HYDROLOGIC DATA FOR THE SAN JUAN AND ANIMAS RIVER VALLEYS IN THE FARMINGTON, AZTEC, BLOOMFIELD, AND CEDAR HILL AREAS, SAN JUAN COUNTY, NEW MEXICO

By Douglas P. McAda and Shareen G. Shelton

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CONTENTS

FIGURES

TABLES

CONVERSION FACTORS

Except for chemical concentrations and temperature, figures for measurement in this report are given in inch-pound units. The following table contains factors for converting to metric units.

Multiply inch-pound units	By	To obtain metric units
foot	0.3048	meter
mile	1.609	kilometer

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

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ABSTRACT

In July 1985, the U.S. Geological Survey initiated a 3-year study in San Juan County, New Mexico, to determine the concentrations of chemical constituents in the ground water in the San Juan and Animas River valleys and to determine the direction and rate of ground-water flow and its relation to river stage. The study was conducted in cooperation with the San Juan County Commission and the New Mexico Oil Conservation Division. This report is a compilation of the data that was collected during the first 1½ years of the study. The report includes well records for 51 wells and water levels from 23 wells, hydrographs from 4 observation wells and 1 river-stage site, and available chemical analyses from 50 wells and 14 surface-water sites.

INTRODUCTION

There are numerous domestic wells in the valleys along the San Juan and Animas Rivers upstream from Farmington, New Mexico. The potential for contamination of ground water exists because of possible seepage from irrigation water, septic tanks, and oil-disposal pits.

In July 1985, the U.S. Geological Survey initiated a 3-year study in San Juan County, New Mexico, to determine the concentrations of chemical constituents in the ground water along the San Juan and Animas River valleys and to determine the direction and rate of ground-water flow and its relation to river stage. The study was conducted in cooperation with the San Juan County Commission and the New Mexico Oil Conservation Division. The purpose of this report is to disseminate data that were collected during the first 1½ years of the study.

The study areas include the San Juan River valley from Farmington to Bloomfield, the Animas River valley from Farmington to Aztec, and the Animas River valley near Cedar Hill (fig. 1).

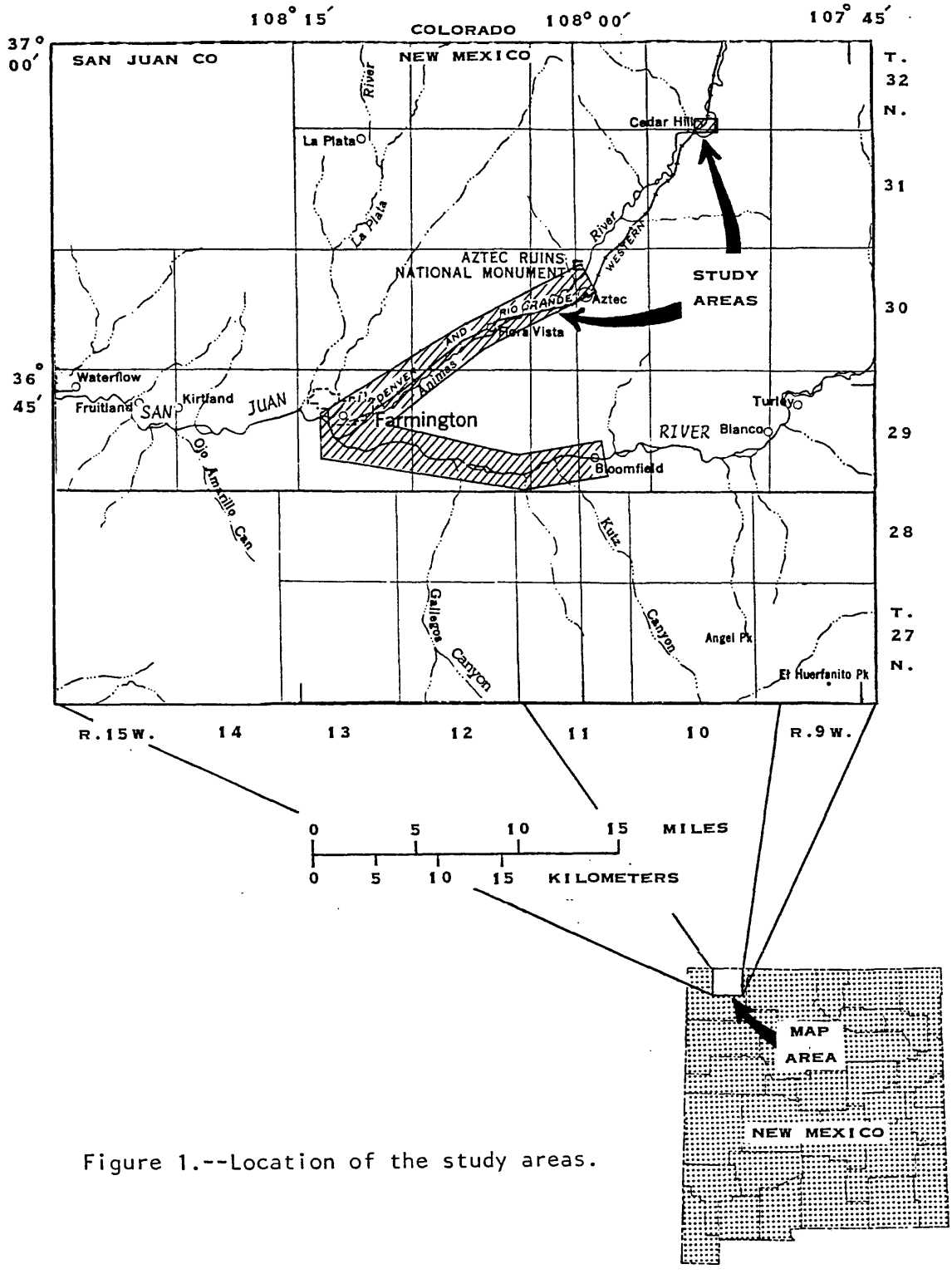

Figure 1.--Location of the study areas.

WELL-NUMBERING SYSTEM

The system of numbering wells in this report is based on the common subdivision of land into townships, ranges, and sections in the Federal land-survey system. The well numbers consist of four parts separated by periods (fig. 2). The first part is the township number, the second part is the range number, and the third part is the section number. The letters N (north) or S (south) in the township number indicate the direction from the New Mexico base line, and the letters E (east) or W (west) in the range number indicate the direction from the New Mexico principal meridian. Hence, the number 30N.12W.23 is assigned to any well located in sec. 23, T. 30 N., R. 12 W.

The fourth part of the well number indicates the tract within the section where the well is located. The method of numbering the tracts within the section is shown in figure 2. For this purpose, the section is divided into four quarters, numbered 1, 2, 3, and 4, in the normal reading order, for the northwest, northeast, southwest, and southeast quarters, respectively. The first digit of the fourth part gives the quarter section, which is a tract of 160 acres. Each quarter is subdivided in the same manner so that the first and second digits together define the 40-acre tract and the third digit defines the 10-acre tract. Additional digits can be used in the same manner to further divide the tracts. For example, well 30N.12W.23.142 is in the NE¼ of the SE¼ of the NW¼ of sec. 23, T. 30 N., R. 12 W. (fig. 2).

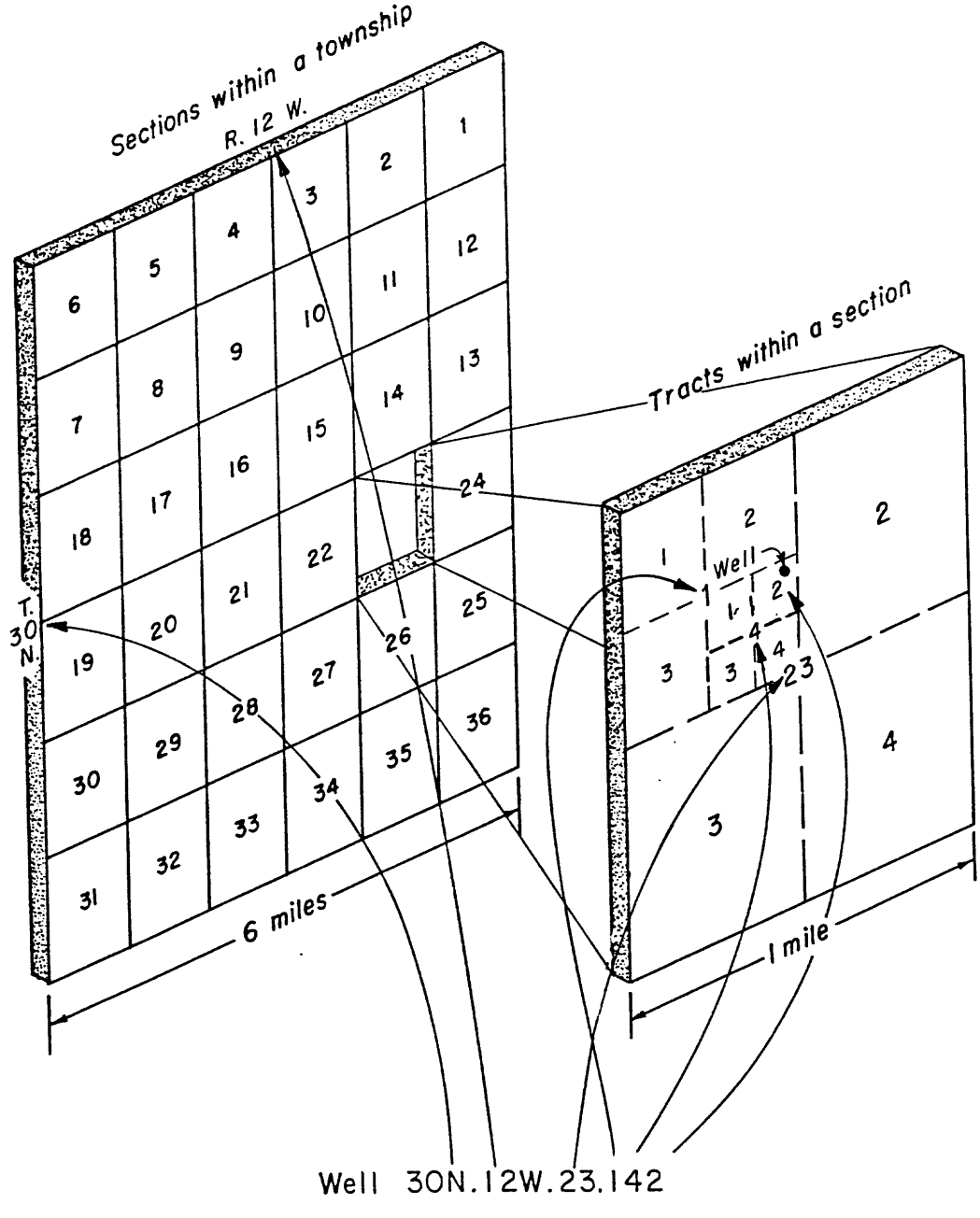

Figure 2.--Well-numbering system.

PRESENTATION OF THE DATA

Seven observation wells and one stream-stage gage were installed along the San Juan River near Hammond Bridge for this study. The location of these wells and the stream-stage gage is shown in figure 3. Four of the observation wells (PN-1, PS-1, PS-2, and PS-3) and the stream-stage gage were fitted with water-level recorders. Water levels measured in the observation wells and the depths of each well are shown in table 1. Hydrographs from the four recorder wells and the stream-stage gage are shown in figure 4. Water levels at 15-minute intervals from these recorder stations are available from the U.S. Geological Survey's National Water-Data Storage and Retrieval System (WATSTORE).

Records of wells inventoried during the study are listed in table 2. Chloride concentration and specific conductance of water from the privately owned wells in the Farmington-Aztec-Bloomfield area and the well locations are shown in figure 5.

Records of surface-water sites where samples were collected are listed in table 3. Chloride concentration and specific conductance of water from those sites in the Farmington-Aztec-Bloomfield area and the site locations are shown in figure 6.

Water samples from six wells and one surface-water site were analyzed for the purgeable organic compounds listed in table 4. The wells sampled are noted in table 2 by an asterisk next to the location number. The surface-water site was Cedar Ditch at Cedar Hill and is noted by an asterisk in table 3. The detection limit in the chemical analysis for these compounds is 3.0 micrograms per liter. None of the compounds listed in table 4 were detected in any of the water samples.

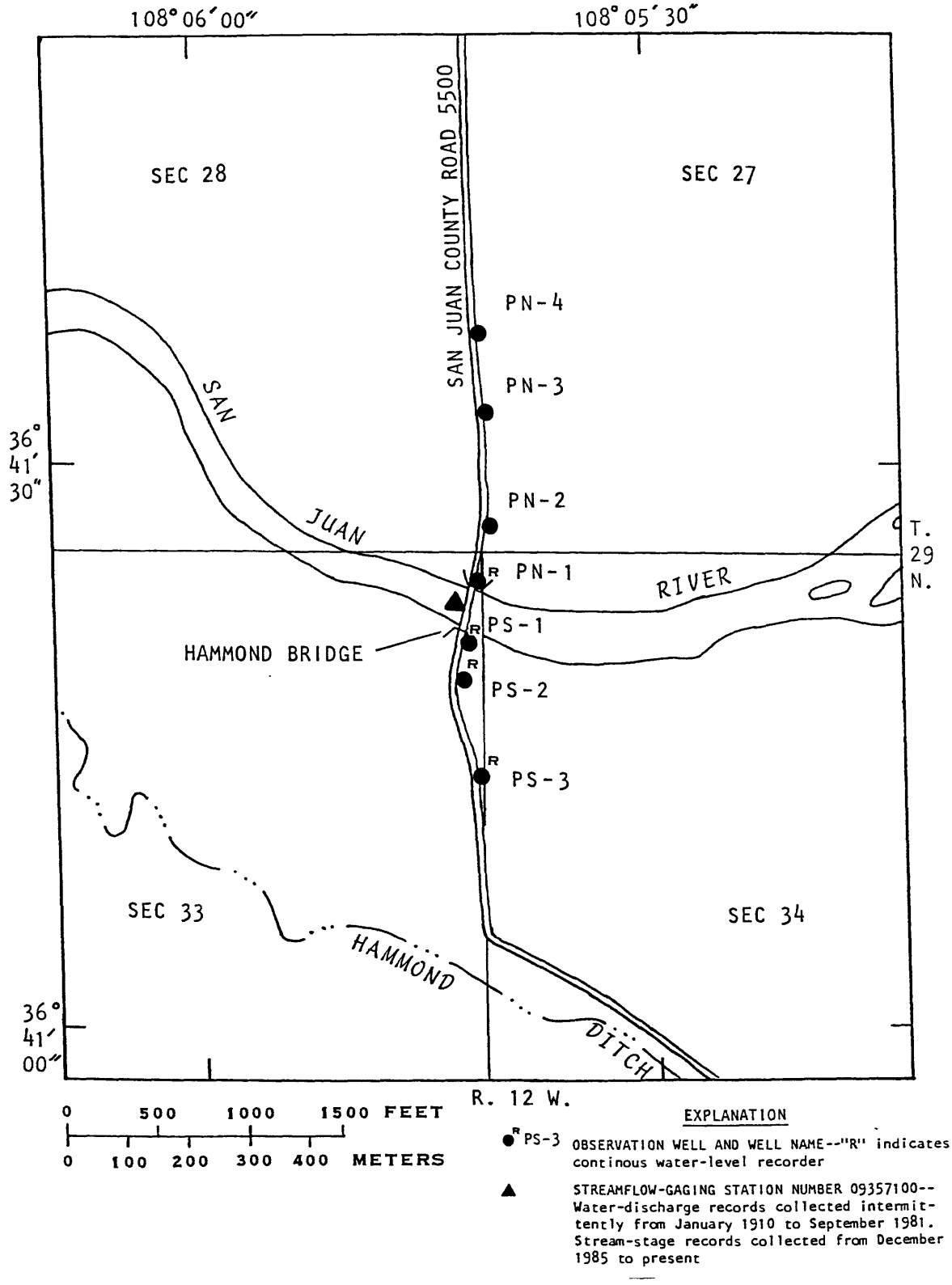

Figure 3.--Location of observation wells and San Juan River stage gage at Hammond Bridge.

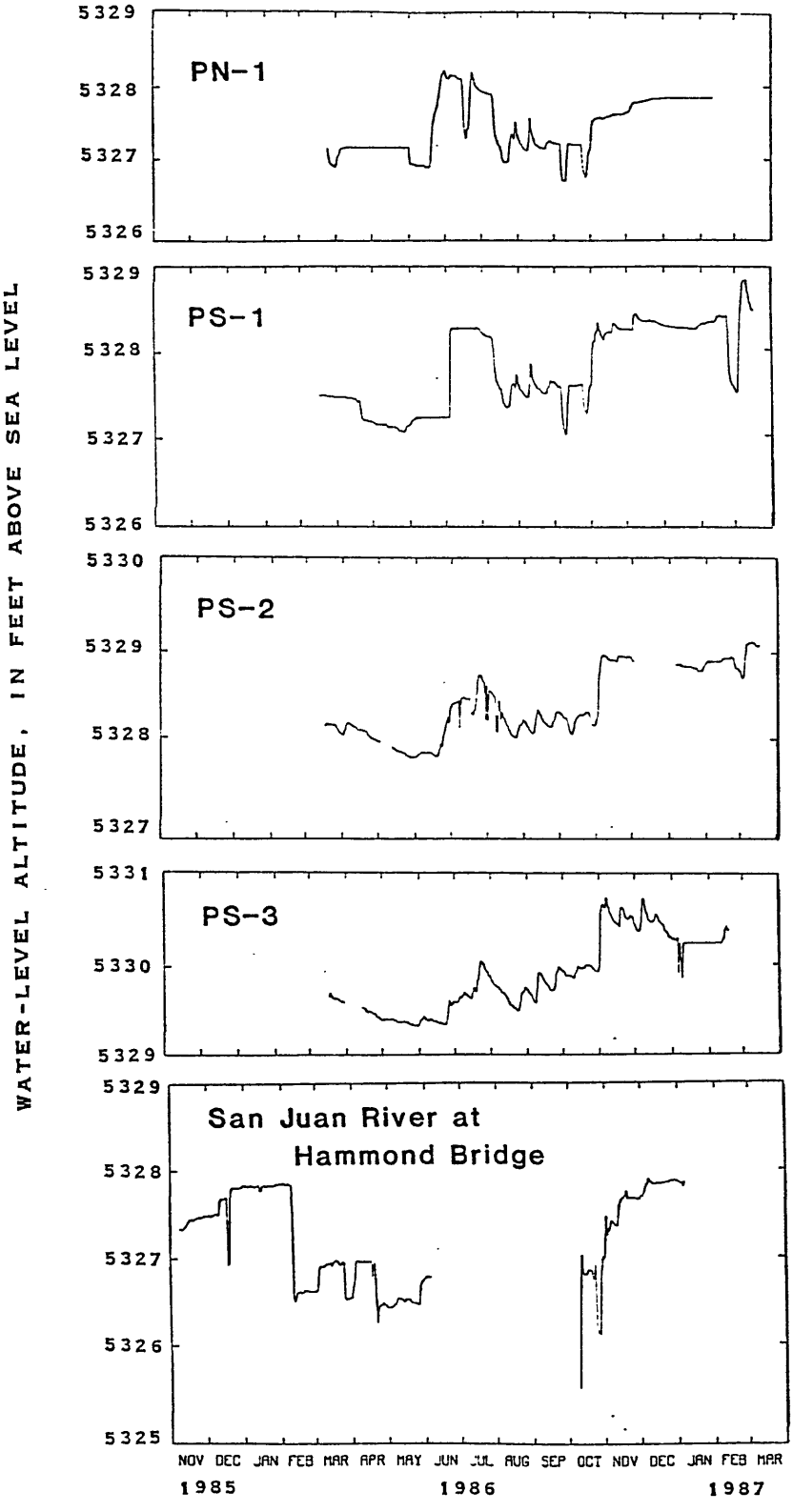

Figure 4.--Water levels in observation wells PN-1, PS-1, PS-2, and PS-3 and river stage at Hammond Bridge.

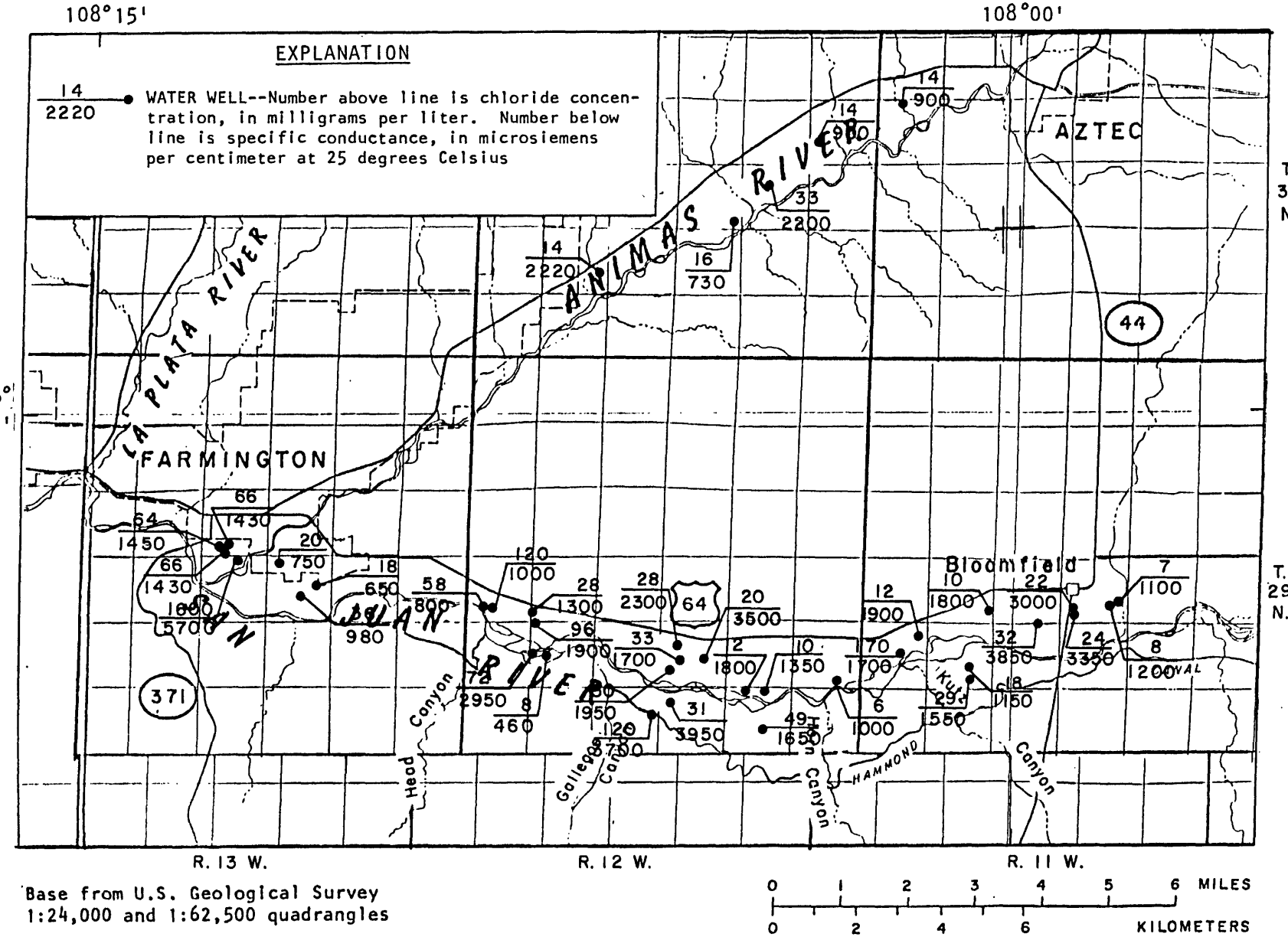

Figure 5.--Chloride concentration and specific conductance of ground water from selected wells.

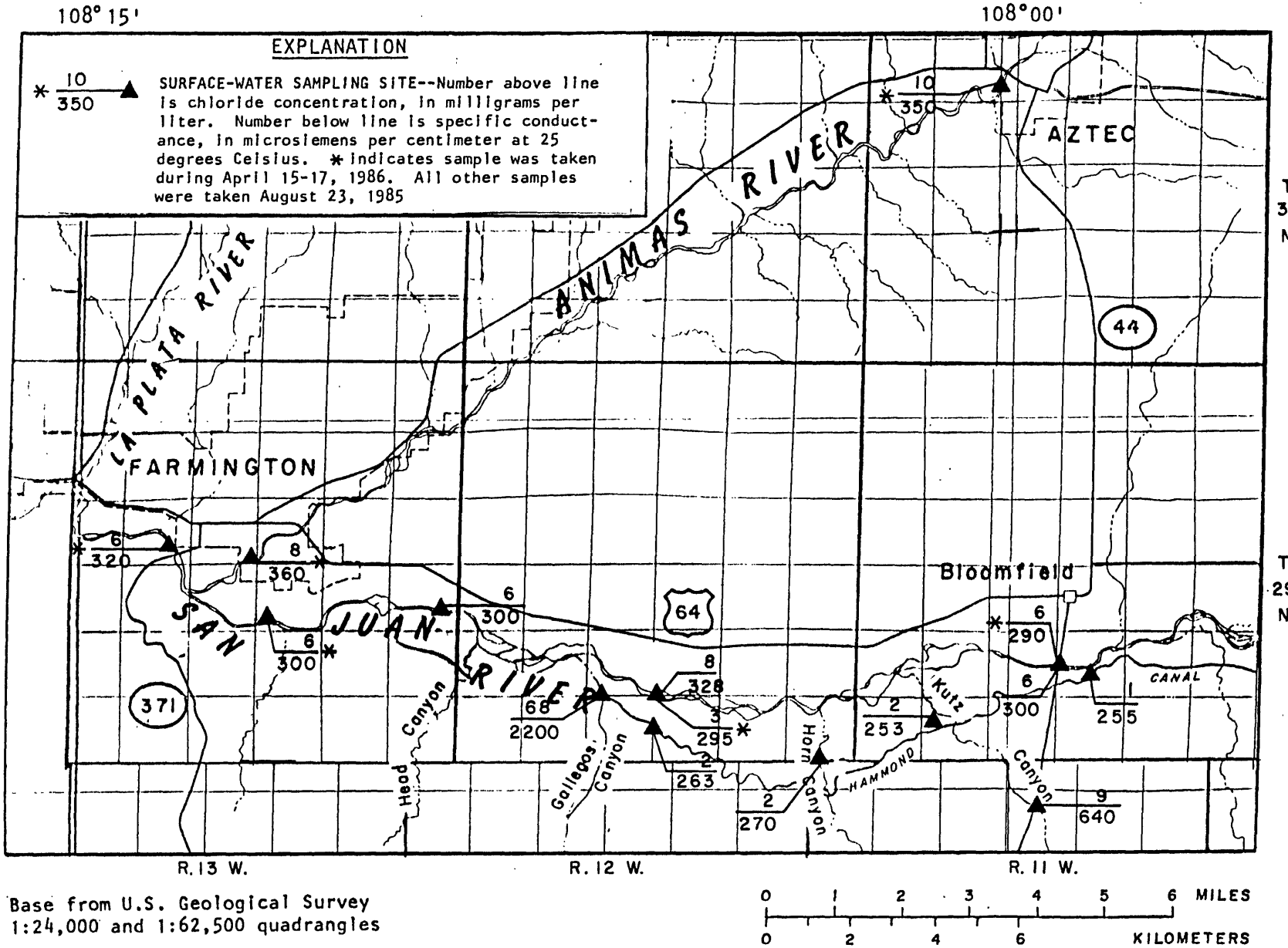

Figure 6.--Chloride concentration and specific conductance of surface water at selected sites.

Table 1. Water levels measured in observation wells near Hammond Bridge

EXPLANATION

Location number: See text and figure 2 for explanation of numbering system.
Depth of well: Depth of the well, in feet below land surface.
Date: Date of the water-level measurement.
Water level: Depth to water, in feet below land surface.

Well name	Location number	Depth of well (feet)	Date	Water level (feet)
PN-4	29N.12W.27.331113	16	01-24-86	8.34
			02-28-86	8.44
			03-13-86	7.45
			03-20-86	8.44
			04-14-86	8.41
			06-02-86	9.18
			07-30-86	10.47
			08-19-86	10.92
			10-07-86	9.77
			12-03-86	8.12
			01-06-87	8.09
			02-11-87	8.13
PN-3	29N.12W.27.331333	16	01-24-86	8.33
			02-28-86	7.22
			03-13-86	7.30
			03-20-86	7.26
			04-14-86	7.25
			06-02-86	8.19
			07-30-86	8.76
			08-19-86	9.33
			10-07-86	8.48
			12-03-86	7.16
			01-06-87	7.12
			02-11-87	7.06
			03-16-87	6.91
PN-2	29N.12W.27.333331	8	01-22-86	2.48
			02-28-86	2.74
			03-13-86	2.63
			03-20-86	2.57
			04-14-86	2.62
			06-02-86	2.84
			07-30-86	2.32
			08-18-86	2.79
			10-07-86	2.74
			12-03-86	2.25

Table 1. Water levels measured in observation wells near Hammond Bridge - Continued

Well name	Location number	Depth of well (feet)	Date	Water level (feet)
PN-2	29N.12W.27.333331	8	01-06-87	2.12
			02-11-87	2.02
			03-16-87	2.02
PN-1	29N.12W.33.222224	10	01-24-86	4.88
			02-28-86	5.40
			03-13-86	5.18
			03-20-86	5.16
			04-14-86	5.16
			06-02-86	5.32
			07-30-86	4.35
			10-07-86	5.45
			12-04-86	2.64
			01-06-87	4.52
			02-11-87	4.34
			03-16-87	4.36
PS-1	29N.12W.33.222424	10	01-24-86	3.87
			02-28-86	4.68
			03-13-86	4.54
			03-20-86	4.53
			04-14-86	4.56
			06-02-86	4.84
			07-30-86	3.79
			10-07-86	4.75
			12-04-86	3.80
			01-06-87	3.76
			02-11-87	3.71
			03-16-87	3.56
PS-2	29N.12W.33.222443	10	01-24-86	3.09
			02-27-86	3.51
			02-28-86	3.52
			03-13-86	3.55
			03-20-86	3.53
			04-14-86	3.60
			06-02-86	3.88
			07-30-86	3.05
			12-04-86	2.81
			01-06-87	2.82
			02-11-87	2.75
			03-16-87	2.45

Table 1. Water levels measured in observation wells near Hammond Bridge - Concluded

Well name	Location number	Depth of well (feet)	Date	Water level (feet)
PS-3	29N.12W.33.224442	8	01-24-86	1.73
			02-27-86	1.97
			02-28-86	1.97
			03-13-86	2.09
			03-20-86	2.11
			04-14-86	2.23
			06-02-86	2.36
			07-30-86	1.79
			10-07-86	1.86
			12-04-86	1.36
			01-06-87	1.41
			02-11-87	1.44
			03-16-87	.89

Table 2. Records of wells inventoried

[Location number: See text and figure 2 for explanation of numbering system; * - indicates sample was analyzed for the purgeable organic compounds listed in table 4. Depth of well: Depth of the well, in feet below land surface; reported depths indicated by R; all others were measured. Water level: Depth to water, in feet below land surface; reported water levels indicated by R; all others were measured. Specific conductance: Specific conductance of the well water, in microsiemens per centimeter at 25 degrees Celsius. Chloride: Dissolved-chloride concentration of the well water, in milligrams per liter]

Location number	Well owner	Depth of well (feet)	Date water level measured	Water level (feet)	Date sampled	Temperature (degrees Celsius)	Specific conductance	pH (units)	Chloride
29N.11W.20.4422	Tony Perez	36 R	—	—	04-16-86	—	1,800	7.4	10
29N.11W.21.4343	—	38	04-16-86	2.32	04-16-86	—	3,850	6.8	32
29N.11W.22.33221	Myron Jacquez	20 R	—	—	04-16-86	—	3,000	7.8	22
29N.11W.22.332232	Sam Hinson	27 R	—	—	04-16-86	—	3,350	7.4	24
					04-19-86	—	3,360	7.4	22
29N.11W.22.42334	Christobol Carrillo	20 R	—	—	04-16-86	—	1,200	8.1	8.0
29N.11W.22.42343	Paul J. Bright	21 R	04-16-86	6 R	04-16-86	—	1,100	7.7	7.0
29N.11W.29.41324 *	Dan Woodward	—	—	—	04-16-86	—	1,150	7.5	18
29N.11W.29.43122 *	E.H. Woodward	—	—	—	04-16-86	—	1,550	7.7	29
29N.11W.30.2243	Terry Olson	12	—	—	04-17-86	—	1,900	7.5	12
29N.11W.30.23332	Duke Smith	25 R	—	—	04-17-86	—	1,700	7.6	170
29N.12W.19.341	Vaughn Varbel	30 R	—	—	04-15-86	—	1,000	7.8	120
29N.12W.19.342	—	—	—	—	04-15-86	—	800	8.0	58
29N.12W.20.33331	J.R. Hammond	46 R	—	—	04-15-86	—	1,300	7.4	28
29N.12W.20.33333	J.R. Hammond	28 R	05-29-77	10 R	04-15-86	—	1,900	7.5	96
29N.12W.25.4331	—	90 R	—	—	04-17-86	—	1,000	7.5	6.0

Table 2. Records of wells inventoried - Continued

Location number	Well owner	Depth of well (feet)	Date water level measured	Water level (feet)	Date sampled	Temperature	Specific conductance	pH (units)	Chloride
29N.12W.27.1344	Richard Torres	35 R	06-05-78	17 R	04-15-86	—	2,300	7.5	28
29N.12W.27.31312	Jerald Brewer	32 R	03-19-79	15 R	04-15-86	—	1,950	7.8	30
29N.12W.27.314143	Kenneth Piersall	—	—	—	04-15-86	—	1,700	7.8	33
29N.12W.27.331113	U.S. Geological Survey	16	01-24-86	8.34	02-27-86	—	2,600	8.0	90
29N.12W.27.331333	U.S. Geological Survey	16	01-24-86	8.33	02-27-86	—	3,300	7.4	70
29N.12W.27.333331	U.S. Geological Survey	8	01-22-86	2.48	02-27-86	—	1,200	7.9	20
29N.12W.27.4113	Phil Offerle	90 R	—	—	04-17-86	—	3,500	7.2	20
29N.12W.29.11334	Jim Price	18	—	—	04-15-86	—	2,950	7.7	72
29N.12W.29.132424	Lee Clapp	21 R	—	—	04-15-86	—	460	8.0	8.0
29N.12W.33.222224	U.S. Geological Survey	10	01-24-86	4.88	—	—	—	—	—
29N.12W.33.222424	U.S. Geological Survey	10	01-24-86	3.90	02-26-86	—	4,700	7.6	38
29N.12W.33.222443	U.S. Geological Survey	10	01-24-86	3.09	02-26-86	—	4,300	8.0	34
29N.12W.33.224442	U.S. Geological Survey	8	01-24-86	1.73	02-27-86	—	5,900	7.5	720
29N.12W.33.24221	Loyd Medina	—	09-11-85	5.44	04-14-86	—	3,700	7.3	120
29N.12W.34.11334	Joe Merriman	10 R	—	—	09-12-85	—	3,950	7.2	31
29N.12W.35.12114	Ralph Wilson	30 R	—	—	04-17-86	—	1,800	7.5	12
29N.12W.35.21114	Roberta Archer	38 R	—	—	04-17-86	—	1,350	7.6	10
29N.12W.35.413132	Lee Fernandez	11	04-16-86	6.26	04-16-86	—	1,650	7.6	49
29N.13W.16.34243	J.A. Drake	44 R	09-27-77	35 R	04-15-86	—	1,430	7.5	66
29N.13W.16.34412	Guy Bell, Jr.	—	—	—	04-15-86	—	1,450	7.5	64

Table 2. Records of wells inventoried - Concluded

Location number	Well owner	Depth of well (feet)	Date water level measured	Water level (feet)	Date sampled	Temperature	Specific conductance	pH (units)	Chloride
29N.13W.16.344421	Dick Moyer	45 R	—	—	04-15-86	—	1,430	7.5	66
29N.13W.21.211144	—	40 R	—	—	04-15-86	—	5,700	7.8	1,600
29N.13W.22.121344	Feliberto Graham	43 R	08-31-78	21 R	04-16-86	—	750	7.7	20
29N.13W.22.24333	Bill Garrison	32 R	07-10-84	14 R	04-14-86	—	650	7.6	18
29N.13W.22.31133	Felix Valdez	32 R	—	—	04-14-86	—	980	7.5	36
30N.11W.18.12242	Joseph Marr	45 R	—	—	04-17-86	—	900	7.6	14
30N.12W.13.31441	Richard Ervine	62 R	—	—	04-17-86	—	900	7.3	14
30N.12W.22.4441	D.E. Hawkins	37 R	—	—	04-17-86	—	730	8.0	16
30N.12W.23.142	Jack Haley	—	—	—	04-17-86	—	2,200	7.3	33
30N.12W.29.424	Nannie McCarty	—	—	--	04-17-86	—	2,220	7.3	14
32N.10W.33.41431	Robert Gillingham	45 R	04-18-86	36.89	04-18-86	—	800	—	—
			08-19-86	20.81	08-20-86	—	560	7.1	—
32N.10W.33.423	William Townsend	70 R	04-18-86	31.82	04-18-86	—	600	—	—
			08-19-86	20.81					
32N.10W.33.4243 *	William Townsend	30	04-18-86	28.16	08-20-86	—	500	6.6	—
32N.10W.33.44111 *	Neal Brixner	31 R	04-18-86	29.97	08-20-86	16.0	780	7.1	—
			08-19-86	16.76					
32N.10W.33.44112 *	C. C. Hunter	32 R	08-19-86	16.93	08-20-86	16.5	530	7.3	—
32N.10W.33.4421 *	William Townsend	30	04-18-86	27.21	08-20-86	17.0	510	6.6	—
			08-19-86	14.50					

Table 3. Records of surface-water sites sampled

[Station name and location: See text and figure 2 for explanation of numbering system. Station number: Unique 8- or 15-digit number identifying station in WATSTORE. Date: Date sample was taken. Specific conductance: Specific conductance of the water, in microsiemens per centimeter at 25 degrees Celsius. Chloride: Dissolved-chloride concentration, in milligrams per liter]

Station name and location	Station number	Date	Temperature (degrees Celsius)	Specific conductance	pH (units)	Chloride
San Juan River at Bloomfield	09357000	08-23-85	17.0	300	8.0	6.0
29N.11W.27.131		04-16-86	8.5	290	7.8	6.0
San Juan River at Hammond Bridge near Bloomfield	09357100	08-23-85	15.5	328	8.0	8.0
29N.12W.33.222		02-28-86	—	330	8.4	6.0
		04-16-86	8.0	295	7.7	3.0
San Juan River at Bolack Bridge near Farmington	364229108090310	08-23-85	15.0	300	—	6.0
29N.13W.24.441						
San Juan River at pumping station near Farmington	364226108115210	04-15-86	7.5	300	7.7	6.0
29N.13W.22.332						
San Juan River at Farmington	09365000	04-15-86	8.0	320	7.7	6.0
29N.13W.17.414						
Animas River at Highway 550 at Aztec	364930108001210	04-17-86	9.0	350	7.6	10
30N.11W.09.311						
Animas River at Farmington	09364500	04-15-86	8.5	360	7.9	8.0
29N.13W.15.331						

Table 3. Records of surface-water sites sampled - Concluded

Station name and location	Station number	Date	Temperature (degrees Celsius)	Specific conductance	pH (units)	Chloride
Hammond Ditch below refinery near Bloomfield 29N.11W.27.322	364148107584410	08-23-85	16.0	225	—	1.0
Hammond Ditch west of Kutz Canyon near Bloomfield 29N.11W.32.133	364059108011810	08-23-85	17.0	253	—	2.0
Hammond Ditch south of Hammond Bridge near Farmington 29N.12W.34.133	364103108054110	08-23-85	17.0	263	—	2.0
Kutz Canyon at State Highway 44 near Bloomfield 28N.11W.15.122	364005107593010	08-23-85	—	640	8.0	9.0
Horn Canyon Wash at County Road 5500 near Bloomfield 29N.12W.36.344	364033108030310	08-23-85	19.0	270	—	2.0
Gallegos Canyon Wash near Farmington 29N.12W.28.334	364128108063510	08-23-85	27.0	2,200	8.3	68
Cedar Ditch at Cedar Hill * 32N.10W.33.414	365618107525601	08-20-86	17.0	440	8.0	—

* Sample was analyzed for the purgeable organic compounds listed in table 4.

Table 4. Purgeable organic compounds for which samples were analyzed

Chloromethane
Bromomethane
Vinyl chloride
Chloroethane
Methylene chloride
1,1-dichloroethane
1,1-dichloroethene
Trans-1,2-dichloroethene
Chloroform
1,2-dichloroethane
1,1,1-trichloroethane
Carbon tetrachloride
Bromodichloromethane
1,2-dichloropropane
Trans-1,3-dichloropropene
Trichloroethene
Dibromochloromethane
Benzene
1,1,2-trichloroethane
Cis-1,3-dichloropropene
2-chloroethylvinyl ether
Bromoform
1,1,2,2-tetrachloroethane
Tetrachloroethene
Toluene
Chlorobenzene
Ethylbenzene
Dichlorodifluoromethane
1,3-dichloropropane
Trichlorofluoromethane
1,2-dichlorobenzene
1,4-dichlorobenzene
1,3-dichlorobenzene