Data on Ground-Water Quality, Carson Valley and Topaz Lake Areas, Douglas County, Nevada, For Year Ending September 1987

By Carl E. Thodal

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CONVERSION FACTORS AND ABBREVIATIONS

"Inch-pound units" of measure used in this report may be converted to metric (International System) units by using the following factors:

Multiply	*By*	*To obtain*
Acre	0.4047	Square hectometer (hm^2)
Acre-foot (acre-ft)	0.001233	Cubic hectometer (hm^3)
Foot (ft)	0.3048	Meter (m)
Inch (in)	25.40	Millimeter (mm)
Square mile (mi^2)	2.590	Square kilometer (km^2)

For temperature, degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) by using the formula °F = [(1.8)(°C)] + 32.

SEA LEVEL

In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929, formerly called "Sea-Level Datum of 1929"), which is derived from a general adjustment of the first-order leveling networks of both the United States and Canada.

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ABSTRACT

Douglas County encompasses 708 square miles in western Nevada and has been one of the fastest growing counties in the Nation, according to the 1980 census. This rapid population growth has led to concern about the present and future impacts of development upon the ground water, which is the principal source of drinking water for most of Douglas County. A network of wells was established recently (1985) by the U.S. Geological Survey, in cooperation with Douglas County, to characterize the current ground-water quality and its seasonal variability and to monitor temporal responses to changing land-use activities in the Carson Valley and Topaz Lake areas of Douglas County. This report presents data collected from that network during January through August 1987.

The primary drinking-water standard was exceeded for fluoride [4.0 milligrams per liter (mg/L)] at one observation well, and the primary standard for nitrate-nitrogen (10 mg/L) was exceeded at one domestic well. The following secondary drinking-water standards were exceeded: pH (6.5-8.5 units) at one public-supply well and three domestic wells, turbidity (1-5 standard turbidity units) at one domestic and four shallow observation wells; sulfate (250 mg/L) at two shallow observation wells and one domestic well; dissolved solids (500 mg/L) at three shallow observation wells; iron (0.3 mg/L) at one shallow observation well; and manganese (0.05 mg/L) at one shallow observation well, two domestic wells, and one public-supply well. Indicator fecal bacteria were detected in water samples from two public-supply wells, six domestic wells, and three shallow observation wells.

Manmade, organic compounds were identified by gas chromatography and mass-spectrometer analysis in water sampled from four public-supply wells, three domestic wells, and five shallow observation wells. Naturally occurring activities of radon-222 gas ranged from less than 100 picocuries per liter (pCi/L) to 14,000 pCi/L, and the median activity was 480 pCi/L.

INTRODUCTION

Douglas County encompasses 708 mi^2 (U.S. Bureau of the Census, 1983, p. 82) in western Nevada (figure 1). North-south-trending mountain ranges, the Carson Range on the west and the Pine Nut Mountains on the east, divide the county into three major valleys: the Lake Tahoe Basin along the western border (about 70 mi^2), Carson Valley in the central part (about 420 mi^2), and Antelope Valley in the southeastern corner of the county (about 110 mi^2). Two major river systems flow in a northerly direction through the county: the Carson River through Carson Valley and the West Walker River through Antelope Valley. The economics of the county are dominated by agriculture in Carson and Antelope Valleys, and by tourism and gaming along the southeast shore of Lake Tahoe. The major population centers are Stateline at Lake Tahoe and the Minden-Gardnerville area in Carson Valley.

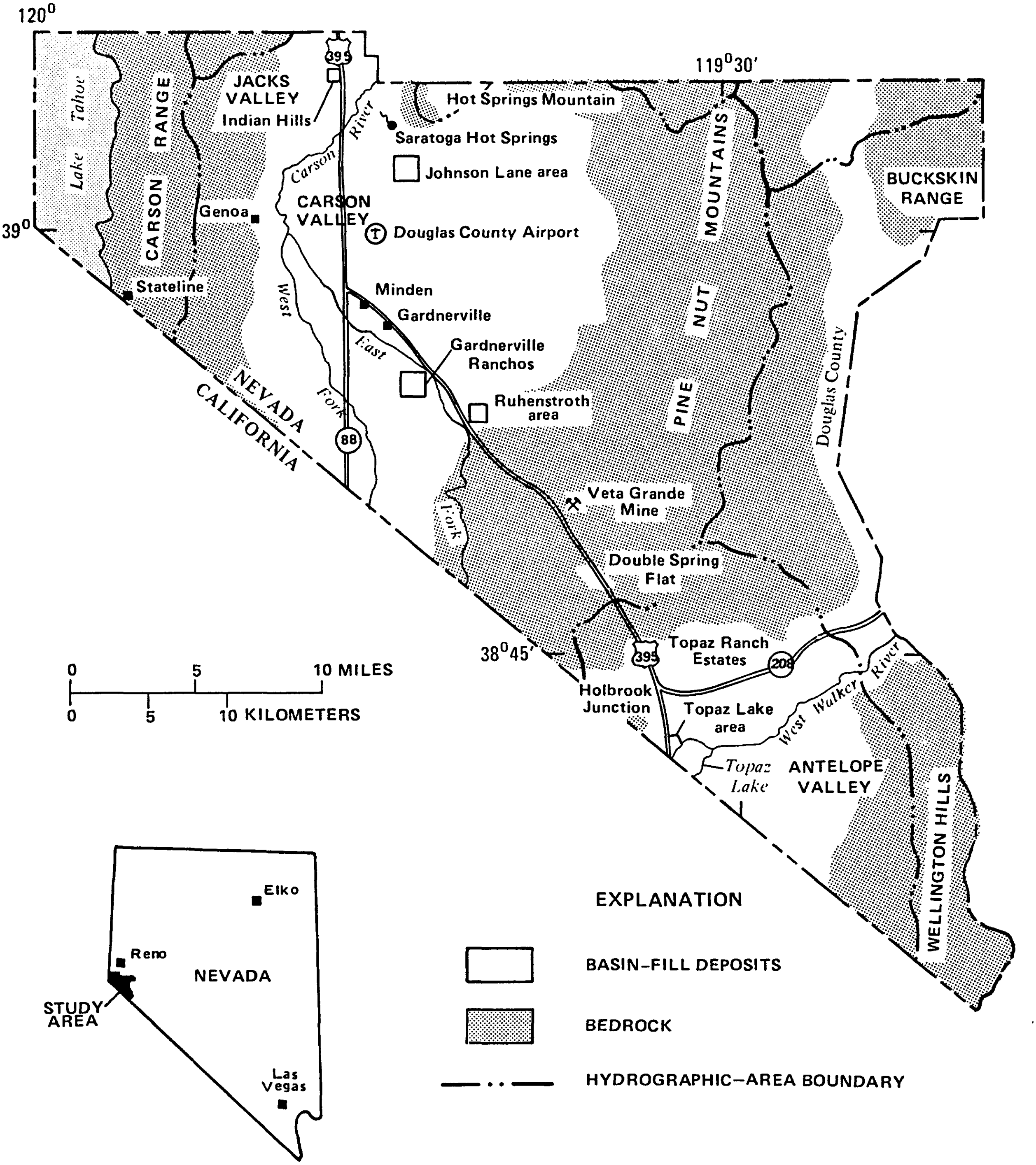

FIGURE 1.--Location of study area.

Douglas County has been one of the fastest growing counties in the Nation, with a 182-percent increase in population between the 1970 and 1980 censuses (Governor's Office of Planning Coordination, 1984, p. 37). This increase is apparently a result of recent economic growth in the gaming industry, availability of residential property, and the esthetic qualities of the area. The rapid growth has led to concern about the present and future impacts of development on the land and water resources.

Ground water is the principal source of drinking water for most of Douglas County except in the Lake Tahoe basin where the lake is the primary source. Ground water is also used for irrigation in Carson and Antelope Valleys. In 1969, just prior to the rapid population increase, the estimated 6,000 inhabitants in Douglas County withdrew approximately 7,000 acre-feet of ground water for irrigation and about 420 acre-feet for public supply. By 1985, the County's population had increased to 23,200 inhabitants and estimated annual ground-water withdrawals had increased to 10,500 acre-feet for irrigation and 3,900 acre-feet for public supply. Estimates of surface-water withdrawals decreased from 230,000 acre-feet for irrigation in 1969 to 220,000 acre-feet in 1985, while surface-water withdrawals for public supply increased from 1,200 acre-feet in 1969 to about 2,200 acre-feet in 1985 (State of Nevada, 1971, p. 18; E.A. Frick, U.S. Geological Survey, written communication, 1987).

Six community water-supply systems of varying sizes serve developed areas in and near the Minden-Gardnerville area, in southern Carson Valley, and a residential area in Indian Hills, in the northern part of the valley. Smaller community systems serve developments adjacent to and northeast of Topaz Lake, in Antelope Valley. The remainder of the county outside the Lake Tahoe Basin is served by private domestic wells.

Potential sources of ground-water contamination in Douglas County include (1) natural, localized sources of mineralized water and of uranium and its radioactive decay products, including radon-222, a natural gas produced by radioactive decay of radium-226 (Otton and others, 1985); (2) leachate from a gold mining and milling operation in the southeastern corner of Carson Valley; (3) leachate from a large landfill in Carson Valley; (4) infiltration of agricultural chemicals (fertilizers and pesticides) applied in Carson and Antelope Valleys; (5) infiltration of contaminants from land application of municipal sewage effluents in Carson Valley; (6) percolation of domestic wastes from septic fields in more densely developed surburban areas of the county (Garcia, 1989); and (7) infiltration of organic contaminants from spills or improper disposal of solvents and leakage of petroleum products from underground storage tanks.

Previous studies have identified areas in Douglas County with potential for ground-water quality degradation (Nowlin, 1982; Garcia, 1989). In addition to the ground-water quality studies, a three-dimensional model has been developed to simulate surface-water flow and ground-water levels in response to various ground-water withdrawal alternatives (Maurer, 1986). Measurements of ground-water levels and estimates of pumpage have been compiled from data-collection activities in the Carson Valley (Berger, 1987).

In 1985, the Geological Survey, in cooperation with Douglas County, established a network of 33 wells for monitoring ground-water quality in the Carson Valley and Topaz Lake areas; six supplemental wells were added to this network late in 1986. The ground-water quality data collected during the first year of network operation were compiled and published in another U.S. Geological Survey report (Thodal, 1989).

The purpose of this report is to present the ground-water quality data collected from January through August 1987. The data include: physical properties and major chemical constituents, indicator organisms of fecal contamination, nutrients, trace elements, manmade organic compounds, and radon-222. These, in addition to data collected during the first year of network operation, document current (1987) conditions and serve as a baseline from which future ground-water quality responses to changing land-use practices can be assessed.

METHODS AND MATERIALS USED

The monitoring network is composed of wells defined as (1) primary sites--heavily pumped municipal wells and wells in areas that have a high potential for contamination; (2) long-term trend sites--wells sampled to observe time trends in water quality; and (3) supplemental sites--wells sampled to fill in data gaps. Primary sites were sampled quarterly, long-term trend sites were sampled biannually, and supplemental sites were sampled annually. Long-term trend site 7 was discontinued at the well-owner's request in 1987; therefore, a nearby supplemental well (site 34) was converted to a long-term trend site. The current network consists of 6 primary sites (wells 1-6), 20 long-term trend sites (wells 8-26 and 34), and 9 supplemental sites (wells 27-29, 31, and 35-39). Information regarding wells used in the monitoring network (location, land-surface altitude, well depth, screened interval, and casing diameter) is summarized in table 1 and the well locations are shown in figure 2.

Three supplemental sites (wells 27, 28, and 31) and long-term trend site number 10 are constructed of polyvinyl chloride (PVC) thermoplastic well casings. PVC has many desirable properties for monitoring-well construction. Some data, however, suggest potential interferences from the use of PVC for monitoring trace-organic chemical species (Barcelona and others, 1983, p. 43) and particularly when casing sections and screens are joined by using organic solvent primers and cements (Barcelona and others, 1983, p. 41). The integrity of major-ion chemical data collected from these sites to characterize the water quality of the shallow ground-water system should not be affected by the materials used for well construction, but interpretation of trace-organic chemical data warrants careful scrutiny.

Ground-water samples were collected using the existing pump at each monitoring well, or from the natural discharge of flowing (artesian) wells. Samples from U.S. Geological Survey observation wells (sites 27, 28, and 31) and site 10 were obtained with a peristaltic pump. Each well was allowed to discharge a minimum volume equivalent to three times the calculated volume of well casing so that samples representative of water in the aquifer could be collected. Water temperature, pH, and specific-conductance measurements were made frequently during the flushing period. Stabilization of measured values indicated that the water being withdrawn was from the aquifer.

TABLE 1.--*Information regarding wells used in monitoring network*

[--, indicates that information was not available]

		U.S. Geological Survey site designations[1]			Depth (feet below land surface)			
Site number[1] (fig. 2)	Type of site[2]	Standard identification	Local identification	Land-surface altitude (feet above sea level)	Well	Top of uppermost open interval	Bottom of lowermost open interval	Casing diameter (inches)
1	P	390503119463501	105 N14 E20 18ABAB1	4,760	425	151	301	8.0
2	P	385719119454701	105 N13 E20 29CDC1	4,720	400	--	--	--
3	P	385604119435601	105 N12 E20 04ADA1	4,780	300	100	300	16
4	P	385414119425401	105 N12 E20 15ADD1	4,850	375	183	372	16
5	P	385412119401401	105 N12 E21 18CAB1	5,110	--	--	--	8.0
6	P	384333119301701	106 N10 E22 15DCB1	5,120	--	--	--	--
8	L	390542119472001	105 N14 E19 12ADA1	4,895	150	120	150	7.0
9	L	390457119491301	105 N14 E19 14BBD1	5,040	100	76	96	8.0
10	L	390446119451401	105 N14 E20 17ADCA1	4,640	27	--	--	2.0
11	L	390232119443201	105 N14 E20 28CDC1	4,690	88	68	88	7.0
12	L	390208119433201	105 N14 E20 34BDC1	4,760	100	--	--	6.0
13	L	390106119424301	105 N13 E20 02CBB1	4,860	176	156	176	6.0
14	L	390021119504301	105 N13 E19 09ADCA1	4,820	180	156	176	8.0
15	L	390017119453901	105 N13 E20 08CAA1	4,695	130	110	125	7.0
16	L	390015119500101	105 N13 E19 10DBB1	4,680	115	80	115	8.0
17	L	385926119481601	105 N13 E19 13BCC1	4,675	500	150	500	16
18	L	385801119421501	105 N13 E20 26ABB1	4,870	130	90	130	9.0
19	L	385742119453801	105 N13 E20 29BDDD1	4,720	118	93	114	7.0
20	L	385654119431801	105 N13 E20 34ACC1	4,790	80	--	--	8.0
21	L	385509119414801	105 N12 E20 11ADD 1	4,900	125	105	125	6.0
22	L	385352119455401	105 N12 E20 17CCD 1	4,760	91	67	87	8.0
23	L	385321119405002	105 N12 E20 24ADC 2	4,980	145	122	142	8.0
24	L	385255119482301	105 N12 E19 23DDD 1	4,740	141	121	141	9.0
25	L	384156119323301	106 N10 E22 29CADA1	5,067	183	140	183	6.0
26	L	384136119323901	106 N10 E22 32BAAB2	5,075	105	80	105	7.0
27	S	390205119464301	105 N14 E20 30DCCB1	4,654	20.5	10.5	20.5	2.0
28	S	390137119453601	105 N14 E20 32DCCC1	4,679	21	11	21	2.0
29	S	390024119453501	105 N13 E20 08ACBC1	4,692	21.1	--	--	1.0
31	S	385948119464401	105 N13 E20 18BAAA1	4,682	20.5	10.5	20.5	2.0
34	L	390623119470501	105 N14 E20 06CBAB2	4,840	96	73	93	8.0
35	S	385738119465301	105 N13 E20 30BCAD1	4,695	360	200	360	26
36	S	385703119381301	105 N13 E21 33BCAB1	5,200	163	140	160	8.6
37	S	385410119494501	105 N12 E19 15DBAA1	4,920	300	125	300	10
38	S	385342119451701	105 N12 E20 20ABAA1	4,795	450	200	450	16
39	S	384640119351801	105 N11 E21 35ABB 1	5,880	115	93	115	8.0

[1] In this table, wells are referenced to figure 2 by a site number, and identified by the standard identification (ID) and the local (Nevada) ID used by the U.S. Geological Survey. Except in this table, only the site numbers (1-39) are used, for convenience. In 1987, long-term trend site 7 was discontinued at the request of the well owner, and in 1986, supplemental site 34 was converted to a long-term trend site to replace site 7. Sites 30, 32, and 33 (Thodal, 1989, table 1) were not sampled during this (1987) study period.

The standard identification is based on the grid system of latitude and longitude. The number consists of 15 digits: The first six digits denote the degrees, minutes, and seconds of latitude; the next seven digits denote the degrees, minutes, and seconds of longitude; and the last two digits (assigned sequentially) identify the site within a 1-second grid. For example, site 385604119435601 is at 38°56'04" latitude and 119°43'56" longitude, and it is the first site recorded in that 1-second grid. The assigned number is retained as a permanent identifier even if a more precise latitude and longitude are later determined.

A local site designation is used in Nevada to identify a site by hydrographic area (Rush, 1968) and by the official rectangular subdivision of the public lands referenced to the Mount Diablo base line and meridian. Each site designation consists of four units: The first unit is the hydrographic area number. The second unit is the township, preceded by an N to indicate location north of the base line. The third unit is the range, preceded by an E to indicate location east of the meridian. The fourth unit consists of the section number and letters designating the quarter section, quarter-quarter section, and so on (A, B, C, and D indicate the northeast, northwest, southwest, and southeast quarters, respectively), followed by a number indicating the sequence in which the site was recorded. For example, well 105 N12 E21 18CAB1 is in Carson Valley (hydrographic area 105). It is the first well recorded in the northwest quarter of the northeast quarter of the southwest quarter of section 18, Township 12 North, Range 21 East, Mount Diablo base line and meridian.

[2] P, primary sites--heavily pumped municipal wells or wells in areas that have a high potential for contamination; L, long-term trend sites--wells sampled to observe time trends in water quality; S, supplemental sites--wells sampled to fill in data gaps.

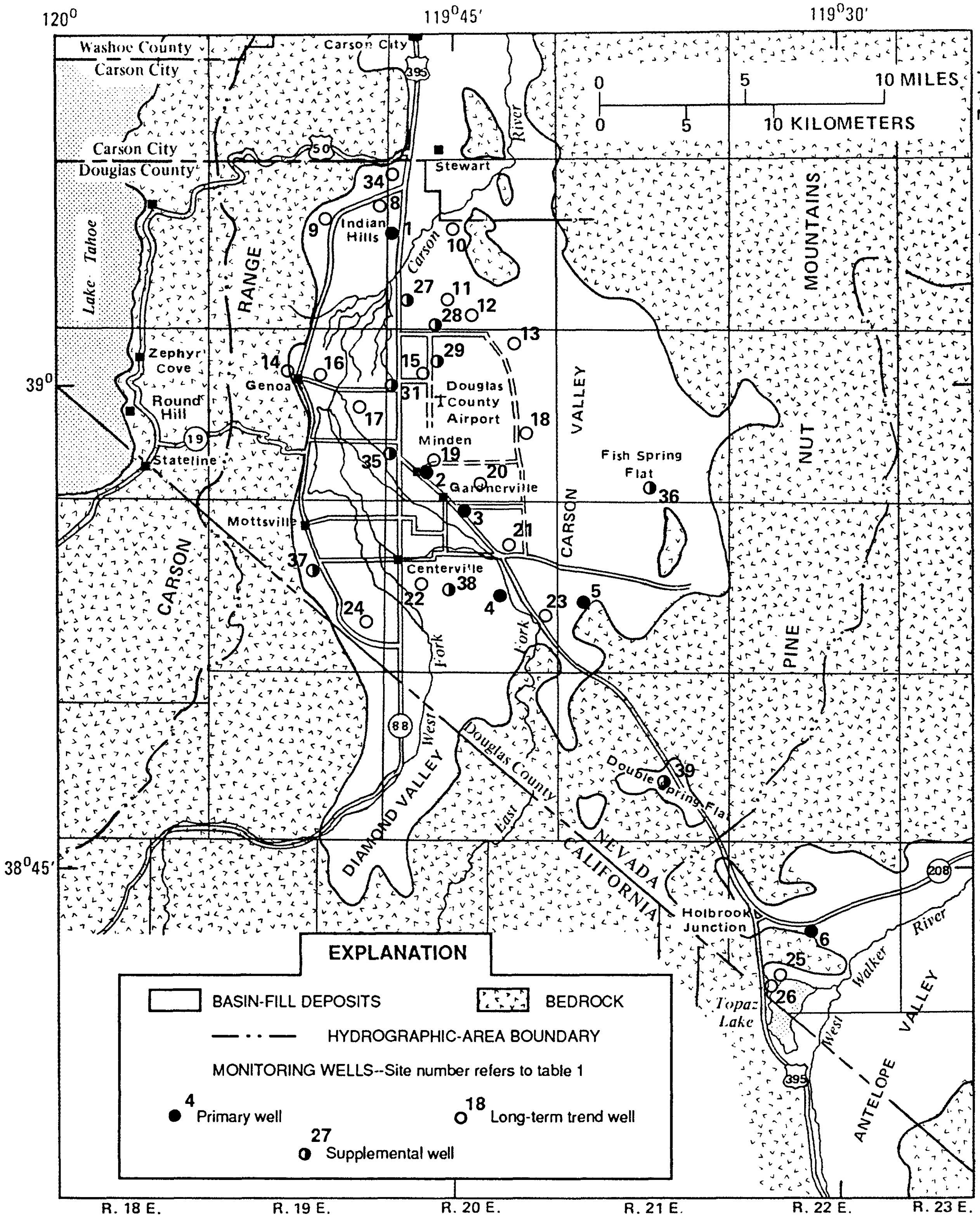

FIGURE 2.--Monitoring wells in Carson Valley, Double Spring Flat, and Topaz Lake areas.

Water-quality properties measured at each site included: (1) temperature, accurate to ±0.5 °C; (2) pH, accurate to ±0.1 unit; (3) specific conductance, accurate to 3 significant figures and expressed in microsiemens per centimeter at 25 °C (µS/cm); and (4) alkalinity as $CaCO_3$, by incremental-pH titration accurate to ±1 mg/L. Measurements were made in accordance with methods described by the U.S. Environmental Protection Agency (1972, chapters 3 and 4) and by Barnes (1964).

The presence and abundance of biological indicators of fecal contamination were determined by the membrane filter method for fecal coliform bacteria and fecal streptococcal bacteria. Samples were filtered immediately after collection. The filter was placed on a nutrient medium, incubated for 24 hours at 44.5 °C for fecal coliform bacteria and for 48 hours at 35 °C for fecal streptococcal bacteria, and colonies were then counted. These methods are described in detail by Ehlke and others (1977, p. 53-62).

Water samples for chemical analysis were collected and treated following standard U.S. Geological Survey methods (Skougstad and others, 1979), and shipped within 2 days to the U.S. Geological Survey laboratory in Arvada, Colo. The types of containers and preservation and treatment procedures used for the various water samples are listed in table 2. The methods and precision of the analyses are described by Feltz and Anthony (1985).

Samples collected for dissolved radon-222 determination were sent to the Department of Physics and Astronomy, University of Maine in Orono, for analysis by the liquid scintillation counter technique (Prichard and Gesell, 1977, p. 577-581). A subset of samples from five monitoring sites was collected in all-glass deemanation bubblers and sent to United States Testing Company, Inc., Richland, Wash., for analysis by direct deemanation and alpha-scintillation counting (Yang, 1987, p. 194-198).

In water year 1986, semiquantitative "scan" for the presence and cumulative concentration (but not the individual identities) of organic compounds was made on samples from 30 sites, using gas chromatography and a flame-ionization detector (Thodal, 1989, p. 10-11). Sixteen sites where organic compounds were detected by the "scan" in water year 1986, and five new "supplemental" sites were sampled in water year 1987 for determination of specific organic compounds using gas chromatography and a mass spectrometer for purgeable organic compounds (Wershaw and others, 1983, p. 61-71), acid extractable compounds (Wershaw and others, p. 71-75), and base/neutral extractable compounds (Wershaw and others, p. 76-80). Organochlorine compounds were analyzed by gas chromatography and an electron-capture detector, and organophosphate compounds were analyzed by gas chromatography and a flame-photometric detector (Wershaw and others, p. 50-58). Organic compounds analyzed by these methods are listed in table 3.

Water-quality properties and constituents measured and detected in water samples collected from network wells during water year 1986 with respect to source, occurrence in uncontaminated water, use of standards, and significance are described in a previous report (Thodal, 1989, p. 12-18).

TABLE 2.--*Sample containers and preservation and treatment procedures for water-quality samples*

[Abbreviation: °C, degrees Celsius]

Type of sample	Container	Treatment
Dissolved major anions	250-milliliter polyethylene bottle, field-rinsed	Filtered[1]
Dissolved major cations and trace constituents	500-milliliter polyethylene bottle, acid-rinsed	Filtered[1], acidified to pH <2 with concentrated nitric acid
Dissolved nutrients	250-milliliter brown polyethylene bottle, field-rinsed	Filtered[1], preserved with mercuric chloride, chilled to 4 °C
Dissolved organic carbon	125-milliliter glass bottle, baked at 350 °C	Filtered[2], chilled to 4 °C
Dissolved mercury	250-milliliter glass bottle, acid-rinsed	Filtered[1], acidified, to pH <2 with concentrated nitric acid, preserved with potassium dichromate
Radon-222	20-milliliter scintillation vial; duplicate sample required	Mineral oil
Purgeable organic compounds	40-milliliter amber, glass vial with septum; duplicate sample required	Chilled to 4 °C, protected from sunlight
Extractable organic compounds	1-liter glass bottle, baked at 350 °C	Chilled to 4 °C
Organochlorine and organophosphorus compounds	1-liter glass bottle, baked at 350 °C	Chilled to 4 °C

[1] Prerinsed, 0.45-micrometer (pore-size) membrane filter.

[2] Prerinsed, 0.45-micrometer (pore-size) silver-metal membrane filter.

TABLE 3.--*List of organic compounds for which analyses were made*

Purgeable organic compounds	Acid-extractable organic compounds	Base/neutral-extractable organic compounds	Organochlorine compounds	Organophosphate compounds
Benzene	4-Chloro-3-methylphenol	Acenaphthene	Aldrin	Chlorpyrifos (Dursban)
Bromoform	2-Chlorophenol	Acenapthylene	Chlordane	Diazinon
Carbon tetrachloride	2,4-Dichlorophenol	Anthracene	DDD	Ethion
Chlorobenzene	2,4,Dimethylphenol	Benzo(a)anthracene	DDE	Malathion
Chloroethane	2,4-Dinitrophenol	(1,2-benzanthracene)	DDT	Methyl parathion
2-Chloroethyl vinyl ether	4,6-Dinitro-2-methylphenol	Benzo(b)fluoranthene	Dieldrin	Methyl trithion
Chloroform	2-Nitrophenol	Benzo(k)fluoranthene	Endosulfan	Parathion
Chlorodibromomethane	4-Nitrophenol	Benzo(g,h,i)perylene	Endrin	Trithion
1,2-Dichlorobenzene	Pentachlorophenol	(1,12-benzoperylene)	Gross polychlorinated biphenyls	
1,3-Dichlorobenzene	Phenol	Benzo(a)pyrene	(PCB)	
	2,4,6-Trichlorophenol			
1,4-Dichlorobenzene		4-Bromophenyl phenyl ether	Gross polychlorinated naphthalenes	
Dichlorobromomethane		Butyl benzyl phthalate	(PCN)	
Dichlorodifluoromethane		bis(2-Chloroethoxy)methane	Heptachlor	
1,2-Dibromoethylene; EDB		bis(2-Chloroethyl)ether	Heptachlor epoxide	
1,1-Dichloroethane		bis(2-Chloroisopropyl)ether	Lindane	
1,2-Dichloroethane		2-Chloronaphthalene	Methoxychlor	
1,1-Dichloroethylene		4-Chlorophenyl phenyl ether	Mirex	
1,2-trans-Dichloroethylene		Chrysene	Perthane	
1,2-Dichloropropane		1,2,5,6-Dibenzanthracene	Toxaphene	
Cis-1,3-Dichloropropene		1,2-Dichlorobenzene		
Trans-1,3-Dichloropropene		1,3-Dichlorobenzene		
1,3-Dichloropropene		1,4-Dichlorobenzene		
Ethylbenzene		Diethyl phthalate		
Methyl bromide		Dimethyl phthalate		
(bromomethane)		Di-n-butyl phthalate		
Methyl chloride		2,4-Dinitrotoluene		
(chloromethane)		2,6-Dinitrotoluene		
Methylene chloride		Di-n-octyl phthalate		
		bis(2-Ethylhexyl)phthalate		
Styrene				
1,1,2,2-Tetrachloroethane		Fluoranthene		
Tetrachloroethylene; PCE		Fluorene		
Toluene		Hexachlorobenzene		
1,1,1-Trichloroethane		Hexachlorobutadiene		
1,1,2-Trichloroethane		Hexachlorocyclopentadiene		
Trichloroethylene; TCE		Hexachloroethane		
Trichlorofluoromethane		Indeno(1,2,3-cd)pyrene		
Vinyl chloride		Isophorone		
Xylenes, mixed		Naphthalene		
		Nitrobenzene		
		N-Nitrosodimethylamine		
		N-Nitrosodi-n-propylamine		
		N-Nitrosodiphenylamine		
		Phenanthrene		
		Pyrene		
		1,2,4-Trichlorobenzene		

WATER-QUALITY DATA

This report presents the data collected during water year 1987. Locations where primary and secondary State of Nevada drinking-water standards have been exceeded are shown in figures 3 and 4, respectively. Primary drinking-water standards are maximum contaminant levels established by the U.S. Environmental Protection Agency, adopted and enforceable by the State of Nevada for public water supplies which serve water to at least 25 people, or 15 service connections, for at least 60 days per year. Secondary drinking-water standards are unenforceable contaminant levels recommended by the U.S. Environmental Protection Agency and adopted by the State of Nevada to define thresholds of esthetic quality. Primary and Secondary standards are listed in table 4.

Primary drinking-water standards for inorganic properties and constituents (table 4) were exceeded for fluoride at site 10 (5.6 and 6.8 mg/L) and for nitrite plus nitrate nitrogen at site 34 (12 mg/L). Secondary maximum contaminant levels were exceeded as follows: pH at site 1 (8.6 to 9.1 units), site 9 (8.6 units), site 35 (8.9 units), and site 38 (8.7 units); turbidity at site 10 (70 to 82 NTU [nephelometric turbidity units]), site 28 (20 NTU), site 29 (390 NTU), site 31 (32 NTU) and site 39 (6.5 NTU) sulfate at site 10 (1,700 mg/L), site 15 (290 mg/L) and site 29 (290 mg/L); dissolved solids at site 10 (2,920 and 2,940 mg/L), site 29 (924 mg/L), and site 31 (622 mg/L); iron at site 10 (9.6 mg/L); and manganese at site 10 (1.2 mg/L), site 15 (0.062 mg/L), site 35 (0.051 mg/L), and site 36 (0.22 mg/L).

Locations where indicator fecal bacteria were detected are shown in figure 5. Fecal coliform bacteria were detected in water samples from two wells [site 5, 1 sample: 3 colonies per 100 milliliters (mL); and site 18, 1 sample: 140 colonies per 100 mL]. Fecal streptococcal bacteria were detected in water samples from 11 wells (site 5, 1 sample: 2 colonies per 100 mL; site 15, 2 samples: 40 and 8 colonies per 100 mL; site 18, 2 samples: 32 and 23 colonies per 100 mL; site 20, 2 samples: 2 and 18 colonies per 100 mL; site 21, 2 samples: 4 and 8 colonies per 100 mL; site 27, 1 sample: 1,000 colonies per 100 mL; site 28: 420 colonies per 100 mL; site 29, 1 sample: 10 colonies per 100 mL; site 36, 1 sample: 14 colonies per 100 mL; site 37, 1 sample: 5 colonies per 100 mL; and site 38, 1 sample: 35 colonies per 100 mL). Locations where manmade organic compounds were detected are shown in figure 6. The primary maximum contaminant level for vinyl chloride was exceeded at site 31 (0.005 mg/L). Figure 7 shows the distribution of dissolved radon-222 activities measured in water samples from monitoring-network wells.

Physical, biological, and chemical data are given in tables 5-9, and a statistical summary, by constituent, of water-quality data collected at all wells in the monitoring network, is presented in table 10. Measurements below detection limits were incorporated into the mean and standard deviation estimates by assigning values predicted by log-probability regression analysis, and the median was estimated based on lognormal maximum likelihood procedures (Gilliom and Helsel, 1984; Helsel and Gilliom, 1985).

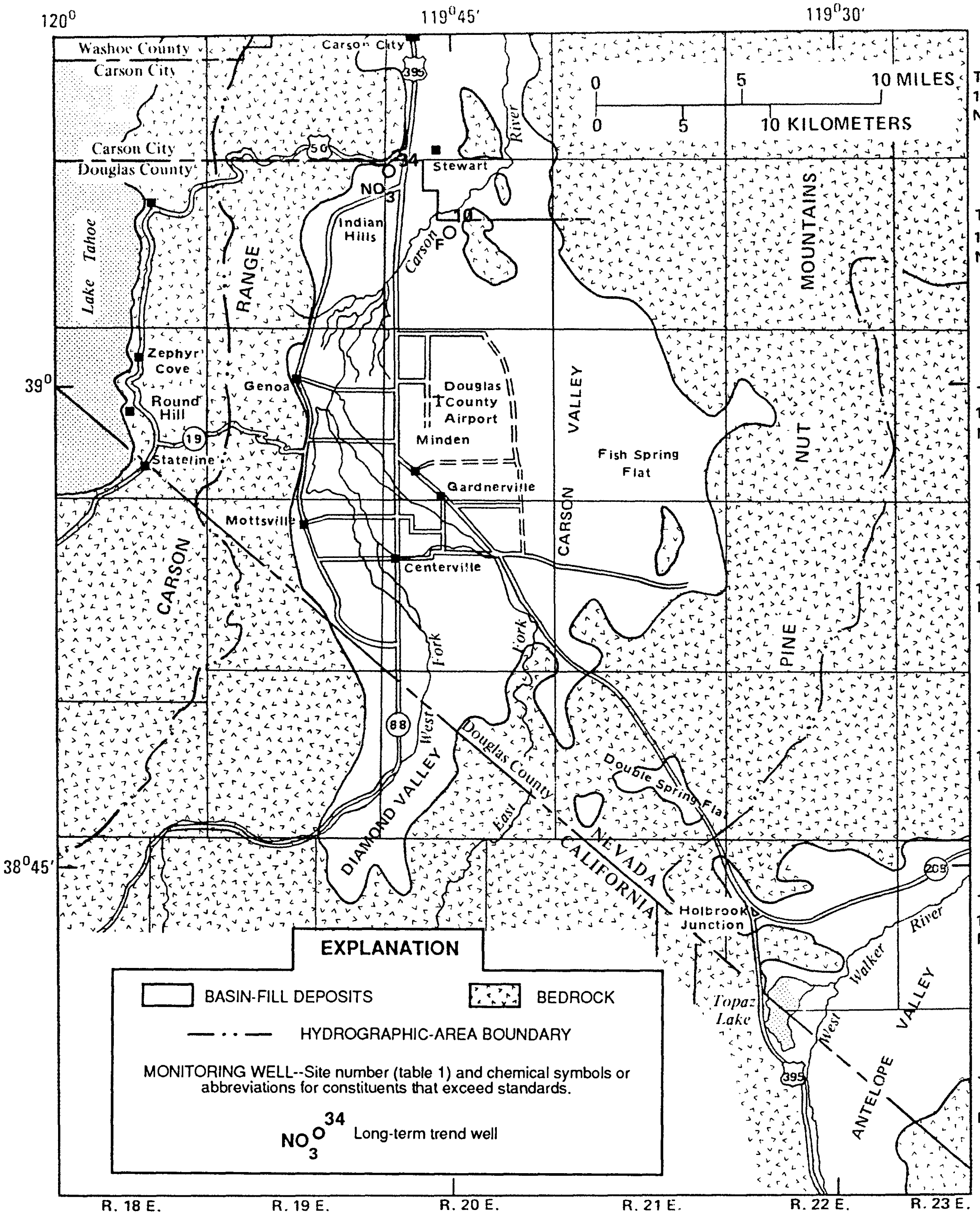

FIGURE 3.--Monitoring wells where State primary drinking-water standards were exceeded. The fluoride (F) standard was exceeded at long-term trend site 10 and the nitrate (NO_3) standard was exceeded at long-term trend site 34.

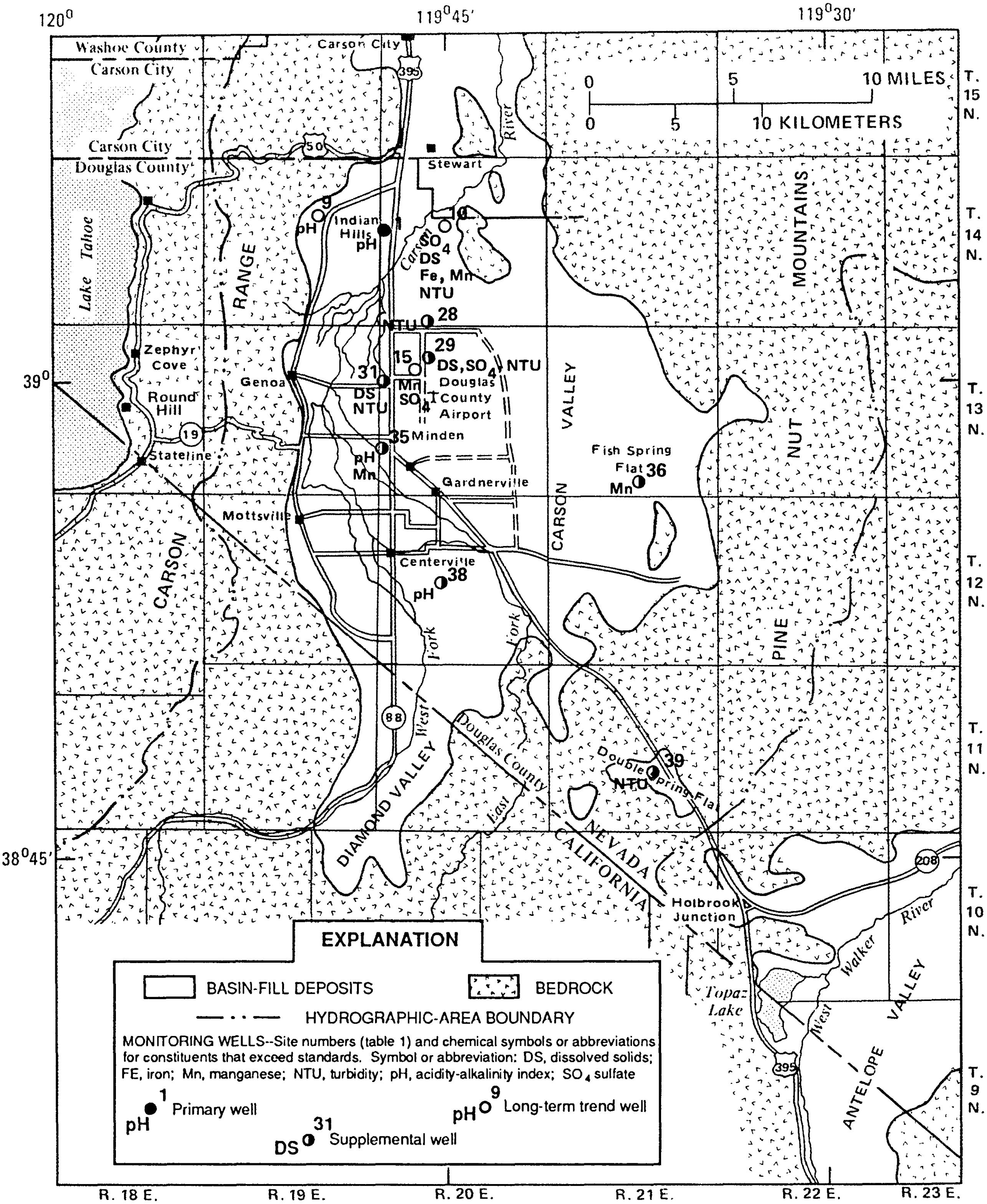

FIGURE 4.--Monitoring wells where State secondary drinking-water standards were exceeded.

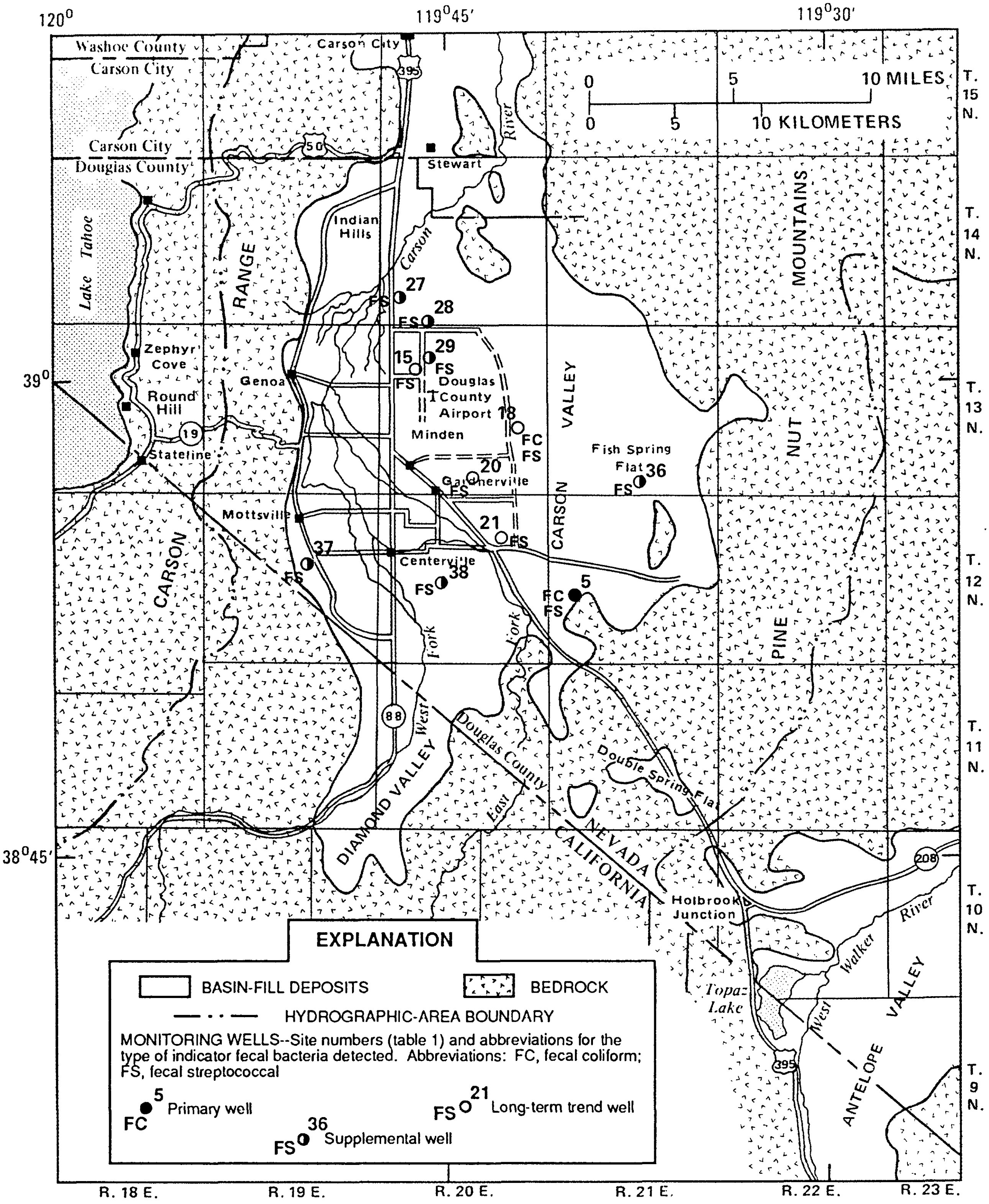

FIGURE 5.--Monitoring wells where indicator fecal bacteria were detected.

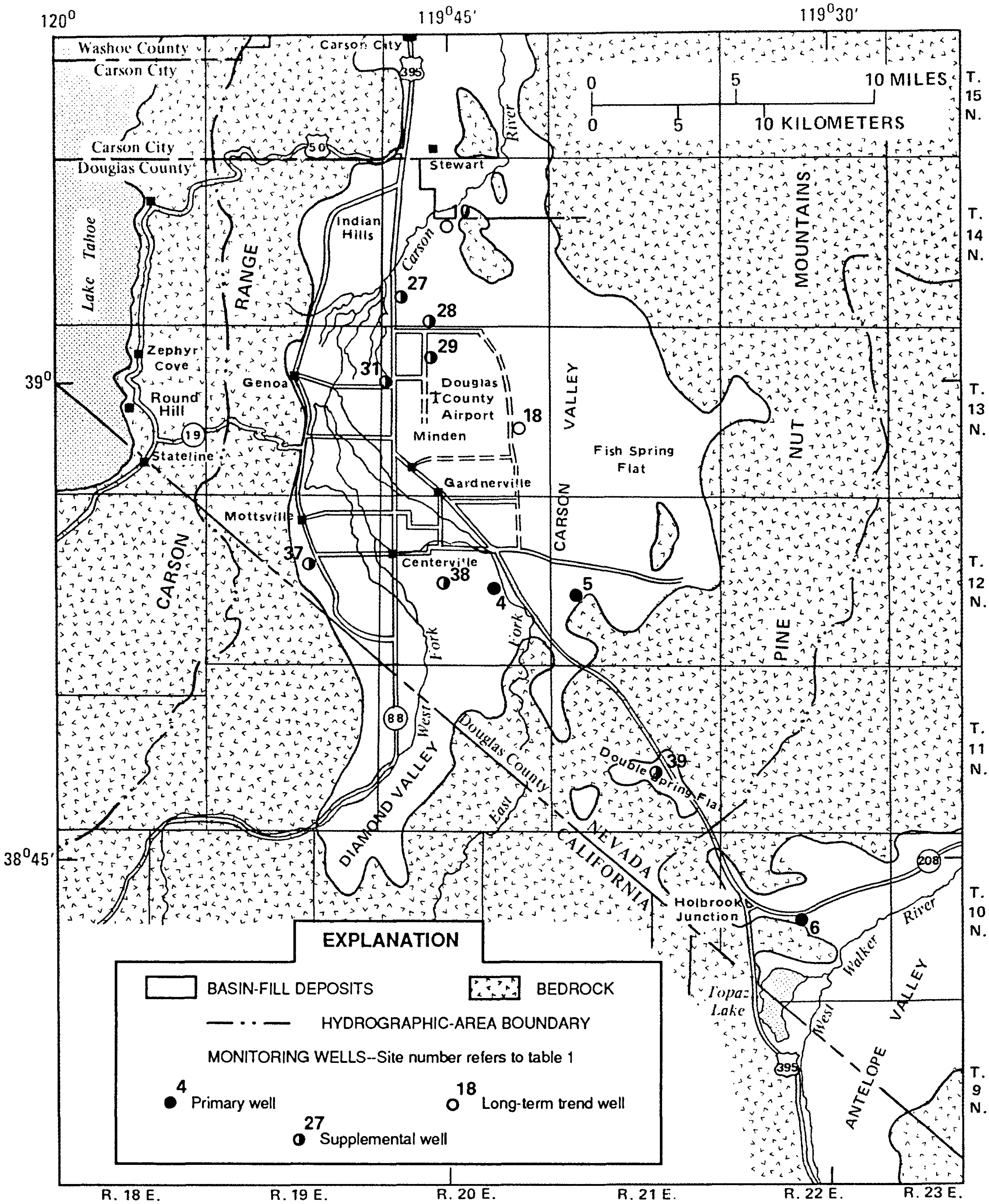

FIGURE 6.--Monitoring wells where manmade organic compounds were detected.

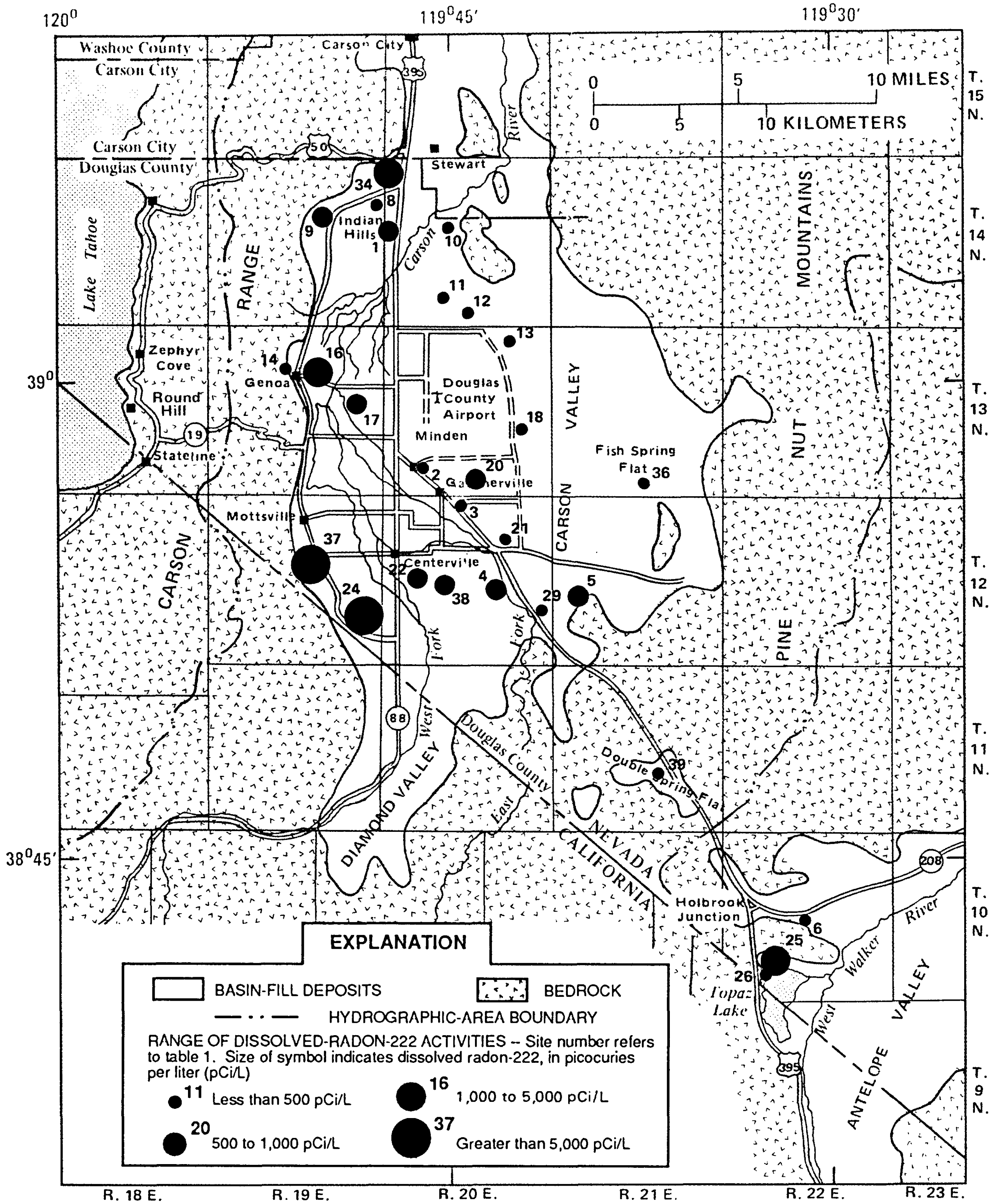

FIGURE 7.--Dissolved radon-222 activities measured in water samples from monitoring wells.

TABLE 4.--*Background information on constituents and properties of water*

[Modified from Nowlin (1982, table 2). Abbreviations: NBCHPS, Nevada Bureau of Consumer Health Protection Services (1980); EPA, U.S. Environmental Protection Agency; µg/L, micrograms per liter; mg/kg, milligrams per kilogram; mg/L, milligrams per liter; mL, milliliter; pCi/L, picocuries per liter; °C, degrees Celsius; --, no data available]

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Specific conductance	Capability of water to conduct electric current at specified temperature of 25 °C. Presence of charged ionic species dissolved in water makes solution conductive, whereas pure liquid water (without dissolved ions) has very low electrical conductance. As ion concentrations increase, conductance of solution increases; therefore, specific conductance is indication of ion concentrations (Hem, 1985, p. 66).	Generally less than 1,000 microsiemens per centimeter at 25 °C for potable water (Hem, 1985, p. 67).	No enforceable standard.	Provides field estimate of dissolved-solids concentration and quality control for associated laboratory analysis.
pH	A measure of acidity (pH value less than 7.0) or alkalinity (pH greater than 7.0) of water, which is based on effective concentration (also called "activity") of dissolved hydrogen ions. Primary source of hydrogen ions in most natural ground-water systems is from reaction of water with carbon dioxide that is produced by soil microorganisms; this reaction forms dissolved bicarbonate and hydrogen ions (Hem, 1985, p. 61-63).	The pH of pure water at 25 °C is 7.00 (which is termed a neutral pH). Typical ground-water values range from about 6.0 to about 8.5 (Hem, 1985, p. 63-64).	Secondary standard: range of acceptable pH is from 6.5 to 8.5 (NBCHPS).	Toxicity of certain compounds (such as hydrogen cyanide or ammonia), solubility of metal compounds, and corrosiveness of water are affected by pH (EPA, 1976, p. 178-179). The pH is also a controlling factor in geochemical equilibrium.
Turbidity	Semiquantitative measure of scattering of light due to suspended inorganic and organic particles, precipitates, colloids, and phytoplankton. May be derived from soil erosion, algal blooms, industrial wastes, sewage, or chemical reactions such as oxidation of dissolved iron.	--	Secondary standard: 1 to 5 standard turbidity units, depending upon size of population served by water-supply systems (NBCHPS).	Esthetically objectionable in drinking water.

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Fecal coliform bacteria	Bacteria that are present in intestine or feces of warm-blooded animals. Are widely used as indicators of sanitary quality of water. Technically defined for laboratory purposes as all organisms that produce blue colonies within 24 hours when incubated at 44.5 °C plus or minus 0.2 °C on M-FC medium (nutrient medium for bacterial growth). Fecal-coliform abundance expressed as number of colonies per 100 mL of sample (Britton and Greeson, 1988, p. 63).	Not expected in potable ground water; however, some species of *E. coli* bacteria have been found to survive and multiply on organic matter introduced to ground-water through artificially recharged lake water. (Canter and Knox, 1985, p. 72).	Primary drinking water standards: (1) one colony per 100 mL of sample as the arithmetic mean of all samples examined per compliance period; (2) four colonies per 100 mL when less than 20 samples are examined per month; (3) four colonies per 100 mL in more than 5 percent of the samples when 20 or more are examined per month (NBCHPS).	Some nonfecal coliform organisms can survive and multiply on organic substrates and may produce slime inside pipes. Fecal-coliform membrane-filter procedure used in this investigation is considered to have 93 percent accuracy in differentiating between coliforms from warm-blooded animals and those of other sources (American Public Health Association and others, 1985, p. 896). Presence of fecal-coliform bacteria in ground water suggests presence of other microorganisms, some pathogenic; however, such contamination is generally due to ineffective surface seal at individual well, rather than extensive aquifer contamination.
Fecal streptococcal bacteria	Bacteria found in intestine or feces of warm-blooded animals. Their presence in water is considered to verify fecal pollution. Technically defined for laboratory purposes as gram-positive cocci bacteria that produce red or pink colonies within 48 hours at 35 °C plus or minus 0.5 °C on KF-streptococcus medium (nutrient medium for bacterial growth). Abundance expressed as number of colonies per 100 mL of sample (Britton and Greeson, 1988, p. 81).	Not expected in potable ground water; however, some species of *E. coli* bacteria have been found to survive and multiply on organic matter introduced to ground water through artificially recharged lake water. (Canter and Knox, 1985, p. 72).	No enforceable standard.	Intestines of humans and animals are normal habitat for fecal streptococci; thus, these organisms are indicators of fecal pollution. Limited survival outside normal habitat makes these organisms poor choice for sole indicator of contamination; but combined with fecal coliform data, inferences about pollution source may be made (American Public Health Association and others, 1985, p. 903).
Hardness (as $CaCO_3$)	Derived principally from dissolved calcium and magnesium.	Commonly 200 to 300 mg/L in carbonate ground water.	No enforceable standard.	Consumes soap and detergents before lather will form, resulting in soap curds depositing on sinks and bathtubs. Hard water forms scales in pipes, boilers, and water heaters. Water-hardness classification: 0-60 mg/L, soft; 61-120 mg/L, moderately hard; 121-180 mg/L, hard; more than 180 mg/L, very hard. Soft water is corrosive to metal pipes and fixtures.

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Calcium (Ca) and magnesium (Mg)	Dissolved from rocks and soils, especially those containing limestone, dolomite, and gypsum.	Calcium: 1 to more than 1,000 mg/L. Magnesium: Normally much less than calcium and usually less than sodium (Hem, 1985, p. 89-100).	Secondary standards for magnesium: 125 mg/L unless alternative supply unavailable, then 150 mg/L (NBCHPS).	Impart hardness and scale-forming properties to water (see hardness). High concentrations unsuitable for laundries, steam plants, textile processing, dyeing, and electroplating. Small amounts desirable to prevent corrosion.
Sodium (Na) and potassium (K)	Dissolved from most rocks and soils. High concentrations may be found in natural brines, industrial waste, and sewage.	Sodium: Generally 1 to 1,000 mg/L. Potassium: Commonly 0.1 to 0.5 times sodium; generally less than 10 mg/L (Hem, 1985, p. 100-105).	No enforceable standard.	Concentrations greater than 50 mg/L may cause foaming in boilers. Combine with chloride to impart salty taste. Sodium may contribute to hypertension and cardiovascular diseases. Sodium may be objectionable in irrigation water at concentrations that depend on type of crop and soil.
Bicarbonate (HCO_3) and carbonate (CO_3)	Dissolved from most rocks and soils by carbon dioxide reacting with carbonate minerals such as limestone and dolomite. Carbonate ion can exist only if the pH is 8.3 or more.	Bicarbonate: Generally less than 200 mg/L in surface water and 500 mg/L in ground water. Carbonate: Generally less than 10 mg/L (Hem, 1985, p. 105-109).	No enforceable standard.	Increases alkalinity and, usually, pH of water. In combination with calcium and magnesium, causes scales in pipes and, upon heating, may release corrosive carbon dioxide.
Sulfate (SO_4)	Dissolved from rocks and soils containing gypsum and sulfide or sulfate minerals. Commonly associated with coal deposits, metallic ore deposits, and geothermal areas. May be derived from industrial wastes and atmospheric pollution.	Generally ranges from 1 to 1,000 mg/L (Hem, 1985, p. 116-117).	Secondary standards: 250 mg/L unless alternate supply unavailable, then 500 mg/L (NBCHPS).	Forms boiler scale in combination with calcium. Causes bitter taste when combined in high concentrations with other ions and may have laxative effects when ingested in higher concentrations than an individual is accustomed to. Combines with hydrogen ions in low-pH water to form sulfuric acid.
Chloride (Cl)	High concentrations may be derived from marine and desert evaporites and brines. Commonly present in sewage and industrial wastes. May be derived from salts used for control of ice on streets and highways.	Commonly less than 100 mg/L in potable water (Hem, 1985, p. 117-120).	Secondary standards: 250 mg/L unless alternate supply unavailable, then 400 mg/L (NBCHPS).	May contribute to corrosiveness of water. Imparts salty taste in concentrations as low as 100 mg/L. The chloride ion is very stable in ground water and is often used as a tracer of ground-water movement in aquifers.
Fluoride (F)	Dissolved in small amounts from most rocks and soils. Added to many public water supplies to inhibit tooth decay.	Commonly less than 1.0 mg/L in potable natural water (Hem, 1985, p. 120-123).	Primary standard, 4.0 mg/L; secondary standard, 2.0 mg/L (EPA, 1986b).	Concentrations between 0.6 and 1.7 mg/L may have beneficial effects on the structure and resistance to decay of children's teeth. Concentrations in excess of 6.0 mg/L may cause mottling and disfiguration of teeth (Committee on Water Quality Criteria, 1973, p. 66).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Silica (SiO_2)	Dissolved in most natural water in hydrated form [$Si(OH)_4$] from rocks and soils containing minerals such as quartz, kaolinite, or potassium feldspar (Hem, 1985, p. 69-73).	Commonly 1 to 30 mg/L with concentrations up to 100 mg/L occurring frequently (Hem, 1985, p. 73).	No enforceable standard.	Silica solubility is controlled by temperature and pH, and changes in these properties may cause precipitation of silicate minerals from solution.
Dissolved solids	Sum of all minerals dissolved in water. Concentrations may be increased by industrial wastes, sewage, or agricultural drainage.	Ground water is generally in the range of 25 to 1,000 mg/L (Hem, 1985, p. 31).	Secondary standards: 500 mg/L unless alternate supply not available, then 1,000 mg/L (NBCHPS).	Specific effects upon water uses depend upon individual constituents present.
Nitrogen (N)	Derived from atmosphere by nitrogen fixation or leached from decaying organic matter, fertilizer, sewage, or industrial, agricultural, and domestic wastes. Nitrogen generally occurs in ground water as nitrate (NO_3), nitrite (NO_2), ammonium (NH_4), ammonia (NH_3), and organic nitrogen. Cyanide (CN) may also be introduced to ground water through improper waste disposal (Hem, 1985, p. 124-126).	Nitrate, less than 10 mg/L; nitrite, ammonium, ammonia, and organic nitrogen, all less than 1 mg/L (Hem, 1985, p. 124-126).	Primary standard: Nitrate, 10 mg/L as N or 44 mg/L as NO_3; no enforceable standards for other nitrogen species (NBCHPS).	Nitrate concentrations in excess of 10 mg/L (as N) may cause methemoglobinemia (infant cyanosis, or "blue-baby" syndrome). Nitrogen is also an essential nutrient which may promote plant and algal growth in lakes and streams. High concentrations of of dissolved nitrogen may indicate contamination from agricultural, domestic, or industrial wastes, or from fertilizer.
Dissolved organic carbon (DOC)	Dissolved in moderate amounts from land-surface organic matter and from fossilized organic matter (kerogen; Thurman, 1985, p. 14-15).	From 0.2 to 15 mg/L; commonly less than 2 mg/L (Thurman, 1985, p. 8-9).	No enforceable standard.	Normal concentrations of dissolved organic carbon play significant role in aqueous geochemistry and can facilitate the movement of charged molecules and ions through an aquifer. High concentrations may indicate contamination from landfill leachate.
Arsenic (As)	Associated with volcanic minerals and metallic ore deposits. Common in thermal ground water.	--	Primary standard: 50 µg/L (NBCHPS).	Trivalent arsenic (arsenite) is more toxic than pentavalent arsenic (arsenate). Epidemiologic studies by U.S. Public Health Service suggest that elevated concentrations in drinking water may be related to increased incidence of skin cancer (Hammond and Beliles, 1980, p. 437-438).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Barium (Ba)	Dissolved in small amounts from rocks and soils containing soluble barium salts. Higher concentrations have been reported associated with certain oil-field waters and other brines. Common minerals are barite and witherite (Hem, 1985, p. 135-137). Uses: metallurgy, paint, glass, electronics, and medicine.	Reported median concentration in public water supplies: 43 µg/L (Hem, 1985, p. 137).	Primary standard: 1,000 µg/L (NBCHPS).	May affect central nervous system and gastrointestinal system and may act as muscle stimulant, especially of heart muscle (EPA, 1986b).
Boron (B)	Dissolved in small to moderate amounts from soils and rocks containing sodium or calcium borate salts. Higher concentrations have been associated with volcanic areas and geothermal spring water (Hem, 1985, p. 129). Uses: fire retardants, glass, leather tanning and finishing, cosmetics, photography, metallurgy, and high-energy rocket fuels.	Commonly a few tenths of a milligram per liter (Hem, 1985, p. 129).	No enforceable standard. Criterion: 750 µg/L for long-term irrigation of sensitive crops (EPA, 1986b).	Essential element for plant growth, but sensitive crops have shown toxic effects at concentrations less than 1,000 µg/L. There is no evidence that it is required by animals (EPA, 1986b).
Cadmium (Cd)	Dissolved in small amounts from rocks and soils containing minerals such as sphalerite, commonly associated with zinc and copper ores. High concentrations may be found in landfill leachate (Hem 1985, p. 142). Uses: electroplating, paint, printing inks, plastics, electrical batteries, and fluorescent and video tubes.	Commonly less than 10 µg/L (Hem, 1985, p. 142).	Primary standard: 10 µg/L (NBCHPS). Criteria: 10 µg/L for irrigation water; for aquatic life, criterion is related to water-hardness concentration (EPA, 1986b).	Causes deterioration of bones in humans. Irrigation-water criteria established on basis of human toxicity and tendency to accumulate in plants. Acute toxicity to aquatic life is buffered by hardness and salinity.
Chromium (Cr)	Dissolved in very small amounts from rocks and soils containing minerals such as chromite, and is found in greater relative abundance in magnesium- and iron-rich igneous rocks. High concentrations may indicate contamination from waste-disposal leachate (Hem, 1985, p. 138). Ground-water pollution from industrial application of chromium has occurred in many places. Plating processes are the primary industrial application of chromium.	Commonly less than 10 ug/L (Hem, 1985, p. 138).	Primary standard: 50 µg/L (NBCHPS).	Trivalent chromium is essential element in animal metabolism of glucose and lipids. Occupational exposure to hexavalent chromium compounds causes dermatitis, penetrating ulcers on hands and forearms, perforation of nasal septum, and inflamation of larynx and liver. Epidemiological studies estimate relative risk of chromate plant workers for respiratory cancer is 20 times greater than that of general population. Laboratory mice, given 5 mg/L hexavalent chromium in drinking water, had slightly higher incidence of malignant tumors than control mice (Hammond and Beliles, 1980, p. 441-442).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Copper (Cu)	Dissolved in small amounts from rocks and soils containing minerals such as chalcopyrite and chalcocite. Also leached from water pipes and plumbing fixtures by water with less than neutral pH (Hem, 1985, p. 141). High concentrations are associated with acid drainage from mines.	Commonly less than 10 µg/L (Hem, 1985, p. 141).	Secondary standard: 1,000 µg/L. Criteria: 500 µg/L for livestock water; 200 µg/L for long-term irrigation (EPA, 1986b).	Copper is essential to plant and animal metabolism, but range from deficiency to toxicity is low for organisms such as algae, fungi, some invertebrates, and fish, which lack effective barriers to control absorption Monogastric mammals, including humans, are less sensitive to copper than rumanants, and excessive copper exposure in normal persons is not thought to result in chronic disease. Acute poisoning resulting from excessive ingestion of copper salts may cause death (Hammond and Beliles, 1980, p. 443).
Iron (Fe)	Dissolved from iron-bearing minerals present in most rocks and soils. Found in some industrial wastes, and can be corroded from pipes, well casings, pumps, and other equipment. Also can be concentrated in wells and springs by certain bacteria.	Concentrations in ground water as high as 1,000 to 10,000 µg/L may be common in some aquifers. Areal distribution is commonly erratic (Hem, 1985, p. 83).	Secondary standards: 300 µg/L unless alternate supply is unavailable, then 600 µg/L (NBCHPS).	Oxidizes to reddish-brown sediment. Stains utensils, enamelware, clothing, and plumbing fixtures. May cause objectionable taste and odor problems for food and beverage processing.
Lead (Pb)	Dissolved in small amounts from soils and rocks containing minerals such as galena (principal ore of lead). Lead minerals are most abundant in sedimentary rock. "Leaded" gasoline and lead water pipes also can increase concentrations of lead (Hem, 1985, p. 143-144). Uses: paints, batteries, and in sport-hunting and fishing industry.	Less than 10 µg/L in potable water (Hem, 1985, p. 143-144).	Primary standard: 50 µg/L (NBCHPS).	Lead adversely affects the central nervous system, peripheral nerves, kidney, and hematopoietic system. Chronic or subchronic exposure to high concentrations of inorganic lead may lead to commonly fatal condition referred to as lead encephalopathy, whereas toxic effects of alkyl lead compounds on central nervous system result in hallucinations, delusions, and excitement, progressing to delirium in fatal cases. Other effects of lead exposure include colic, chromosomal aberrations, and abnormal sperm morphology. Inhalation is principal mode of exposure. (Hammond and Beliles, 1980, p. 418-421)
Manganese (Mn)	Dissolved from some rocks, soils, and lake-bottom sediments. Generally associated with iron; often associated with acid drainage from mines (Hem, 1985, p. 86).	Generally less than 1,000 µg/L; usually less than iron (Hem, 1985, p. 89).	Secondary standards: 50 µg/L unless alternate supply is unavailable, then 100 µg/L (NBCHPS).	Oxidizes to dark brown or black sediment. Problems similar to those of iron.

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Mercury (Hg)	Dissolved in very small amounts from soils and rocks containing minerals such as cinnabar (principal ore of mercury). Use as amalgam for gold and silver extraction may have increased its abundance in vicinity of pre-1900 mining operations. Other uses: electrical, electrolytic preparation of chlorine and caustic soda, thermometers, pharmaceuticals, dentistry, and as agricultural and industrial biocide.	Less than 1.0 µg/L in potable water (Hem, 1985, p. 142-143).	Primary standard: 2 µg/L (NBCHPS).	Mercury is highly poisonous element that is known to accumulate in aquatic organisms. Adverse effects of mercury are principally manifested in kidney and central nervous system. Neurotoxicity of of mercury poisoning is due to disruption integrity of blood-brain barrier, inhibition of protein synthesis, and blocked synaptic and neuromuscular transmission. Mercury nephrotoxicity results only from exposure to inorganic mercury, and pathogenetic mechanism is not well understood. Other effects include: stomatitis, gingivitis, and inflammation of intestinal mucosa (Hammond and Beliles, 1980, p. 424-426). Also accumulates in organs of animals and humans.
Selenium (Se)	Dissolved in very small amounts from rocks and soils containing minerals such as clausthalite, ferroselite, or challomenite (Fairbridge, 1972, p. 1080). Also may be leached from soils containing detritus of selenium-accumulating vegetation (organic selenium) or selenium salts [for example, ferric selenite or calcium selenate (Wigget and Alfors, 1986, p. 105)].	Rarely exceeds 1 µg/L in potable water. Up to 3,000 µg/L in drainage water from seleniferous irrigated soils (Hem, 1985, p. 145-146).	Primary standard: 10 µg/L (NBCHPS).	Selenium is essential nutrient for animals, and its deficiency in livestock diet is common. However, when intake becomes excessive, selenium toxicity ("blind staggers") can result.
Silver (Ag)	Dissolved in small amounts from rocks and soils containing minerals such as argentite or cerargyrite (Fairbridge, 1972, p. 1092). Limited solubility and distribution of silver suggests its occurrence in ground water may indicate contamination from silver mining/milling operations or improper disposal of photographic-processing wastes. Uses: jewelry and coinage, photography, and electronics; silver iodide has been used in "cloud seeding" for weather modification (Hem, 1985, p. 141).	Much less than 10 µg/L in most natural water (Hem, 1985, p. 141).	Primary standard: 50 µg/L (NBCHPS).	Elemental silver is not considered toxic (although it does cause skin discoloration--argyria), but most silver salts are toxic due to associated anions.

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Zinc (Zn)	Dissolved in small amounts from rocks or soils containing minerals such as sphalerite, willemite, or zinc-rich magnetite (Fairbridge, 1972, p. 1293). Uses: metallurgy, paint, rubber, and paper products.	Less than 100 µg/L in potable water (Hem, 1985, p. 142).	Secondary standard: 5,000 µg/L (NBCHPS).	Zinc is considered essential element to plant and animal life, but water is not normally a significant dietary source. Human dwarfism and lack of sexual development have been related to zinc deficiency. Consumption of acidic food or beverages from galvanized containers has caused accidental poisoning, with symptoms such as fever, vomiting, stomach cramps, and diarrhea (Hammond and Beliles, 1980, p. 460-462).
Radon-222 (^{222}Rn)	Derived as water-soluble, alpha-emitting noble gas from radioactive decay of radium-226. Radon-222 is lost from solution by release to atmosphere and by radioactive decay (radon-222 half-life, 3.82 days; Hem, 1985, p. 149). Radon-222 may enter buildings through cracked basements or foundation blocks, and it may be released from domestic water (Hiltebrand and others, 1987, p. 522).	Recent EPA survey of 2,500 public drinking-water supply systems in the contiguous USA resulted in a mean radon-222 value of 340 pCi/L and a range from less than reporting level to more than 10,000 pCi/L (Horton, 1983, p. 10).	No enforceable standard.	Radon-222 poses no threat in open air, but may accumulate to hazardous levels if it seeps into enclosed spaces. EPA recently estimated that one in eight American homes has radon-222 levels equal in risk to smoking half a pack of cigarettes a day and considers radon-222 as the leading cause of lung cancer among nonsmokers (EPA, 1986a). Relatively simple technologies currently are available to mitigate risk of radon-222. Impacts of ingestion of radon-222 in water are unknown.
Benzene	Volatile, colorless liquid. May occur naturally as a component of petroleum, and is produced in low levels by numerous biological processes. Estimated manmade production, 9 billion pounds in 1981. Solubility in water, 1,800 mg/L at 25 °C. Uses: gasoline additive, chemical intermediate in the synthesis of many organic compounds (such as synthetic rubber, styrene, and phenol). Occurrence in ground water is mainly due to petroleum-product spills. Movement through soils and with ground water is somewhat retarded by adsorption, but compound is expected to remain stable in ground-water systems (EPA, 1987, p. 19-20).	Not expected in most natural water.	Primary standard: 5 µg/L (NBCHPS).	Classified by EPA as human carcinogen. Major source of benzene exposure is probably from air, but drinking-water surveys indicate that 1.3 percent of of all ground-water supply systems contain benzene at concentrations greater than 0.5 µg/L. Other human-health effects include depression of immune system, bone marrow toxicity, chromosomal aberration, and central nervous system dysfunction. Exposure to 25,000 parts of benzene per million parts of air by inhalation is rapidly fatal (EPA, 1987, p. 21-26).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Bis (2-ethylhexyl) phthalate	Manmade, light-colored liquid. Other names include dioctyl phthalate, di-2-ethylhexyl phthalate, DOP, DEHP, 1,2-benzenedicarboxylic acid bis (2-ethylhexyl) ester. Solubility in water, 0.285 mg/L at 24 °C. Uses: plastics manufacturing, processing, and recycling as a plasticizer; organic pump fluid. Occurrence in ground water may result from improper disposal of plastics, manufacturing wastes, or pump fluids.	Not expected in natural water.	No enforceable standard.	Is principal phthalate ester used to make otherwise-rigid polyvinyl chloride flexible. Early use in medical-industry supplies (blood-bag assemblies and tubing, for example) is responsible for recognition that these esters may be leached from plastics and may pose health problems. Subsequent studies on primates indicate that DEHP affects liver and may be stored in liver for several months. In man, however, half-life is only about 28 minutes (Autian, 1980, p. 542-544).
Chloroethane	Manmade, volatile, colorless liquid or gas. Solubility in water, 5.74 mg/L at 20 °C. Other names include ethyl chloride, monochlorethane, chlorethyl, hydrochloric ether, and muriatic ether. Uses: Refrigerant, solvent, alkylating agent, manufacture of tetraethyl lead and ethyl cellulose, and as a topical anesthetic (Windholz, 1976, p. 497). Estimated U.S. production in 1982, 28,000 pounds (Smith and others, 1988, p. 51). Occurrence in ground water may result from improper disposal of solvents, gasoline, and refrigerants, or from leakage from underground storage tanks.	Not expected in natural water.	No enforceable standard.	Human exposure primarily through inhalation; mildly irritating to mucous membranes; high concentrations reported to cause narcosis and unconciousness (Windholz, 1976, p. 497).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Chloroform	Manmade, halogenated, colorless, nonflammable, volatile liquid. Solubility in water, 8,000 mg/L at 20 °C. Other names include trichloromethane. Uses: manufacture of fluorocarbon refrigerants, propellants, plastics, anesthetics and pharmaceuticals, and electronic circuitry; primary source for chlorodifluoromethane; solvent, sweetener, fire extinguisher, and insecticide (Verschueren, 1983, p. 367). Also produced, inadvertently, by chlorination of water supplies and sewage wastes containing dissolved methane (Thurman, 1985, p. 226-227). Information on the occurrence of chloroform in ground water is unavailable, but presence may indicate contamination from chlorinated sewage effluent, fire retardants, or solvents.	Not expected in natural water.	Primary standard for total trihalomethanes (the sum of chloroform, bromoform, dibromochloromethane, and bromodichloromethane): 100 µg/L (NBCHPS).	Found to be carcinogenic by the National Cancer Institute and subsequently banned by the FDA from use in drug, cosmetic, and food packaging products. Environmental exposure primarily through air, with inhalation of large doses causing hypotension, respiratory and myocardial depression and death (Windholz, 1976, p. 273).
Diazinon	Manmade organophosphorus insecticide. Solubility in water, 40 mg/L at 20 °C; other names include Dimpylate, Spectracide, Garden Tox, phosphorothioic acid 0,0-diethyl 0-[6 methyl-2-(1 methylethyl)-4-pyrimidinyl] ester. Use: insecticide (Windholz, 1976, p. 435). In Nevada, applied to alfalfa hay crops at rates less than 2 pints per acre for alfalfa weevil control (Robbin E. Rose, Nevada Department of Agriculture, written commun., 1986). Relatively immobile in soils (Helling and others, 1971, p. 163). Total use in 1981 was 9 million pounds (Smith and others, 1988, p. 37).	Not expected in natural water.	No enforceable standard.	Inhibits enzyme cholinesterase, which normally hydrolyzes acetylcholine to acetic acid and choline; an essential metabolic pathway (Windholz, 1976, p. 435). Commercial formulations often contain the pesticide sulfotepp as an impurity (1.4-6.9 mg/kg). Acute oral dosage lethal to 50 percent of test population of laboratory rats is 300-400 mg/kg; persistence of 10 mg/kg initial concentration in non-sterile organic soil is 50 percent remaining after 2 weeks (Verschueren, 1983, p. 457-459).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Dichloro-difluoro-methane	Colorless, nonflammable gas. Other names include difluorodichloromethane, Arcton 6, Freon 12, Frigen 12, Genetron 12, Halon, Isotron 2 (Windholz, 1976, p. 404). Solubility in water, 280 mg/L at 25 °C. Uses: refrigerant, aerosol propellant, blowing agent, leak-detecting agent, low-temperature solvent, and in some plastics (Verschueren, 1983, p. 484). Occurence in ground water may result from improper disposal of refrigerators, air conditioners, or aerosol cans.	Not expected in natural water.	No enforceable standard.	Commercial production began in early 1930's, and many applications have been found due to its chemical inertness, useful physical properties, low toxicity, and low cost. Dichlorodifluoromethane and other halogenated methane compounds are presently being scrutinized both for their adverse environmental impacts on protective layer of ozone that envelopes the earth and for their potential as hydrologic tool for ground-water resource management (Thompson and Hayes, 1979, p. 546).
1,1-Dichloro-ethane	Manmade, colorless, halogenated, organic liquid. Solubility in water, 5,500 mg/L at 20 °C. Other names include ethylidenechloride, ethylidenedichloride. Used in production of vinyl chloride and chlorinated solvents, organic sythesis, as paint and varnish remover, and as coupling agent in antiknock gasoline (Verschueren, 1983, p. 486-487). Occurrence in ground water may result from improper disposal of solvents and degradation of vinyl-chloride compounds.	Not expected in natural water.	No enforceable standard.	Narcotic at high dosages (Windholz, 1976, p. 501).
Ethion	Manmade, organophosphorus insecticide. Solubility in water, 2 mg/L at 20 °C (Smith and others, 1988, p. 36). Other names include Nialate, Niagara 1240, diethion, phosphorodithioic acid, S,S'-methylene 0,0,0',0'-tetraethyl ester, ethyl methylene phosphorodithioate. Use: insecticide (Windholz, 1976, p. 491-492). Classified as immobile in soils (Helling and others, 1971, p. 163). Total use in 1981 was 2 million pounds (Smith and others, 1988, p. 37).	Not expected in natural water.	No enforceable standard.	Inhibits enzyme cholinesterase, which normally hydrolyzes acetylcholine to acetic acid and choline; an essestial metabolic pathway (Windholz, 1976, p. 492). Acute oral dosage lethal to 50 percent of test population of laboratory rats is 96 mg/kg (Verschueren, 1983, p. 622). Persistence of 10 mg/kg initial concentration in non-sterile organic soil: 50 percent remaining after 8 weeks (Verschueren, 1983, p. 621).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Ethylbenzene	Clear, flammable liquid. Other names include phenyl ethane, ethylbenzol, and EB. Solubility in water, 152 mg/L at 20 °C. Uses: styrene and acetophenone manufacture; component of gasoline and asphalt; solvent. U.S. production totaled 3.3 million tons in 1982. Only limited information is available on occurrence in drinking-water supplies, but one "non-random" data set of 945 ground-water sources had less than 1 percent detection of ethylbenzene with median concentration of 0.87 µg/L (EPA, 1987, p. 216-217).	Not expected in natural water.	No enforceable standard. Ambient-water criterion: 1,400 µg/L (EPA, 1986b).	Limited data available on toxicological effects of ethylbenzene. Human volunteers exposed to 100 parts of ethylbenzene per per million parts of air by inhalation did not exhibit adverse health effects. Unspecified increase in exposure level resulted in fatigue, sleepiness, headache, and mild respiratory and eye irritation (EPA, 1987, p. 218).
Methyl chloride	Manmade halomethane; colorless gas, only slightly soluble in water. Other names include chloromethane. Used as refrigerant and local anesthetic (Windholz, 1976, p. 789). Occurrence in ground water may result from improper disposal of refrigerants.	Not expected in natural water.	No enforceable standard. Lifetime cancer-risk criteria for total halomethanes (EPA, 1986b): Criterion (µg/L) — Estimated risk 0.019 — 1:10,000,000 0.19 — 1:1,000,000 1.9 — 1:100,000	One of seven halomethanes listed by EPA as a potential carcinogen (EPA, 1986b). Poisonous; may injure liver, kidneys, and central nervous system (Windholz, 1976, p. 789).
Phorate	Manmade organophosphorus insecticide. Solubility in water, 50 mg/L at 20 °C. Other names include Thimet, American Cyanamid 3911, phosphorodithiotic acid 0, 0-diethyl S-[(ethylthio) methyl] ester. Use: systemic pesticide (Windholz, 1976, p. 954). In Nevada, applied to alfalfa hay crops at rates less than 10 pounds per acre for alfalfa weevil control (Robbin E. Rose, Nevada Department of Agriculture, written commun., 1987). Classified as immobile in soils (Helling and others, 1971, p. 163).	Not expected in natural water.	No enforceable standard.	Inhibits enzyme cholinesterase, which normally hydrolyzes acetylcholine to acetic acid and choline; an essential metabolic pathway (Windholz, 1976, p. 954). Acute oral dosage lethal to 50 percent of test population of laboratory rats is 1.6-4 mg/kg (Verschueren, 1983, p. 996). Relatively nonpersistent in environment; oxidized or hydrolyzed to non-toxic breakdown products by soil microorganisms and chemical reactions (Kaufman, 1974, p. 144).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Tetrachloroethylene (PCE)	Manmade, colorless, halogenated organic liquid. Solubility in water, at 25 °C is 150 mg/L. About 550 million pounds produced in 1982 (EPA, 1987, p. 305). Other names include perchloroethylene, ethylene tetrachloride, tetrachlorethylene, Nema, Tetracup, Tetropil, Perclene, Ankilostin, Didakene Perc. Uses: dry cleaning; degreasing metals; as a solvent, and as an anthelmintic (hookworm eliminator) in the 1920's (Windholz, 1976, p. 1184). Occurrence in ground water is common, and it may remain for months or years (EPA, 1987, p. 306).	Not expected in natural water.	No enforceable standard. Lifetime cancer-risk criteria (EPA, 1986b): Criterion (µg/L) — Estimated risk 0.08 — 1:10,000,000 0.8 — 1:1,000,000 8 — 1:100,000	Narcotic at high dosages (Windholz, 1976, p. 1184). Clinical data suggest ingestion is relatively nontoxic, but liver, kidney, and central-nervous-system effects reportedly have resulted from occupational exposure. Is very mobile in soils, and under specific conditions may degrade to trichloroethylene, then to dichlorethylene, and to vinyl chloride. EPA estimates that 3 percent of all public water supplies contain 0.5 µg/L or more (EPA, 1987, p. 306).
Toluene	Naturally occurring in tar oil; clear, colorless liquid. Solubility in water, 535 mg/L at 25 °C. About 5 billion pounds produced in 1981. Other names include methylbenzene, phenylmethane, toluol, methylbenzol, and methacide. Uses: production of benzene and other organic solvents and compounds, solvent, gasoline additive. Toluene migrates slowly through soil and and aquifer material and under specific conditions is readily biodegraded to carbon dioxide (EPA, 1987, p. 325).	Not expected in natural water.	No enforceable standard. Ambient-water criterion: 14,300 µg/L (EPA, 1986b).	Human exposure primarily through occupational inhalation. Oral toxicity is relatively low, resulting in inhibition of central nervous system. Limited data from experiments with pregnant laboratory mice suggest adverse developmental effects on fetuses (EPA, 1987, p. 327-328).
Trichloroethylene (TCE)	Man-made, colorless, halogenated organic liquid. Solubility in water, 1,000 mg/L at 20 °C. About 200 million pounds produced in 1982. Other names include: trichloroethene, acetylene trichloride, Tri, Trilene. Uses: industrial solvent, drycleaning, and degreaser for metal. TCE migrates readily through soil and may reside in ground-water systems for months to years. May also form in ground water from degradation of tetrachloroethylene (EPA, 1987, p. 356).	Not expected in natural water.	Primary standard: 5 µg/L (NBCHPS).	Most reported exposure is by inhalation, resulting in narcotic effect and death due to ventricular fibrillation (Verschueren, 1983, p. 1135). Surveys of drinking-water supplies suggest that 3 percent of all ground-water public supply sources in the U.S. contain at least 0.5 µg/L (EPA, 1987, p. 356).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Vinyl chloride	Manmade, colorless gas that polymerizes to polyvinyl chloride (PVC) in light or in the presence of a catalyst. Solubility in water, 1,100 mg/L at 28 °C. Other names include chlorethylene, chloroethene, and monochloroethylene (Windholz, 1976, p. 1283). Uses: raw material in the plastics, rubber, paper, glass, and automotive industries; electrical pipe insulation, piping; medical supplies; food packaging; and construction. In excess of 7 billion pounds have been produced since 1979. Occurrence in ground water is relatively rare due to its rapid degradation to carbon dioxide and chloride. Less than 2 percent of all public-supply systems derived from ground water contain levels exceeding 1 µg/L. Movement through soil is not retarded by adsorption; once in ground water, vinyl chloride is expected to remain for months to years. Vinyl chloride is reported to be a degradation product of trichloroethylene and tetrachloroethylene. Contaminated water is believed to be major source of exposure (EPA, 1987, p. 368-369).	Not expected in natural water.	Primary standard: 2 µg/L (NBCHPS).	Classified by EPA as human carcinogen; linked to increased occurrence of liver angiosarcomas as well as brain and lung tumors associated with long-term occupational exposure. Short-term toxicity requires relatively high-level exposure (100,000 parts of vinyl chloride per million parts of air by inhalation) to induce narcosis and death (EPA, 1987, p. 371-372). Concentrations of vinyl chloride found in PVC-bottled liquids range from 0 to 400 µg/L, depending on the time of storage and quality of PVC (Verschueren, 1983, p. 1185).

TABLE 4.--*Background information on constituents and properties of water*--Continued

Constituent or property	Source or cause of occurrence	Normal range of values in natural waters	Standards or criteria for water use[1]	Remarks
Xylene	Colorless, mobile, flammable liquid. Other names include dimethylbenzene, xylols. First isolated from wood distillate; also present in petroleum oil and in coal tar (primary raw material for xylene manufacture). Estimated production in 1982, 5 billion pounds. Commercial xylene is mixture of three isomers: ortho-xylene, meta-xylene, and para-xylene; meta-xylene predominates. Solubility in water: ortho-xylene, 175 mg/L at 20 °C; meta-xylene, 160 mg/L at 20 °C; and para-xylene, 198 mg/L at 25 °C. Uses: solvent for paints, inks, and adhesives; manufacture of aviation gasoline, polyester, and protective coatings; component of petroleum and asphalt. Movement with ground water retarded by moderate binding to soil; readily biodegraded, but expected stable in ground water. About 3 percent of all public water supplies derived from ground water contain levels greater than 0.5 µg/L, with a maximum reported concentration of 2.5 µg/L (EPA, 1987, p. 384-385).	Not expected in natural water.	No enforceable standard. Carcinogenic potential has not been evaluated. Suggested-no-adverse-response-levels (SNARL's) calculated by National Academy of Science: 21,000 µg/L for 1-day exposure and 11,200 µg/L for 7-day exposure (EPA, 1987, p. 393).	Environmental exposure primarily to air, with release to water due to spills and leaks of gasoline and other petroleum products. Occurrence in ground water may also indicate improper disposal of paints, inks, or industrial products (EPA, 1987, p. 385).

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[1] Primary drinking-water standards specify maximum contaminant levels that are health-related and Federally mandated; secondary drinking-water standards are based on esthetic qualities and are enforceable by the State of Nevada (Jeffrey A. Fontaine, Nevada Bureau of Consumer Health Protection Agency Services, oral commun., 1989). Criteria are recommended limits for specific water uses, based on current scientific knowledge. Some standards and criteria for trace elements and organic compounds are expressed in milligrams per liter in the cited references; these values are herein converted to micrograms per liter to maintain consistency with units of measure used in the accompanying water-quality data tabulations.

TABLE 5.--*Water-quality properties, fecal bacteria, and major inorganic chemical constituents*

[Abbreviations: DEG C, degrees Celsius; NTU, nephelometric turbidity units; MF, membrane filter; COLS., colonies; KF AGAR, a nutrient medium designed to promote the growth of fecal streptococci and to suppress the growth of other organisms; FLD, field; WH WAT, whole-water (unfiltered); IT, incremental titration; mL, milliliters; mg/L, milligrams per liter; µg/L, micrograms per liter; µm, micrometer; µS/cm, microsiemens per centimeter at 25 °C; <, less than indicated detection level; --, data not available]

SITE NUMBER (FIGURE 2)	DATE	24-HOUR TIME	SPECIFIC CONDUCTANCE (µS/cm)	pH (STANDARD UNITS)	TEMPERATURE WATER (DEG C)	TURBIDITY (NTU)	COLIFORM FECAL, 0.7-µm MF (COLS./ 100 mL)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 mL)	HARDNESS (mg/L AS CaCO3)	HARDNESS, NONCARBONATE (mg/L AS CaCO3)	CALCIUM, DISSOLVED (mg/L AS Ca)	MAGNESIUM, DISSOLVED (mg/L AS Mg)
1	01-26-87	1235	288	8.7	18.5	2.2	--	--	47	0	16	1.8
	04-16-87	1730	260	8.6	19.0	.4	<1	<1	42	0	14	1.7
	06-22-87	1700	246	9.1	19.0	.3	--	--	19	0	7.0	.31
	08-18-87	1230	236	9.0	19.5	.2	--	--	18	0	6.7	.19
2	01-26-87	1115	195	8.4	13.0	.3	--	--	71	0	22	3.9
	04-27-87	1130	183	8.4	14.0	.5	<1	<1	69	0	21	3.9
	06-22-87	1230	192	8.3	13.0	.2	--	--	69	0	21	3.9
	08-27-87	0830	292	7.8	13.0	.2	--	--	120	0	34	7.9
3	01-21-87	1210	456	7.1	12.0	.1	--	--	160	0	43	12
	04-13-87	1500	385	7.2	12.0	1.0	<1	<1	160	4	44	13
	06-25-87	1200	427	7.3	12.0	<.1	--	--	190	0	52	15
	08-26-87	1430	502	7.1	12.0	.2	--	--	220	0	59	17
4	02-06-87	1030	212	7.0	12.5	.8	--	--	74	7	20	5.9
	04-10-87	1030	219	7.3	12.0	.6	<1	<1	83	2	22	6.8
	06-23-87	1100	213	7.3	12.5	.3	--	--	79	0	21	6.4
	08-24-87	1345	207	7.1	12.5	.2	--	--	79	0	21	6.4
5	01-21-87	1040	426	7.8	21.0	.3	--	--	92	0	30	4.2
	04-14-87	1720	414	7.5	21.0	.2	3	2	110	0	34	5.0
	06-25-87	1445	373	7.7	21.0	.4	<1	<1	87	0	28	4.2
	08-24-87	1800	455	7.5	21.0	.2	--	--	99	0	32	4.7
6	02-20-87	0910	498	7.6	15.0	.2	--	--	220	30	66	14
	04-14-87	0930	477	7.5	15.0	.3	<1	<1	220	53	66	14
	06-24-87	1045	484	7.8	16.0	.2	--	--	210	40	63	14
	08-19-87	1000	490	7.6	15.0	.2	--	--	240	49	70	15
8	04-30-87	1200	243	8.2	13.0	.6	--	--	53	0	18	2.0
	08-27-87	1530	258	7.8	14.0	.2	<1	<1	51	0	17	2.0
9	04-29-87	1740	117	8.6	15.0	.5	<1	<1	33	0	13	.07
	08-27-87	1300	125	8.6	15.0	.2	--	--	31	0	12	.14
10	04-29-87	1155	3,670	6.7	14.0	70	<1	<1	600	480	230	6.9
	07-01-87	0950	3,490	6.7	13.5	82	--	--	600	480	230	6.2
11	04-17-87	1130	473	8.0	15.0	.3	<1	<1	110	0	38	4.3
	08-26-87	1245	460	8.0	15.0	.4	--	--	100	0	35	4.0
12	04-17-87	1400	353	7.7	16.0	.5	<1	<1	58	0	15	4.9
	08-25-87	1615	328	7.6	16.0	.2	--	--	58	0	15	5.0
13	04-15-87	1715	339	8.0	20.0	.7	<1	<1	35	0	9.2	3.0
	06-25-87	1845	335	8.0	20.5	.2	--	--	37	0	9.7	3.1
14	04-29-87	1615	282	7.2	12.0	.6	<1	<1	130	0	42	5.7
	08-27-87	1100	283	7.1	12.0	.2	--	--	130	0	41	5.7
15	04-27-87	1430	383	8.0	15.0	.4	<1	40	110	24	38	2.9
	06-26-87	1530	1,070	7.6	14.0	.3	<1	8	320	130	110	11
16	04-29-87	1345	199	7.6	13.0	.6	<1	<1	93	0	28	5.7
	08-26-87	1630	206	7.5	13.0	.2	--	--	94	0	28	5.8
17	04-28-87	1700	196	8.0	15.5	.2	<1	<1	55	0	15	4.3
	06-22-87	1500	198	8.0	15.0	.2	--	--	56	0	15	4.4
18	04-13-87	1300	318	7.7	15.5	.5	<1	32	120	0	31	9.3
	06-26-87	1315	310	7.7	15.0	.7	140	23	110	0	29	9.0
19	04-15-87	1315	476	7.9	12.0	.2	<1	<1	220	0	63	16
	08-19-87	1700	449	7.8	12.5	.2	--	--	210	0	61	15

TABLE 5.--*Water-quality properties, fecal bacteria, and major inorganic chemical constituents*--Continued

SITE NUMBER (FIGURE 2)	DATE	SODIUM, DIS-SOLVED (mg/L AS Na)	POTAS-SIUM, DIS-SOLVED (mg/L AS K)	BICAR-BONATE, WATER WHOLE IT-FLD (mg/L AS HCO3	CAR-BONATE, WATER WHOLE IT-FLD (mg/L AS CO3)	ALKA-LINITY, WH WAT TOTAL FIELD (mg/L AS CaCO3)	SULFATE DIS-SOLVED (mg/L AS SO4)	CHLO-RIDE, DIS-SOLVED (mg/L AS Cl)	FLUO-RIDE, DIS-SOLVED (mg/L AS F)	SILICA, DIS-SOLVED (mg/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG C DIS-SOLVED (mg/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (mg/L)
1	01-26-87	46	0.80	123	5	109	17	13	0.4	24	177	190
	04-16-87	42	.70	111	5	100	17	12	.4	23	174	170
	06-22-87	47	.50	88	13	95	17	9.7	.4	18	158	160
	08-18-87	49	.80	88	8	85	17	11	.4	18	152	150
2	01-26-87	13	2.2	91	0	75	16	4.3	<.1	29	127	140
	04-27-87	13	2.1	93	1	77	17	4.4	.1	29	122	140
	06-22-87	13	2.2	96	0	79	17	5.0	.1	29	136	140
	08-27-87	16	2.8	154	0	125	20	5.5	.1	30	180	190
3	01-21-87	20	2.7	192	0	157	31	15	.1	30	236	250
	04-13-87	21	2.8	195	0	160	32	11	.1	32	250	250
	06-25-87	24	3.3	246	0	200	35	8.3	.4	30	293	290
	08-26-87	25	3.3	272	0	223	33	6.7	.1	31	303	310
4	02-06-87	13	1.8	82	0	68	25	8.2	.1	32	138	150
	04-10-87	14	1.8	97	0	81	24	5.5	.1	32	146	150
	06-23-87	13	1.7	97	0	79	25	5.7	<.1	31	153	150
	08-24-87	14	1.7	96	0	79	23	4.9	.1	31	140	150
5	01-21-87	49	2.2	164	0	134	33	17	.1	29	261	250
	04-14-87	53	2.4	168	0	136	34	17	.1	31	263	260
	06-25-87	48	2.4	158	0	130	36	15	.1	30	264	240
	08-24-87	48	2.5	176	0	143	34	16	.1	31	266	250
6	02-20-87	19	1.0	235	0	192	85	3.7	.2	25	297	330
	04-14-87	20	1.0	207	0	170	78	3.2	.1	26	375	310
	06-24-87	19	1.0	214	0	175	84	3.7	.1	25	307	310
	08-19-87	19	1.4	229	0	188	81	3.5	.1	25	319	330
8	04-30-87	33	1.7	107	0	88	20	12	1.4	34	161	170
	08-27-87	34	1.5	103	0	85	18	13	1.4	33	157	170
9	04-29-87	14	1.0	65	2	58	.7	1.0	<.1	17	79	81
	08-27-87	14	.80	65	3	58	3.1	0.80	.1	17	79	83
10	04-29-87	570	6.8	143	0	118	1,700	200	5.6	57	2,920	2,900
	07-01-87	520	6.6	141	0	117	1,700	210	6.8	64	2,940	2,800
11	04-17-87	63	3.5	169	0	140	76	13	1.7	63	342	350
	08-26-87	61	3.7	187	0	153	72	12	1.8	59	344	340
12	04-17-87	56	3.3	128	0	106	47	16	1.5	67	262	270
	08-25-87	55	3.5	132	0	108	49	15	1.5	65	260	270
13	04-15-87	59	3.8	138	0	113	37	10	1.5	77	272	270
	06-25-87	58	4.3	143	0	118	38	8.3	1.5	78	280	270
14	04-29-87	15	3.1	184	0	150	12	1.2	.2	23	172	190
	08-27-87	15	2.8	180	0	148	11	1.0	.2	23	172	190
15	04-27-87	41	3.6	101	0	82	82	18	4	55	284	290
	06-26-87	110	5.9	231	0	189	290	72	<.1	50	785	760
16	04-29-87	10	1.4	125	0	102	2.1	2.0	<.1	24	123	130
	08-26-87	10	1.2	125	0	102	2.7	2.1	.1	23	127	130
17	04-28-87	17	4.4	100	0	82	18	4.4	.3	49	147	160
	06-22-87	17	4.4	95	0	78	18	5.0	.3	49	162	160
18	04-13-87	24	2.9	172	0	140	30	7.7	.2	53	242	240
	06-26-87	26	3.0	154	0	126	30	5.5	.2	51	234	250
19	04-15-87	20	3.4	275	0	224	19	5.6	<.1	33	289	290
	08-19-87	19	3.8	277	0	225	19	5.2	.1	32	276	290

TABLE 5.--*Water-quality properties, fecal bacteria, and major inorganic chemical constituents*--Continued

SITE NUMBER (FIGURE 2)	DATE	24-HOUR TIME	SPECIFIC CONDUCTANCE (µS/cm)	pH (STANDARD UNITS)	TEMPERATURE WATER (DEG C)	TURBIDITY (NTU)	COLIFORM FECAL, 0.7-µm MF (COLS./100 mL)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 mL)	HARDNESS (mg/L AS CaCO3)	HARDNESS, NONCARBONATE (mg/L AS CaCO3)	CALCIUM, DISSOLVED (mg/L AS Ca)	MAGNESIUM, DISSOLVED (mg/L AS Mg)
20	04-16-87	1530	300	7.8	14.0	0.5	<1	2	110	0	33	7.4
	06-26-87	1115	285	7.8	14.0	.2	<1	18	100	0	30	7.1
21	04-15-87	1030	273	8.1	11.0	.2	<1	4	110	7	34	6.4
	08-20-87	1700	272	8.0	13.0	.5	--	8	110	0	33	6.2
22	04-16-87	0900	200	6.9	13.5	.4	<1	<1	88	4	21	8.7
	08-24-87	1130	208	6.8	14.0	.2	--	--	90	0	21	9.1
23	04-28-87	1515	578	7.9	14.0	.2	<1	<1	250	49	78	14
	08-24-87	1600	507	7.9	14.0	.2	--	--	240	57	75	14
24	04-16-87	1130	102	7.8	15.0	.4	<1	<1	15	0	5.2	0.50
	08-20-87	1300	105	7.6	15.0	.4	--	--	15	0	5.2	.40
25	04-28-87	1100	495	7.2	17.0	.5	<1	<1	220	61	61	16
	06-24-87	1315	491	7.3	16.5	.3	--	--	200	78	57	15
26	04-14-87	1430	447	7.0	14.0	.3	<1	<1	210	23	53	18
	08-19-87	1330	497	7.1	16.5	.5	--	--	230	18	60	20
27	06-30-87	1645	401	7.5	12.0	1.7	<1	1,000	140	0	43	7.6
28	06-30-87	1415	397	7.9	13.5	20	<1	420	83	0	20	8.1
29	06-30-87	0730	1,370	7.5	12.0	390	<1	10	470	250	130	36
31	06-29-87	1500	889	7.2	12.0	32	--	--	340	91	100	23
34	06-30-87	1000	518	7.4	13.5	.3	<1	<1	180	0	61	7.1
	08-27-87	1735	528	7.4	14.0	.2			180	6	62	7.3
35	06-25-87	0945	164	8.9	12.0	1.4	<1	<1	50	0	15	3.0
36	06-24-87	1600	331	8.0	14.5	.3	<1	14	130	20	35	11
37	06-23-87	0800	82	6.9	12.0	.2	<1	5	25	0	8.4	1.0
	08-20-87	0945	77	7.0	12.5	--	--	<1	--	--	--	--
38	06-23-87	1245	351	8.7	17.5	.3	<1	35	29	0	8.2	2.0
39	06-23-87	1645	437	7.6	13.0	6.5	<1	<1	170	18	42	16

TABLE 5.--*Water-quality properties, fecal bacteria, and major inorganic chemical constituents*--Continued

SITE NUMBER (FIGURE 2)	DATE	SODIUM, DIS-SOLVED (mg/L AS Na)	POTAS-SIUM, DIS-SOLVED (mg/L AS K)	BICAR-BONATE, WATER WHOLE IT-FLD (mg/L AS HCO3)	CAR-BONATE, WATER WHOLE IT-FLD (mg/L AS CO3)	ALKA-LINITY, WH WAT TOTAL FIELD (mg/L AS CaCO3)	SULFATE DIS-SOLVED (mg/L AS SO4)	CHLO-RIDE, DIS-SOLVED (mg/L AS Cl)	FLUO-RIDE, DIS-SOLVED (mg/L AS F)	SILICA, DIS-SOLVED (mg/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C, DIS-SOLVED (mg/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (mg/L)
20	04-16-87	23	1.6	164	0	134	20	5.2	0.2	38	198	210
	06-26-87	22	1.5	150	0	124	21	5.6	.2	37	203	200
21	04-15-87	16	2.2	127	0	104	21	9.1	.1	33	183	180
	08-20-87	16	2.4	131	0	108	22	9.0	.1	32	185	190
22	04-16-87	11	2.3	102	0	84	11	5.3	<.1	49	156	160
	08-24-87	11	2.6	109	0	90	11	6.0	.1	47	175	160
23	04-28-87	26	2.5	248	0	204	64	22	<.1	33	367	360
	08-24-87	26	2.5	228	0	188	70	19	.1	32	348	350
24	04-16-87	18	0.70	36	0	31	21	1.1	.8	21	80	87
	08-20-87	17	.80	36	0	30	20	1.2	.8	20	81	83
25	04-28-87	23	1.6	192	0	157	89	5.8	.1	40	330	330
	06-24-87	22	1.6	193	0	159	90	5.4	.1	38	327	300
26	04-14-87	14	5.4	224	0	184	13	13	<.1	53	288	280
	08-19-87	15	6.3	261	0	214	13	16	.1	51	328	310
27	06-30-87	31	5.1	195	0	160	50	11	.4	45	294	290
28	06-30-87	58	1.9	183	0	149	54	8.5	.9	54	282	290
29	06-30-87	50	9.1	273	0	225	290	190	.2	9.5	924	850
31	06-29-87	65	5.4	310	0	253	130	71	.2	49	622	600
34	06-30-87	41	2.6	227	0	186	23	17	.6	45	367	310
	08-27-87	40	2.5	218	0	179	25	16	.7	46	354	310
35	06-25-87	19	2.5	78	7	75	16	4.6	.4	13	110	120
36	06-24-87	25	3.9	136	0	113	66	6.9	.2	37	236	250
37	06-23-87	7.4	.60	41	0	34	7.3	0.60	.2	30	74	76
38	06-23-87	70	.90	146	5	128	39	5.9	1.4	31	248	240
39	06-23-87	27	2.4	187	0	153	77	6.9	.3	48	306	310

TABLE 6.--*Dissolved nitrogen species and organic carbon*

[NO2+NO3, the combined concentration of nitrite plus nitrate is determined as an analytical convenience, subtracting measured nitrite concentration from nitrite plus nitrate results in a calculated concentration of nitrate; mg/L, milligrams per liter; --, data not available; <, less than indicated detection level]

SITE NUMBER (FIGURE 2)	DATE	24-HOUR TIME	NITROGEN, NITRATE, DISSOLVED (mg/L AS N)	NITROGEN, NITRITE, DISSOLVED (mg/L AS N)	NITROGEN, NO2+NO3, DISSOLVED (mg/L AS N)	NITROGEN, AMMONIA, DISSOLVED (mg/L AS N)	NITROGEN, ORGANIC, DISSOLVED (mg/L AS N)	NITROGEN, AMMONIA+ ORGANIC, DISSOLVED (mg/L AS N)	CARBON, ORGANIC, DISSOLVED (mg/L AS C)
1	01-26-87	1235	1.3	<0.01	1.3	0.06	0.34	0.4	0.6
	04-16-87	1730	1.4	<.01	1.4	<.01	.3	.3	.5
	06-22-87	1700	0.9	<.01	0.97	<.01	<.2	<.2	4.4
	08-18-87	1230	.9	<.01	.91	<.01	.2	.2	.8
2	01-26-87	1115	.3	<.01	.33	.06	.14	.2	.6
	04-27-87	1130	.2	<.01	.28	<.01	<.2	<.2	.5
	06-22-87	1230	.2	<.01	.28	.01	<.2	<.2	4.0
	08-27-87	0830	.4	<.01	.44	<.01	.4	.4	.7
3	01-21-87	1210	1.1	<.01	1.1	.06	.14	.2	.6
	04-13-87	1500	1.1	<.01	1.1	<.01	.2	.2	.7
	06-25-87	1200	1.6	<.01	1.6	.01	<.2	<.2	.5
	08-26-87	1430	2.0	<.01	2.0	<.01	.9	.9	.6
4	02-06-87	1030	.9	<.01	.92	.05	.15	.2	.6
	04-10-87	1030	.9	<.01	.90	<.01	.3	.3	.8
	06-23-87	1100	.8	<.01	.80	.03	<.2	<.2	4.3
	08-24-87	1345	.4	<.01	.48	<.01	.6	.6	.7
5	01-21-87	1040	4.4	<.01	4.4	.08	1.3	1.4	.6
	04-14-87	1720	4.4	<.01	4.4	<.01	.4	.4	.8
	06-25-87	1445	4.3	<.01	4.3	.02	1.1	1.1	.4
	08-24-87	1800	4.3	<.01	4.3	<.01	.6	.6	.6
6	02-20-87	0910	.5	<.01	.51	.04	.66	.7	.6
	04-14-87	0930	.5	<.01	.54	.02	.68	.7	.8
	06-24-87	1045	.6	<.01	.62	.02	<.2	<.2	.5
	08-19-87	1000	.5	<.01	.58	<.01	.5	.5	.6
8	04-30-87	1200	.3	<.01	.31	.02	.28	.3	.8
	08-27-87	1530	.4	<.01	.42	<.01	.4	.4	.4
9	04-29-87	1740	1.0	<.01	1.0	.02	.48	.5	.5
	08-27-87	1300	1.0	<.01	1.0	<.01	.5	.5	.3
10	04-29-87	1155	<.1	<.01	<.10	.22	.08	.3	2.5
	07-01-87	0950	<.1	<.01	<.10	.27	.53	.8	2.7
11	04-17-87	1130	.6	<.01	.61	<.01	.2	.2	.7
	08-26-87	1245	.7	<.01	.71	<.01	.4	.4	.7
12	04-17-87	1400	.9	<.01	.95	<.01	.3	.3	--
	08-25-87	1615	1.0	<.01	1.0	<.01	.5	.5	.6
13	04-15-87	1715	1.4	<.01	1.4	<.01	.3	.3	.6
	06-25-87	1845	1.5	<.01	1.5	.01	<.2	<.2	.5
14	04-29-87	1615	.1	<.01	.18	.01	.39	.4	.6
	08-27-87	1100	.1	<.01	.16	<.01	.7	.7	.5
15	04-27-87	1430	<.1	.01	<.10	.03	.27	.3	.9
	06-26-87	1530	.2	<.01	.21	.07	<.2	<.2	2.0
16	04-29-87	1345	1.5	<.01	1.5	.01	.29	.3	.5
	08-26-87	1630	1.5	<.01	1.5	<.01	.4	.4	.5
17	04-28-87	1700	.40	.03	.43	.09	.21	.3	.6
	06-22-87	1500	.35	.03	.38	.10	.2	.3	4.4
18	04-13-87	1300	.6	<.01	.62	<.01	.4	.4	.6
	06-26-87	1315	.7	<.01	.72	.02	<.2	<.2	.5
19	04-15-87	1315	2.0	<.01	2.0	.01	.29	.3	1.1
	08-19-87	1700	2.0	<.01	2.0	<.01	.4	.4	.6

TABLE 6.--*Dissolved nitrogen species and organic carbon*--Continued

SITE NUMBER (FIGURE 2)	DATE	24-HOUR TIME	NITROGEN, NITRATE, DISSOLVED (mg/L AS N)	NITROGEN, NITRITE, DISSOLVED (mg/L AS N)	NITROGEN, NO2+NO3, DISSOLVED (mg/L AS N)	NITROGEN, AMMONIA, DISSOLVED (mg/L AS N)	NITROGEN, ORGANIC, DISSOLVED (mg/L AS N)	NITROGEN, AMMONIA+ ORGANIC, DISSOLVED (mg/L AS N)	CARBON, ORGANIC, DISSOLVED (mg/L AS C)
20	04-16-87	1530	0.9	<0.01	0.92	0.02	0.28	0.3	0.7
	06-26-87	1115	1.0	<.01	1.0	<.01	.2	.2	.6
21	04-15-87	1030	1.1	<.01	1.1	<.01	.5	.5	.5
	08-20-87	1700	1.0	<.01	1.0	.03	.67	.7	.7
22	04-16-87	0900	1.3	<.01	1.3	<.01	.4	.4	.8
	08-24-87	1130	1.4	<.01	1.4	<.01	.5	.5	1.9
23	04-28-87	1515	2.9	<.01	2.9	.01	.29	.3	.9
	08-24-87	1600	2.8	<.01	2.8	<.01	1.1	1.1	1.1
24	04-16-87	1130	<.1	<.01	<.10	.08	.12	.2	.5
	08-20-87	1300	<.1	<.01	<.10	.07	.33	.4	.6
25	04-28-87	1100	3.0	<.01	3.0	<.01	.4	.4	.5
	06-24-87	1315	3.1	<.01	3.1	.02	.68	.7	.4
26	04-14-87	1430	4.9	<.01	4.9	.01	.79	.8	1.2
	08-19-87	1330	6.1	<.01	6.1	<.01	.5	.5	.7
28	06-30-87	1415	<.1	<.01	<.10	.18	.62	.8	2.8
29	06-30-87	0730	<.1	<.01	<.10	.84	.46	1.3	8.1
31	06-29-87	1500	1.45	.05	1.5	.56	.74	1.3	8.8
34	06-30-87	1000	12	<.01	12	.01	1.8	1.8	1.2
	08-27-87	1735	12	<.01	12	<.01	1.4	1.4	1.1
35	06-25-87	0945	<.1	<.01	<.10	.02	.38	.4	.4
36	06-24-87	1600	<.1	<.01	<.10	.08	.32	.4	.4
37	06-23-87	0800	.4	<.01	.45	.01	<.2	<.2	4.5
38	06-23-87	1245	2.2	<.01	2.2	<.01	<.2	<.2	4.4
39	06-23-87	1645	.35	<.01	.35	.01	.29	.3	4.4

TABLE 7.--*Dissolved trace elements*

[µg/L, micrograms per liter; --, data not available;
<, less than indicated detection limit]

SITE NUMBER (figure 2)	DATE	24-HOUR TIME	ARSENIC, DIS-SOLVED (µg/L AS As)	BARIUM, DIS-SOLVED (µg/L AS Ba)	BORON, DIS-SOLVED (µg/L AS B)	CADMIUM, DIS-SOLVED (µg/L AS Cd)	CHRO-MIUM, DIS-SOLVED (µg/L AS Cr)	COPPER, DIS-SOLVED (µg/L AS Cu)
1	04-16-87	1730	5	30	110	<1	--	<10
2	04-27-87	1130	10	53	160	<1	<10	<10
3	04-13-87	1500	2	130	200	<1	<10	<10
4	04-10-87	1030	2	59	170	<1	<10	<10
5	04-14-87	1720	11	110	50	2	--	<10
6	04-14-87	0930	<1	72	10	1	<10	<10
8	04-30-87	1200	<1	20	220	<1	<10	<10
9	04-29-87	1740	5	8	<10	1	<10	<10
10	04-29-87	1155	20	<100	2,900	<10	<10	<10
11	04-17-87	1130	17	51	220	<1	--	<10
12	04-17-87	1400	22	41	160	<1	<10	<10
13	04-15-87	1715	30	11	170	<1	<10	<10
14	04-29-87	1615	<1	21	20	<1	<10	<10
15	04-27-87	1430	26	29	180	<1	<10	<10
16	04-29-87	1345	<1	15	<10	<1	<10	<10
17	04-28-87	1700	--	--	--	--	--	--
18	04-13-87	1300	7	86	50	<1	<10	<10
19	04-15-87	1315	2	170	160	2	10	10
20	04-16-87	1530	8	66	110	<1	<10	<10
21	04-15-87	1030	6	74	80	<1	<10	<10
22	04-16-87	0900	2	78	70	<1	--	<10
23	04-28-87	1515	3	130	60	2	<10	<10
24	04-16-87	1130	3	6	50	<1	<10	<10
25	04-28-87	1100	18	67	10	<1	<10	<10
26	04-14-87	1430	16	120	20	1	<10	<10
34	06-30-87	1000	2	100	110	<1	<10	<10
35	06-25-87	0945	3	63	120	1	40	<10
36	06-24-87	1600	4	130	30	1	<10	<10
37	06-23-87	0800	<1	5	10	<1	<10	<10
38	06-23-87	1245	22	23	260	<1	<10	<10
39	06-23-87	1645	1	44	20	<1	<10	<10

TABLE 7.--*Dissolved trace elements*--Continued

SITE NUMBER (figure 2)	DATE	IRON, DIS-SOLVED (µg/L AS Fe)	LEAD, DIS-SOLVED (µg/L AS Pb)	MANGA-NESE, DIS-SOLVED (µg/L AS Mn)	MERCURY, DIS-SOLVED (µg/L AS Hg)	SELE-NIUM, DIS-SOLVED (µg/L AS Se)	SILVER, DIS-SOLVED (µg/L AS Ag)	ZINC, DIS-SOLVED (µg/L AS Zn)
1	04-16-87	3	<10	<1	<0.1	<1	<1	<3
2	04-27-87	<3	<10	<1	<.1	<1	<1	6
3	04-13-87	<3	<10	1	<.1	<1	<1	4
4	04-10-87	7	<10	3	<.1	<1	<1	4
5	04-14-87	7	--	4	<.1	1	<1	130
6	04-14-87	9	30	<1	<.1	<1	<1	<3
8	04-30-87	16	<10	3	<.1	<1	<1	28
9	04-29-87	120	<10	<1	<.1	<1	<1	9
10	04-29-87	9,600	<100	1,200	<.1	<1	<1	10
11	04-17-87	5	20	<1	<.1	<1	<1	28
12	04-17-87	<3	<10	<1	<.1	<1	<1	34
13	04-15-87	10	<10	<1	<.1	<1	<1	38
14	04-29-87	14	<10	4	<.1	<1	<1	84
15	04-27-87	26	20	62	<.1	<1	<1	19
16	04-29-87	14	<10	3	<.1	<1	<1	33
17	04-28-87	--	--	--	<.1	--	--	--
18	04-13-87	36	<10	6	<.1	<1	<1	66
19	04-15-87	<3	10	<1	<.1	<1	<1	110
20	04-16-87	3	<10	1	<.1	<1	<1	7
21	04-15-87	<3	<10	<1	<.1	<1	<1	22
22	04-16-87	<3	20	5	<.1	<1	<1	53
23	04-28-87	<3	<10	<1	<.1	5	<1	21
24	04-16-87	59	<10	13	.2	<1	<1	<3
25	04-28-87	36	<10	19	<.1	<1	<1	310
26	04-14-87	<3	30	3	<.1	<1	<1	230
34	06-30-87	5	<10	<1	<.1	<1	<1	110
35	06-25-87	79	<10	51	<.1	<1	<1	4
36	06-24-87	32	<10	220	<.1	<1	<1	46
37	06-23-87	12	<10	1	<.1	<1	<1	12
38	06-23-87	8	<10	<1	.2	<1	<1	6
39	06-23-87	120	<10	22	.3	<1	<1	58

TABLE 8.--*Total recoverable organic compounds detected at one or more sampling sites*

[Abbreviations: µg/L, micrograms per liter; <, less than indicated detection level; --, data not available]

SITE NUMBER (figure 2)	DATE	24-HOUR TIME	BENZENE, TOTAL (µg/L)	CHLORO-ETHANE, TOTAL (µg/L)	CHLORO-FORM, TOTAL (µg/L)	DI-AZINON, TOTAL (µg/L)	DI-CHLORO-DI-FLUORO-METHANE, TOTAL (µg/L)	1,1-DI-CHLORO-ETHANE, TOTAL (µg/L)	ETHION, TOTAL (µg/L)	ETHYL-BENZENE, TOTAL (µg/L)
2	06-22-87	1230	<0.2	<0.2	<0.2	--	<0.2	<0.2	--	<0.2
3	06-25-87	1200	<.2	<.2	<.2	--	<.2	<.2	--	<.2
4	06-23-87	1100	<.2	<.2	<.2	--	<.2	<.2	--	<.2
5	06-25-87	1445	<.2	<.2	<.2	--	2.0	.2	--	<.2
6	06-24-87	1045	<.2	<.2	<.2	--	<.2	<.2	--	<.2
10	07-01-87	0950	<.2	<.2	<.2	--	<.2	<.2	--	<.2
	08-26-87	1045	-	-	-	--	-	-	--	-
13	06-25-87	1845	<.2	<.2	<.2	--	<.2	<.2	--	<.2
15	06-26-87	1530	-	-	-	--	-	-	--	-
17	06-22-87	1500	<.2	<.2	<.2	--	<.2	<.2	--	<.2
18	06-26-87	1315	<.2	<.2	<.2	--	.3	<.2	--	<.2
20	06-26-87	1115	<.2	<.2	<.2	--	<.2	<.2	--	<.2
25	06-24-87	1315	<.2	<.2	<.2	--	<.2	<.2	--	<.2
27	06-30-87	1645	<.2	<.2	<.2	--	<.2	<.2	--	<.2
28	06-30-87	1415	.3	<.2	<.2	--	<.2	<.2	--	<.2
29	06-30-87	0730	1.9	3.5	<.2	0.01	<.2	10	0.02	.5
31	06-29-87	1500	<.2	<.2	<.2	--	<.2	<.2	--	<.2
35	06-25-87	0945	<.2	<.2	<.2	--	<.2	<.2	--	<.2
36	06-24-87	1600	<.2	<.2	<.2	--	<.2	<.2	--	<.2
37	06-23-87	0800	<.2	<.2	.2	--	<.2	<.2	--	<.2
38	06-23-87	1245	<.2	<.2	.2	--	<.2	<.2	--	<.2
39	06-23-87	1645	<.2	<.2	.2	--	<.2	<.2	--	<.2

SITE NUMBER (figure 2)	DATE	BIS (2-ETHYL-HEXYL) PHTHAL-ATE, TOTAL (µg/L)	METHYL-CHLO-RIDE, TOTAL (µg/L)	PHORATE, TOTAL (µg/L)	TETRA-CHLORO-ETHYL-ENE, TOTAL (µg/L)	TOLUENE, TOTAL (µg/L)	TRI-CHLORO-ETHYL-ENE, TOTAL (µg/L)	VINYL CHLO-RIDE, TOTAL (µg/L)	XYLENE, WHOLE WATER, TOTAL RECOV-ERABLE (µg/L)
2	06-22-87	<5.0	<0.2	--	<0.2	<0.2	<0.2	<0.2	<0.2
3	06-25-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
4	06-23-87	<5.0	<.2	--	.2	<.2	<.2	<.2	<.2
5	06-25-87	<5.0	2.5	--	9.8	<.2	.9	<.2	<.2
6	06-24-87	<5.0	<.2	--	<.2	<.2	.6	<.2	<.2
10	07-01-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
13	06-25-87	13.0	<.2	--	<.2	<.2	<.2	<.2	<.2
17	06-22-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
18	06-26-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
20	06-26-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
25	06-24-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
27	06-30-87	<5.0	<.2	--	<.2	<.2	<.2	1.0	<.2
28	06-30-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
29	06-30-87	<5.0	<.2	0.05	<.2	.3	4.6	<.2	1.5
31	06-29-87	<5.0	<.2	--	<.2	<.2	<.2	5.0	<.2
35	06-25-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
36	06-24-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
37	06-23-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
38	06-23-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2
39	06-23-87	<5.0	<.2	--	<.2	<.2	<.2	<.2	<.2

TABLE 9.--*Radon-222*

[<, less than indicated detection level]

Site number (figure 2)	Date	24-hour time	Radon-222 (picocuries per liter)	Site number (figure 2)	Date	24-hour time	Radon-222 (picocuries per liter)
1	08-18-87	1229	560	18	08-25-87	1200	440
	08-18-87	1230	[a]420				
				19	08-19-87	1700	480
2	08-27-87	0830	350				
				20	08-18-87	1600	780
3	07-06-87	1522	480				
				21	08-20-87	1700	440
4	08-24-87	1345	530				
				22	08-24-87	1130	800
5	07-07-87	1323	590				
				23	08-24-87	1600	<100
6	08-19-87	0959	480				
	08-19-87	1000	[a]300	24	07-07-87	1141	3,600
					08-20-87	1259	5,500
8	08-27-87	1530	460		08-20-87	1300	[a]2,700
9	07-06-87	1237	660	25	08-18-87	1150	1,400
10	08-05-87	1130	<100	26	08-19-87	1329	450
	08-26-87	1045	<100		08-19-87	1330	[a]360
11	08-26-87	1245	200	34	08-27-87	1735	1,200
12	08-25-87	1615	460	36	08-25-87	1015	310
13	08-25-87	1415	302	37	07-07-87	1029	14,000
					08-20-87	0943	10,000
14	08-27-87	1100	380		08-20-87	0945	[a]7,200
16	07-07-87	0858	1,100	38	07-07-87	1455	760
17	07-06-87	1353	500	39	08-20-87	1530	220

[a] Radon activity determined by direct deemanation and alpha-scintillation counting; all other values determined by liquid-scintillation counting.

TABLE 10.--*Statistical summary of selected water-quality data*

[Deg. C, degrees celsius; µS/cm, microsiemens per centimeter; mg/L, milligrams per liter; DS, dissolved solids; (res. evap.), residue remaining after evaporation at 180 at 25 °C; NTU, nephelometric turbidity units; µg/L, micrograms per liter; pCi/L, picocuries per liter; --, insufficient data for meaningful estimates]

Property or constituent	Mean value	Standard deviation	Median value	Minimum		Maximum		Number of measurements	
				Value	Site No.[1] (figure 2)	Value	Site No. (figure 2)	Counted	Below detection
Specific conductance; µS/cm	520	727	344	77	37	3,670	10	80	0
pH; standard units	7.7	0.5	7.7	6.7	10	9.1	1	80	0
Water temperature; deg. C	15	2.6	14	11	21	21	5	92	0
Turbidity; NTU	8.6	47.1	0.3	<0.1	3	390	29	73	1
Hardness as $CaCO_3$; µg/L	137	116	110	15	24	600	10	73	0
Calcium; mg/L	42	41	32	5.2	24	230	10	73	0
Magnesium; mg/L	8.0	6.3	6.4	.07	9	36	29	73	0
Sodium; mg/L	44	87	23	7.4	37	570	10	73	0
Potassium; mg/L	2.7	1.7	2.4	.50	1	9.1	29	73	0
Alkalinity as $CaCO_3$; mg/L	129	51	125	30	24	253	31	73	0
Sulfate; mg/L	88	277	25	.7	9	1,700	10	73	0
Chloride; mg/L	18	40	7.7	.6	37	210	10	73	0
Fluoride; mg/L	0.53	1.1	.2	<.10	*	6.8	10	73	9
Silica as SiO_2; mg/L	37	15	32	9.5	29	78	13	73	0
DS (res. evap.); mg/L	321	462	248	74	37	2,940	10	73	0
NO_2 as N; mg/L	--	--	--	<.01	*	0.05	31	72	68
NO_3 + NO_2 as N; mg/L	1.6	2.2	.39	<.1	*	12	34	72	9
NH_4 as N; mg/L	.05	.12	.01	<.01	*	.84	29	72	32
NH_4 + organic as N; mg/L	.47	.35	.40	<.20	*	1.8	34	72	11
Dissolved organic carbon; mg/L	1.35	1.69	.60	.30	9	8.8	31	71	0
Arsenic; µg/L	8	9	4.5	<1	*	30	13	30	5
Barium; µg/L	61	44	44	5	37	170	19	30	1
Boron; µg/L	285	729	110	<10	9,16	2,900	10	31	2
Cadmium; µg/L	.7	.5	.7	<1	*	2	19,23	30	22
Chromium; µg/L	--	--	--	<10	*	40	35	26	24
Copper; µg/L	--	--	--	<10	*	10	19	30	29
Iron; µg/L	341	1,749	8.5	<3	*	9,600	10	30	8
Lead; µg/L	9	8	4	<10	*	30	6,26	29	23
Manganese; µg/L	54	220	2	<1	*	1,200	10	30	12
Mercury; µg/L	--	--	--	<0.1	*	0.3	39	31	28
Selenium; µg/L	--	--	--	<1	*	5	23	30	28
Silver; µg/L	--	--	--	<1	*	1	5	30	29
Zinc; µg/L	50	70	25	<3	1,6,24	310	25	30	3
Radon-222; pCi/L	1,600	2,900	480	<100	10,23	14,000	37	37	3

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[1] Asterisk (*) indicates occurrence of this value at more than one site.

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