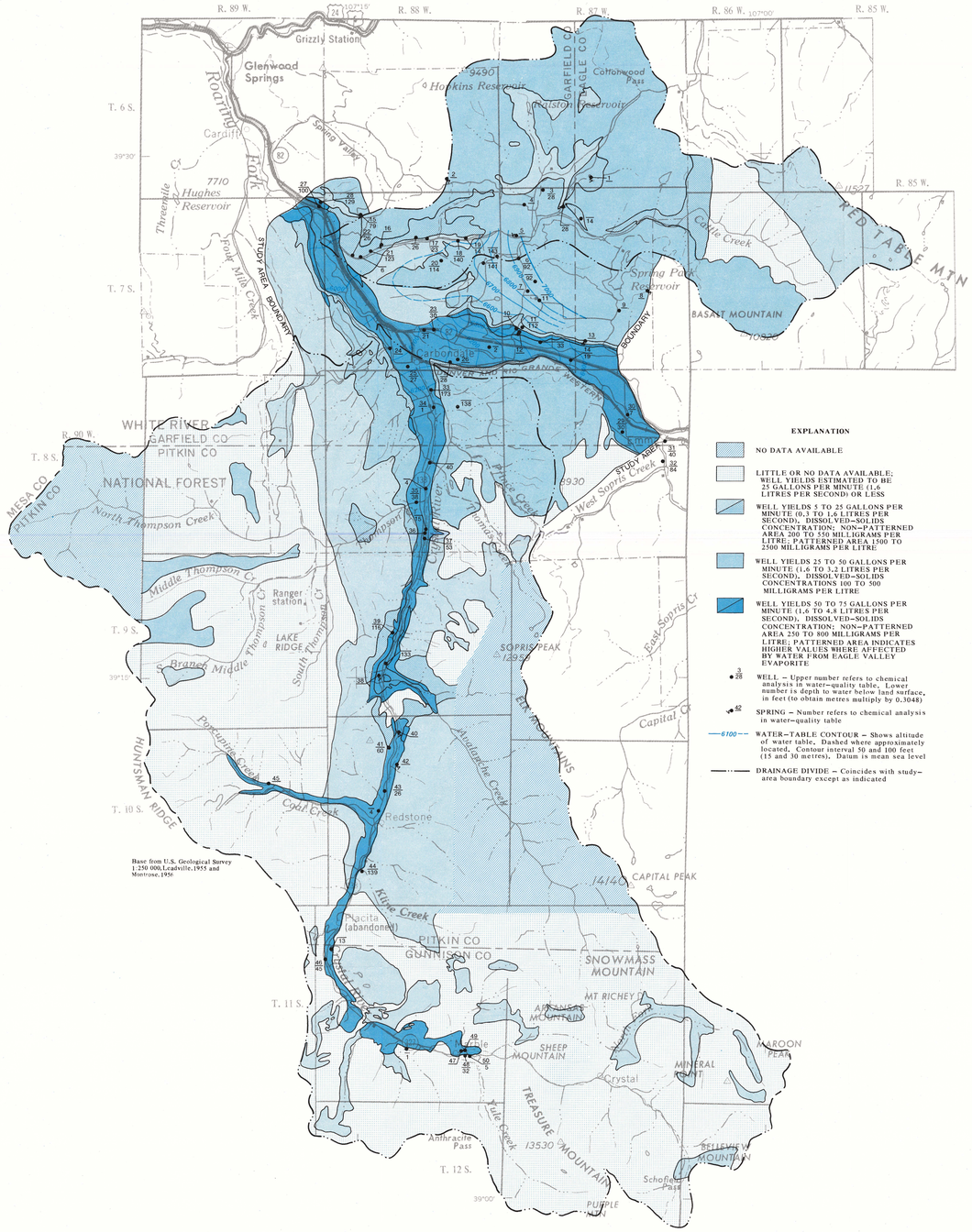
Prepared in cooperation with the
COLORADO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RESOURCES



EXPLANATION

NO DATA AVAILABLE

LITTLE OR NO DATA AVAILABLE; WELL YIELDS ESTIMATED TO BE 25 GALLONS PER MINUTE (1.6 LITRES PER SECOND) OR LESS

WELL YIELDS 5 TO 25 GALLONS PER MINUTE (0.3 TO 1.6 LITRES PER SECOND), DISSOLVED-SOLIDS CONCENTRATION: NON-PATTERNED AREA 200 TO 350 MILLIGRAMS PER LITRE; PATTERNED AREA 1500 TO 2500 MILLIGRAMS PER LITRE

WELL YIELDS 25 TO 50 GALLONS PER MINUTE (1.6 TO 3.2 LITRES PER SECOND), DISSOLVED-SOLIDS CONCENTRATIONS 100 TO 500 MILLIGRAMS PER LITRE

WELL YIELDS 50 TO 75 GALLONS PER MINUTE (1.6 TO 4.8 LITRES PER SECOND), DISSOLVED-SOLIDS CONCENTRATION: NON-PATTERNED AREA 250 TO 800 MILLIGRAMS PER LITRE; PATTERNED AREA INDICATES HIGHER VALUES WHERE AFFECTED BY WATER FROM EAGLE VALLEY EVAPORITE

28 WELL – Upper number refers to chemical analysis in water-quality table. Lower number is depth to water below land surface, in feet (to obtain metres multiply by 0.3048)

42 SPRING – Number refers to chemical analysis in water-quality table

6100 WATER-TABLE CONTOUR – Shows altitude of water table. Dashed where approximately located. Contour interval 50 and 100 feet (15 and 30 metres). Datum is mean sea level

DRAINAGE DIVIDE – Coincides with study-area boundary except as indicated

HYDROLOGIC MAP

HYDROLOGY AND WATER QUALITY

CHEMICAL CHARACTERISTICS OF GROUND WATER

Chemical characteristics of ground water stored in the aquifers vary considerably depending on the rock type (water-quality table). There are three types of water in the area: calcium bicarbonate, calcium sulfate, and sodium bicarbonate. Ground water in the basalt is of the calcium bicarbonate type, and generally contains less than 500 mg/l (milligrams per litre) dissolved solids.

Ground water in sedimentary-rock aquifers varies from a calcium bicarbonate type to a calcium sulfate type depending on the presence or absence of interbedded evaporites. The Eagle Valley Evaporite, a formation with interbeds of gypsum and anhydrites, yields water of a calcium sulfate type. Concentrations of constituents, including selenium, are often in excess of U.S. Public Health Service (1962) drinking-water standards. Dissolved-solids concentrations in the sampled wells are as high as 2,630 mg/l. Ground water from the Maroon Formation, an arkosic sandstone with interbeds of shale and siltstone, yields water of the calcium bicarbonate type and generally contains less than 550 mg/l dissolved solids. However, in the Carbondale area, the Maroon Formation overlies the Eagle Valley Evaporite. Near the contact of the two formations where mixing of waters is possible, sulfate and other constituents can occur in concentrations in excess of U.S. Public Health Service (1962) drinking-water standards. Sodium bicarbonate type water in the Maroon Formation can occur where water is in contact with beds of highly weathered shale. Water from other bedrock aquifers is of the calcium bicarbonate type.

The chemical characteristics of water in the alluvial aquifer vary from a calcium sulfate type to a calcium bicarbonate type. The water quality in the aquifer is partly determined by the quality of water in the underlying bedrock aquifer and by the chemical composition of the source rock that was eroded to form the alluvial sediment. Water from the alluvial aquifer generally contains less than 600 mg/l dissolved solids, except in areas where the alluvial sediment has been derived from the Eagle Valley Evaporite or where poor-quality ground water is discharged from the evaporite deposit to the alluvial aquifer. In these areas, selenium and other constituents can occur in concentrations in excess of U.S. Public Health Service (1962) drinking-water standards. The variation in chemical characteristics of water in the alluvial aquifer suggests ground-water discharge from bedrock and basalt aquifers to the aquifers in the stream valleys.

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CONVERSION FACTORS

For the use of those readers who may prefer to use metric units rather than English units, the conversion factors for the terms used in this report are listed below:

Multiply English unit	*By*	*To obtain metric unit*
feet (ft)	0.3048	metres (m)
miles (mi)	1.609	kilometres (km)
square miles (mi^2)	2.590	square kilometres (km^2)
feet per day (ft/d)	.3048	metres per day (m/d)
gallons per minute (gal/min)	.06309	litres per second (l/s)

Chemical analyses of water from wells and springs

[ANALYSES BY U.S. GEOLOGICAL SURVEY. UNDERLINED CONCENTRATION IS IN EXCESS OF THAT RECOMMENDED BY U.S. PUBLIC HEALTH SERVICE (1962) STANDARDS FOR DRINKING WATER. MG/L=MILLIGRAMS PER LITRE; UG/L=MICROGRAMS PER LITRE]

LOCATION NO. ON HYDROLOGIC MAP	LOCATION TN. R. SEC.	GEOLOGIC UNIT	DATE OF SAMPLE	DIS-SOLVED SILICA (SIO2) (MG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	DIS-SOLVED SODIUM (NA) (MG/L)	DIS-SOLVED PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)	DIS-SOLVED SULFATE (SO4) (MG/L)	DIS-SOLVED CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	DIS-SOLVED NITRITE PLUS NITRATE (N) (MG/L)	DIS-SOLVED NITRITE PLUS NITRATE (N) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	HARD-NESS (CA,MG) (MG/L)	SODIUM-AD-SORP-TION RATIO	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	DIS-SOLVED ARSENIC (AS) (UG/L)	DIS-SOLVED SELE-NIUM (SE) (UG/L)
1	SC00608733DAD	EAGLE VALLEY EVAPORITE	04-23-75	34	40	2	51	17	6.8	1.2	248	203	6.6	2.6	0.3	1.2	0.21	247	200	0.2	350	8.0	13.0	1	0
2	SC00608835CAB	BASALT	04-21-75	31	10	0	42	6.4	6.8	1.6	171	140	4.3	1.5	.1	.51	.18	180	130	.3	230	7.6	5.0	4	0
3	SC00708705BAB	ALLUVIUM	04-23-75	29	10	0	65	18	12	2.3	293	240	14	4.3	.2	1.6	.31	297	240	.3	440	7.3	9.0	2	1
4	SC00708706DBA	BASALT	04-10-75	27	10	0	88	27	29	.8	386	317	51	13	.5	2.9	.37	440	330	.7	675	7.4	4.0	1	2
5	SC00708707CAB	BASALT	04-10-75	30	20	0	53	23	15	3.2	252	207	36	12	.3	.85	.18	301	230	.4	470	7.9	10.0	1	3
6	SC00708718BAD	BASALT	04-22-75	35	20	0	91	32	23	3.6	357	293	44	21	.2	11	.15	475	360	.5	640	7.7	11.0	1	2
7	SC00708719ACD	BASALT	04-10-75	38	10	0	45	37	25	4.4	334	274	26	6.7	.7	1.6	.15	355	260	.7	535	7.6	10.0	1	1
8	SC00708723ACC	BASALT	04-23-75	29	50	0	19	4.6	3.8	2.3	84	69	8.6	.9	.1	.33	.28	111	66	.2	150	7.9	4.0	0	0
9	SC00708727ABA	BASALT	04-23-75	38	10	0	30	33	16	3.7	256	210	21	6.9	.5	1.4	.15	282	210	.5	420	8.2	8.0	2	0
10	SC00708730CAA	ALLUVIUM	04-10-75	35	20	0	84	38	19	2.2	344	282	110	10	.7	2.6	.21	480	370	.4	700	7.9	5.0	1	4
11	SC00708730CDA	EAGLE VALLEY EVAPORITE	04-09-75	24	90	20	530	110	26	2.3	283	232	1500	18	.7	.46	.12	2350	1800	.3	2600	6.7	9.0	0	19
12	SC00708730CDB	ALLUVIUM	04-09-75	30	10	0	230	75	25	2.4	337	276	580	16	.8	1.3	.12	1130	880	.4	1420	7.4	6.0	0	22
13	SC00708734ABC	EAGLE VALLEY EVAPORITE	04-23-75	38	10	10	470	50	24	3.1	266	218	1100	13	.7	2.7	.21	1840	1400	.3	1840	8.1	13.0	1	3
14	SC00708733CBC	ALLUVIUM	04-24-75	11	10	0	91	14	4.1	1.6	219	180	110	2.3	.2	.52	.12	345	290	.1	500	7.3	11.0	0	0
15	SC00708805CDD	BASALT	04-22-75	38	40	20	46	26	14	3.9	284	233	18	4.4	.3	.60	.18	293	220	.4	400	8.0	11.0	3	0
16	SC00708809CCC	EAGLE VALLEY EVAPORITE	04-23-75	39	10	10	520	170	50	4.4	279	229	1700	7.7	.9	.02	.21	2630	2000	.5	2600	7.3	8.0	2	2
17	SC00708810DBC	ALLUVIUM	04-22-75	27	40	10	160	35	15	2.1	296	243	320	7.0	.2	.89	.15	716	540	.3	910	7.2	12.0	0	2
18	SC00708811DAC	MAROON FORMATION	04-23-75	31	10	20	33	28	28	3.5	235	193	46	17	.7	2.4	.12	314	200	.9	470	8.2	6.0	1	3
19	SC00708811DAD	ALLUVIUM	04-22-75	29	60	20	85	17	20	1.8	324	266	41	8.1	.2	.57	.18	365	280	.5	510	7.7	8.0	1	1
20	SC00708814BCC	MAROON FORMATION	04-22-75	30	30	10	41	34	34	3.3	311	255	42	8.5	.5	1.3	.15	353	240	1.0	530	7.6	10.0	--	--
21	SC00708817AAB	EAGLE VALLEY EVAPORITE	04-21-75	13	2600	350	550	86	26	4.3	234	192	1500	17	.3	.02	.09	2320	1700	.3	2200	7.4	9.0	0	0
22	SC00708817BBC	ALLUVIUM	04-23-75	23	20	0	110	19	13	3.0	274	225	130	7.7	.2	1.1	.09	446	350	.3	590	7.2	9.0	1	2
23	SC00708827DAA	MAROON FORMATION	04-24-75	23	10	80	100	39	33	3.0	371	304	130	19	.4	2.8	.06	543	410	.7	780	7.0	11.0	1	3
24	SC00708833BAD	ALLUVIUM	04-25-75	11	130	20	180	37	16	2.2	251	206	280	11.8	.2	.08	.09	753	600	.3	1150	7.1	17.0	0	1
25	SC00708833DDD	ALLUVIUM	04-18-75	12	50	0	170	26	16	1.6	265	217	320	4.7	.1	.63	.03	684	530	.3	900	7.1	33.0	0	0
26	SC00708835DCB	ALLUVIUM	04-25-75	8.6	2000	100	390	42	6.2	2.5	283	232	870	3.1	.3	.01	.09	1460	1100	.1	1900	6.8	18.0	0	0
27	SC00708901ADB	EAGLE VALLEY EVAPORITE	04-18-75	21	50	0	180	67	47	2.3	314	258	440	50	.3	10	.09	1010	730	.8	1450	7.4	13.0	0	27
28	SC00708901ADD	MAROON FORMATION	02-24-75	22	30	20	250	55	19	10	322	264	620	12	.3	2.5	.03	1160	850	.3	1505	6.8	10.0	0	3
29	SC00808710DDD	STATE BRIDGE FORMATION	04-12-75	13	10	0	135	20	8.4	3.8	337	276	140	2.7	.3	.94	.12	489	410	.2	730	6.9	10.0	0	2
30	SC00808711BBB	ALLUVIUM	02-24-75	6.5	20	10	75	10	3.8	1.6	117	96	130	3.2	.2	.42	.00	290	230	.1	530	7.0	4.0	1	1
31	SC00808713BAC	ALLUVIUM	04-12-75	13	120	0	98	17	10	4.0	316	259	80	3.3	.0	.81	.06	385	310	.2	625	7.1	10.0	0	1
32	SC00808713CCD	ALLUVIUM	04-12-75	15	6000	180	150	25	10	3.7	298	244	240	8.9	.2	.03	.06	606	480	.2	885	7.5	11.0	0	0
33	SC00808803DBA	ALLUVIUM	04-18-75	25	250	0	100	38	34	1.9	362	281	180	3.4	.2	1.0	.09	556	410	.7	610	7.2	30.0	0	1
34	SC00808810AAC	ALLUVIUM	02-24-75	14	40	0	110	16	12	2.3	238	195	140	5.6	.1	.52	.00	420	340	.3	720	7.1	9.5	0	0
35	SC00808827BCB	ALLUVIUM	02-24-75	13	40	0	55	9.4	79	3.1	341	280	56	5.0	2.6	.69	.00	394	180	2.6	666	7.3	8.0	1	1
36	SC00808834BDD	MAROON FORMATION	04-26-75	16	30	30	59	14	49	5.9	324	266	38	4.4	.2	.18	.12	347	210	1.5	430	7.5	11.0	1	1
37	SC00808834CAA	ALLUVIUM	04-11-75	11	30	0	120	23	15	2.5	253	208	190	9.8	.3	.31	.06	498	390	.3	740	7.2	8.5	0	0
38	SC00908829DBB	MAROON FORMATION	04-26-75	14	30	0	37	28	16	2.3	275	226	18	1.8	.1	.09	.12	253	210	.5	360	8.6	9.0	1	0
39	SC00908821BCA	MAROON FORMATION	04-11-75	10	20	0	72	34	12	4.7	369	303	44	1.6	.4	.11	.03	361	320	.3	590	7.2	11.0	0	1
40	SC01008804BAC	----------	02-21-75	73	270	270	380	59	390	34	606	497	1300	240	2.6	.04	.31	2780	1200	4.9	3000	6.6	44.0	2	0
41	SC01008809BBB	EAGLE VALLEY EVAPORITE	04-25-75	7.8	50	10	200	24	8.8	1.9	202	166	440	.8	.2	.16	.09	784	600	.2	950	7.6	14.0	0	1
42	SC01008809BDB	MAROON FORMATION	04-25-75	7.9	30	10	59	6.2	3.6	1.7	216	177	7.4	.9	.1	.14	.06	194	170	.1	275	7.7	7.0	0	0
43	SC01008817ADD	ALLUVIUM	04-24-75	9.4	120	140	72	5.8	5.1	.9	190	156	56	1.1	.1	.05	.12	245	200	.2	350	8.0	8.0	0	0
44	SC01008829CCD	MAROON FORMATION	04-11-75	7.5	60	0	3.5	1.3	100	2.2	258	213	26	2.2	.6	.21	.06	272	14	12	440	8.6	3.0	1	0
45	SC01008911CCB	ALLUVIUM	04-25-75	5.9	340	140	59	20	37	1.4	309	253	66	4.1	.2	.05	.09	347	230	1.1	550	7.6	7.0	0	0
46	SC01108078BD	ALLUVIUM	02-25-75	13	520	70	43	6.4	15	1.4	192	157	2.7	4.3	.2	.01	.00	181	130	.6	380	7.8	6.0	1	0
47	SC01108826ACD	ALLUVIUM	04-24-75	8.1	40	0	100	27	4.4	1.9	397	326	42	.9	.1	.48	.03	382	360	.1	540	7.4	4.0	0	1
48	SC01108826ADA	ALLUVIUM	04-17-75	7.8	220	0	93	22	5.2	1.2	360	295	26	3.1	.1	.68	1.1	340	320	.1	360	6.9	7.0	0	2
49	SC01108826ADA	MANCOS SHALE	04-17-75	7.8	60	0	55	17	7.2	1.1	223	183	34	2.0	.1	.66	.03	237	210	.2	410	6.9	21.0	0	1
50	SC01108826ADD	ALLUVIUM	04-24-75	6.8	20	5	71	16	4.1	1.5	284	233	29	1.5	.1	.33	.09	271	240	.1	430	7.5	7.0	0	1

OPEN-FILE REPORT
W GPO 777-034

AVAILABILTY AND CHEMICAL QUALITY OF GROUND WATER IN THE CRYSTAL RIVER AND CATTLE CREEK DRAINAGE BASINS NEAR GLENWOOD SPRINGS, WEST-CENTRAL COLORADO

By
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1976