold]

GAMA identification No.	Turbidity (NTU) (63676)	Barometric Pressure (mm of mercury) (00025)	Dissolved oxygen (mg/L) (00300)	pH, field (standard units) (00400)	Specific conductance, field (µS/cm at 25 degrees C) (00095)	Water temperature (degrees C) (00010)	Alkalinity (mg/L as $CaCO_3$) (29802)	Bicarbonate (mg/L as HCO_3) (63786)	Carbonate (mg/L as CO_3) (63788)
Threshold type	**na**	**na**	**na**	**SMCL-US**	**SMCL-CA[1]**	**na**	**na**	**na**	**na**
Threshold	**na**	**na**	**na**	**<6.5 or >8.5**	**900**	**na**	**na**	**na**	**na**
MSMB-45	1.2	762	1.3	6.6	497	17.4	100	122	0
MSMB-46	nc	nc	0.7	nc	746	16.7	nc	nc	nc
MSMB-47	0.1	759	2.8	7.7	541	25.7	136	165	0
MSMB-48	nc	nc	12.0	nc	*912	17.7	nc	nc	nc
MSMBFP-01	nc	nc	0.3	nc	615	29.1	nc	nc	nc
MSMBFP-02	0.1	758	1.4	7.3	*1,240	19.8	295	359	0.5
MSMBFP-03	0.1	nc	1.3	6.9	*1,360	19.2	224	nc	nc
MSMBMW-01	2.9	nc	2.2	8.2	670	24.2	175	nc	nc
MSMBMW-02	3.8	nc	4.6	7.7	606	24.0	187	nc	nc
MSMBMW-03	1.7	nc	3.8	7.1	567	23.4	159	nc	nc
MSPR-01	0.1	737	4.0	7.1	847	18.0	260	316	0.3
MSPR-02	nc	nc	2.0	nc	*1,140	21.2	nc	nc	nc
MSPR-03	nc	nc	1.7	nc	815	24.0	nc	nc	nc
MSPR-04	nc	nc	1.1	nc	871	28.2	nc	nc	nc
MSPR-05	nc	nc	0.2	nc	*941	30.8	nc	nc	nc
MSPR-06	nc	nc	6.2	nc	871	22.4	nc	nc	nc
MSPR-07	nc	nc	nc	nc	719	24.5	nc	nc	nc
MSPR-08	0.1	743	0.8	7.5	*1,140	21.0	219	267	0.4
MSPR-09	nc	nc	nc	nc	*1,590	23.5	nc	nc	nc
MSPR-10	0.2	744	0.1	7.2	*1,480	20.0	275	335	0.1
MSPR-11	nc	nc	nc	nc	605	24.0	nc	nc	nc
MSSC-01	nc	nc	8.4	nc	475	13.5	nc	nc	nc
MSSC-02	nc	nc	0.2	nc	*978	18.3	nc	nc	nc
MSSC-03	nc	nc	2.8	nc	495	16.7	nc	nc	nc
MSSC-04	1.5	746	0.4	7.6	783	19.7	135	164	0.4
MSSC-05	nc	nc	1.8	nc	823	26.6	nc	nc	nc
MSSC-06	0.1	759	0.2	7.5	694	18.5	128	156	0.1
MSSC-07	0.1	759	0.3	7.7	505	24.9	nc	nc	nc
MSSC-08	0.2	758	0.2	7.6	403	19.6	165	200	0.1
MSSC-09	nc	nc	6.6	nc	446	17.2	nc	nc	nc
MSSC-10	nc	nc	5.5	nc	646	23.4	nc	nc	nc
MSSC-11	nc	nc	0.1	nc	414	17.7	nc	nc	nc
MSSC-12	nc	nc	0.2	nc	444	15.7	nc	nc	nc
MSSC-13	nc	nc	3.0	nc	326	16.8	nc	nc	nc
MSSV-01	0.4	748	0.1	7.0	*1,650	28.4	305	372	0.1
MSSV-02	0.1	752	0.1	7.2	509	19.2	154	187	0.4
MSSV-03	0.1	756	0.6	7.3	*1,060	18.4	171	208	0.4
MSSV-04	nc	nc	nc	nc	615	21.7	nc	nc	nc
MSSV-05	nc	nc	<0.1	nc	590	18.6	nc	nc	nc
MSSV-06	nc	nc	nc	nc	538	19.1	nc	nc	nc
MSSV-07	nc	754	0.1	7.5	534	19.0	149	181	0.2
MSSV-08	nc	nc	3.5	nc	*1,390	19.2	nc	nc	nc
MSSV-09	nc	nc	4.7	nc	815	18.0	nc	nc	nc
MSSV-10	nc	nc	2.2	nc	599	18.4	nc	nc	nc

Table 10. Water-quality indicators determined in the field for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

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GAMA identification No.	Turbidity (NTU) (63676)	Barometric Pressure (mm of mercury) (00025)	Dissolved oxygen (mg/L) (00300)	pH, field (standard units) (00400)	Specific conductance, field (µS/cm at 25 degrees C) (00095)	Water temperature (degrees C) (00010)	Alkalinity (mg/L as $CaCO_3$) (29802)	Bicarbonate (mg/L as HCO_3) (63786)	Carbonate (mg/L as CO_3) (63788)
Threshold type	**na**	**na**	**na**	**SMCL-US**	**SMCL-CA[1]**	**na**	**na**	**na**	**na**
Threshold	**na**	**na**	**na**	**<6.5 or >8.5**	**900**	**na**	**na**	**na**	**na**
MSSV-11	0.2	753	8.0	7.4	473	17.9	138	168	0.8
MSSV-12	nc	nc	nc	nc	387	14.3	nc	nc	nc
MSSV-13	nc	nc	10.4	nc	345	13.9	nc	nc	nc
MSSV-14	nc	nc	nc	nc*	*1,830	18.2	nc	nc	nc
MSSV-15	nc	nc	nc	nc	606	18.2	nc	nc	nc
MSSV-16	nc	nc	7.7	nc	nc	20.0	nc	nc	nc
MSSV-17	nc	nc	4.5	nc	341	14.5	nc	nc	nc
MSSV-18	0.1	756	0.3	7.6	848	25.4	156	189	0.55
MSSV-19	0.1	756	2.5	7.4	708	23.4	156	191	0.1

[1]SMCL-CA threshold for specific conductance has a recommended value of 900 mg/L, an upper value of 1,600 mg/L, and a short term value of 2,200 mg/L.

Table 11. Results of analyses for volatile organic compounds (VOCs) and gasoline additives in unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property. Out of 97 samples, only those with detections are listed. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency defined maximum contaminant level; MCL-CA; California Department of Health Services defined maximum contaminant level; NL, California notification level; E, estimated value; LRL, laboratory reporting level; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; µg/L, micrograms per liter; —, not detected; percentage values are detection frequencies]

GAMA identification No.	Chloroform (Trichloromethane) (µg/L) (32106)	Tetrachloroethene (PCE) (µg/L) (34475)	Carbon disulfide (µg/L) (77041)	1,2,4-Trimethylbenzene (µg/L) (77222)	*tert*-Butyl methyl ether (MTBE) (µg/L) (78032)	Trichloroethene (TCE) (µg/L) (39180)	Bromodichloromethane (µg/L) (32101)	*cis*-1,2-Dichloroethylene (µg/L) (77093)	Tetrachloromethane (carbon tetrachloride) (µg/L) (32102)	Bromoform (tribromomethane) (µg/L) (32104)	Dibromochloromethane (µg/L) (32105)
Threshold type	**MCL-US**	**HAL-US**	**NL**	**NL**	**MCL-CA**	**MCL-CA**	**MCL-US**	**MCL-CA**	**MCL-CA**	**MCL-US**	**MCL-US**
Threshold (µg/L)	**80**	**10**	**160**	**330**	**13**	**5**	**80**	**6**	**0.5**	**80**	**80**
LRL	**[0.02]**	**[0.03]**	**[0.04]**	**[0.06]**	**[0.1]**	**[0.04]**	**[0.03]**	**[0.02]**	**[0.06]**	**[0.1]**	**[0.1]**
MSMB-01	0.17	—	—	—	E0.1	—	—	—	—	—	—
MSMB-02	0.17	0.48	—	—	E0.1	E0.06	E0.08	—	—	—	E0.1
MSMB-05	E0.09	E0.09	—	—	E0.1	—	E0.04	—	—	0.84	0.2
MSMB-08	E0.02	—	—	E0.03	—	—	—	—	—	—	—
MSMB-11	—	E0.01	—	—	—	—	—	—	—	—	—
MSMB-13	E0.08	0.43	—	—	—	0.80	—	0.38	E0.03	—	—
MSMB-15	—	—	—	0.22	—	—	—	—	—	—	—
MSMB-16	E0.04	E0.04	—	—	—	0.41	—	E0.04	E0.06	—	—
MSMB-18	E0.02	—	—	E0.05	—	—	—	—	—	—	—
MSMB-20	E0.07	0.24	—	—	—	0.23	—	0.56	E0.02	—	—
MSMB-24	0.14	E0.08	—	—	—	—	—	—	—	—	—
MSMB-29	—	—	—	E0.02	—	—	—	—	—	—	—
MSMB-30	E0.07	2.05	—	E0.02	—	—	—	—	E0.07	—	—
MSMB-31	E0.02	—	—	—	—	—	—	—	—	—	—
MSMB-32	E0.03	—	—	—	—	—	—	—	—	—	—
MSMB-33	0.12	—	E0.02	—	—	—	—	—	—	—	—
MSMB-36	—	—	—	—	—	—	E0.06	—	—	0.59	0.2
MSMB-40	—	—	—	—	—	—	—	—	—	—	—
MSMB-42	—	—	—	—	2.2	—	—	—	—	—	—
MSMB-45	—	—	—	0.11	—	—	—	—	—	—	—
MSPR-02	—	—	—	—	—	—	—	—	—	—	—
MSPR-04	E0.04	—	—	—	—	—	—	—	—	—	—
MSPR-06	E0.01	—	—	—	—	—	—	—	—	—	—
MSPR-08	E0.04	—	—	—	—	—	—	—	—	0.11	—
MSPR-10	—	—	E0.07	—	—	—	—	—	—	—	—

Table 11. Results of analyses for volatile organic compounds (VOCs) and gasoline additives in unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property. Out of 97 samples, only those with detections are listed. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency defined maximum contaminant level; MCL-CA; California Department of Health Services defined maximum contaminant level; NL, California notification level; E, estimated value; LRL, laboratory reporting level; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; µg/L, micrograms per liter; —, not detected; percentage values are detection frequencies]

GAMA identification No.	Chloroform (Trichloromethane) (µg/L) (32106)	Tetrachloroethene (PCE) (µg/L) (34475)	Carbon disulfide (µg/L) (77041)	1,2,4-Trimethylbenzene (µg/L) (77222)	*tert*-Butyl methyl ether (MTBE) (µg/L) (78032)	Trichloroethene (TCE) (µg/L) (39180)	Bromodichloromethane (µg/L) (32101)	*cis*-1,2-Dichloroethylene (µg/L) (77093)	Tetrachloromethane (carbon tetrachloride) (µg/L) (32102)	Bromoform (tribromomethane) (µg/L) (32104)	Dibromochloromethane (µg/L) (32105)
Threshold type	**MCL-US**	**HAL-US**	**NL**	**NL**	**MCL-CA**	**MCL-CA**	**MCL-US**	**MCL-CA**	**MCL-CA**	**MCL-US**	**MCL-US**
Threshold (µg/L)	**80**	**10**	**160**	**330**	**13**	**5**	**80**	**6**	**0.5**	**80**	**80**
LRL	**[0.02]**	**[0.03]**	**[0.04]**	**[0.06]**	**[0.1]**	**[0.04]**	**[0.03]**	**[0.02]**	**[0.06]**	**[0.1]**	**[0.1]**
MSSC-01	—	—	E0.03	—	—	—	—	—	—	—	—
MSSC-02	E0.02	—	—	—	—	—	—	—	—	—	—
MSSC-03	E0.04	—	—	—	—	—	—	—	—	—	—
MSSC-04	—	E0.08	—	—	1.5	E0.10	—	E0.07	—	—	—
MSSC-06	—	—	0.17	—	—	—	—	—	—	—	—
MSSV-01	—	—	E0.06	—	—	—	—	—	—	—	—
MSSV-03	0.46	—	—	—	—	—	E0.06	—	—	—	—
MSSV-05	—	—	0.16	—	—	—	—	—	—	—	—
MSSV-08	E0.02	—	—	—	—	—	—	—	—	—	—
Number of wells with detections	20	9	6	6	5	5	4	4	4	3	3
Detection frequency (percent)	22	10	7	7	5	5	4	4	4	3	3
Flow-path wells[1]											
MSMBFP-02	—	—	—	—	—	E0.06	—	—	—	—	—
MSMBFP-03	1.94	—	—	—	—	—	0.71	—	—	0.64	E0.7
MSMBMW-01	—	3.95	—	—	—	—	—	—	—	—	—
MSMBMW-02	—	E0.06	—	—	—	—	—	—	—	—	—
MSMBMW-03	—	0.19	—	E0.04	—	—	—	—	—	—	—

[1]Flow-path wells were not included in statistical calculations.

Table 11. Results of analyses for volatile organic compounds (VOCs) and gasoline additives in unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property. Out of 97 samples, only those with detections are listed. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency defined maximum contaminant level; MCL-CA; California Department of Health Services defined maximum contaminant level; NL, California notification level; E, estimated value; LRL, laboratory reporting level; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; µg/L, micrograms per liter; —, not detected; percentage values are detection frequencies]

GAMA identification No.	Tetrahydrofuran (µg/L) (81607)	1,1,2-Trichlorotrifluoroethane (CFC-113) (µg/L) (77652)	1,1-Dichloroethane (µg/L) (34496)	1,1-Dichloroethene (µg/L) (34501)	1,2-Dichloropropane (µg/L) (34541)	2-Butanone (Ethyl methyl ketone) (µg/L) (81595)	Benzene (µg/L) (34030)	Dibromomethane (µg/L) (30217)	Dichloromethane (µg/L) (34423)	Diisopropyl ether (µg/L) (81577)	Ethylbenzene (µg/L) (34371)
LRL	**na**	**[0.04]**	**[0.04]**	**[0.02]**	**[0.03]**	**[4 (2)]**	**[0.02]**	**[0.05]**	**[0.1]**	**[0.1]**	**[0.03]**
Threshold type	**na**	**MCL-US**	**MCL-CA**	**MCL-CA**	**MCL-US**	**na**	**MCL-CA**	**na**	**MCL-US**	**na**	**MCL-CA**
Threshold (µg/L)	**[1]**	**1,200**	**5**	**6**	**0.5**	**na**	**1**	**na**	**5**	**na**	**300**
MSMB-01	—	—	—	—	—	—	—	—	—	—	—
MSMB-02	—	—	—	—	—	—	—	—	—	—	—
MSMB-05	—	—	E0.04	—	—	—	—	—	—	—	E0.07
MSMB-08	—	—	—	—	—	—	—	—	—	—	—
MSMB-11	—	—	—	—	—	—	—	—	—	—	—
MSMB-13	—	—	—	—	—	—	—	—	—	—	—
MSMB-15	—	—	—	—	—	—	—	—	—	—	—
MSMB-16	—	—	—	—	—	—	—	—	—	—	—
MSMB-18	—	—	—	—	—	—	—	—	—	—	—
MSMB-20	—	—	—	—	—	—	—	—	—	—	—
MSMB-24	—	—	—	E0.02	—	—	—	—	—	—	—
MSMB-29	—	—	—	—	—	—	—	—	—	—	—
MSMB-30	—	—	—	—	—	—	—	—	—	—	—
MSMB-31	—	—	—	—	—	—	—	—	—	—	—
MSMB-32	—	—	—	—	—	—	—	—	—	—	—
MSMB-33	—	—	—	—	—	—	—	—	—	—	—
MSMB-36	—	—	—	—	—	—	—	E0.07	—	—	—
MSMB-40	—	E0.07	—	—	—	—	—	—	—	—	—
MSMB-42	—	—	—	—	—	—	—	—	—	—	—
MSMB-45	—	—	—	—	—	—	—	—	—	—	—
MSPR-02	E0.8	—	—	—	—	—	—	—	—	—	—
MSPR-04	—	—	—	—	—	—	—	—	—	—	—
MSPR-06	—	—	—	—	—	—	—	—	—	—	—
MSPR-08	—	—	—	—	—	—	—	—	—	—	—
MSPR-10	—	—	—	—	—	—	—	—	—	—	—

Table 11. Results of analyses for volatile organic compounds (VOCs) and gasoline additives in unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property. Out of 97 samples, only those with detections are listed. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency defined maximum contaminant level; MCL-CA; California Department of Health Services defined maximum contaminant level; NL, California notification level; E, estimated value; LRL, laboratory reporting level; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; µg/L, micrograms per liter; —, not detected; percentage values are detection frequencies]

GAMA identification No.	Tetrahydrofuran (µg/L) (81607)	1,1,2-Trichlorotrifluoroethane (CFC-113) (µg/L) (77652)	1,1-Dichloroethane (µg/L) (34496)	1,1-Dichloroethene (µg/L) (34501)	1,2-Dichloropropane (µg/L) (34541)	2-Butanone (Ethyl methyl ketone) (µg/L) (81595)	Benzene (µg/L) (34030)	Dibromomethane (µg/L) (30217)	Dichloromethane (µg/L) (34423)	Diisopropyl ether (µg/L) (81577)	Ethylbenzene (µg/L) (34371)
LRL	**na**	**[0.04]**	**[0.04]**	**[0.02]**	**[0.03]**	**[4 (2)]**	**[0.02]**	**[0.05]**	**[0.1]**	**[0.1]**	**[0.03]**
Threshold type	**na**	**MCL-US**	**MCL-CA**	**MCL-CA**	**MCL-US**	**na**	**MCL-CA**	**na**	**MCL-US**	**na**	**MCL-CA**
Threshold (µg/L)	**[1]**	**1,200**	**5**	**6**	**0.5**	**na**	**1**	**na**	**5**	**na**	**300**
MSSC-01	—	—	—	—	—	—	—	—	—	—	—
MSSC-02	2.0	—	—	—	—	E0.9	—	—	—	—	—
MSSC-03	—	—	—	—	—	—	—	—	—	—	—
MSSC-04	—	—	—	—	—	—	E0.05	—	—	E0.06	—
MSSC-06	—	—	—	—	—	—	—	—	—	—	—
MSSV-01	—	—	—	—	—	—	—	—	—	—	—
MSSV-03	—	—	—	—	E0.03	—	—	—	E 0.04	—	—
MSSV-05	—	—	—	—	—	—	—	—	—	—	—
MSSV-08	—	—	—	—	—	—	—	—	—	—	—
Number of wells with detections	2	1	1	1	1	1	1	1	1	1	1
Detection frequency (percent)	2	1	1	*1*	1	1	1	1	1	1	1
Flow-path wells[1]											
MSMBFP-02	—	—	0.12	0.34	—	—	—	—	—	—	—
MSMBFP-03	—	—	—	—	—	—	—	—	—	—	—
MSMBMW-01	—	—	—	—	—	—	—	—	—	—	—
MSMBMW-02	—	—	—	—	—	—	—	—	—	—	—
MSMBMW-03	—	—	—	—	—	—	—	—	—	—	—

[1]Flow-path wells were not included in statistical calculations.

Table 11. Results of analyses for volatile organic compounds (VOCs) and gasoline additives in unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property. Out of 97 samples, only those with detections are listed. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency defined maximum contaminant level; MCL-CA; California Department of Health Services defined maximum contaminant level; NL, California notification level; E, estimated value; LRL, laboratory reporting level; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; µg/L, micrograms per liter; —, not detected; percentage values are detection frequencies]

GAMA identification No.	Isopropyl benzene (µg/L) (77223)	*m*-Xylene plus *p*-xylene (µg/L) (85795)	*tert*-Amyl alcohol (µg/L) (77073)	*tert*-Butyl benzene (µg/L) (77353)	*trans*-1,2-Dichloro ethene (µg/L) (34546)	1,1,1-Trichloro ethane (TCA) (µg/L) (34506)	Detections per well
LRL	**[0.04]**	**[0.06]**	**[1]**	**[0.06]**	**[0.03]**	**[0.03]**	
Threshold type	**na**	**MCL-CA**	**na**	**na**	**MCL-CA**	**MCL-US**	
Threshold (µg/L)	**na**	**1,750**	**na**	**na**	**10**	**200**	
MSMB-01	—	—	—	—	—	—	2
MSMB-02	—	—	—	E0.01	—	—	7
MSMB-05	—	—	—	—	—	—	8
MSMB-08	—	E0.03	—	—	—	—	3
MSMB-11	—	—	—	—	—	—	1
MSMB-13	—	—	—	—	—	—	5
MSMB-15	—	—	—	—	—	—	1
MSMB-16	—	—	—	—	—	—	5
MSMB-18	—	—	—	—	—	—	2
MSMB-20	—	—	—	—	E0.02	—	6
MSMB-24	—	—	—	—	—	—	3
MSMB-29	—	—	—	—	—	—	1
MSMB-30	—	—	—	—	—	—	4
MSMB-31	—	—	—	—	—	—	1
MSMB-32	—	—	—	—	—	—	1
MSMB-33	—	—	—	—	—	—	2
MSMB-36	—	—	—	—	—	—	4
MSMB-40	—	—	—	—	—	—	1
MSMB-42	—	—	—	—	—	—	1
MSMB-45	—	—	—	—	—	—	1
MSPR-02	—	—	—	—	—	—	1
MSPR-04	—	—	—	—	—	—	1
MSPR-06	E0.02	—	—	—	—	—	2
MSPR-07	—	—	—	—	—	—	1
MSPR-08	—	—	—	—	—	—	2
MSPR-10	—	—	—	—	—	—	1
MSSC-01	—	—	—	—	—	—	1
MSSC-02	—	—	—	—	—	—	3

Table 11. Results of analyses for volatile organic compounds (VOCs) and gasoline additives in unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property. Out of 97 samples, only those with detections are listed. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency defined maximum contaminant level; MCL-CA; California Department of Health Services defined maximum contaminant level; NL, California notification level; E, estimated value; LRL, laboratory reporting level; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; µg/L, micrograms per liter; —, not detected; percentage values are detection frequencies]

GAMA identification No.	Isopropyl benzene (µg/L) (77223)	*m*-Xylene plus *p*-xylene (µg/L) (85795)	*tert*-Amyl alcohol (µg/L) (77073)	*tert*-Butyl benzene (µg/L) (77353)	*trans*-1,2-Dichloroethene (µg/L) (34546)	1,1,1-Trichloroethane (TCA) (µg/L) (34506)	Detections per well
LRL	**[0.04]**	**[0.06]**	**[1]**	**[0.06]**	**[0.03]**	**[0.03]**	
Threshold type	**na**	**MCL-CA**	**na**	**na**	**MCL-CA**	**MCL-US**	
Threshold (µg/L)	**na**	**1,750**	**na**	**na**	**10**	**200**	
MSSC-03	—	—	—	—	—	—	1
MSSC-04	—	—	E0.7	—	—	—	7
MSSC-06	—	—	—	—	—	—	1
MSSV-01	—	—	—	—	—	—	1
MSSV-03	—	—	—	—	—	—	4
MSSV-05	—	—	—	—	—	—	1
MSSV-08	—	—	—	—	—	—	1
Number of wells with detections	1	1	1	1	1	0	86 Total detections
Detection frequency (percent)	1	1	1	1	1	0	34 Total wells
			Flow-path wells[1]				
MSMBFP-02	—	—	—	—	—	E0.02	4
MSMBFP-03	—	—	—	—	—	—	4
MSMBMW-01	—	—	—	—	—	—	1
MSMBMW-02	—	—	—	—	—	—	1
MSMBMW-03	—	—	—	—	—	—	2

[1]Flow-path wells were not included in statistical calculations.

Table 12. Pesticides and pesticide degradates detected in filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property. Out of 97 samples, only those with detections are listed. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency defined maximum contaminant level; MCL-CA, California Department of Health Services defined maximum contaminant level; E, estimated value; LRL, laboratory reporting level; na, not available; VE, estimated value censored due to blank contamination and not included in ground-water quality analyses; µg/L, microgram per liter; —, not detected; percentage values are detection frequencies]

GAMA identification No.	Simazine (µg/L) (04035)	Deethyl atrazine (µg/L) (04040)	Atrazine (µg/L) (39632)	Caffeine (µg/L) (50305)	Dacthal (DCPA) (µg/L) (82682)	Metolachlor (µg/L) (39415)
Threshold type	**MCL-US**	**na**	**MCL-CA**	**na**	**MCL-CA**	**HAL-US**
Threshold (µg/L)	**4**	**na**	**1**	**na**	**4**	**100**
[LRL]	**[0.005]**	**[0.006 (0.03)]**	**[0.007]**	**[0.018]**	**[0.003]**	**[0.006]**
MSMB-01	0.009	—	—	—	—	—
MSMB-02	0.020	E0.007	0.035	—	—	—
MSMB-05	—	E0.004	—	—	—	—
MSMB-19	—	E0.004	0.008	—	—	—
MSMB-20	—	—	—	—	—	E0.005
MSMB-30	—	E0.004	—	—	—	—
MSMB-35	—	—	—	E0.008	—	—
MSMB-44	—	E0.003	—	—	—	—
MSMB-46	—	—	—	—	E0.004	—
MSPR-01	0.008	—	—	—	—	—
MSPR-04	0.010	E0.010	0.011	—	—	—
MSPR-08	0.008	E0.006	E0.005	—	—	—
MSPR-09	—	E0.005	E0.006	—	—	—
MSPR-11	0.007	—	—	—	—	—
MSSC-01	—	—	—	—	—	E0.007
MSSV-03	E0.005	—	—	—	—	—
MSSV-04	—	E0.005	—	—	—	—
MSSV-05	0.008	—	—	—	—	—
MSSV-06	E0.005	—	—	—	—	—
MSSV-07	0.008	—	—	—	—	—
MSSV-08	E0.005	—	—	—	E0.004	—
MSSV-09	E0.008	—	—	—	—	—
MSSV-11	0.010	—	—	E0.012	—	—
MSSV-12	E0.006	—	—	—	—	—
MSSV-14	E0.006	E0.006	—	—	—	—
MSSV-15	E0.006	—	—	—	E0.002	—
MSSV-19	—	—	—	E0.004	—	—
Number of wells with detections	16	10	5	3	3	2
Detection frequency (percent)	18	11	5	3	3	2
Flow-path wells[1]						
MSMBMW-03	—	—	—	E0.012	—	—

Table 12. Pesticides and pesticide degradates detected in filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property. Out of 97 samples, only those with detections are listed. MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency defined maximum contaminant level; MCL-CA, California Department of Health Services defined maximum contaminant level; E, estimated value; LRL, laboratory reporting level; na, not available; VE, estimated value censored due to blank contamination and not included in ground-water quality analyses; µg/L, microgram per liter; —, not detected; percentage values are detection frequencies]

GAMA identification No.	Deisopropyl atrazine (µg/L) (04038)	Dieldrin (µg/L) (39381)	Prometon (µg/L) (04037)	Terbuthyl azine (µg/L) (04022)	Detections per well
LRL	**[0.08]**	**[0.009]**	**[0.01]**	**[0.01]**	
Threshold type	**na**	**na**	**HAL-US**	**na**	
Threshold (µg/L)	**na**	**na**	**100**	**na**	
MSMB-01	—	—	E0.01	—	2
MSMB-02	—	E0.006	—	—	4
MSMB-05	—	—	—	—	1
MSMB-19	—	—	—	—	2
MSMB-20	—	—	—	—	1
MSMB-30	—	—	—	—	1
MSMB-35	—	—	—	—	1
MSMB-44	—	—	—	—	1
MSMB-46	—	—	—	—	1
MSPR-01	—	—	—	—	1
MSPR-04	—	—	—	—	3
MSPR-08	—	—	—	—	3
MSPR-09	—	—	—	—	2
MSPR-11	—	—	—	—	1
MSSC-01	—	—	—	—	1
MSSV-03	—	—	—	—	1
MSSV-04	—	—	—	—	1
MSSV-05	—	—	—	—	1
MSSV-06	—	—	—	—	1
MSSV-07	—	—	—	E0.01	2
MSSV-08	—	—	—	—	2
MSSV-09	—	—	—	—	1
MSSV-11	E0.004	—	—	—	3
MSSV-12	—	—	—	—	1
MSSV-14	—	—	—	—	2
MSSV-15	—	—	—	—	2
MSSV-19	—	—	—	—	1
Number of wells with detections	1	1	1	1	43 Total detections
Detection frequency (percent)	1	1	1	1	27 Total wells
Flow-path wells[1]					
MSMBMW-03	—	—	—	—	—

[1]Flow-path wells were not included in statistical calculations.

Table 13. Results of analyses by Montgomerey Watson-Harza Laboratory for the constituents of special interest: perchlorate, N-nitrosodimethylamine (NDMA), and trichloropropane (1,2,3-TCP) in the ground-water samples collected in the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSSC, Santa Cruz study area well; MRL, method reporting level; NL, California notification level; µg/L, microgram per liter; —, analyzed but not detected]

GAMA identification No.[1]	Perchlorate (µg/L)	*N*-nitrosodimethylamine (µg/L)	1,2,3-trichloropropane (µg/L)
Threshold type	NL	NL	NL
Threshold (µg/L)	6	0.01	0.005
[MRL]	[0.5]	[0.002]	[0.005]
MSMB-44	—	0.0030	0.034
MSSC-08	—	0.0022	—

[1]Out of 97 samples, only those with detections are listed.

Table 14. Nutrients and dissolved organic carbon in filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; E, estimated value; LRL, laboratory reporting level; mg/L, milligrams per liter; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; *, value exceeds regulatory threshold; —, not detected]

GAMA identification No.	Ammonia as nitrogen (mg/L) (00608)	Dissolved organic carbon (mg/L) (00681)	Nitrite as nitrogen (mg/L) (00613)	Nitrite plus nitrate as nitrogen (mg/L) (00631)	Total nitrogen (nitrate + nitrite + ammonia + organic-nitrogen) as nitrogen (mg/L) (62854)	Phosphorous as orthophos - phate (mg/L) (00671)
Threshold type	**HAL-US**	**na**	**MCL-US**	**MCL-US**	**na**	**na**
Threshold (mg/L)	**30**	**na**	**1**	**10**	**na**	**na**
[LRL]	**[0.04]**	**[0.3]**	**[0.008]**	**[0.06]**	**[0.03]**	**[0.006]**
MSMB-04	—	—	—	—	—	0.011
MSMB-09	—	E0.2	—	0.09	0.13	0.079
MSMB-12	0.50	0.4	—	—	0.55	0.013
MSMB-18	—	E0.3	—	0.67	0.70	0.057
MSMB-20	—	0.4	—	1.60	1.75	0.068
MSMB-22	—	1.8	—	—	—	0.014
MSMB-29[1]	—	4.4	—	4.67	4.56	0.066
MSMB-30	—	E0.3	—	3.87	4.00	0.060
MSMB-33	—	0.4	E0.005	1.52	1.55	0.039
MSMB-35	0.07	1.8	—	—	0.17	0.048
MSMB-37	—	VE0.2	—	1.64	1.68	0.054
MSMB-40	—	E0.3	—	1.18	1.18	0.034
MSMB-44[1]	—	V1.0	—	*37.8	37.5	0.025
MSMB-45	0.11	1.3	0.008	—	0.17	0.075
MSMB-47	—	VE0.2	—	0.56	0.59	—
MSMBFP-02[1]	—	0.7	—	*11.6	11.4	0.016
MSMBFP-03	—	0.5	—	9.34	9.55	0.060
MSMBMW-01	—	VE0.3	—	0.80	0.82	0.006
MSMBMW-02	—	VE0.3	—	0.95	1.02	0.009
MSMBMW-03	—	V0.4	—	1.38	1.40	0.066
MSPR-01	—	1.0	—	2.19	2.25	0.010
MSPR-08[1]	—		—	3.57	3.74	E0.005
MSPR-10	—	0.4	E0.004	0.38	0.40	E0.005
MSSC-04	0.70	0.8	—	—	0.75	0.007
MSSC-06	0.07	0.4	—	—	0.09	0.103
MSSC-07	0.68	0.4	—	—	0.70	0.018
MSSC-08	0.35	0.7	—	—	0.39	0.075
MSSV-01	1.60	0.9	—	—	1.64	E0.005
MSSV-02	—	0.6	—	0.31	0.40	0.051
MSSV-03	—	1.3	—	E0.04	0.10	0.106
MSSV-07	—	0.7	—	1.03	1.17	0.040
MSSV-11	—	0.4	—	1.85	1.96	0.013
MSSV-18	0.04	0.3	—	0.24	0.30	0.007
MSSV-19	—	0.4	—	1.02	1.06	0.011

[1]Total nitrogen in these samples is less than the sum of the filtered nitrogen analytes, but falls within the U.S. Geological Survey National Water Quality Laboratory acceptance criterion of a 10 percent relative percent difference.

Table 15. Major and minor ions and dissolved solids in filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; SMCL-CA, California Department of Health Services secondary maximum contaminant level; SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; LRL, laboratory reporting level; mg/L, milligrams per liter; E, estimated value; na, not available; nd, no data; *, value exceeds regulatory threshold; —, not detected]

GAMA identification No.	Calcium (mg/L) (00915)	Magnesium (mg/L) (00925)	Potassium (mg/L) (00935)	Sodium (mg/L) (00930)	Bromide (mg/L) (71870)	Chloride (mg/L) (00940)	Fluoride (mg/L) (00950)	Iodide (mg/L) (71865)	Silica (mg/L) (00955)	Sulfate (mg/L) (00945)	Total dissolved solids (residue on evaporation) (mg/L) (70300)
Threshold type	na	na	na	na	na	SMCL-CA	MCL-US	na	na	SMCL-CA[1]	SMCL-CA[2]
Threshold (mg/L)	na	na	na	na	na	250	2	na	na	250	500
[LRL]	[0.02]	[0.008]	[0.16]	[0.2]	[0.02]	[0.2]	[0.1]	[0.002]	[0.04]	[0.18]	[10]
MSMB-04	40.2	52.4	16.9	112	1.01	241	E0.1	E0.015	31.2	61.9	*658
MSMB-09	49.5	20.8	1.85	20.3	—	17.0	0.3	0.004	34.0	31.6	281
MSMB-12	15.4	0.64	3.78	130	0.42	123	0.1	0.049	39.0	46.4	446
MSMB-18	34.8	14.6	1.97	45.7	E0.01	61.2	0.2	—	51.1	14.4	302
MSMB-20	78.9	32.7	2.53	39.0	0.28	31.3	0.2	0.008	37.5	54.3	464
MSMB-22	69.2	53.2	2.56	69.1	0.27	73.9	0.2	0.041	30.9	125	*619
MSMB-29	163	62.0	5.46	149	0.66	68.3	0.2	0.012	37.3	*445	*1,230
MSMB-30	84.0	30.9	2.21	58.4	0.38	112	0.3	E0.002	45.5	88.1	*547
MSMB-33	27.7	11.0	1.93	69.7	0.22	71.2	0.4	0.029	31.4	6.80	312
MSMB-35	100	57.9	2.36	89.5	0.92	98.2	0.3	0.030	31.5	216	*828
MSMB-37	47.0	16.2	1.81	75.8	0.36	113	0.5	0.003	45.5	15.2	425
MSMB-40	58.4	22.3	3.46	57.9	0.29	48.0	0.4	0.003	41.2	133	*517
MSMB-44	171	73.1	4.07	118	0.52	112	0.3	E0.004	36.6	*387	*1,300
MSMB-45	50.6	14.9	3.17	27.2	0.08	29.1	0.3	E0.002	24.4	102	326
MSMB-47	47.7	15.8	2.50	40.9	0.12	28.2	0.2	—	46.8	92.6	366
MSMBFP-02	120	46.0	4.55	83.6	0.34	76.0	0.3	—	43.1	223	*853
MSMBFP-03	114	49.6	4.24	84.8	0.58	178	0.3	0.004	41.0	161	*826
MSMBMW-01	39.0	14.4	3.28	74.0	0.22	69.6	0.2	0.003	47.3	32.7	386
MSMBMW-02	32.3	11.1	5.31	71.3	0.19	58.8	0.5	0.003	43.8	30.9	378
MSMBMW-03	43.6	14.9	3.46	49.3	0.22	69.4	0.3	E0.001	44.7	26.3	360
MSPR-01	100	38.1	1.54	34.5	0.25	58.8	0.2	0.002	37.7	126	*593
MSPR-08	59.2	55.3	3.00	102	0.32	111	0.4	0.035	51.0	173	*725
MSPR-10	124	58.9	4.17	209	0.29	86.5	0.4	0.009	39.9	*563	*1,330
MSSC-04	72.8	8.93	2.68	76.2	0.28	44.1	0.1	0.022	39.4	180	*518
MSSC-06	70.4	16.8	6.95	43.0	0.36	70.0	0.1	0.004	67.8	102	455
MSSC-07	40.3	14.9	5.49	44.0	0.28	22.7	0.4	0.007	63.4	38.9	348
MSSC-08	43.4	13.2	5.07	21.4	0.04	11.2	0.3	0.003	71.2	26.6	287
MSSV-01	134	62.9	14.1	138	0.43	99.2	0.1	0.075	55.1	*449	*1,190
MSSV-02	52.6	22.1	1.46	25.7	0.06	18.9	0.2	0.007	32.6	78.4	332
MSSV-03	106	41.0	1.77	51.1	0.27	70.7	0.3	0.020	32.5	*272	*723
MSSV-07	50.2	20.6	1.47	28.3	0.08	24.0	0.2	0.005	35.6	79.2	347
MSSV-11	55.5	14.3	2.54	21.3	0.04	11.2	0.3	—	29.6	80.8	322
MSSV-18	55.5	18.8	2.77	95.4	0.45	115	0.2	0.205	37.1	111	*555
MSSV-19	57.2	21.4	3.09	61.2	0.16	41.8	0.3	0.003	44.1	136	470

[1]SMCL-CA threshold for sulfate has a recommended value of 250 mg/L, an upper value of 500 mg/L, and a short-term value of 600 mg/L.

[2]SMCL-CA threshold for total dissolved solids has a recommended value of 500 mg/L, an upper value of 1,000 mg/L, and a short-term value of 1,500 mg/L.

Table 16. Trace elements in filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; NL, California notification level; SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; TT-US, U.S. Environmental Protection Agency treatment technique; E, estimated value; LRL, laboratory reporting level; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; µg/L, micrograms per liter; —, not detected; *, value exceeds regulatory threshold]

GAMA identification no.	Aluminum (µg/L) (01106)	Antimony (µg/L) (01095)	Arsenic (µg/L) (01000)	Barium (µg/L) (01005)	Beryllium (µg/L) (01010)	Boron (µg/L) (01020)	Cadmium (µg/L) (01025)	Chromium (µg/L) (01030)	Cobalt (µg/L) (01035)
Threshold type	**MCL-US**	**MCL-US**	**MCL-US**	**MCL-CA**	**MCL-US**	**NL**	**MCL-US**	**MCL-CA**	**na**
Threshold (µg/L)	**1,000**	**6**	**10**	**1,000**	**4**	**1,000**	**5**	**50**	**na**
[LRL]	**[2]**	**[0.2]**	**[0.2]**	**[0.2]**	**[0.06]**	**[8]**	**[0.04]**	**[0.8]**	**[0.014]**
MSMB-04	E1	—	—	4	—	88	—	—	0.073
MSMB-09	E0.9	—	0.6	26	—	64	—	14.2	0.059
MSMB-12	7	—	2.3	23	—	131	—	E0.04	—
MSMB-18	—	—	1.4	51	—	32	E0.03	13.1	0.059
MSMB-20	—	—	0.7	59	—	162	—	7.4	0.126
MSMB-22	E1	—	0.56	96	—	463	E0.02	0.07	0.161
MSMB-29	E1	—	2.6	46	—	656	0.37	E0.6	0.299
MSMB-30	E0.9	E0.11	3.3	89	—	46	0.04	3.5	0.183
MSMB-33	—	0.39	7.3	87	—	168	0.07	0.2	0.127
MSMB-35	E1	E0.14	V0.5	191	1.28	427	—	VE0.03	1.2
MSMB-37	VE1	E0.13	5.5	37	—	144	E0.02	0.13	0.094
MSMB-40	—	—	1.0	72	—	146	—	3.5	0.101
MSMB-44	—	—	1.2	48	—	325	0.14	6.6	E0.030
MSMB-45	—	—	0.8	62	—	30	0.07	—	0.267
MSMB-47	—	—	1.9	55	—	84	E0.03	6.3	0.061
MSMBFP-02	—	—	1.6	46	—	252	0.12	2.8	0.282
MSMBFP-03	—	—	1.4	128	—	87	0.18	5.4	0.125
MSMBMW-01	10	E0.17	3.2	78	0.06	129	E0.03	6.5	0.180
MSMBMW-02	20	E0.17	2.1	86	—	118	E0.03	7.3	0.050
MSMBMW-03	3	E0.17	2.7	71	—	49	0.04	4.2	0.180
MSPR-01	—	—	1.3	55	—	76	0.32	—	0.221
MSPR-08	—	E0.12	3.6	73	—	488	0.06	1.1	0.128
MSPR-10	—	—	1.3	16	—	753	0.07	—	0.390
MSSC-04	—	—	—	24	—	151	—	—	0.144
MSSC-06	—	—	0.2	22	—	47	—	—	0.179
MSSC-07	—	—	—	10	—	288	—	—	0.094
MSSC-08	E1	—	—	9.0	—	83	—	—	0.065
MSSV-01	—	—	4.8	13	—	285	—	—	0.192
MSSV-02	—	E0.11	1.3	41	—	80	0.11	E0.4	0.077
MSSV-03	—	—	2.6	55	—	240	0.04	E0.03	0.219
MSSV-07	E0.8	—	1.4	36	—	153	0.06	E0.7	0.112
MSSV-11	E0.9	—	0.8	54	—	34	0.13	1.2	0.082
MSSV-18	E1	—	1.6	108	—	330	E0.03	3.7	0.106
MSSV-19	E0.8	—	1.8	40	—	208	0.05	4.7	0.108

Table 16. Trace elements in filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; NL, California notification level; SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; TT-US, U.S. Environmental Protection Agency treatment technique; E, estimated value; LRL, laboratory reporting level; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; µg/L, micrograms per liter; —, not detected; *, value exceeds regulatory threshold]

GAMA identification no.	Copper (µg/L) (01040)	Iron (µg/L) (01046)	Lead (µg/L) (01049)	Lithium (µg/L) (01130)	Manganese (µg/L) (01056)	Mercury (µg/L) (71890)	Molybdenum (µg/L) (01060)	Nickel (µg/L) (01065)	Selenium (µg/L) (01145)
Threshold type	**TT-US**	**SMCL-US**	**NL**	**na**	**SMCL-US**	**MCL-US**	**HAL-US**	**MCL-CA**	**MCL-US**
Threshold (µg/L)	**1,300**	**300**	**15**	**na**	**50**	**2**	**40**	**100**	**50**
[LRL]	**[0.4]**	**[6]**	**[0.08]**	**[0.6]**	**[0.2]**	**[0.01]**	**[0.4]**	**[0.06]**	**[0.4]**
MSMB-04	4.4	48	0.55	10.9	13.3	—	2.1	1.22	—
MSMB-09	E0.4	18	0.25	13.2	0.6	—	5.0	1.80	0.9
MSMB-12	VE0.3	11	—	45	5.5	—	4.5	0.42	E0.1
MSMB-18	0.7	—	0.14	16.1	—	—	0.9	1.35	0.9
MSMB-20	0.8	—	0.85	18.2	1.6	—	2.3	2.68	2.0
MSMB-22	—	90	—	12.8	*60.8	—	4.2	1.41	—
MSMB-29	3.9	VE4.0	3.60	19.4	3.2	—	36.7	4.74	9.8
MSMB-30	4.0	9.0	0.94	29	1.3	E.010	2.7	4.26	4.8
MSMB-33	VE0.2	87	0.46	5.8	*208	—	*42.6	0.87	0.2
MSMB-35	2.0	35	E0.15	19.3	*2,410	—	3.7	7.24	0.1
MSMB-37	V1.9	VE6.0	0.38	56.1	VE0.1	—	6.3	1.67	—
MSMB-40	1.5	—	0.82	15.6	E0.1	—	3.6	1.47	0.6
MSMB-44	0.68	E4.0	0.59	35	0.6	—	8.2	0.76	6.2
MSMB-45	0.6	*2,830	0.14	3.4	*170	—	3.7	2.74	0.5
MSMB-47	0.6	10	1.99	16.6	0.8	—	6.8	1.49	1.4
MSMBFP-02	2.2	VE3.0	0.65	30.8	—	—	4.6	5.49	2.4
MSMBFP-03	2.3	23	0.43	17.2	0.3	.050	1.8	2.99	6.2
MSMBMW-01	0.6	—	—	25.8	0.4	—	10.4	1.42	0.8
MSMBMW-02	0.42	—	—	43.3	0.8	—	11.5	2.10	1.0
MSMBMW-03	0.45	—	—	28.4	1	—	4.9	4.20	1.9
MSPR-01	2.0	E4.0	3.52	7.9	0.2	—	6.2	4.67	7.3
MSPR-08	1.9	10	0.09	86.1	1	.030	17.8	2.44	2.7
MSPR-10	5.4	185	—	110	*78.4	—	18.2	5.20	17.6
MSSC-04	0.7	37	—	71	13.8	—	2.1	4.04	0.4
MSSC-06	0.7	*657	0.09	19.1	*197	—	2.8	3.44	0.7
MSSC-07	E0.3	92	E0.06	45.7	38.8	—	2.9	1.84	—
MSSC-08	VE0.2	218	0.38	35.2	*63	—	2.3	0.80	—
MSSV-01	1.1	*508	6.62	95.6	34.5	—	18.2	4.17	0.4
MSSV-02	0.4	—	0.33	8.8	5.1	—	4.8	1.73	0.4
MSSV-03	V1.5	33	0.17	25.5	*536	—	6.3	3.52	0.4
MSSV-07	1.2	6.0	4.03	16.5	E0.2	—	4.0	0.48	1.2
MSSV-11	0.6	—	0.17	9.4	E0.2	—	6.2	2.20	0.9
MSSV-18	0.8	24	0.29	33.7	19.3	—	11.5	1.03	1.6
MSSV-19	1.0	7.0	0.15	23.5	2.7	—	9.5	1.93	2.0

Table 16. Trace elements in filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; NL, California notification level; SMCL-US, U.S. Environmental Protection Agency secondary maximum contaminant level; TT-US, U.S. Environmental Protection Agency treatment technique; E, estimated value; LRL, laboratory reporting level; na, not available; V or VE, value censored due to blank contamination and not included in ground-water quality analyses; µg/L, micrograms per liter; —, not detected; *, value exceeds regulatory threshold]

GAMA identification no.	Silver (µg/L) (01075)	Strontium (µg/L) (01080)	Thallium (µg/L) (01057)	Tungsten (µg/L) (01155)	Uranium (µg/L) (22703)	Vanadium (µg/L) (01085)	Zinc (µg/L) (01090)
Threshold type	**na**	**HAL-US**	**MCL-US**	**na**	**MCL-US**	**NL**	**SMCL-US**
Threshold (µg/L)	**na**	**4,000**	**2**	**na**	**30**	**50**	**5,000**
[LRL]	**[0.2]**	**[0.4]**	**[0.04]**	**[0.5]**	**[0.04]**	**[0.1]**	**[0.04]**
MSMB-04	—	276	—	—	0.74	0.3	3.0
MSMB-09	—	248	—	—	0.50	3.7	6.5
MSMB-12	—	284	—	—	E0.03	—	E0.38
MSMB-18	—	239	—	—	0.91	12.6	0.8
MSMB-20	—	504	—	—	1.72	4.4	1.4
MSMB-22	—	698	—	—	2.38	4.8	E0.59
MSMB-29	—	785	—	—	17.20	7.3	8.0
MSMB-30	—	494	E0.02	—	5.94	7.1	4.5
MSMB-33	—	245	—	—	0.21	1.0	4.0
MSMB-35	—	699	—	—	1.35	3.0	6.6
MSMB-37	—	374	—	—	1.79	11.1	3.2
MSMB-40	—	326	—	—	4.80	16.7	8.2
MSMB-44	—	996	—	—	18.50	4.9	3.9
MSMB-45	—	255	—	—	0.20	0.8	1.8
MSMB-47	—	395	—	—	3.00	12.8	2.5
MSMBFP-02	—	696	—	—	13.10	9.7	4.3
MSMBFP-03	—	671	—	—	9.12	6.2	2.9
MSMBMW-01	—	401	—	0.9	3.50	18.9	E0.4
MSMBMW-02	—	332	—	0.4	2.21	12.4	—
MSMBMW-03	—	260	—	0.5	2.21	3.9	0.97
MSPR-01	—	455	0.04	—	2.58	2.4	3.1
MSPR-08	—	1,330	—	—	18.30	20.5	9.4
MSPR-10	—	1,790	—	—	28.90	6.8	3.3
MSSC-04	—	900	—	—	—	0.3	2.6
MSSC-06	—	226	—	—	E0.03	—	10.0
MSSC-07	—	467	—	—	—	0.4	1.7
MSSC-08	—	281	—	0.2	—	—	3.0
MSSV-01	—	1,530	0.05	—	0.37	E0.1	1,470
MSSV-02	—	326	—	—	1.42	3.4	1.0
MSSV-03	—	688	—	—	3.00	0.8	4.6
MSSV-07	—	344	—	—	1.09	3.7	1.7
MSSV-11	—	293	—	—	4.08	3.7	E0.5
MSSV-18	—	572	—	—	2.83	9.4	1.4
MSSV-19	—	436	—	—	4.13	9.6	3.7

Table 17. Inorganic arsenic and iron speciation results for filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; HAL-US, U.S. Environmental Protection Agency Lifetime Health Advisory; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; MDL, method detection limit; na, not available; µg/L, micrograms per liter; —, not detected]

GAMA identification No.	Arsenic, dissolved (µg/L) (99033)	Arsenic (III), dissolved (µg/L) (99034)	Iron, dissolved (µg/L) (01046)	Iron (II), dissolved (µg/L) (01047)
Threshold type	**MCL-US**	**na**	**HAL-US**	**na**
Threshold (µg/L)	**10**	**na**	**300**	**na**
[MDL]	**[0.5]**	**[1]**	**[1]**	**[1]**
MSMB-04	<0.5	<1	45	9.0
MSMB-09	<0.5	<1	<2	<2
MSMB-12	1.5	<1	13	12
MSMB-18	0.7	<1	<2	<2
MSMB-20	<0.5	<1	<2	<2
MSMB-22	<0.5	<1	72	64
MSMB-29	2.1	<1	<2	<2
MSMB-30	1.8	<1	24	3.0
MSMB-33	4.3	2.1	77	54
MSMB-35	<0.5	<1	16	14
MSMB-37	4.1	<1	3.0	<2
MSMB-40	0.6	<1	16	3.0
MSMB-44	1.2	<1	3.0	<2
MSMB-45	0.6	<1	2,560	2,550
MSMB-47	1.1	<1	13	4.0
MSMBFP-02	1.5	<1	<2	<2
MSMBFP-03	1.4	<1	23	7.0
MSMBMW-01	2.5	<1	2.0	<2
MSMBMW-02	1.3	<1	3.0	<2
MSMBMW-03	2.5	<1	3.0	<2
MSPR-01	1.1	<1	3.0	2.0
MSPR-08	2.2	<1	10	7.0
MSPR-10	0.9	<1	173	146
MSSC-04	<0.5	<1	31	30
MSSC-06	<0.5	<1	607	588
MSSC-07	<0.5	<1	86	60
MSSC-08	0.6	<1	203	186
MSSV-01	4.2	3.3	478	468
MSSV-02	1.7	<1	5.0	4.0
MSSV-03	1.9	<1	39	24
MSSV-07	0.8	<1	<2	<2
MSSV-11	<0.5	<1	2.0	<2
MSSV-18	0.9	<1	25	11

Table 18. Chromium speciation results for filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; DLR, detection level for the purposes of reporting; MDL, method detection limit; µg/L, micrograms per liter; —, not detected; *, value exceeds regulatory threshold]

GAMA identification no.	Chromium, dissolved (µg/L) (01030)	Chromium (VI), (hexavalent) dissolved (µg/L) (01032)
Threshold type	MCL-CA	DLR
Threshold (µg/L)	50	1
[MDL]	[0.1]	[0.1]
MSMB-01	8	*9
MSMB-02	<1	<1
MSMB-03	17	*16
MSMB-04	<1	<1
MSMB-05	25	*22
MSMB-06	<1	<1
MSMB-07	7	*8
MSMB-08	1	*1
MSMB-09	17	*13
MSMB-10	23	*23
MSMB-11	7	*7
MSMB-12	2	*2
MSMB-13	6	*6
MSMB-14	8	*7
MSMB-15	6	*6
MSMB-16	5	*4
MSMB-17	14	*12
MSMB-18	13	*13
MSMB-19	12	*12
MSMB-20	8	*7
MSMB-21	28	*27
MSMB-22	3	*3
MSMB-23	19	*16
MSMB-24	10	*10
MSMB-25	18	*18
MSMB-26	5	*5
MSMB-27	7	*6
MSMB-28	8	*8
MSMB-29	2	*2
MSMB-30	8	*6
MSMB-31	<1	<1
MSMB-32	19	*19
MSMB-33	3	*2
MSMB-34	<1	<1
MSMB-35	3	*5
MSMB-36	<1	<1
MSMB-37	20	*20
MSMB-38	4	*4
MSMB-39	nc	nc
MSMB-40	4	*4
MSMB-41	33	*33
MSMB-42	<1	<1
MSMB-43	5	*6
MSMB-44	24	*22
MSMB-45	3	*2
MSMB-46	33	*33
MSMB-47	1	*1
MSMB-48	36	*34
MSMBFP-01	<1	<1
MSMBFP-02	3	*3
MSMBFP-03	8	*7
MSMBMW-01	8	*7
MSMBMW-02	13	*13
MSMBMW-03	12	*11
MSPR-01	<1	<1
MSPR-02	6	*5
MSPR-03	6	*4
MSPR-04	6	*5
MSPR-05	4	*5
MSPR-06	7	*7
MSPR-07	4	*4
MSPR-08	1	*1
MSPR-09	2	*2
MSPR-10	<1	<1
MSPR-11	1	*1
MSSC-01	10	*10
MSSC-02	18	*15
MSSC-03	1	*2
MSSC-04	3	*2
MSSC-05	11	*7
MSSC-06	2	*2
MSSC-07	2	*2
MSSC-08	2	*3
MSSC-09	13	*16
MSSC-10	9	*9
MSSC-11	18	*18
MSSC-12	16	*14
MSSC-13	12	*17
MSSV-01	3	*3
MSSV-02	2	*2
MSSV-03	8	*7
MSSV-04	8	*8
MSSV-05	5	*4
MSSV-06	7	*8
MSSV-07	2	*2
MSSV-08	17	*22
MSSV-09	31	*26
MSSV-10	32	*42

Table 18. Chromium speciation results for filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; DLR, detection level for the purposes of reporting; MDL, method detection limit; µg/L, micrograms per liter; —, not detected; *, value exceeds regulatory threshold]

GAMA identification no.	Chromium, dissolved (µg/L) (01030)	Chromium (VI), (hexavalent) dissolved (µg/L) (01032)
Threshold type	**MCL-CA**	**DLR**
Threshold (µg/L)	**50**	**1**
[MDL]	**[0.1]**	**[0.1]**
MSSV-11	4	*3
MSSV-12	7	*5
MSSV-13	8	*12
MSSV-14	12	*10
MSSV-15	6	*6
MSSV-16	22	*22
MSSV-17	2	*2
MSSV-18	4	*3
MSSV-19	7	*7

Table 19. Summary of radioactive constituents and carbon isotopes for filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. environmental Protection Agency maximum contaminant level; Delta, notation, in per mil, of the differences in the carbon-13/carbon-12 ratio relative to University of Chicago Peedee Formation Standard; E, estimated value; na, not available; nc, sample not collected; pCi/L, picocuries per liter; SSMDC, sample specific minimum detectable concentration; *, value exceeds regulatory threshold; <, less than]

GAMA identification no.	Alpha radioactivity, 72-hour count pCi/L) (62636)				Alpha radioactivity, 30-day count (pCi/L) (62639)				Beta radioactivity, 72-hour count (pCi/L) (62642)			
	Result	Critical value	1-sigma combined uncertainty	SSMDC	Result	Critical value	1-sigma combined uncertainty	SSMDC	Result	Critical value	1-sigma combined uncertainty	SSMDC
Threshold type	MCL-US[1]	na	na	na	MCL-US[1]	na	na	na	MCL-CA	na	na	na
Threshold	15	na	na	na	15	na	na	na	50	na	na	na
MSMB-04	<2.9	1.3	0.75	2.9	<2.1	0.82	0.55	2.1	18.6	1.1	2.1	2.3
MSMB-09	E0.5	0.4	0.32	1.0	<1.3	0.52	0.37	1.3	E1.8	0.77	0.53	1.6
MSMB-12	<1.7	0.7	0.55	1.7	E1.1	0.81	0.61	1.9	4.9	1.1	0.94	2.4
MSMB-18	<2.5	1.0	0.55	2.5	<1.5	0.65	0.40	1.5	E3.1	1.8	1.20	3.7
MSMB-20	E1.5	0.7	0.57	1.5	E2.5	0.43	0.60	1.1	E2.4	1.1	0.74	2.2
MSMB-22	E2.3	0.8	0.74	1.9	E2.4	0.74	0.79	1.7	E3.8	1.1	0.80	2.2
MSMB-29	E13.4	2.5	3.00	5.6	E8.2	1.40	1.80	3.4	9.3	1.2	1.30	2.5
MSMB-30	E4.5	1.2	1.10	2.6	E2.0	1.10	0.87	2.5	E4.8	1.4	1.10	3.0
MSMB-33	E1.4	0.7	0.57	1.7	<2.0	0.89	0.70	2.0	E1.8	1.1	0.72	2.2
MSMB-35	<3.7	1.6	1.10	3.7	<4.0	1.80	1.10	4.0	<4.9	2.4	1.5	4.9
MSMB-37	E2.8	0.8	0.80	1.8	E2.5	0.87	0.88	2.0	E2.3	1.3	0.88	2.6
MSMB-40	E4.5	0.7	0.92	1.7	E3.2	0.70	0.77	1.6	E3.7	0.9	0.75	1.9
MSMB-44	11.2	1.6	2.20	3.8	14.1	2.00	2.80	4.6	6.0	1.3	1.0	2.6
MSMB-45	E2.5	0.5	0.89	1.7	E0.8	0.45	0.35	1.1	E4.7	1.2	1.00	2.6
MSMB-47	E5.8	1.2	1.60	3.1	E1.5	0.90	0.72	2.1	E4.1	1.9	1.40	3.9
MSMBFP-02	9.1	1.5	1.80	3.5	E5.9	1.60	1.50	3.6	4.7	1.0	0.80	2.0
MSMBFP-03	E6.1	1.8	1.60	4.2	E3.3	1.50	1.20	3.4	7.1	1.0	1.00	2.1
MSMBMW-01	E4.4	0.8	0.91	1.7	5.2	0.59	0.95	1.4	6.6	1.2	1.10	2.5
MSMBMW-02	4.4	0.6	0.82	1.4	E3.1	0.53	0.68	1.3	4.4	0.9	0.78	1.9
MSMBMW-03	E2.5	0.5	0.60	1.2	E1.8	0.52	0.52	1.2	E2.3	1	0.69	2.0
MSPR-01	E4.1	0.8	1.00	1.8	E3.4	0.92	0.91	2.1	<3.3	1.6	0.95	3.3
MSPR-08	12.7	1.1	2.00	2.7	11.3	0.91	1.70	2.1	1.7	1.8	1.20	3.7
MSPR-10	*17.4	1.4	2.80	3.5	*16.3	1.80	2.80	4.1	6.6	1.5	1.20	3.2
MSSC-04	E1.7	1.1	0.97	2.5	<1.9	0.82	0.55	1.9	E2.7	1.2	0.80	2.4
MSSC-06	<1.5	0.6	0.40	1.5	<1.8	0.77	0.41	1.8	8.5	1.1	1.20	2.2
MSSC-07	E1.1	0.7	0.51	1.6	<2.9	1.10	0.70	2.9	6.3	0.9	0.90	1.9
MSSC-08	E3.2	1.3	1.20	3.2	<1.0	0.45	0.26	1.0	7.6	1.2	1.30	2.6
MSSV-01	E5.4	1.2	1.60	3.0	E3.2	0.93	1.00	2.4	21.2	1.4	2.40	2.8
MSSV-02	E1.1	0.4	0.44	1.0	<1.7	0.77	0.47	1.7	E1.7	0.9	0.58	1.8
MSSV-03	5.1	0.7	1.00	1.6	E3.2	0.73	0.86	1.8	E2.0	1.4	0.92	2.9
MSSV-07	E0.5	0.5	0.35	1.1	E0.7	0.53	0.40	1.2	E1.9	0.8	0.58	1.7
MSSV-11	E3.1	0.7	1.00	2.0	E2.3	0.47	0.51	1.1	E3.6	1.3	0.97	2.8
MSSV-18	E4.7	0.7	1.10	1.7	E3.3	0.65	0.77	1.6	E2.8	1	0.75	2.1
MSSV-19	4.2	0.6	0.81	1.4	E2.5	1.10	1.00	2.5	3.7	1.1	0.83	2.3

[1]Combined Radium-226 plus Radium-228.

[2]Proposed MCL-US.

Table 19. Summary of radioactive constituents and carbon isotopes for filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. environmental Protection Agency maximum contaminant level; Delta, notation, in per mil, of the differences in the carbon-13/carbon-12 ratio relative to University of Chicago Peedee Formation Standard; E, estimated value; na, not available; nc, sample not collected; pCi/L, picocuries per liter; SSMDC, sample specific minimum detectable concentration; *, value exceeds regulatory threshold; <, less than]

GAMA identification no.	Beta radioactivity, 30-day count (pCi/L) (62645)				Radium-226 (pCi/L) (09511)			
	Result	Critical value	1-sigma combined uncertainty	SSMDC	Result	Critical value	1-sigma combined uncertainty	SSMDC
Threshold type	MCL-CA	na	na	na	MCL-US[1]	na	na	na
Threshold	50	na	na	na	[1]5	na	na	na
MSMB-04	20.8	0.83	2.20	1.7	E0.075	0.014	0.016	0.034
MSMB-09	E1.8	0.91	0.62	1.9	E0.059	0.017	0.013	0.036
MSMB-12	E4.8	1.3	0.98	2.6	0.255	0.013	0.024	0.031
MSMB-18	E1.8	0.65	0.45	1.3	E0.047	0.015	0.012	0.033
MSMB-20	E3.0	1.1	0.81	2.4	<0.034	0.015	0.010	0.034
MSMB-22	4.1	0.99	0.77	2.0	0.058	0.01	0.011	0.024
MSMB-29	15.9	1.3	1.90	2.6	E0.040	0.015	0.013	0.035
MSMB-30	5.5	0.75	0.78	1.5	0.326	0.017	0.022	0.036
MSMB-33	E2.8	1.2	0.80	2.4	E0.075	0.019	0.017	0.044
MSMB-35	<5.0	2.5	1.60	5.0	0.111	0.016	0.017	0.037
MSMB-37	E2.5	1.4	0.89	2.8	0.075	0.013	0.013	0.029
MSMB-40	5.8	0.91	0.87	1.9	0.092	0.011	0.014	0.027
MSMB-44	16.4	1.2	1.90	2.5	0.071	0.014	0.012	0.03
MSMB-45	3.4	0.62	0.54	1.3	0.072	0.013	0.013	0.03
MSMB-47	E3.6	1.2	0.88	2.6	0.103	0.009	0.015	0.024
MSMBFP-02	12.5	0.97	1.50	2.0	E0.066	0.017	0.014	0.037
MSMBFP-03	5.5	1.2	0.97	2.5	0.212	0.017	0.018	0.036
MSMBMW-01	6.7	1.1	1.00	2.2	nc			
MSMBMW-02	5.2	0.91	0.83	1.9	nc			
MSMBMW-03	E3.2	0.98	0.72	2.0	nc			
MSPR-01	<3.2	1.6	1.00	3.2	0.284	0.010	0.017	0.021
MSPR-08	9.7	1.3	1.40	2.6	0.230	0.012	0.021	0.029
MSPR-10	14.8	2.7	2.40	5.4	0.155	0.011	0.013	0.023
MSSC-04	E3.6	1.2	0.88	2.5	0.097	0.014	0.014	0.031
MSSC-06	8.1	1.2	1.20	2.5	E0.020	0.013	0.009	0.029
MSSC-07	7.0	1.6	1.30	3.3	0.169	0.014	0.014	0.029
MSSC-08	4.9	0.81	0.74	1.7	E0.028	0.019	0.013	0.042
MSSV-01	21.4	1.1	2.40	2.3	0.372	0.012	0.025	0.028
MSSV-02	E1.8	0.84	0.58	1.7	0.061	0.012	0.011	0.027
MSSV-03	E3.9	1.3	0.94	2.6	0.576	0.016	0.036	0.037
MSSV-07	E2.0	0.73	0.52	1.5	0.083	0.011	0.012	0.025
MSSV-11	3.8	0.65	0.60	1.3	0.141	0.017	0.016	0.036
MSSV-18	5.0	1.2	0.95	2.4	0.169	0.013	0.015	0.028
MSSV-19	3.9	1.1	0.80	2.2	0.127	0.011	0.014	0.025

[1]Combined Radium-226 plus Radium-228.

[2]Proposed MCL-US.

Table 19. Summary of radioactive constituents and carbon isotopes for filtered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; MCL-US, U.S. environmental Protection Agency maximum contaminant level; Delta, notation, in per mil, of the differences in the carbon-13/carbon-12 ratio relative to University of Chicago Peedee Formation Standard; E, estimated value; na, not available; nc, sample not collected; pCi/L, picocuries per liter; SSMDC, sample specific minimum detectable concentration; *, value exceeds regulatory threshold; <, less than]

GAMA identification No.	Radium-228 (pCi/L) (81366)				Radon-222 (pCi/L) (82303)	Radon-222 2-sigma combined uncertainty (pCi/L) (76002)	Delta carbon-13 (per mil)	Carbon-14 (percent modern) (49933)	Carbon-14 counting error, water, filtered, percent modern (49934)
	Result	Critical value	1-sigma combined uncertainty	SSMDC	Result	Result	Result	Result	Result
Threshold type	MCL-US[1]	na	na	na	MCL-US[2]	na	na	na	na
Threshold	[1]5	na	na	na	300	na	na	na	na
MSMB-04	E0.37	0.25	0.12	0.53	*300	21	–15.50	5.7	0.1
MSMB-09	E0.41	0.21	0.09	0.45	210	19	–14.60	73.0	0.4
MSMB-12	<0.61	0.28	0.12	0.61	*1,450	36	–14.13	6.3	0.2
MSMB-18	<0.70	0.33	0.14	0.70	*360	20	–15.10	55.9	0.3
MSMB-20	<0.67	0.31	0.12	0.67	*480	23	–16.80	76.8	0.4
MSMB-22	<0.48	0.22	0.14	0.48	250	19	–13.67	80.1	0.4
MSMB-29	E0.49	0.22	0.10	0.48	*340	20	–16.15	96.0	0.4
MSMB-30	E0.31	0.22	0.10	0.47	*560	24	–14.40	78.9	0.4
MSMB-33	<0.58	0.27	0.11	0.58	*1,610	36	–17.32	53.8	0.4
MSMB-35	E0.29	0.21	0.09	0.45	170	16	–14.56	96.8	0.5
MSMB-37	<0.51	0.24	0.10	0.51	*750	26	–14.35	57.2	0.4
MSMB-40	E0.46	0.26	0.14	0.56	*460	23	–11.77	72.6	0.4
MSMB-44	E0.24	0.22	0.13	0.47	*410	22	nc	nc	nc
MSMB-45	E0.53	0.23	0.12	0.49	260	19	–13.40	91.7	0.4
MSMB-47	<0.39	0.18	0.08	0.39	*610	25	–10.60	32.4	0.2
MSMBFP-02	<0.54	0.25	0.10	0.54	*450	22	–14.53	92.9	0.5
MSMBFP-03	E0.56	0.21	0.22	0.45	*560	23	–15.70	89.9	0.4
MSMBMW-01	nc				nc	nc	–12.64	19.7	0.2
MSMBMW-02	nc				nc	nc	–13.38	43.3	0.3
MSMBMW-03	nc				nc	nc	–14.07	72.4	0.4
MSPR-01	E0.36	0.21	0.12	0.46	*650	24	–14.30	90.5	0.4
MSPR-08	<0.58	0.27	0.14	0.58	*470	23	–12.90	47.4	0.3
MSPR-10	E0.42	0.21	0.12	0.45	*450	22	–13.00	67.1	0.3
MSSC-04	E0.66	0.27	0.16	na	280	19	–19.50	65.6	0.3
MSSC-06	<0.45	0.21	0.10	0.45	190	18	–20.40	71.2	0.3
MSSC-07	E0.56	0.21	0.13	0.45	280	20	–14.30	31.3	0.2
MSSC-08	<0.59	0.27	0.10	0.59	200	17	–15.97	57.2	0.4
MSSV-01	0.96	0.22	0.13	0.46	*390	20	–15.10	8.8	0.1
MSSV-02	<0.53	0.25	0.11	0.53	*650	25	–12.50	100.1	0.4
MSSV-03	E0.25	0.25	0.11	0.53	*930	29	–13.09	99.0	0.5
MSSV-07	<0.47	0.22	0.09	0.47	*590	23	–12.60	99.8	0.4
MSSV-11	<0.46	0.21	0.09	0.46	*820	28	–10.50	89.4	0.4
MSSV-18	<0.44	0.21	0.10	0.44	*680	26	–10.80	16.2	0.2
MSSV-19	<0.54	0.25	0.12	0.54	600	26	–10.80	33.6	0.2

[1]Combined Radium-226 plus Radium-228.

[2]Proposed MCL-US.

Table 20. Hydrogen and oxygen isotopes in unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; δ, notation, in per mil, of the differences in oxygen-18/oxygen-16 and hydrogen-2/hydrogen-1 ratios relative to Standard Mean Ocean Water (SMOW); na, not available; pCi/L, picocuries per liter; —, not detected]

GAMA identification No.	$\delta^{2}H$ (per mil) (82082)	$\delta^{18}O$ (per mil) (82085)	Tritium (pCi/L)	Tritium 2-sigma combined uncertainty (pCi/L) (75985)
Threshold type	**na**	**na**	**MCL-CA**	**na**
Threshold	**na**	**na**	**20000**	**na**
MSMB-01	–43.9	–6.26	1.0	1.0
MSMB-02	–41.9	–6.34	4.5	1.0
MSMB-03	–50.7	–7.38	—	0.6
MSMB-04	–45.9	–7.32	2.2	1.0
MSMB-05	–37.2	–6.00	3.8	1.0
MSMB-06	–34.0	–5.81	1.6	0.6
MSMB-07	–35.9	–6.05	0.6	0.6
MSMB-08	–36.9	–6.01	3.8	1.0
MSMB-09	–36.5	–6.14	1.6	1.0
MSMB-10	–38.5	–5.80	0.6	0.6
MSMB-11	–42.3	–6.35	1.0	1.0
MSMB-12	–46.2	–6.80	—	0.6
MSMB-13	–44.5	–6.59	0.6	0.0
MSMB-14	–44.8	–6.43	0.6	1.0
MSMB-15	–43.6	–6.32	2.2	0.6
MSMB-16	–45.6	–6.72	1.0	0.6
MSMB-17	–43.2	–6.40	—	1.0
MSMB-18	–38.6	–6.24	—	0.6
MSMB-19	–39.4	–5.94	0.3	1.0
MSMB-20	–35.4	–5.53	2.6	1.0
MSMB-21	–38.0	–6.11	—	0.6
MSMB-22	–38.8	–5.81	1.0	0.6
MSMB-23	–39.4	–6.04	—	0.6
MSMB-24	–40.1	–6.14	1.0	0.6
MSMB-25	–43.0	–6.29	0.3	0.6
MSMB-26	–43.9	–6.68	1.3	1.0
MSMB-27	–48.0	–6.81	0.6	0.6
MSMB-28	–46.5	–6.66	1.6	0.6
MSMB-29	–37.8	–5.60	9.0	1.0
MSMB-30	–43.4	–6.49	0.3	0.6
MSMB-31	–41.7	–6.30	6.7	1.0
MSMB-32	–41.6	–6.13	1.3	0.6
MSMB-33	–41.0	–6.28	1.6	0.6
MSMB-34	–40.0	–6.08	1.0	1.0
MSMB-35	–37.6	–5.37	8.0	1.0
MSMB-36	–42.3	–6.34	1.6	0.6
MSMB-37	–42.4	–6.39	—	1.0
MSMB-38	–43.7	–6.54	1.9	0.6
MSMB-39	–45.1	–6.72	1.0	0.6
MSMB-40	–44.3	–6.74	1.6	0.6
MSMB-41	–36.2	–5.43	11.8	1.0
MSMB-42	–44.5	–6.69	6.4	0.6
MSMB-43	–37.0	–5.32	10.2	0.6
MSMB-44	–37.9	–5.64	7.4	1.0
MSMB-45	–42.3	–6.60	7.0	1.0
MSMB-46	–38.9	–5.70	7.0	1.0
MSMB-47	–45.6	–6.92	—	1.0
MSMB-48	–42.9	–6.30	4.5	0.6
MSMBFP-01	–54.8	–7.94	0.6	1.0
MSMBFP-02	–38.8	–5.68	9.3	1.0
MSMBFP-03	–41.9	–6.14	3.8	0.6
MSMBMW-01	–46.6	–6.78	—	0.6
MSMBMW-02	–45.3	–6.67	—	0.6
MSMBMW-03	–41.8	–6.46	—	0.6
MSPR-01	–38.3	–5.65	7.0	0.6
MSPR-02	–40.0	–6.14	4.5	0.6
MSPR-03	–58.4	–8.30	0.3	0.6
MSPR-04	–53.0	–7.47	1.6	0.6
MSPR-05	–56.8	–8.09	0.6	0.6
MSPR-06	–43.8	–6.27	1.6	0.6
MSPR-07	–45.0	–5.83	—	0.6
MSPR-08	–44.3	–6.25	0.6	0.6
MSPR-09	–55.2	–7.93	—	0.6
MSPR-10	–49.3	–7.08	—	0.6
MSPR-11	–50.9	–7.46	—	0.6
MSSC-01	–33.8	–5.90	8.0	1.0
MSSC-02	–28.8	–5.06	7.4	0.6
MSSC-03	–32.9	–5.66	6.7	1.0
MSSC-04	–35.4	–5.70	5.4	1.0
MSSC-05	–38.1	–6.25	—	0.6
MSSC-06	–32.9	–5.45	4.5	1.0
MSSC-07	–34.0	–5.80	1.3	1.0
MSSC-08	–35.6	–5.86	—	0.6
MSSC-09	–34.2	–6.12	4.5	0.6
MSSC-10	–39.2	–6.32	—	0.6
MSSC-11	–38.1	–6.28	—	0.6
MSSC-12	–36.9	–6.18	—	0.6
MSSC-13	–34.7	–6.11	13.8	1.0
MSSV-01	–54.2	–7.41	—	0.6
MSSV-02	–34.0	–4.85	6.7	0.6
MSSV-03	–34.0	–4.59	6.7	0.6
MSSV-04	–43.7	–6.05	2.2	1.0
MSSV-05	–36.6	–5.29	6.4	0.6
MSSV-06	–34.9	–4.87	6.7	1.0
MSSV-07	–34.2	–4.88	6.0	1.0
MSSV-08	–33.8	–4.94	7.4	1.0

Table 20. Hydrogen and oxygen isotopes in unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; δ, notation, in per mil, of the differences in oxygen-18/oxygen-16 and hydrogen-2/hydrogen-1 ratios relative to Standard Mean Ocean Water (SMOW); na, not available; pCi/L, picocuries per liter; —, not detected]

GAMA identification No.	$\delta^{2}H$ (per mil) (82082)	$\delta^{18}O$ (per mil) (82085)	Tritium (pCi/L)	Tritium 2-sigma combined uncertainty (pCi/L) (75985)
Threshold type	**na**	**na**	**MCL-CA**	**na**
Threshold	**na**	**na**	**20000**	**na**
MSSV-09	–33.1	–4.69	6.4	0.6
MSSV-10	–29.1	–3.83	8.0	1.0
MSSV-11	–45.7	–7.00	8.6	0.6
MSSV-12	–44.8	–7.14	8.0	1.0
MSSV-13	–45.4	–7.15	5.1	0.6
MSSV-14	–43.1	–6.13	5.8	0.6
MSSV-15	–27.0	–3.58	7.0	1.0
MSSV-16	–46.2	–7.16	—	1.0
MSSV-17	–48.2	–7.46	3.5	1.0
MSSV-18	–48.0	–7.04	—	0.6
MSSV-19	–45.2	–6.74	—	0.6

Table 21. Tritium and noble gas results, analyzed at Lawrence Livermore National Laboratory, for unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; cm^3 STP g–1 H_20, cubic centimeters at standard temperature and pressure per gram of water; na, not available; nc, sample not collected; pCi/L, picocuries per liter]

GAMA identification No.	Collection date (mm/dd/yy)	Tritium (pCi/L) (07000)	Tritium measurement uncertainty (+/–) (pCi/L) (07001)	Dissolved gas analysis date (mm/dd/yy)	Helium^{-3}/ Helium^{-4} (atom ratio) (61040)	Helium^{-4} (85561)	Neon (61046)	Argon (85563)	Krypton (85565)	Xenon (85567)
						(cm^3 STP g^{-1} H_2O)				
					x 10^{-6}	x 10^{-7}	x 10^{-7}	x 10^{-4}	x 10^{-8}	x 10^{-8}
Threshold type	**na**	**MCL-CA**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Threshold	**na**	**20,000**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
MSMB-01	08/04/05	2.65	0.3	08/30/05	0.97	0.73	2.22	3.53	7.72	1.08
MSMB-02	08/10/05	5.85	0.3	09/01/05	0.54	2.76	3.94	4.48	8.95	1.16
MSMB-03	08/31/05	<1.0	0.2	11/14/05	0.22	4.97	2.28	4.73	9.06	1.29
MSMB-04	08/17/05	<1.0	0.2	09/07/05	0.49	2.86	3.25	5.03	11.4	1.57
MSMB-05	08/08/05	3.71	0.3	08/31/05	1.44	0.48	2.15	3.46	7.93	1.12
MSMB-06	08/08/05	2.00	0.2	08/31/05	1.26	0.58	2.49	4.12	9.41	1.29
MSMB-07	08/08/05	1.73	0.2	08/31/05	0.83	1.09	2.91	4.56	10.1	1.46
MSMB-08	08/16/05	3.51	0.3	09/07/05	1.64	0.57	2.28	4.01	9.03	0.00
MSMB-09	08/15/05	<1.0	0.1	09/09/05	1.37	0.76	3.35	4.63	10.0	1.27
MSMB-10	08/30/05	<1.0	0.2	11/14/05	1.33	0.67	2.65	4.88	8.85	1.16
MSMB-11	08/18/05	<1.0	0.2	09/07/05	0.18	11.18	3.35	4.48	9.74	1.28
MSMB-12	09/14/05	<1.0	0.2	10/28/05	0.29	2.71	2.48	4.07	9.08	1.24
MSMB-13	08/17/05	1.07	0.2	09/07/05	1.10	0.85	2.74	3.95	8.79	1.13
MSMB-14	08/03/05	<1.0	0.3	08/30/05	1.09	0.89	3.10	4.32	9.48	1.23
MSMB-15	08/04/05	2.43	0.3	08/30/05	1.37	0.89	3.60	4.65	9.71	1.25
MSMB-16	08/17/05	<1.0	0.2	09/08/05	1.09	0.84	2.67	3.89	8.74	1.17
MSMB-17	08/09/05	<1.0	0.2	08/31/05	0.14	17.8	3.30	4.43	9.62	1.28
MSMB-18	08/11/05	<1.0	0.2	09/01/05	0.94	1.07	3.00	4.43	9.30	1.20
MSMB-19	08/16/05	<1.0	0.2	09/07/05	1.32	0.58	2.46	3.87	8.56	1.14
MSMB-20	08/16/05	2.70	0.2	09/07/05	1.31	0.71	2.85	4.21	9.35	1.20
MSMB-21	09/20/05	<1.0	0.2	11/29/05	1.31	0.66	2.77	4.33	9.28	1.31
MSMB-22	09/19/05	1.48	0.3	11/29/05	1.51	0.61	2.51	3.80	8.23	1.15
MSMB-23	08/30/05	<1.0	0.2	11/14/05	1.23	0.59	2.26	4.47	8.24	1.12
MSMB-24	08/09/05	1.73	0.2	09/01/05	1.31	0.53	2.15	3.46	7.76	1.06
MSMB-25	09/19/05	<1.0	0.2	11/14/05	0.20	7.33	3.21	5.34	9.60	1.20
MSMB-26	08/11/05	1.89	0.2	09/01/05	0.88	1.40	3.11	4.08	9.40	1.22
MSMB-27	08/03/05	1.49	0.2	08/31/05	0.40	2.58	3.17	4.40	9.45	1.29
MSMB-28	08/03/05	2.18	0.2	08/31/05	1.31	0.70	2.62	3.92	8.86	1.21
MSMB-29	08/30/05	7.86	0.6	10/28/05	1.64	0.56	2.31	3.39	7.99	1.07
MSMB-30	08/08/05	<1.0	0.2	08/31/05	0.76	1.45	3.18	4.39	9.57	1.29
MSMB-31	08/11/05	7.33	0.4	09/01/05	1.60	0.84	3.49	4.65	10.5	1.33
MSMB-32	08/31/05	1.71	0.2	11/14/05	1.36	0.47	1.96	4.03	7.51	1.02
MSMB-33	09/13/05	2.50	0.3	11/14/05	0.67	2.64	2.50	5.06	8.24	1.11
MSMB-34	08/16/05	<1.0	0.2	09/07/05	0.97	0.86	2.52	3.95	9.09	1.21
MSMB-35	09/20/05	9.02	0.5	11/29/05	1.41	0.72	3.04	4.06	8.54	1.12
MSMB-36	08/10/05	2.76	0.2	09/01/05	0.27	5.54	3.18	4.43	9.07	1.29
MSMB-37	09/01/05	<1.0	0.2	10/28/05	0.12	24.4	3.35	4.42	9.45	1.19
MSMB-38	08/11/05	3.18	0.2	09/01/05	0.77	1.52	3.05	4.12	9.47	1.24

Table 21. Tritium and noble gas results, analyzed at Lawrence Livermore National Laboratory, for for unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; cm^3 STP g–1 H_20, cubic centimeters at standard temperature and pressure per gram of water; na, not available; nc, sample not collected; pCi/L, picocuries per liter]

GAMA identification No.	Collection date (mm/dd/yy)	Tritium (pCi/L) (07000)	Tritium measurement uncertainty (+/–) (pCi/L) (07001)	Dissolved gas analysis date (mm/dd/yy)	Helium^{-3}/ Helium^{-4} (atom ratio) (61040)	Helium^{-4} (85561)	Neon (61046)	Argon (85563)	Krypton (85565)	Xenon (85567)
						(cm^3 STP g^{-1} H_2O)				
					x 10^{-6}	x 10^{-7}	x 10^{-7}	x 10^{-4}	x 10^{-8}	x 10^{-8}
Threshold type	**na**	**MCL-CA**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Threshold	**na**	**20,000**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
MSMB-39	09/19/05	2.33	0.2	10/28/05	1.14	0.92	2.98	4.12	8.87	1.23
MSMB-40	08/29/05	1.57	0.2	10/28/05	1.23	1.15	3.63	5.06	11.0	1.42
MSMB-41	09/20/05	13.97	0.7	10/28/05	2.59	0.64	2.68	3.87	8.57	1.11
MSMB-42	08/10/05	7.70	0.4	09/07/05	1.33	7.31	31.9	9.06	34.4	0.00
MSMB-43	09/23/05	12.69	0.6	10/28/05	2.36	0.50	2.13	3.51	7.86	1.10
MSMB-44	09/19/05	13.36	0.6	10/27/05	1.81	0.55	2.38	3.72	8.35	1.08
MSMB-45	08/10/05	6.47	0.3	01/10/06	1.29	0.94	3.44	4.26	8.81	1.15
MSMB-46	09/20/05	7.80	0.4	10/28/05	1.78	0.66	2.72	3.90	8.60	1.10
MSMB-47	08/03/05	<1.0	0.2	08/31/05	0.67	2.15	3.75	4.61	9.82	1.27
MSMB-48	09/21/05	5.07	0.3	01/11/06	1.31	1.12	4.11	4.81	9.56	1.22
MSMBFP-01	08/17/05	<1.0	0.2	09/08/05	0.13	14.0	2.71	4.16	9.52	1.31
MSMBFP-02	08/09/05	10.01	0.5	09/01/05	1.66	0.73	2.77	3.92	8.41	1.19
MSMBFP-03	08/09/05	4.83	0.3	08/31/05	1.59	0.64	2.57	3.95	9.04	1.18
MSMBMW-01	09/21/05	<1.0	0.2	10/29/05	0.15	11.8	3.07	4.25	9.33	1.25
MSMBMW-02	09/22/05	<1.0	0.2	11/15/05	0.22	6.14	3.19	3.84	9.43	1.21
MSMBMW-03	09/22/05	<1.0	0.2	11/23/05	0.65	1.90	3.50	4.61	9.30	1.21
MSPR-01	07/19/05	7.27	0.4	08/26/05	1.27	1.39	4.91	5.15	10.1	1.26
MSPR-02	07/27/05	5.23	0.3	08/24/05	0.32	4.06	2.25	3.65	8.11	1.10
MSPR-03	07/28/05	<1.0	0.2	08/24/05	0.30	5.32	2.47	3.86	8.83	1.18
MSPR-04	07/28/05	1.88	0.2	08/25/05	0.28	5.63	2.30	3.66	8.01	1.13
MSPR-05	07/27/05	1.26	0.2	08/24/05	0.26	7.34	2.74	4.08	9.21	1.21
MSPR-06	07/27/05	2.07	0.2	08/24/05	1.24	0.66	2.37	3.45	7.48	0.95
MSPR-07	07/21/05	<1.0	0.2	08/26/05	0.98	0.82	2.42	3.43	7.33	0.99
MSPR-08	07/20/05	1.55	0.6	08/25/05	0.90	0.94	2.37	3.67	8.10	1.13
MSPR-09	07/18/05	<1.0	0.2	01/10/06	0.26	14.4	2.66	3.79	8.43	1.13
MSPR-10	07/18/05	<1.0	0.1	08/25/05	0.47	3.10	3.09	4.05	8.61	1.15
MSPR-11	07/21/05	2.15	0.2	08/26/05	1.17	0.84	2.85	4.20	8.88	1.19
MSSC-01	08/29/05	11.9	0.6	nc	nc	nc	nc	nc	nc	nc
MSSC-02	09/12/05	9.00	0.4	nc	nc	nc	nc	nc	nc	nc
MSSC-03	08/29/05	10.24	0.5	11/28/05	1.32	0.53	2.17	3.59	7.78	1.10
MSSC-04	08/25/05	5.62	0.3	11/29/05	1.02	1.52	2.55	4.81	8.38	1.16
MSSC-05	08/30/05	<1.0	0.2	nc	nc	nc	nc	nc	nc	nc
MSSC-06	08/24/05	4.57	0.3	11/28/05	1.53	0.54	2.25	3.64	8.04	1.13
MSSC-07	08/23/05	<1.0	0.3	11/28/05	0.64	1.42	2.29	3.73	8.20	1.15
MSSC-08	09/15/05	4.39	0.3	11/29/05	1.32	0.52	2.20	3.43	7.57	1.06

Table 21. Tritium and noble gas results, analyzed at Lawrence Livermore National Laboratory, for unfiltered ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005—Continued.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSMBMW, Monterey Bay study area monitoring well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-CA, California Department of Health Services maximum contaminant level; cm^3 STP g–1 H_20, cubic centimeters at standard temperature and pressure per gram of water; na, not available; nc, sample not collected; pCi/L, picocuries per liter]

GAMA identification No.	Collection date (mm/dd/yy)	Tritium (pCi/L) (07000)	Tritium measurement uncertainty (+/–) (pCi/L) (07001)	Dissolved gas analysis date (mm/dd/yy)	Helium^{-3}/ Helium^{-4} (atom ratio) (61040)	Helium^{-4} (85561)	Neon (61046)	Argon (85563)	Krypton (85565)	Xenon (85567)
						(cm^3 STP g^{-1} H_2O)				
					x 10^{-6}	x 10^{-7}	x 10^{-7}	x 10^{-4}	x 10^{-8}	x 10^{-8}
Threshold type	**na**	**MCL-CA**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Threshold	**na**	**20,000**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
MSSC-09	08/31/05	8.68	0.5	11/29/05	1.46	0.59	2.54	3.79	8.28	1.11
MSSC-10	08/29/05	4.17	0.2	11/28/05	0.93	0.85	2.70	4.47	10.0	1.40
MSSC-11	09/13/05	4.09	0.3	11/29/05	1.33	0.95	11.3	4.98	9.91	1.26
MSSC-12	09/13/05	4.34	0.8	11/29/05	1.34	0.75	3.44	4.80	10.1	1.31
MSSC-13	09/13/05	16.88	0.7	11/29/05	1.50	0.45	2.18	4.02	9.29	1.25
MSSV-01	07/26/05	<1.0	0.3	08/24/05	0.42	12.1	2.39	3.76	8.20	1.14
MSSV-02	07/28/05	7.26	0.4	08/25/05	1.54	0.49	2.09	3.49	7.95	1.06
MSSV-03	08/02/05	8.34	0.5	08/30/05	0.58	3.87	1.97	3.32	7.58	1.03
MSSV-04	08/02/05	2.19	0.2	08/27/05	1.28	0.92	3.30	3.82	8.26	1.09
MSSV-05	07/25/05	7.54	0.4	08/25/05	1.22	10.0	2.08	3.45	7.67	1.07
MSSV-06	08/02/05	7.72	0.6	08/30/05	1.43	0.54	2.25	3.41	7.67	1.04
MSSV-07	08/02/05	7.29	0.4	08/27/05	1.41	0.56	2.32	3.48	7.74	1.04
MSSV-08	08/04/05	9.09	0.5	01/10/06	1.14	0.79	2.36	3.52	7.76	1.06
MSSV-09	09/14/05	7.79	0.4	01/10/06	1.42	1.07	4.15	4.69	9.17	1.14
MSSV-10	09/21/05	7.43	0.4	10/27/05	1.39	0.51	2.13	3.45	7.73	1.04
MSSV-11	07/25/05	9.30	0.4	08/25/05	1.58	1.62	5.80	5.84	11.1	1.38
MSSV-12	08/01/05	7.13	0.4	08/26/05	1.41	1.22	4.89	5.37	10.7	1.33
MSSV-13	09/15/05	6.42	0.4	01/10/06	1.37	1.09	4.45	4.98	10.0	1.28
MSSV-14	08/01/05	5.86	0.3	08/26/05	1.29	0.93	2.87	4.06	9.04	1.19
MSSV-15	08/01/05	7.49	0.6	01/10/06	1.34	1.23	4.86	5.74	10.9	1.31
MSSV-16	09/14/05	<1.0	0.2	10/27/05	1.40	0.78	3.25	4.33	9.19	1.22
MSSV-17	09/14/05	6.30	0.6	10/27/05	1.44	0.74	3.02	4.28	9.46	1.26
MSSV-18	08/01/05	<1.0	0.2	nc	nc	nc	nc	nc	nc	nc
MSSV-19	07/27/05	<1.0	0.1	08/24/05	0.78	2.28	3.41	4.45	9.41	1.20

Table 22. Summary of microbial indicators detected in ground-water samples collected for the Monterey Bay and Salinas Valley Ground-Water Ambient Monitoring and Assessment (GAMA) study, California, July to October 2005.

[The five-digit number below the constituent name is the U.S. Geological Survey parameter code used to uniquely identify a specific constituent or property; MSMB, Monterey Bay study area well; MSMBFP, Monterey Bay study area flow-path well; MSPR, Paso Robles study area well; MSSC, Santa Cruz study area well; MSSV, Salinas Valley study area well; MCL-US, U.S. Environmental Protection Agency maximum contaminant level; E, estimated value; mL, milliliter, —, not detected; TT, treatment technique; *, value exceeds regulatory threshold]

GAMA Identification no.	Coliphage F-specific (99335)	Coliphage somatic (99332)	*E.* coli colonies/ 100 mL (90901)	Total coliforms colonies/ 100 mL (90900)
Threshold type	**TT**	**TT**	**TT**	**MCL-US**
Threshold	**99.9 percent Killed/Inactive**	**99.9 percent Killed/Inactive**	**No fecal coliforms are allowed**	**5 percent**
MSMB-04	—	—	—	—
MSMB-09	—	—	—	—
MSMB-12	—	—	—	—
MSMB-18	—	—	—	—
MSMB-20	—	—	—	—
MSMB-22	—	—	—	*2
MSMB-29	—	—	—	—
MSMB-30	—	—	—	—
MSMB-33	—	—	—	—
MSMB-35	—	—	—	—
MSMB-37	—	—	—	—
MSMB-40	—	—	—	—
MSMB-44	—	—	—	*110
MSMB-45	—	—	—	—
MSMB-47	—	—	—	—
MSMBFP-02	—	—	—	—
MSMBFP-03	—	—	—	—
MSPR-01	—	—	—	—
MSPR-10	—	—	—	—
MSSC-04	—	—	—	—
MSSC-06	—	—	—	—
MSSC-07	—	—	—	—
MSSC-08	—	—	—	*5
MSSV-01	—	—	—	—
MSSV-02	—	—	—	—
MSSV-03	—	—	—	—
MSSV-07	—	—	—	—
MSSV-11	—	—	—	*E1
MSSV-18	—	—	—	—
MSSV-19	—	—	—	—