WATER-QUALITY ASSESSMENT OF THE RIO GRANDE VALLEY, COLORADO, NEW MEXICO, AND TEXAS--Water-quality data for water-column, suspended-sediment, and bed-material samples collected at selected surface-water sites in the upper Rio Grande Basin, June and September 1994

By Lynn K. Miller, Robert L. Moquino, and Bruce A. Hill

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<http://wwwrvares.er.usgs.gov/nawqa/nawqa_home.html>

FOREWORD

The mission of the U.S. Geological Survey (USGS) is to assess the quantity and quality of the earth resources of the Nation and to provide information that will assist resource managers and policymakers at Federal, State, and local levels in making sound decisions. Assessment of water-quality conditions and trends is an important part of this overall mission.

One of the greatest challenges faced by water-resources scientists is acquiring reliable information that will guide the use and protection of the Nation's water resources. That challenge is being addressed by Federal, State, interstate, and local water-resource agencies and by many academic institutions. These organizations are collecting water-quality data for a host of purposes that include: compliance with permits and water-supply standards; development of remediation plans for a specific contamination problem; operational decisions on industrial, wastewater, or water-supply facilities; and research on factors that affect water quality. An additional need for water-quality information is to provide a basis on which regional and national-level policy decisions can be based. Wise decisions must be based on sound information. As a society we need to know whether certain types of water-quality problems are isolated or ubiquitous, whether there are significant differences in conditions among regions, whether the conditions are changing over time, and why these conditions change from place to place and over time. The information can be used to help determine the efficacy of existing water-quality policies and to help analysts determine the need for and likely consequences of new policies.

To address these needs, the Congress appropriated funds in 1986 for the USGS to begin a pilot program in seven project areas to develop and refine the National Water-Quality Assessment (NAWQA) Program. In 1991, the USGS began full implementation of the program. The NAWQA Program builds upon an existing base of water-quality studies of the USGS, as well as those of other Federal, State, and local agencies. The objectives of the NAWQA Program are to:

- Describe current water-quality conditions for a large part of the Nation's freshwater streams, rivers, and aquifers.
- Describe how water quality is changing over time.
- Improve understanding of the primary natural and human factors that affect water-quality conditions.

This information will help support the development and evaluation of management, regulatory, and monitoring decisions by other Federal, State, and local agencies to protect, use, and enhance water resources.

The goals of the NAWQA Program are being achieved through ongoing and proposed investigations of 60 of the Nation's most important river basins and aquifer systems, which are referred to as study units. These study units are distributed throughout the Nation and cover a diversity of hydrogeologic settings. More than two-thirds of the Nation's freshwater use occurs within the 60 study units and more than two-thirds of the people served by public water-supply systems live within their boundaries.

National synthesis of data analysis, based on aggregation of comparable information obtained from the study units, is a major component of the program. This effort focuses on selected water-quality topics using nationally consistent information. Comparative studies will explain differences and similarities in observed water-quality conditions among study areas and will identify changes and trends and their causes. The first topics addressed by the national synthesis are pesticides, nutrients, volatile organic compounds, and aquatic biology. Discussions on these and other water-quality topics will be published in periodic summaries of the quality of the Nation's ground and surface water as the information becomes available.

This report is an element of the comprehensive body of information developed as part of the NAWQA Program. The program depends heavily on the advice, cooperation, and information from many Federal, State, interstate, Tribal, and local agencies and the public. The assistance and suggestions of all are greatly appreciated.

Robert M. Hirsch
Chief Hydrologist

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FIGURE

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CONVERSION FACTORS

Multiply	By	To obtain
mile	1.609	kilometer
square mile	2.590	square kilometer
gallon	3.785	liter
cubic foot per second	0.02832	cubic meter per second

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

$$°F = 1.8\ °C + 32$$

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Abstract

As part of the Rio Grande Valley National Water-Quality Assessment Program, samples were collected at 34 sites in the upper Rio Grande Basin in Colorado and New Mexico during June and September 1994. The focus of the sampling was on trace-element concentrations in the water column, suspended sediment, and bed material. Water-column samples were analyzed for major constituent, nutrient, dissolved organic carbon, and dissolved trace-element concentrations. Suspended-sediment samples were analyzed for suspended-sediment and total trace-element concentrations. Bed-material samples were analyzed for nutrient and total trace-element concentrations. Physical properties of the water column also were measured at each site.

INTRODUCTION

The Rio Grande Valley study unit assessment began in 1991 as one of 20 study units of the National Water-Quality Assessment (NAWQA) Program of the U.S. Geological Survey (USGS) (Gilliom and others, 1995). The study unit includes approximately 45,900 square miles in Colorado, New Mexico, and Texas and encompasses the surface-water drainage for the Rio Grande upstream from the International Boundary and Water Commission streamflow-gaging station Rio Grande at El Paso, Texas. The study unit also includes the closed surface-water basins between the Rio Grande and Continental Divide and the San Luis Closed Basin (Ellis and others, 1993).

Since the late 1800's, mining activities have been prevalent in the northern part of the study unit in Colorado and New Mexico. By 1994, however, most mining activities had ceased, and several areas were in various stages of remediation. Trace elements from mines and associated tailings and naturally occurring mineral deposits have impaired water quality in the main stem Rio Grande and several smaller streams in the area. To document the surface-water quality in this area, a synoptic study focusing on trace elements in the water column, suspended sediment, and bed material was conducted in June and September 1994.

Purpose and Scope

This report presents water-quality data for water-column, suspended-sediment, and bed-material samples collected in the upper Rio Grande Basin during June and September 1994. Samples were collected at 34 sites, including 17 sites on the main stem, 14 sites on tributaries to the main stem, 1 non-tributary site to the main stem, 1 site on a conveyance channel that discharges to the main stem, and 1 site at the discharge point for a spring (fig. 1). Data collected in the field included on-site measurements of stream discharge, specific conductance, pH, water temperature, barometric pressure, and dissolved-oxygen concentration. Water-column samples were analyzed for major constituent, nutrient, dissolved organic carbon, and dissolved trace-element concentrations. Suspended-sediment samples, collected only at main-stem sites, were analyzed for suspended-sediment and total trace-element concentrations. Bed-material samples were analyzed for nutrient and total trace-element concentrations. Quality-control data are not presented in this report but are available from the USGS New Mexico District Office in Albuquerque, New Mexico. Table 1 lists the 34 sampling sites where data were collected.

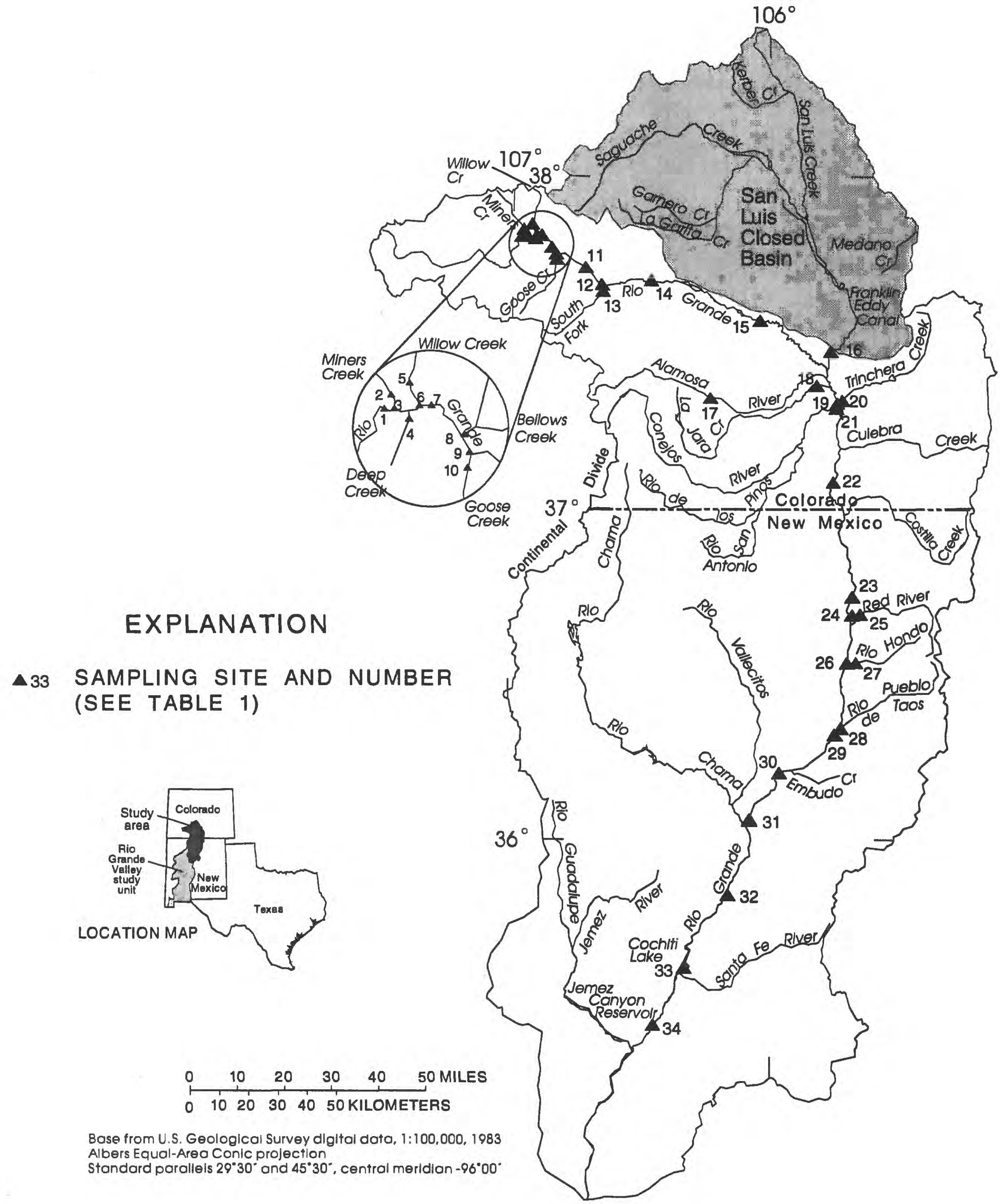

Figure 1.--Synoptic study area and sampling sites.

Table 1.--Synoptic sampling sites

[MS, main stem; x, sample collected; TR, tributary; --, no sample collected; CC, conveyance channel; USFS, United States Forest Service; NT, non-tributary to main stem; SP, spring]

Site number (fig. 1)	U.S. Geological Survey station number and name		Type	Water column		Suspended sediment	Bed material
				June	September	June	September
1	374903106580810	Rio Grande at U.S. 149 above Creede, Colo.	MS	x	x	x	x
2	375025106573510	Miners Creek near Creede, Colo.	TR	--	--	--	x
3	374926106565710	Miners Creek at U.S. 149 near Creede, Colo.	TR	x	x	--	x
4	374843106544510	Deep Creek at 550 Rd. at Creede, Colo.	TR	x	x	--	x
5	08216500	Willow Creek at Creede, Colo.	TR	x	x	--	x
6	374921106543110	Willow Creek near mouth at Creede, Colo.	TR	x	x	--	x
7	08217000	Rio Grande at Wason, below Creede, Colo.	MS	x	x	x	x
8	374714106505810	Bellows Creek near Wagon Wheel Gap, Colo.	TR	x	x	--	x
9	08217500	Rio Grande at Wagon Wheel Gap, Colo.	MS	x	x	x	x
10	08218500	Goose Creek at Wagon Wheel Gap, Colo.	TR	x	x	--	x
11	374339106425610	Rio Grande at Coller Bridge near Baxterville, Colo.	MS	x	x	x	x
12	374034106390810	Rio Grande at Baxterville, Colo.	MS	x	x	x	x
13	08219500	South Fork Rio Grande at South Fork, Colo.	TR	x	x	--	x
14	08220000	Rio Grande near Del Norte, Colo.	MS	x	x	x	x
15	373412106021910	Rio Grande below Monte Vista, Colo.	MS	x	x	x	x
16	372826105455810	Franklin Eddy Canal at flume near Alamosa, Colo.	CC	x	x	--	--
17	371954106134808	Alamosa River at Rd BB (USFS 255) near Capulin, Colo.	NT	x	x	--	x
18	372214105491210	La Jara Creek near Rd. S-112 near Alamosa, Colo.	TR	x	x	--	x
19	08240000	Rio Grande above mouth of Trinchera Creek, near Lasauses, Colo.	MS	x	x	x	x
20	371931105432010	Trinchera Creek near Lasauses, Colo.	TR	x	--	--	--
21	08249000	Conejos River near Lasauses, Colo.	TR	x	x	--	x
22	08251500	Rio Grande near Lobatos, Colo.	MS	x	x	x	x
23	08263500	Rio Grande near Cerro, N. Mex.	MS	x	x	x	x
24	364047105411101	Big Arsenic Springs near Cerro, N. Mex.	SP	--	x	--	--
25	08266820	Red River below Fish Hatchery, near Questa, N. Mex.	TR	x	x	--	x
26	08267400	Rio Grande above Rio Hondo at Dunn Bridge, N. Mex.	MS	x	x	x	x
27	363202105422310	Rio Hondo near mouth, near Arroyo Hondo, N. Mex.	TR	x	x	--	x
28	362019105434610	Rio Pueblo de Taos above mouth near Taos, N. Mex.	TR	x	x	--	x
29	08276500	Rio Grande below Taos Junction Bridge, near Taos, N. Mex.	MS	x	x	x	x
30	08279500	Rio Grande at Embudo, N. Mex.	MS	--	--	--	x
31	08281100	Rio Grande above San Juan Pueblo, N. Mex.	MS	--	--	--	x
32	355009106092710	Rio Grande near White Rock, N. Mex.	MS	--	--	--	x
33	08317400	Rio Grande below Cochiti Dam, N. Mex.	MS	--	--	--	x
34	08319000	Rio Grande at San Felipe, N. Mex.	MS	--	--	--	x

Methods

To ensure that the water-column, suspended-sediment, and bed-material samples represent in situ quality, standardized procedures were used in collecting, preserving, shipping, and analyzing the samples. These procedures are referenced in the following sections.

A USGS modified D-77 trace-element sampler with a perforated, 3-liter polyethylene bottle containing a Teflon collapsible bag liner and Teflon cap and nozzle or a USGS DH-81 hand sampler using a Teflon collapsible bag liner and Teflon cap and nozzle was used to collect depth-integrated water-column samples (Shelton, 1994; Kelly and Taylor, 1996). Water-column samples were analyzed by H.E. Taylor's project in the USGS National Research Program Laboratory in Boulder, Colorado. Dissolved trace elements were determined by a combination of analytical techniques, including inductively coupled plasma-mass spectrometry, inductively coupled plasma-atomic emission spectrometry, and flame atomic absorption spectrometry. Analytical methods, method accuracy, and precision data are described in Taylor and Garbarino (1991) and Garbarino and Taylor (1992).

Suspended-sediment samples were collected using a standard USGS D-77 trace-element sampler. Five to 10 gallons of water were collected for each sample and shipped to A.J. Horowitz of the USGS Sediment Partitioning Research Project in Atlanta, Georgia. Trace-element concentrations were analyzed using methods described in Horowitz (1991).

Bed-material samples were collected using modified protocols developed for the NAWQA Program by Shelton and Capel (1994). Trace-element concentrations in bed material were analyzed in Atlanta, Georgia. Nutrient concentrations in bed material were analyzed at the USGS National Water Quality Laboratory in Arvada, Colorado, using protocols in Fishman and Friedman (1989).

WATER-QUALITY DATA

Data collected during the trace-element synoptic study are presented in this section. Table 2 presents the field measured properties and analytical results for the water-column samples. Table 3 presents analytical results for the suspended-sediment samples. Table 4 presents the analytical results for the bed-material samples.

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Table 2.--Field measurements and analytical results for water-column samples

[ft^3/s, cubic feet per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; mm of Hg, millimeters of mercury; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data; <, less than; e, estimated]

Site number (fig. 1)	Date	Instantaneous discharge (ft^3/s)	Specific conductance (µS/cm)	pH (standard units)	Water temperature (degrees Celsius)	Barometric pressure (mm of Hg)	Oxygen, dissolved (mg/L)
1	06/13/94	2,240	48	7.6	7.5	547	9.3
1	09/13/94	313	76	8.2	--	--	--
3	06/13/94	30	52	7.8	6.7	559	9.0
3	09/13/94	20	58	8.1	--	--	--
4	06/13/94	7.2	90	7.9	8.0	547	8.8
4	09/13/94	3.2	134	8.1	--	--	--
5	06/13/94	44	62	7.7	5.0	556	9.9
5	09/13/94	29	73	7.8	--	--	--
6	06/13/94	36	60	7.6	7.0	547	9.1
6	09/13/94	23	90	7.7	--	--	--
7	06/13/94	e1,700	48	7.8	12.5	555	8.3
7	09/13/94	--	68	7.9	12.5	558	8.0
8	06/13/94	25	60	8.0	15.0	--	e7.8
8	09/13/94	17	64	8.3	10.5	560	8.1
9	06/14/94	1,920	47	7.3	7.5	559	8.8
9	09/14/94	512	72	7.9	--	--	--
10	06/13/94	172	50	7.8	13.5	--	e8.3
10	09/14/94	e59	80	8.0	--	--	--
11	06/14/94	e1,200	46	7.6	10.5	561	8.7
11	09/14/94	474	77	8.0	13.0	566	8.0

Table 2.--Field measurements and analytical results for water-column samples--Continued

Site number (fig. 1)	Date	Instantaneous discharge (ft^3/s)	Specific conductance ($\mu S/cm$)	pH (standard units)	Water temperature (degrees Celsius)	Barometric pressure (mm of Hg)	Oxygen, dissolved (mg/L)
12	06/14/94	2,320	48	7.6	11.0	550	9.2
12	09/13/94	[1]e220	93	8.3	--	--	--
13	06/14/94	e633	40	7.7	9.0	550	8.6
13	09/13/94	[1]e118	59	8.4	14.0	568	7.5
14	06/14/94	2,390	49	7.6	13.5	566	7.9
14	09/13/94	340	125	8.3	12.0	575	7.5
15	06/14/94	300	72	7.6	19.0	560	7.5
15	09/13/94	2.0	172	8.2	15.0	580	6.5
16	06/17/94	e24	403	9.0	--	--	--
16	09/13/94	e22	413	9.1	--	--	--
17	06/15/94	--	160	5.7	10.0	564	8.8
17	09/12/94	--	297	5.3	--	--	--
18	06/15/94	11	592	7.8	8.0	578	7.4
18	09/12/94	3.1	524	7.9	--	--	--
19	06/15/94	251	575	8.3	20.5	579	7.2
19	09/12/94	47	490	8.5	19.0	584	7.2
20	06/15/94	12	284	8.4	22.5	579	6.2
21	06/16/94	215	91	8.2	19.5	582	7.3
21	09/12/94	145	176	8.4	17.0	585	6.9
22	06/16/94	720	290	8.7	23.0	583	8.7

Table 2.--Field measurements and analytical results for water-column samples--Continued

Site number (fig. 1)	Date	Instantaneous discharge (ft^3/s)	Specific conductance (µS/cm)	pH (standard units)	Water temperature (degrees Celsius)	Barometric pressure (mm of Hg)	Oxygen, dissolved (mg/L)
22	09/12/94	60	379	8.9	20.0	581	8.0
23	06/15/94	957	258	8.1	--	--	--
23	09/11/94	119	261	8.8	18.5	590	8.6
24	09/11/94	--	235	8.2	17.4	597	7.4
25	06/16/94	224	227	8.0	--	--	--
25	09/11/94	64	378	8.0	17.0	592	6.7
26	06/16/94	1,210	266	8.2	16.0	--	--
26	09/12/94	e200	276	8.4	16.0	605	8.2
27	06/15/94	90	134	7.9	12.0	--	--
27	09/12/94	19	350	8.8	16.0	605	8.2
28	06/16/94	104	228	8.4	11.0	610	9.2
28	09/11/94	27	480	8.3	15.0	612	8.1
29	06/16/94	1,670	247	8.3	16.0	615	8.5
29	09/11/94	336	305	8.6	17.0	615	7.6

Table 2.--Field measurements and analytical results for water-column samples--Continued

Site number (fig. 1)	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Alkalinity, field (mg/L)	Sulfate, dissolved (mg/L)	Chloride, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Bromide, dissolved (mg/L)	Silica, dissolved (mg/L)	Nitrogen, nitrate, dissolved (mg/L as N)	Nitrogen, nitrite, dissolved (mg/L as N)	Nitrogen, ammonia, dissolved (mg/L as N)	Phosphorus, dissolved (mg/L as P)	Carbon, organic, dissolved (mg/L as C)
1	5.2	0.88	1.6	1.1	20	3.3	0.9	<0.06	<0.02	12	0.025	<0.002	0.006	0.024	2.8
1	8.6	1.5	3.2	1.7	29	4.8	.4	.06	<.02	20	<.02	<.002	<.005	.035	2.4
3	5.0	.58	2.2	1.4	17	3.3	.4	<.06	<.02	22	<.02	<.002	<.006	.055	2.3
3	5.8	.64	2.6	1.9	21	3.7	.4	<.06	<.02	25	<.02	<.002	.009	.056	3.3
4	14	1.6	3.3	.56	42	4.6	.5	.07	<.02	22	<.02	<.002	<.006	.088	4.5
4	19	2.2	3.8	.72	60	4.6	.5	.08	<.02	24	<.02	<.002	.006	.113	3.9
5	7.2	.78	2.2	.79	18	7.4	.3	<.06	<.02	15	.097	<.002	<.006	.031	2.2
5	8.3	.94	2.7	.77	20	11	.3	<.06	<.02	17	.045	<.002	<.005	.024	1.8
6	7.2	.79	2.4	.71	17	8.6	.3	<.06	<.02	15	.048	<.002	.013	.028	2.3
6	8.9	.99	3.0	1.0	--	9.0	.3	<.06	<.02	16	.042	<.002	<.005	.020	1.7
7	5.6	.88	1.8	1.1	17	3.2	.3	<.06	<.02	13	<.02	<.002	<.006	.025	2.8
7	8.7	1.4	3.1	1.6	28	5.1	.4	.06	<.02	23	<.02	<.002	<.005	.033	2.7
8	6.7	.86	3.0	1.4	23	2.6	.4	<.06	<.02	27	.026	<.002	<.006	.058	2.3
8	6.6	.81	2.9	1.6	27	2.5	.4	<.06	<.02	30	<.02	<.002	.007	.046	1.5
9	5.4	.87	1.8	.94	17	3.3	.4	<.06	<.02	13	<.02	<.002	.009	.026	2.7
9	8.9	1.4	3.2	1.6	29	5.1	.4	.07	<.02	20	<.02	<.002	<.005	.037	2.5
10	5.8	.88	2.4	1.1	19	3.2	.5	<.06	<.02	19	<.02	<.002	.017	.031	2.5
10	9.2	1.4	4.6	1.6	33	3.3	.8	.06	<.02	27	<.02	<.002	<.005	.041	2.2
11	5.7	.92	2.0	1.0	17	3.4	.3	<.06	<.02	14	<.02	<.002	<.006	.026	2.6
11	9.3	1.4	3.5	1.7	30	5.6	.5	.06	<.02	22	<.02	<.002	<.005	.040	2.5
12	5.6	.87	1.9	1.0	18	3.4	.3	<.06	<.02	14	.028	<.002	.033	.025	2.9
12	11	1.5	3.9	1.7	35	6.0	.6	.08	<.02	22	<.02	.003	<.005	.030	2.0
13	4.6	.76	1.5	.86	16	2.4	.5	<.06	<.02	14	<.02	<.020	.007	.019	3.2
13	7.2	1.3	2.6	1.2	25	2.9	.4	<.06	<.02	18	<.02	<.002	.005	.027	2.3
14	5.6	.90	1.8	1.0	18	3.0	.3	<.06	<.02	14	<.02	<.002	<.006	.035	2.7
14	14	2.5	5.4	1.9	33	3.8	.4	.09	<.02	24	<.02	<.002	.005	.039	2.2
15	8.6	1.4	3.1	1.4	26	4.1	2.0	.06	<.02	16	.037	.004	.013	.049	3.1
15	19	3.3	7.2	2.0	67	7.1	5.3	.12	<.02	22	<.02	<.002	.005	.033	2.6
16	26	6.0	47	8.9	157	34	14	.69	.16	40	<.02	.002	.042	.032	4.7
16	26	7.6	44	8.1	151	36	15	.46	.11	38	<.02	<.002	.007	.017	3.3

Table 2.--Field measurements and analytical results for water-column samples--Continued

Site number (fig. 1)	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Alkalinity, field (mg/L)	Sulfate, dissolved (mg/L)	Chloride, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Bromide, dissolved (mg/L)	Silica, dissolved (mg/L)	Nitrogen, nitrate, dissolved (mg/L as N)	Nitrogen, nitrite, dissolved (mg/L as N)	Nitrogen, ammonia, dissolved (mg/L as N)	Phosphorus, dissolved (mg/L as P)	Carbon, organic, dissolved (mg/L as C)
17	15	2.4	5.1	0.73	0	59	0.8	0.11	<0.02	9.9	<0.02	0.001	0.11	0.002	0.86
17	29	4.4	9.3	1.3	[1]-2	130	1.6	20	<.02	14	250	<.002	21	002	.55
18	69	13	33	5.2	134	160	8.7	.40	.05	20	<.02	002	008	095	6.6
18	62	12	35	6.9	171	87	11	42	.07	34	021	<.002	12	018	4.6
19	55	12	46	7.3	129	150	13	.46	06	23	<.02	.002	008	085	8.2
19	40	8.7	45	7.0	150	75	13	.46	.09	25	<.02	<.002	.007	.057	4.3
20	36	7.9	8.7	1.3	126	16	3.1	.04	<.02	13	<.02	<.002	.007	029	3.7
21	11	2.0	3.3	1.8	41	2.2	.6	.07	<.02	20	<.02	.002	.008	.042	4.0
21	19	3.1	8.4	5.1	68	11	1.2	.02	.02	38	<.02	<.002	.011	.033	1.6
22	28	6.0	21	3.9	77	57	5.5	.28	.03	21	.020	.002	.006	.061	5.8
22	29	6.0	29	6.3	124	49	8.1	.40	.05	23	<.02	<.002	<.005	.030	3.9
23	28	6.0	21	3.8	80	31	3.1	.27	<.02	21	<.020	<.002	<.006	.056	5.4
23	23	5.4	21	4.6	96	28	5.6	.41	.06	25	.033	.002	<.005	.018	3.2
24	21	5.6	22	2.5	79	23	6.9	.99	.07	34	.77	<.002	<.005	.015	.29
25	29	5.6	5.4	.91	49	53	2.3	.50	<.02	11	.19	<.002	.015	.002	1.6
25	42	9.5	14	1.8	65	110	4.8	.85	.02	17	.29	<.002	.11	.012	.79
26	27	5.6	16	2.9	71	49	4.8	.36	<.02	19	.053	.002	.008	.037	4.2
26	28	6.7	19	2.9	86	45	5.3	.58	.03	26	.23	<.002	.005	.009	1.6
27	20	2.2	2.8	.80	50	10	1.4	.14	<.02	8.0	.16	<.002	<.006	.010	1.5
27	48	8.2	15	1.6	157	23	5.2	.28	.04	19	.21	<.002	.012	.010	1.8
28	33	5.4	4.8	.75	93	19	2.3	.14	<.02	8.5	.024	<.002	.006	.008	2.3
28	63	14	21	.50	187	52	9.9	.35	.03	10	.15	.058	.025	.014	2.4
29	28	5.3	13	2.7	73	39	4.0	.28	<.02	17	.056	.006	<.006	.036	3.7
29	30	7.0	19	3.1	98	45	5.8	.54	.06	23	.18	<.002	<.005	.011	1.6

Table 2.--Field measurements and analytical results for water-column samples--Continued

Site number (fig. 1)	Aluminum, dissolved (µg/L)	Antimony, dissolved (µg/L)	Arsenic, dissolved (µg/L)	Barium, dissolved (µg/L)	Beryllium, dissolved (µg/L)	Boron, dissolved (µg/L)	Cadmium, dissolved (µg/L)	Cesium, dissolved (µg/L)	Chromium, dissolved (µg/L)	Cobalt, dissolved (µg/L)	Copper, dissolved (µg/L)	Gold, dissolved (µg/L)	Iron, dissolved (µg/L)	Lead, dissolved (µg/L)	Lithium, dissolved (µg/L)	Manganese, dissolved (µg/L)
1	13	0.028	0.29	12	<0.007	<0.80	0.24	0.06	<0.10	0.02	0.63	<0.01	17	0.02	0.56	4.3
1	2.2	.039	.62	16	.009	5.1	<.05	.04	<.10	.04	.37	<.01	<13	<.01	1.2	5.2
3	6.8	.033	.60	2.1	.016	<.80	<.05	.03	<.10	.03	.29	<.01	17	<.01	1.1	9.8
3	5.5	.049	.79	1.8	.021	3.4	<.05	.04	<.10	.03	.27	<.01	17	<.01	1.8	12
4	190	.064	1.8	18	.011	3.2	<.05	.09	<.10	.07	.51	<.01	250	.08	1.9	18
4	8.4	.058	2.7	21	.012	6.5	.12	.02	<.10	.19	.63	<.01	27	.08	2.8	18
5	9.9	.12	.94	10	.014	<.80	4.2	.07	<.10	.04	1.9	<.01	<13	5.6	1.4	30
5	7.2	.16	1.1	14	.019	2.8	6.7	.10	<.10	.06	2.7	<.01	<13	6.7	1.9	54
6	27	.17	1.1	13	.017	<.80	6.8	.07	<.10	.07	3.0	<.01	<13	3.1	1.7	44
6	19	.23	1.4	22	.015	4.5	8.8	.07	<.10	.12	3.2	<.01	<13	3.4	2.7	86
7	17	.027	.37	11	<.007	<.80	<.05	.04	<.10	.03	.70	<.01	16	.05	.66	5.4
7	9.1	.045	.63	14	.010	5.3	<.05	.04	<.10	.08	.66	<.01	13	.08	1.4	12
8	3.4	.023	.73	6.6	.007	1.4	<.05	.06	<.10	.03	.23	<.01	<13	<.01	2.2	9.7
8	36	.032	.88	6.0	.014	5.3	<.05	.05	<.10	.03	.53	<.01	78	.05	2.8	8.6
9	12	.029	.40	11	.010	<.80	<.05	.05	.11	.03	.76	<.01	<13	.17	.70	4.6
9	11	.045	.76	14	.011	5.2	.10	.06	<.10	.06	.78	<.01	24	.21	1.7	10
10	14	.029	.39	9.3	.011	4.0	<.05	.14	<.10	.03	.52	<.01	15	.06	2.9	3.9
10	2.4	.052	.67	15	.010	14	<.05	.39	<.10	.03	.39	<.01	14	<.01	8.5	3.2
11	39	.029	.37	11	.015	1.0	<.05	.06	<.10	.05	.71	<.01	16	.28	.93	5.2
11	3.9	.047	.78	15	.010	6.5	<.05	.08	<.10	.06	.56	<.01	<13	.07	2.5	7.2
12	11	.032	.36	11	.008	1.0	<.05	.05	<.10	.03	.65	<.01	13	.04	.93	4.0
12	4.3	.054	.95	16	.009	7.5	<.05	.10	<.10	.05	.53	<.01	<13	.84	3.4	4.9
13	22	.010	.19	8.2	.015	<.80	<.05	.03	<.10	.03	.38	<.01	23	.01	.37	3.8
13	9.4	.026	.26	11	.015	3.9	<.05	.02	<.10	.04	.53	<.01	18	.01	.70	6.6
14	14	.022	.37	9.9	.013	.80	.26	.05	.14	.03	.61	<.01	15	.07	.86	5.6
14	3.0	.047	.87	21	.010	9.8	<.05	.05	<.10	.05	.50	<.01	<13	.04	3.3	15
15	7.3	.042	.54	14	.008	2.3	<.05	.03	<.10	.04	.67	<.01	<13	.12	1.2	18
15	.94	.055	.87	30	.008	14	<.05	.02	.17	.13	.50	<.01	<13	.06	3.4	120
16	3.8	.052	3.8	68	<.007	100	<.05	.01	.51	.02	.46	<.01	<13	.02	7.4	140
16	1.5	.028	1.7	73	.007	59	<.05	.01	.58	<.01	.43	<.01	<13	<.01	12	110

Table 2.--Field measurements and analytical results for water-column samples--Continued

Site number (fig. 1)	Alu-minum, dis-solved (µg/L)	Anti-mony, dis-solved (µg/L)	Arsenic, dis-solved (µg/L)	Barium, dis-solved (µg/L)	Beryl-lium, dis-solved (µg/L)	Boron, dis-solved (µg/L)	Cad-mium, dis-solved (µg/L)	Cesium, dis-solved (µg/L)	Chro-mium, dis-solved (µg/L)	Cobalt, dis-solved (µg/L)	Copper, dis-solved (µg/L)	Gold, dis-solved (µg/L)	Iron, dis-solved (µg/L)	Lead, dis-solved (µg/L)	Lithium, dis-solved (µg/L)	Man-ganese, dis-solved (µg/L)
17	100	0.035	0.11	21	0.13	<0.80	1.1	0.02	<0.10	9.8	500	0.92	1,150	0.08	0.86	360
17	330	.025	.14	30	.28	3.4	1.8	.03	<.10	16	580	1.0	760	.19	1.9	680
18	1.7	.089	2.1	32	<.007	36	<.05	.02	.26	.24	1.9	<.01	23	.01	5.1	100
18	.73	.16	3.2	70	.007	43	<.05	<.01	<.10	.46	.76	<.01	<13	<.01	7.5	1,020
19	1.5	.080	2.3	35	<.007	87	<.05	.01	.35	.13	1.4	<.01	<13	.03	7.4	46
19	3.3	.077	2.5	25	<.007	95	<.05	.02	.43	.11	1.0	<.01	<13	.02	7.5	63
20	21	.043	.56	51	<.007	28	<.05	.03	<.10	.06	1.2	<.01	20	<.01	2.6	11
21	3.3	.037	.82	18	<.007	3.9	<.05	.02	<.10	.07	.63	<.01	20	<.01	1.1	17
21	.65	.057	3.4	24	.007	17	<.05	.02	.26	.08	.42	<.01	<13	<.01	4.5	29
22	75	.060	1.7	26	.007	41	<.05	.03	.22	.12	.99	<.01	14	.10	3.8	18
22	43	.086	3.5	32	<.007	70	<.05	.02	.29	.12	1.1	<.01	33	.06	6.5	14
23	2.2	.058	1.7	27	<.007	37	<.05	.02	.20	.06	1.1	<.01	<13	.04	4.0	.60
23	8.9	.074	2.8	21	<.007	45	.07	.04	.69	.23	.78	<.01	<13	.03	6.7	3.0
24	4.9	.023	1.4	19	.007	24	<.05	.17	1.7	<.01	.13	<.01	<13	<.01	20	.03
25	210	.015	.19	28	.020	5.5	.14	.02	.24	1.1	2.3	<.01	<13	.02	4.0	220
25	110	.024	.59	32	.022	19	.54	.04	.61	2.6	4.4	.02	<13	<.01	13	360
26	75	.047	1.3	25	<.007	36	<.05	.04	.37	.15	1.7	<.01	<13	.04	5.0	23
26	46	.045	1.9	26	.009	34	<.05	.02	.83	.15	1.6	.01	13	<.01	12	22
27	8.8	.004	.10	30	<.007	3.4	<.05	.02	.30	<.01	.95	<.01	<13	.02	.81	3.6
27	4.1	.024	.28	77	.010	18	<.05	<.01	1.3	<.01	.85	<.01	13	.02	1.7	4.1
28	4.3	.020	.21	33	<.007	11	<.05	.01	.15	.01	.56	<.01	<13	.01	2.6	9.8
28	16	.050	.48	63	<.007	49	<.05	<.01	.39	.03	.82	<.01	18	.04	8.6	3.3
29	48	.034	1.1	28	.011	26	<.05	.02	.30	.08	1.3	<.01	<13	.02	4.5	6.5
29	61	.053	1.9	32	.013	37	<.05	.02	.86	.05	1.6	<.01	<13	.05	12	4.5

Table 2.--Field measurements and analytical results for water-column samples--Continued

Site number (fig. 1)	Mercury, dis- solved (µg/L)	Molyb- denum, dis- solved (µg/L)	Neodym- ium, dis- solved (µg/L)	Nickel, dis- solved (µg/L)	Rubid- ium, dis- solved (µg/L)	Samar- ium, dis- solved (µg/L)	Sele- nium, dis- solved (µg/L)	Silver, dis- solved (µg/L)	Stron- tium, dis- solved (µg/L)	Tellu- rium, dis- solved (µg/L)	Terbium, dis- solved (µg/L)	Thal- lium, dis- solved (µg/L)	Thu- lium, dis- solved (µg/L)	Ura- nium, dis- solved (µg/L)	Vana- dium, dis- solved (µg/L)	Zinc, dis- solved (µg/L)
1	0.0009	0.11	0.07	0.5	1.6	0.016	<0.09	0.004	49	0.02	0.005	0.0026	0.0025	0.04	0.39	0.54
1	.0010	.38	.01	.3	2.7	.002	<.06	.005	64	<.02	<.001	<.0008	.0004	.09	.82	.14
3	.0009	.16	.05	.1	2.8	.011	<.06	.004	30	<.02	.004	.0026	.0022	.03	.70	2.1
3	.0009	.22	.04	.2	3.7	.011	<.06	.011	34	<.02	.003	.0029	.0014	.07	.85	1.0
4	.0010	.14	.13	.3	.46	.026	<.06	.007	73	<.02	006	.0024	.0027	.11	2.4	1.6
4	.0005	.25	.03	.4	.48	.006	<.09	.003	100	<.02	.002	<.0008	.0003	.23	1.9	2.0
5	.0010	.18	.10	.2	.97	.021	.16	.013	53	<.02	.005	.023	.0018	.06	.39	580
5	.0008	.22	.14	.3	1.3	.027	.24	.017	63	<.02	.006	.038	.0013	.10	.44	770
6	.0010	.23	.11	.5	.99	.023	.14	.020	53	<.02	.006	.030	.0021	.07	.36	920
6	.0017	.29	.13	.8	1.5	.024	.38	.033	70	<.02	.006	.056	.0011	.11	.41	1,000
7	.0013	.13	.06	.3	1.7	.014	<.06	.005	48	<.02	.004	.0036	.0018	.05	.47	11
7	.0008	.36	.03	.3	2.7	.005	<.06	.007	62	<.02	.002	.0040	.0009	.11	.85	33
8	.0007	.31	.01	.1	2.4	.005	<.09	<.002	37	.02	.002	<.0008	.0012	.03	1.0	.15
8	.0004	.35	.03	.2	2.6	.009	<.06	.004	40	<.02	.002	<.0008	.0008	.07	1.1	.87
9	.0014	.13	.08	.3	1.6	.015	<.09	.011	47	<.02	.006	.0027	.0021	.05	.44	26
9	.0011	.40	.03	.4	2.7	.005	<.06	.007	65	<.02	.001	.0064	.0005	.11	.89	45
10	.0010	.14	.05	.3	1.9	.013	<.09	.004	45	<.02	.004	.0024	.0019	.01	.88	1.1
10	.0010	.18	.02	.3	3.0	.004	<.06	.011	73	<.02	.002	.0014	.0005	.05	.96	.58
11	.0013	.13	.09	.4	1.6	.022	<.09	.004	47	<.02	.006	.0031	.0028	.04	.53	18
11	.0009	.38	.02	.3	2.7	.004	<.09	.004	65	<.02	.001	.0041	.0005	.12	.91	36
12	.0014	.14	.06	.3	1.6	.013	<.09	.004	47	<.02	.004	.0025	.0020	.04	.51	23
12	.0008	.48	.02	.3	3.0	.003	<.09	.010	74	<.02	.001	.0039	<.0003	.14	.91	28
13	.0017	.10	.10	.2	1.3	.027	.6	.004	33	<.02	.006	<.0008	.0035	.04	.49	.61
13	.0010	.20	.02	.3	1.8	.005	<.09	.005	53	<.02	.002	<.0008	.0008	.07	.70	.64
14	.0012	.14	.06	.4	1.6	.014	<.09	.004	46	<.02	.005	.0025	.0023	.04	.57	10
14	.0006	.55	.02	.3	2.7	.002	<.09	.008	100	<.02	<.001	.0039	.0004	.36	1.1	11
15	.0032	.22	.03	.3	1.8	.008	<.09	.028	61	<.02	.003	.0050	.0017	.09	1.1	4.1
15	.0008	.70	.01	<.1	3.0	<.002	.08	.003	140	<.02	.001	.0044	<.0003	.30	1.3	1.9
16	.0012	6.4	.02	.6	2.7	.005	.36	.003	210	.03	.002	<.0008	.0007	2.8	3.9	.47
16	.0005	4.7	.01	<.1	2.9	<.002	<.09	.005	230	<.02	<.001	<.0008	.0004	2.6	3.0	.41

Table 2.--Field measurements and analytical results for water-column samples--Concluded

Site number (fig. 1)	Mercury, dis-solved (µg/L)	Molyb-denum, dis-solved (µg/L)	Neodym-ium, dis-solved (µg/L)	Nickel, dis-solved (µg/L)	Rubid-ium, dis-solved (µg/L)	Samar-ium, dis-solved (µg/L)	Sele-nium, dis-solved (µg/L)	Silver, dis-solved (µg/L)	Stron-tium, dis-solved (µg/L)	Tellu-rium, dis-solved (µg/L)	Terbium, dis-solved (µg/L)	Thal-lium, dis-solved (µg/L)	Thu-lium, dis-solved (µg/L)	Ura-nium, dis-solved (µg/L)	Vana-dium, dis-solved (µg/L)	Zinc, dis-solved (µg/L)
17	0.0007	0.03	0.47	11	1.0	0.093	0.27	0.010	220	<0.02	0.024	0.034	0.0061	0.06	<0.05	190
17	.0013	.04	.95	15	1.9	.19	.46	.009	220	<.02	.053	.065	.0090	.14	<.05	230
18	.0011	1.7	.01	.7	1.4	.004	.44	<.002	520	.03	.002	.0019	.0007	1.3	1.8	3.5
18	.0008	3.7	.02	.6	2.0	.002	.43	.005	440	.08	.001	<.0008	.0004	3.1	3.6	.61
19	.0011	1.9	.02	.3	2.2	.005	.36	<.002	450	.03	.002	.0052	.0010	1.4	3.2	1.6
19	.0008	3.5	.01	.3	2.9	<.002	.17	.007	340	<.02	.001	.0020	.0004	1.8	3.7	.82
20	.0010	2.0	.04	.4	.21	.010	.22	.002	270	<.02	.003	<.0008	.0020	3.4	4.4	.41
21	.0009	.25	.03	.3	1.9	.008	<.06	.007	80	<.02	.002	.0043	.0015	.11	2.6	.36
21	.0006	1.1	.01	.3	5.1	<.002	.15	.004	150	<.02	.001	.0055	.0006	.87	10	.20
22	.0014	1.0	.08	.3	2.1	.017	.13	.003	230	.02	.004	.0055	.0018	.71	3.5	1.1
22	.0010	3.2	.05	.4	2.8	.011	.25	.010	270	<.02	.002	.0043	.0009	1.7	6.8	.79
23	.0016	1.0	.02	.3	2.2	.007	.18	.004	230	<.020	.002	.0039	.0012	.82	3.6	.89
23	.0006	2.8	.02	.3	3.0	.004	.22	.006	200	<.020	<.001	.0018	.0004	1.4	7.7	2.0
24	.0007	3.5	<.01	<.1	4.6	<.002	.50	.004	160	<.02	<.001	<.008	<.0003	2.2	6.2	.28
25	.0009	9.3	.24	5.5	.81	.053	.35	.002	170	<.02	.011	<.0008	.0023	.90	.54	19
25	.0009	31	.18	10	2.2	.035	.46	.003	270	<.02	.008	<.0008	.0012	1.8	2.0	27
26	.0008	3.2	.08	1.5	1.9	.017	.23	.003	200	.02	.005	.0032	.0022	.91	3.2	2.1
26	<.0004	10	.05	1.8	3.1	.010	.34	.002	210	<.02	.004	<.0008	.0007	1.7	6.0	2.2
27	.0008	4.0	.02	<.1	.51	.006	.19	.003	97	<.02	.003	<.0008	.0011	1.6	.38	1.4
27	.0010	5.9	.03	.2	.60	.007	.46	.012	280	<.02	.002	<.0008	<.0003	8.4	1.8	.54
28	.0014	.52	.02	.2	.20	.007	.32	<.002	160	<.02	.003	<.0008	.0010	.95	.39	.65
28	.0011	1.3	.02	<.1	.52	.009	.29	.011	350	<.02	.002	<.0008	.0008	2.9	1.1	2.5
29	.0011	2.9	.05	.9	1.5	.012	.20	.002	190	<.02	.004	.0018	.0014	1.0	2.6	1.6
29	.0009	9.0	.09	1.0	2.9	.018	.29	.007	230	<.02	.004	.0019	.0015	2.1	6.0	1.6

[1]Daily mean discharge; instantaneous discharge is not available.

[2]Alkalinity is defined as the equivalent sum of the bases in the solution that are titratable with strong acid to a pH of 4.5. A negative alkalinity indicates that the solution contained mineral acidity or the solution contains an acid stronger than dissolved carbon dioxide.

Table 3.--Analytical results for suspended-sediment samples

[mg/L, milligrams per liter; %, percent by weight; µg/g, micrograms per gram; <, less than]

Site number (fig. 1)	Date	Suspended sediment (mg/L)	Aluminum (%)	Antimony (µg/g)	Arsenic (µg/g)	Cadmium (µg/g)	Chromium (µg/g)	Cobalt (µg/g)	Copper (µg/g)	Iron (%)	Lead (µg/g)	Manganese (µg/g)	Mercury (µg/g)	Nickel (µg/g)	Selenium (µg/g)	Silver (µg/g)	Titanium (%)	Zinc (µg/g)
1	06/13/94	15	6.7	0.8	6.4	0.8	184	16	39	3.2	148	1,600	0.10	123	0.6	<1	0.31	210
7	06/13/94	15	6.9	.8	7.4	3.4	101	14	31	3.4	86	1,700	.10	57	.5	<1	.33	520
9	06/14/94	18	6.9	1.0	7.6	3.8	86	12	37	3.3	144	1,500	.06	79	.6	<1	.32	600
11	06/14/94	15	6.5	1.0	7.6	3.6	71	11	36	3.2	108	1,500	.06	42	.6	<1	.31	640
12	06/14/94	16	6.4	1.2	8.8	3.2	122	12	44	3.2	110	1,300	.06	71	.6	<1	.31	620
14	06/14/94	16	6.4	1.0	7.2	9.4	99	13	37	3.3	138	1,500	.04	75	.5	<1	.33	660
15	06/14/94	45	7.0	1.0	7.6	3.0	68	12	30	3.3	169	1,400	.04	32	.4	<1	.37	720
19	06/15/94	48	5.1	.6	7.8	1.0	50	12	27	3.1	60	2,600	.02	33	.5	<1	.30	260
22	06/16/94	28	5.0	.8	6.2	.6	80	12	31	3.4	89	2,000	.02	53	.4	<1	.33	220
23	06/15/94	43	4.8	.8	6.4	.6	76	12	33	3.2	72	2,000	.06	37	.5	<1	.31	240
26	06/16/94	52	6.0	1.0	5.8	2.6	104	18	55	3.3	79	2,500	.04	69	.7	<1	.30	440
29	06/16/94	41	6.3	.8	5.8	1.4	97	20	66	3.5	76	2,100	.10	62	.7	<1	.32	290

Table 4.--Analytical results for bed-material samples

[mg/kg, milligrams per kilogram; %, percent by weight; <, less than]

Site number (fig. 1)	Date	Nitrogen, NO_2 + NO_3 (mg/kg as N)	Nitrogen, ammonia (mg/kg as N)	Nitrogen, ammonia + organic (mg/kg as N)	Phos-phorus (mg/kg)	Alu-minum (%)	Anti-mony (mg/kg)	Arsenic (mg/kg)	Cad-mium (mg/kg)	Chro-mium (mg/kg)	Cobalt (mg/kg)
1	09/13/94	<2	23	1,200	520	8.3	0.4	5.6	<0.1	17	12
2	09/13/94	<2	6.8	590	560	7.6	.6	6.0	<.1	9	5
3	09/13/94	<2	8.3	770	510	8.3	.8	10.9	.2	6	5
4	09/13/94	<2	2.9	820	720	9.0	.5	10.3	<.1	8	8
5	09/13/94	<2	21	2,200	860	7.9	9.1	107	29.5	7	8
6	09/13/94	<2	20	2,600	1,000	7.2	13.6	129	30.3	7	9
7	09/14/94	<2	8.2	430	750	8.6	.5	6.7	1.4	9	10
8	09/14/94	<2	2.3	170	650	8.6	.4	4.2	<.1	7	5
9	09/14/94	<2	2.3	120	600	8.7	.7	8.1	1.4	17	11
10	09/14/94	35	4.9	1,100	1,100	9.0	1.0	9.4	.2	21	12
11	09/14/94	33	9.5	920	650	9.3	.8	8.9	2.1	13	10
12	09/13/94	<2	2.0	420	850	7.8	1.2	13	3.3	12	9
13	09/13/94	5	6.2	1,100	540	7.4	.3	2.8	<.1	10	10
14	09/13/94	<2	9.1	1,200	730	8.1	2.2	9.3	2.3	19	9
15	09/13/94	2	14	650	650	8.2	.5	4.8	.7	9	7
17	09/12/94	2	7.2	450	280	7.2	1.6	13.2	<.1	17	14
18	09/12/94	3	51	3,600	1,200	7.8	.7	10.2	.2	20	15
19	09/12/94	<2	20	1,600	880	7.9	.6	6.5	.2	17	9
21	09/12/94	<2	4.4	470	730	9.2	.5	3.3	<.1	28	13
22	09/12/94	<2	2.6	880	490	7.3	.6	5.2	<.1	23	11

Table 4.--Analytical results for bed-material samples--Continued

Site number (fig. 1)	Date	Nitrogen, NO_2 + NO_3 (mg/kg as N)	Nitrogen, ammonia (mg/kg as N)	Nitrogen, ammonia + organic (mg/kg as N)	Phos-phorus (mg/kg)	Alu-minum (%)	Anti-mony (mg/kg)	Arsenic (mg/kg)	Cad-mium (mg/kg)	Chro-mium (mg/kg)	Cobalt (mg/kg)
23	09/11/94	<2	6.0	340	380	7.8	0.5	3.9	0.2	28	10
25	09/11/94	<2	5.0	250	590	7.3	.9	5.5	1.6	48	17
26	09/12/94	<2	4.0	500	610	7.3	.5	4.0	.4	41	12
27	09/12/94	3	12	1,200	440	5.8	.2	1.6	<.1	35	7
28	09/11/94	<2	11	480	340	5.5	.4	2.6	<.1	30	6
29	09/11/94	<2	3.2	520	800	7.7	.6	6.7	1.7	45	17
30	09/15/94	<2	3.4	1,000	500	6.9	.6	7.2	.3	40	10
31	09/26/94	<2	4.6	980	290	5.7	.4	2.8	<.1	21	5
32	09/26/94	<2	3.2	320	390	4.7	.5	3.8	<.1	30	7
33	09/16/94	<2	3.1	140	40	4.2	.3	2.4	<.1	15	4
34	09/16/94	2	1.0	200	320	4.4	.5	4.5	<.1	22	5

Table 4.--Analytical results for bed-material samples--Continued

Site number (fig. 1)	Date	Copper (mg/kg)	Iron (%)	Lead (mg/kg)	Man-ganese (%)	Mercury (mg/kg)	Nickel (mg/kg)	Silver (mg/kg)	Titanium (%)	Zinc (mg/kg)
1	09/13/94	15	4.3	12	0.11	0.01	6	<0.5	0.52	98
2	09/13/94	7	2.3	27	.08	<.01	6	<.5	.30	106
3	09/13/94	8	2.1	19	.10	.03	2	<.5	.29	118
4	09/13/94	12	2.6	21	.08	<.01	6	<.5	.33	64
5	09/13/94	102	2.3	1,970	.19	.07	2	5.3	.27	4,470
6	09/13/94	96	2.7	3,060	.22	.11	4	11.3	.27	7,107
7	09/14/94	14	2.9	58	.09	<.01	3	<.5	.37	265
8	09/14/94	8	2.1	45	.09	<.01	3	<.5	.27	70
9	09/14/94	15	4.3	67	.09	.01	7	<.5	.54	328
10	09/14/94	16	4.3	48	.10	<.01	7	<.5	.48	105
11	09/14/94	15	3.3	90	.08	.01	4	<.5	.41	389
12	09/13/94	15	3.1	130	.11	<.01	4	<.5	.37	592
13	09/13/94	16	3.3	14	.13	.01	4	<.5	.39	93
14	09/13/94	19	3.7	341	.08	<.01	13	1.1	.46	436
15	09/13/94	10	2.4	74	.10	<.01	2	<.5	.31	220
17	09/12/94	369	5.8	31	.06	.07	8	<.5	.50	142
18	09/12/94	72	4.4	30	.15	.06	21	<.5	.40	120
19	09/12/94	19	3.0	30	.28	.01	13	<.5	.37	118
21	09/12/94	23	4.4	10	.10	<.01	18	<.5	.57	92
22	09/12/94	14	3.7	16	.09	<.01	9	<.5	.43	89

Table 4.--Analytical results for bed-material samples--Concluded

Site number (fig. 1)	Date	Copper (mg/kg)	Iron (%)	Lead (mg/kg)	Man-ganese (%)	Mercury (mg/kg)	Nickel (mg/kg)	Silver (mg/kg)	Titanium (%)	Zinc (mg/kg)
23	09/11/94	19	3.1	24	0.12	0.02	18	<0.5	0.41	103
25	09/11/94	104	3.0	72	.13	.01	59	<.5	.26	489
26	09/12/94	45	2.8	38	.09	.01	35	<.5	.29	145
27	09/12/94	29	2.4	26	.07	<.01	14	<.5	.20	71
28	09/11/94	16	2.0	14	.06	<.01	19	<.5	.25	54
29	09/11/94	69	3.5	44	.22	.03	45	<.5	.36	316
30	09/15/94	32	2.9	20	.08	<.01	32	<.5	.34	101
31	09/26/94	13	1.6	14	.04	<.01	17	<.5	.24	35
32	09/26/94	12	2.2	11	.05	<.01	11	<.5	.38	45
33	09/16/94	9	1.6	10	.03	<.01	14	<.5	.18	32
34	09/16/94	15	1.6	13	.04	<.01	18	<.5	.25	37

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