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CHARACTERIZATION OF GLENWOOD SPRINGS AND DOTSERO SPRINGS WATERS

October 1983

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16. ABSTRACT

The Bureau of Reclamation is conducting studies to find disposal methods for preventing high salinity water from 16 identified sources from entering the Colorado River. The Glen-Dot (Glenwood Springs-Dotsero Springs) is one source that contributes 10 percent of the identified salt load or 227 000 metric tons annually. Basic data on physical and chemical properties of the Glen-Dot waters were needed for determining methods of disposal. Consequently, a site sampling and analytical program was conducted from 1972 to 1982 by the Bureau. The analytical data obtained were evaluated to characterize Glen-Dot aquifers for physical properties, major constituents, trace metals, trace anions, radioactivity, and organic compounds.

17. KEY WORDS AND DOCUMENT ANALYSIS

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CHARACTERIZATION OF GLENWOOD SPRINGS AND DOTSERO SPRINGS WATERS

by

R. J. Eisenhauer

October 1983

Hydraulics Branch
Division of Research
Engineering and Research Center
Denver, Colorado

SI METRIC

UNITED STATES DEPARTMENT OF THE INTERIOR * BUREAU OF RECLAMATION

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.

ACKNOWLEDGMENTS

This report consolidates chemical and physical data for the Glen-Dot (Glenwood Springs-Dotsero Springs) salinity control unit obtained by site sampling and offsite analyses from 1972 to 1982. Sampling and analyses were funded and supported by USBR-UCR (Bureau of Reclamation - Upper Colorado Region), GJPO (Grand Junction Project Office), and SLCRO (Salt Lake City Region Office). USBR-ERC (Engineering and Research Center), Denver, Colorado, funding and support was provided by the CRWQO (Colorado River Water Quality Office).

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GLOSSARY

CRWQIP	Colorado River Water Quality Improvement Program.
CRWQO	Colorado River Quality Office.
DOT	Refers to a particular spring in Dotsero Springs.
DS	Dotsero Springs.
EP	Extractable product.
ERC	Engineering and Research Center, Bureau of Reclamation.
GJPO	Grand Junction (Colorado) Project Office, Bureau of Reclamation.
Glen	Refers to a particular spring in Glenwood Springs.
GS	Glenwood Springs.
PIQR	Problem Identification and Qualification Report.
RCRA	Resource Conservation and Recovery Act.
SLCRO	Salt Lake City (Utah) Regional Office, Bureau of Reclamation.
TDS	Total dissolved solids.
UCR	Upper Colorado Region, Bureau of Reclamation.
USBR	Bureau of Reclamation.
USGS	U.S. Geological Survey.

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INTRODUCTION

A number of sources contribute to high salinity levels in the Colorado River. Approximately half of the present salt concentration in the Colorado River is man induced (i.e., irrigation return flow, reservoir evaporation, exports of water, municipal and industrial consumption, or contamination), while the other half is due to natural sources (i.e., direct salt loading from natural springs and weathering of mineral-bearing rocks). The Colorado River drains a total of 663 000 km² (256 000 mi²) in the United States and Mexico and carries a salinity burden that has historically averaged about 10 million metric tons (11 million tons) annually.

The Colorado River at its headwaters in the mountains of north-central Colorado has a salinity of only about 50 mg/L (milligrams per liter). The salinity progressively increases downstream as a result of water diversions and salt contributions from a variety of sources and in 1977 averaged about 820 mg/L at Imperial Dam, the last major diversion point in the United States. Unless control measures are undertaken, the concentration will continue to increase, reaching levels estimated by the Bureau of Reclamation at 1150 to 1210 mg/L at Imperial Dam by the year 2000 [1].* Water of 1000 mg/L or less is generally considered to be satisfactory for irrigating most crops, although concentrations of 500 mg/L can have detrimental effects on salt-sensitive crops. The U.S. Public Health Service recommends that public drinking water supplies should contain less than 500 mg/L.

Salinity not only has economic effects on water users in the lower basin States, but is also an important factor in international relations with Mexico, which is guaranteed an annual supply of 1.5 million acre-ft of Colorado River water by a 1944 treaty. In 1973, the United States and Mexico agreed that the water delivered to Mexico from the main stem of the river would have a salinity of no more than 115 ± 30 mg/L greater than the average salinity of water at Imperial Dam.

In recognition of these facts, Congress passed the Colorado River Basin Salinity Control Act (Public Law 93-320) in June 1974. Title II of that act authorized the Secretary of the Interior to construct, operate, and maintain four specific salinity control units in the Upper Basin as the initial stage of the Colorado River Basin Salinity Control Program. In addition, the Secretary was authorized and directed to expedite completion of planning reports on 12 other units, one of which was the Glenwood-Dotsero Springs Unit.

Among the natural sources of dissolved solids to the Colorado River, the largest of the point-source contributors (e.g., springs, geysers, mine drainage, and wells) to the upper Colorado River is in the reach between the mouth of the Eagle River near Dotsero and the mouth of South Canyon Creek west of Glenwood Springs (fig. 1). In this area, it has been estimated prior to this study [1] thermal springs rising in or near the riverbed and associated ground-water systems contribute about 27 137 000 m³ (22 000 acre-ft) of saline water containing 399 161 metric tons (440 000 tons) of salt annually. The PIQR (Problem Identification and Qualification Report) [2] identified concentrations of 9295 mg/L salt averaged annually at DS (Dotsero Springs) and 18 648 mg/L at GS (Glenwood Springs). In this study, estimated flow weighted average values of 9954 mg/L for DS and 18 780 mg/L for GS were found. Of this amount, approximately 50 percent was contributed by known surface springs while the remaining tonnage was from subsurface inputs. Prior studies [1] of the Glenwood-Dotsero Springs Unit indicated that salinity control measures have the potential of reducing the salt contribution to the Colorado River by at least 190 000 metric tons (209 000 tons) annually from the surface springs alone. Our study recently estimated the salt contribution as 174 700 metric tons (192 200 tons). This would result in a salinity reduction of more than 19 mg/L at Imperial Dam.

Because of the significant salt contribution to the river, the salinity control program focused on the GS and DS point sources. Studies were initiated by CRWQO (Colorado River Water Quality Office) to characterize, quantify, identify beneficial uses, and find ways of preventing these waters from entering the Colorado River. A plan of study was initiated by the Bureau's UCR (Upper Colorado Region) in a report titled "Glenwood-Dotsero Springs Unit, Colorado, Plan Formulation Draft Apendix" [3]. A characterization and application study of GS and DS waters was made by the Bureau's Engineering and Research Center, Division of Research [4]. In another study, the Bureau's UCR contracted URS Corporation to make an investigation of the control and disposal of hot saline water from springs in the area of Glenwood Springs and Dotsero, Colorado. The results of this study were published in a report titled "Final Report, Phase I – Salinity Investigation of Glenwood-Dotsero Springs Unit"[5]. The UCR and URS chemical and physical data were consolidated with water analyses obtained by the Chemical Engineering Unit

* Numbers in brackets refer to entries in bibliography.

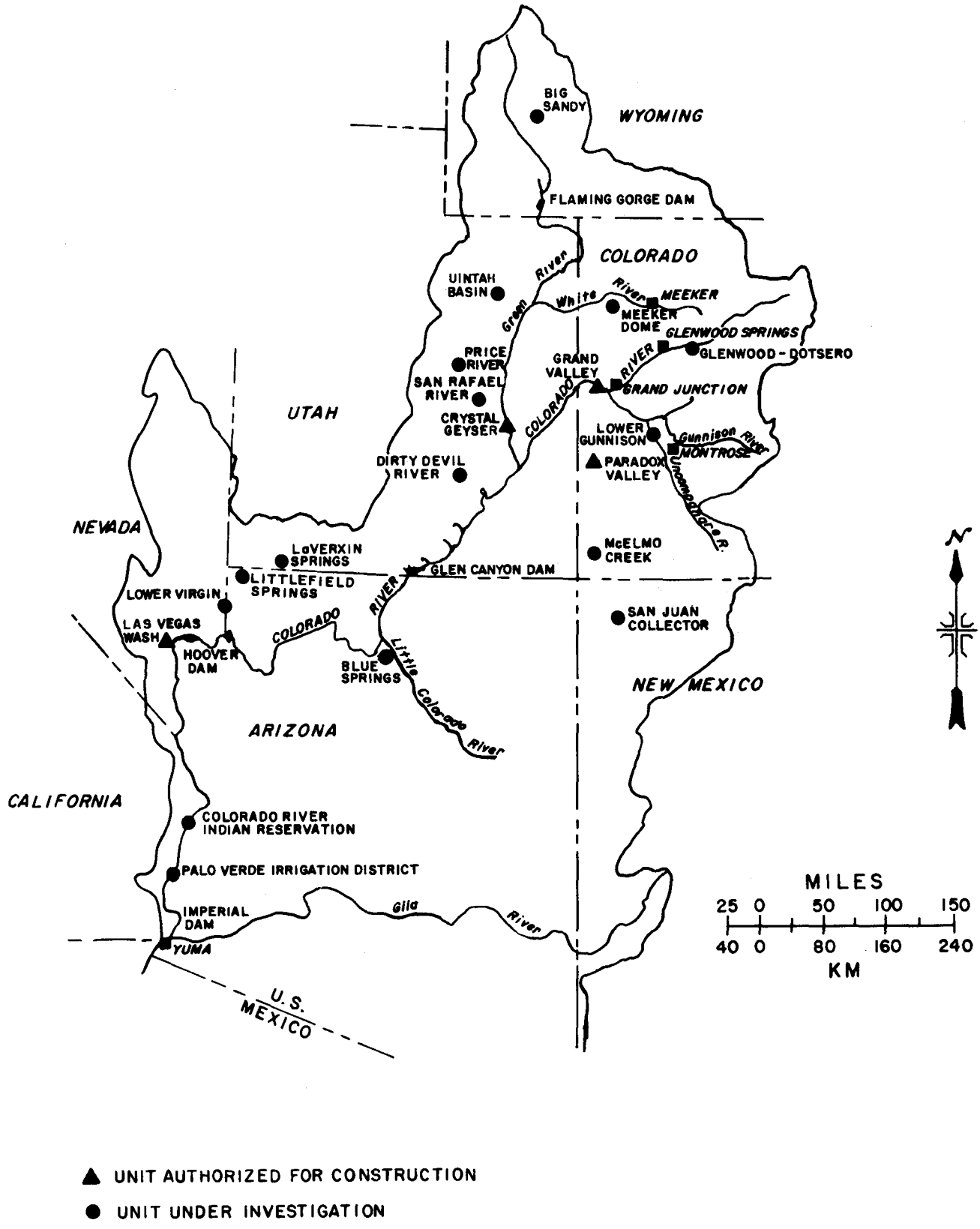

Figure I.–Colorado River Basin map.

to more thoroughly and accurately characterize the GS and DS waters.

CONCLUSIONS

1. The Dotsero Springs are located in the Leadville limestone strata. The combined flow rate of the 11 identified springs was 0.220 m^3/s (7.77 ft^3/s). The characteristics of these springs included:

Temperature range.	23 to 32 °C (73 to 90 °F).
pH	7.2 to 7.7.
TDS	9954 mg/L
Cation (by percent):	
Sodium.	82
Magnesium.	10
Calcium.	7
Potassium.	1
Anions (by percent):	
Chloride.	84.5
Sulfate.	8.7
Bicarbonate.	6.8

Because of the high bicarbonate content of DS water, calcium could be reduced from 260 to 125 mg/L by partial lime treatment. Trace metals and trace anions were in most cases at a concentration of 0.1 mg/L or less and raw water met the toxicity limits for drinking water. Also, dehydrated salts or lime treatment sludges would not exceed toxicity limits for RCRA (Resource Conservation and Recovery Act) hazardous waste. The raw water contained a gross beta radioactivity of 36 pCi/L primarily as potassium-40 (K^{40}). The residual K^{40} levels in concentrated salt brines from either evaporation ponding or desalting of process brines would be less than that encountered in salt mines.

2. The Glenwood Springs are located in the Leadville limestone strata. The combined flow rate of the 14 identified springs was 0.296 m^3/s (10.46 ft^3/s). The characteristics of these springs included:

Temperature range.	25 to 51 °C (77 to 124 °F).
pH	6.6 to 7.6.
TDS	18 780 mg/L
Cations (by percent):	
Sodium.	90
Calcium.	7
Potassium.	2
Magnesium.	1
Anions (by percent):	
Chloride.	83.9
Sulfate.	10.2
Bicarbonate.	6.0

Because of the high bicarbonate content of GS water, calcium could be reduced from 470 to 238 mg/L by neutralization with lime (calcium hydroxide) to precipitate calcium carbonate. The trace metals and trace anions were less than 0.1 mg/L. The raw water exceeded or approached the limits of toxicity for drinking water for cadmium, chromium, fluoride, and selenium. However, chemical pretreatment and desalting necessary to bring water to below TDS limits would reduce cadmium, chromium, fluoride, and selenium below limits. Dehydrated salts or calcium carbonate sludges recovered from GS water did not exceed toxicity limits for RCRA hazardous waste. Glenwood Springs water contained a gross beta radioactivity of 226 pCi/L primarily as K^{40}. The residual potassium-40 levels in concentrated salt brines from either evaporation ponding or desalting process brines and sludges would be less than that encountered in salt mines.

3. The combined flow rate for the 25 identified surface springs (14 GS plus 11 DS) of the GS-DS unit is 0.516 m^3/s (18.23 ft^3/s). The flow rate weighted average TDS for the unit is 15 016 mg/L. The salt load for the 11 Dotsero springs was 69 050 metric tons (76 120 tons) annually and for the 14 Glenwood springs was 174 700 metric tons (192 570 tons) annually. The combined salt load for the unit is 243 700 metric tons (268 600 tons) annually. It was estimated in the PIQR [2] that the identified springs accounted for only 50 percent of the salt load produced by the DS-GS springs. The total salt load from the identified springs and from the unmeasured subsurface was estimated to be 474 000 metric tons (522 500 tons) annually.

DESCRIPTION OF STUDY AREA

The CRWQIP was initiated in 1971 by the Bureau of Reclamation, U.S. Department of the Interior, with the goal of identifying measures that would maintain salinity concentrations at or below the Lower Colorado River Basin levels existing at the time. Under the CRWQIP, 16 control units were chosen (table 1). The Glenwood-Dotsero Springs Control Unit was among these 16 authorized for feasibility level salinity control planning by Public Law 96-375 in 1980. The location of the 16 salinity control units are shown in the Colorado River Basin map (fig. 1).

Table 1.—*Colorado River basin saline water sources [6]*

Unit	Annual average flow		Source quantity		Average TDS	Annual salt load x 10^3		Effect*
	m^3/s	ft^3/s	10^6 m^3/yr	acre-ft/yr	mg/L	metric ton	short ton	mg/L
Big Sandy River	0.57	20	17.89	14 500	6 500	118	130	11
Meeker Dome	0.042	1.5	1.35	1 090	19 300	25	27	3
Glenwood-Dotsero	0.48	17	15.43	12 000	14 200	227	250	23
Grand Valley	1.7	60	53.68	43 500	3 300	173	190	20
Lower Gunnison	0.66	23.5	21.22	17 200	2 900	61	67	5
Paradox Valley	0.057	2	1.79	1 450	260 000	164	180	19
McElmo Creek	0.24	8.5	7.65	6 200	4 700	36	40	4
Uinta Basin	0.42	15	13.45	10 900	4 500	61	67	6
Price River	0.96	34	30.73	24 900	4 000	122	134	13
San Rafael	0.86	30.5	27.39	22 200	3 550	97	107	10
Crystal Geyser	0.006	0.2	0.185	150	14 000	3	3	1
Dirty Devil River	1.56	55	49.36	40 000	2 100	102	113	10
LaVerkin Springs	0.35	12.5	10.24	8 300	9 650	99	109	8
Lower Virgin	0.28	10	8.88	7 200	8 200	73	80	9
Las Vegas Wash	3.128	110.5	98.72	80 000	1 800	189	208	20
Palo Verde	7.30	258	230.8	187 000	1 700	381	420	39
**Energy development wastewater	3.128	110.5	98.72	80 000	1 800	189	208	20
Total	21.76	768.7	687.4	557 090	4 200	2166	2333	221

* Effect at Imperial Dam on the Colorado River.
** Year 2000 estimates.

The Glenwood-Dotsero Springs Salinity Unit lies along the Colorado River between Glenwood Springs and Dotsero in west-central Colorado (fig. 2). The area is located approximately 260 km (160 mi) west of Denver and 150 km (90 mi) east of Grand Junction and includes parts of Garfield and Eagle Counties. Dotsero lies at the eastern end of the unit.

The Dotsero Springs are presently undeveloped and some have been disturbed or covered by construction of Interstate Highway No. 70 (I-70). A cluster of thermal saline springs are located approximately 4 km (2-1/2 mi) west of the town, just east of the upstream end of Glenwood Canyon.

At the western end of Glenwood Canyon lies the city of Glenwood Springs. The second and larger group of thermal saline springs discharges from the banks and from the bed of the Colorado River within the city limits. Some of the larger springs at Glenwood Springs have been developed for commercial swimming pools and health spas which have made the city a well-known resort area.

The Colorado River flows approximately 160 km (100 mi) southwestward from its source in the Rocky Mountain National Park before entering the study area. At Dotsero, the Eagle River enters the Colorado River above the thermal saline spring discharges (figs. 1 and 3). West of the springs, the Colorado River enters Glenwood Canyon where it is diverted through the Shoshone Hydroelectric Plant. At the mouth of the canyon in the city of Glenwood Springs, more thermal saline springs discharge into the river. The confluence of the Roaring Fork River and the Colorado River is west of the city center. Downstream of the Roaring Fork confluence, more thermal saline springs issue into the Colorado River. From Glenwood Springs, the river flows westward to Grand Junction and into Utah.

Specific locations for the Dotsero saline springs are shown in figure 3. The springs were originally numbered by the Bureau in downstream ascending order. With the addition of new springs and the combining of old springs by highway construction, this numbering system has been somewhat altered.

The group of springs emerging from the ground above the river level has been affected by highway construction. When monitoring of the springs by the Bureau began in 1972, this group consisted of two

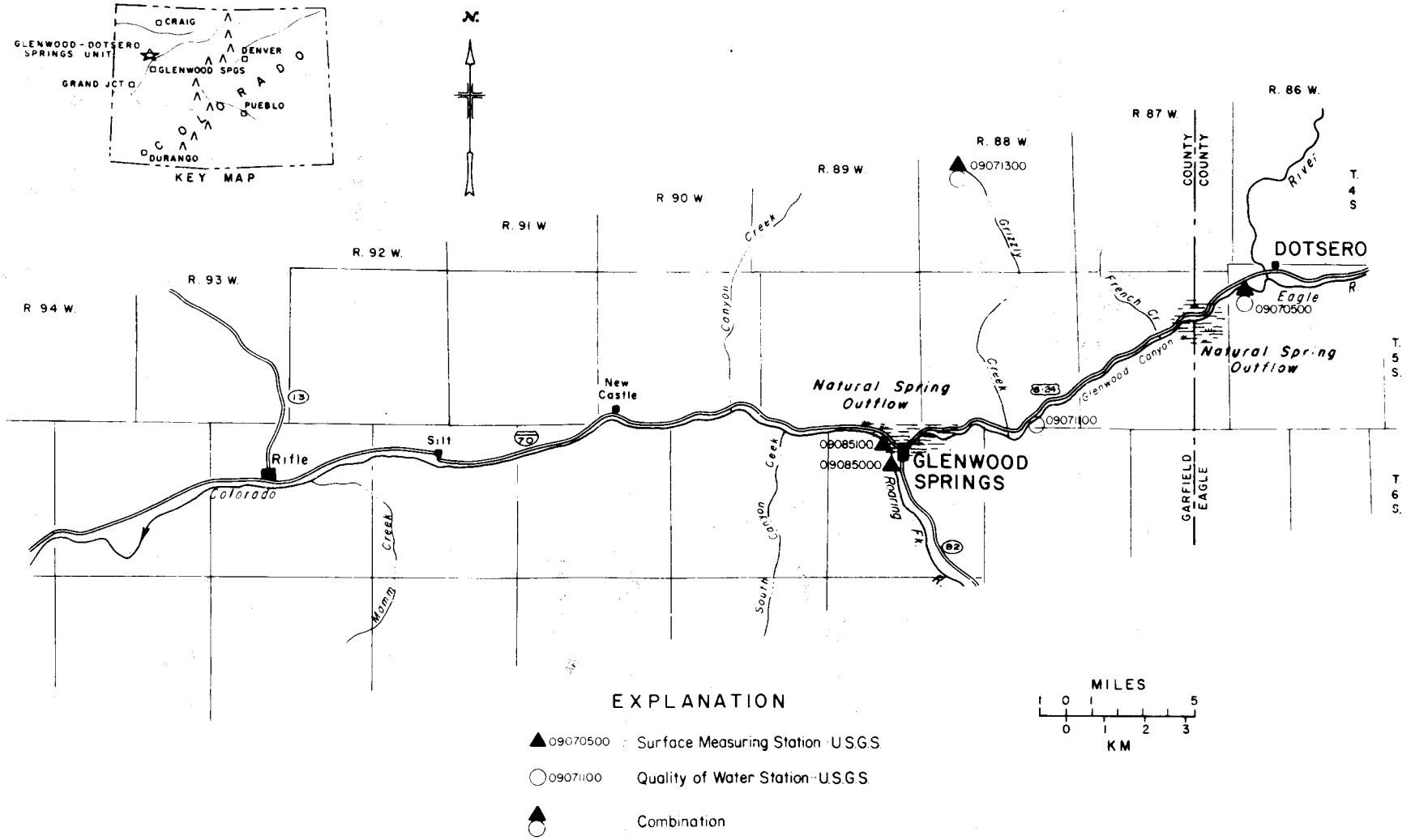

Figure 2.–GS-DS unit location map.

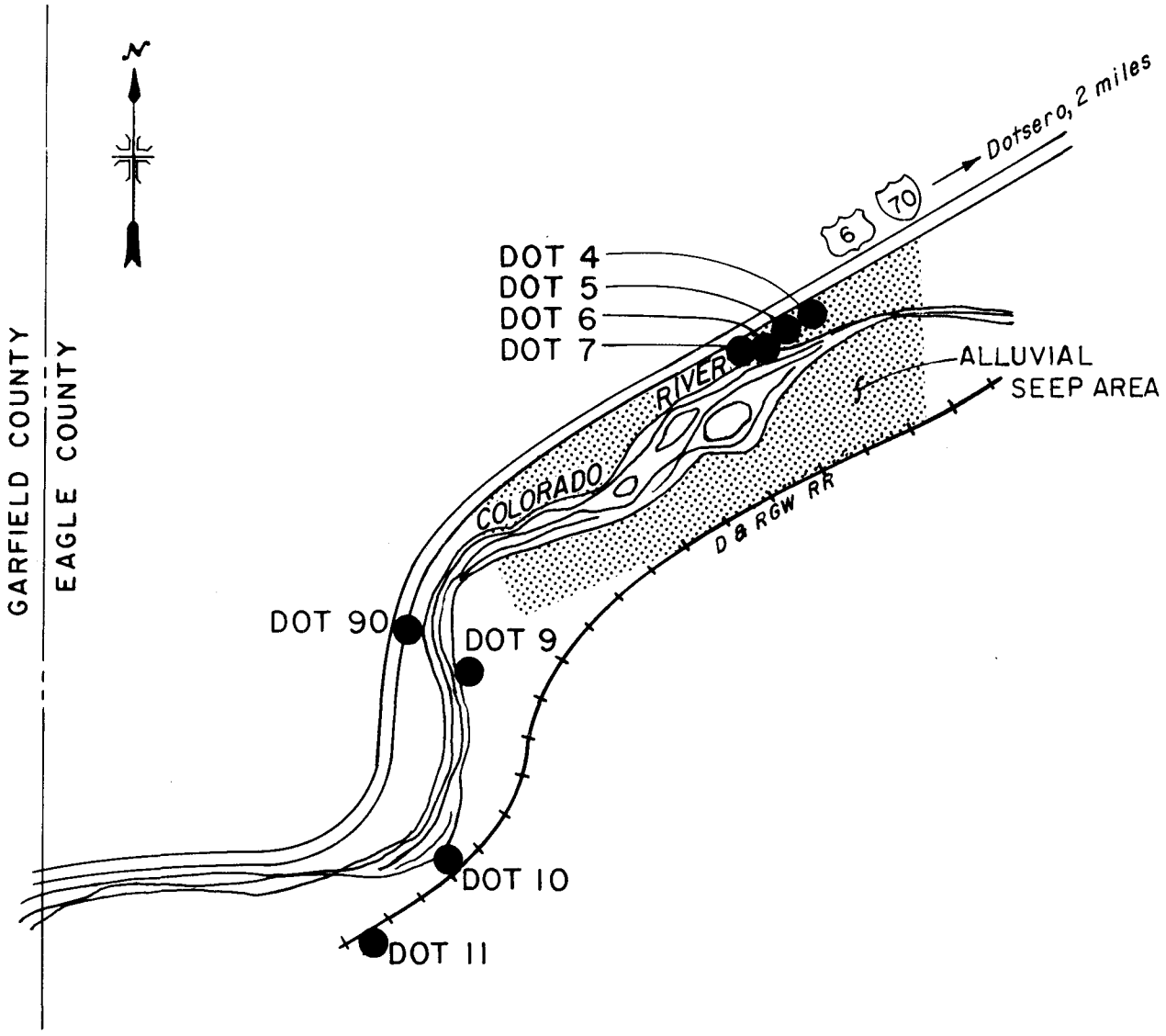

Figure 3.–Dotsero surface springs location map.

springs, DOT-05 and -06. In 1978, these two springs were covered by construction of I-70 and later reemerged as DOT-04, -05, -06, and -07.

Downstream of DOT-07 about 1.6 km (I mi) on the north bank of the Colorado River is DOT-90. This spring also occurs at above-river level. Prior to highway construction in 1978, this spring existed as three separate springs: DOT-20, -30, and -40. Since 1978, their outflow has been combined as DOT-90.

Glenwood Springs specific locations are shown in figure 4. The Glenwood saline springs were also numbered in downstream ascending order. Springs on the south bank of the Colorado River were numbered independently of those on the north bank.

Glen-10, -20, and 30-40 occur on the south bank of the Colorado River above the Roaring Fork confluence. Glen 30-40 is located downstream of both Glen-20 and a water supply siphon crossing the river. Glen-30 and -40 were separate springs prior to the construction involving the siphon. At that time, the flows from these two springs were combined into a single culvert now labeled Glen 30-40.

Glen-12, -50, and -60 are located on the north bank of the river across from the south bank group. Glen-12 is located directly across the river from Glen-10. Flow issues from highway fill and riprap a few feet above the low flow level of the river.

Glen-50 and -60 are located almost directly across the river from Glen-20 and 30-40. Glen-50 is the

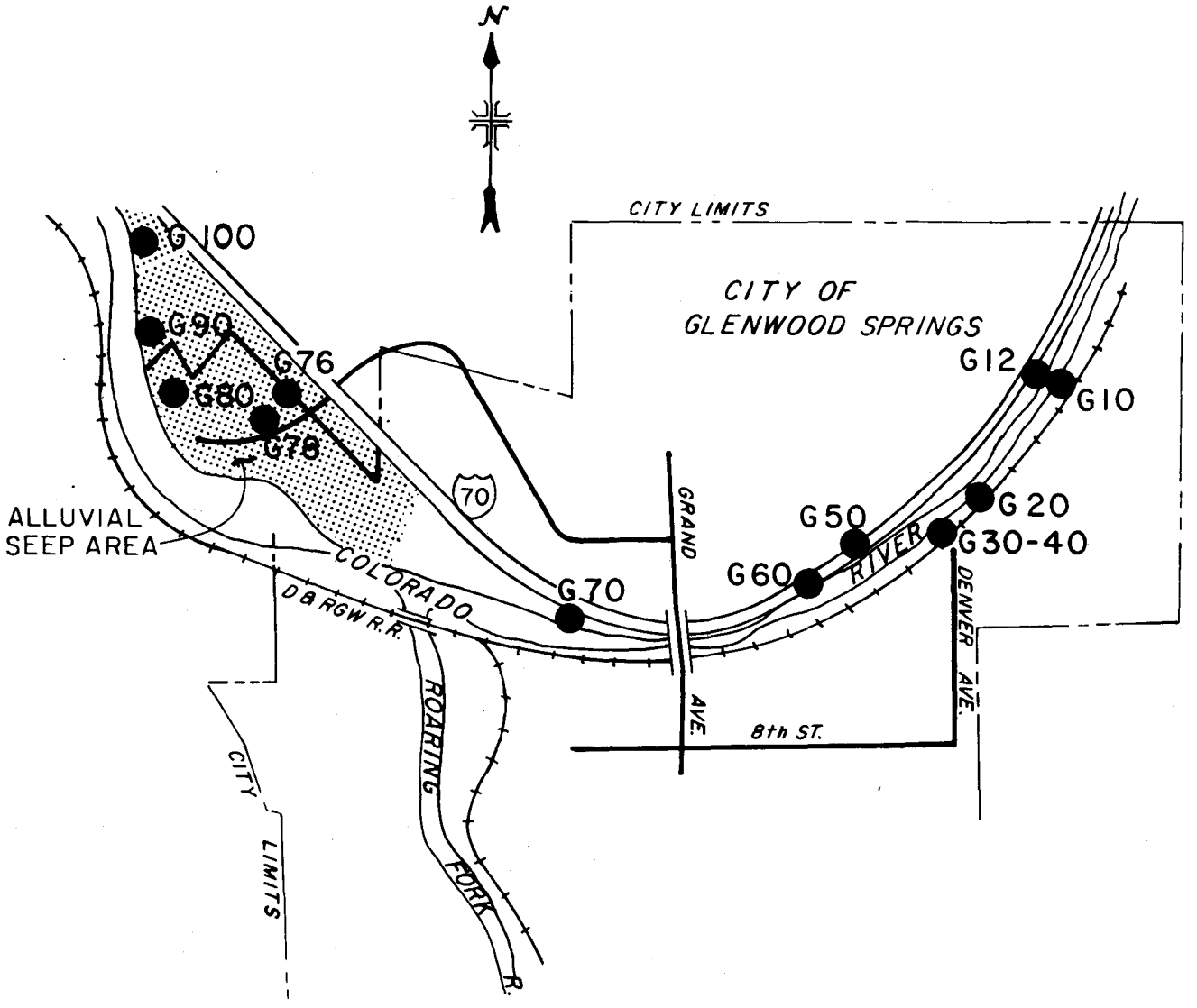

Figure 4.–Glenwood surface springs location map.

discharge from a culvert draining the "Vapor Caves" spa downstream of Glen-12. Glen-60 is the overflow discharge from the large outdoor swimming pool at the Glenwood Hot Springs Lodge. Glen-70 is the outflow from the lodge's swimming pool.

Glen-76, -78, and -80 are located downstream from the Roaring Fork confluence on the north bank of the Colorado River. Glen-76, -78, and -80 are not actually individual springs. They are measuring points for thermal saline water flowing through culverts under the Colorado Department of Highways facilities after being collected in weep drains on the north side of the highway.

Glen-90 is located downstream of Glen-80 on the north bank of the river. Glen-90 is a spring used by a local health spa for medicinal purposes. The spring is routed from the spa to the river through a culvert.

Glen-100 is also on the north bank of the river downstream from Glen-90. Glen-100 is collected under the highway (I-70) and routed to the river through a culvert.

DOTSERO SPRINGS WATER

During the period between April 20, 1972, and November 11, 1979, the UCR-GJPO completed a sampling and analytical program to characterize the 11 Dotsero springs. Physical properties determined included pH, temperature, conductivity, total dissolved solids, and turbidity. Concentrations of soluble cations and anions determined included calcium,

magnesium, sodium, potassium, bicarbonate, chloride, and sulfates. Table 2 shows the sampling periods and number of samples taken. Computer printouts of the data obtained by GJPO are included as appendix A of this report.

The mean values of the GJPO data expressed in different measurement units are included in table 3. All other data in table 3 are from references [2] or [4] as noted. The data shown in column 4 for DOT-04 came from analyzing one sample and the data shown in column 12 for DOT-30 came from analyzing and averaging the results of 21 samples taken on different days. A total of 228 water samples were analyzed to obtain the average values shown in column 15 of table 3.

Physical Properties

The PIQR (Problem Identification and Quantification Report) [2] showed all DS springs are located in Leadville limestone strata. The values of items 1 through 5 of table 3 are plotted on figure 5 for each spring. The pH ranged from 7.2 to 7.7 and averaged 7.4. Conductivity ranged from 1460 mS/m for DOT-11 to 1790 mS/m for DOT-07, and averaged 1640 mS/m. Temperature ranged from 23 to 32 °C (76 to 93 °F).

Flow rates ranged from 0.0028 m^3/s (44.4 gal/min) for DOT-04, -05, -06, and -07 to 0.051 m^3/s (808 gal/min) for DOT-09. The combined flow rate of the 11 identified surface springs was 0.220 m^3/s (3490 gal/min). The contribution of each spring to total flow is summarized in table 4. Springs No. -04, -05, -06, and -07 contribute only 4.8 percent of the total flow. These springs emerge from the bank of the Colorado River near the area that has been affected by the construction of I-70. The low flow of springs No. -04, -05, -06, and -07 can be more easily visualized by expressing the average flow of each spring as 0.0028 m^3/s (44 gal/min).

The bulk of the flow, 95.2 percent is from seven identified springs. Springs No. -09, -10, -11, and -90 (fig. 3) contribute 76.2 percent of the flow. Springs No. -20, -30, and -40 contribute the remaining 19 percent of the flow. Springs No. -20, -30, and -40 are not indicated on figure 3 because highway construction since these data were taken has combined DOT-20, -30, -40, and -90 into a single flume as DOT-90 outflow.

Referring to figure 5 and item 4 of table 3, the TDS (total dissolved solids) range from 8300 mg/L for DOT-10 to 10 650 mg/L for DOT-04, -05, -06, and -07. The springs labeled DOT-04, -05, -06, and -07 emerge from a bank above and about 15 m (50 ft) from the river and can be readily sampled without dilution by river water. Consequently, the average concentration of DOT-04, -05, -06, and -07 is more representative of the salt concentration of the source aquifer (10 647 mg/L). Where the other springs, particularly DOT-10 emerge at or below river level, some mixing of the river water and emerging spring water had likely occurred before water samples were taken for analyses. The flow rate weighted average value of TDS for the 11 springs was 9954 mg/L.

A combined flow of 0.220 m^3/s (3490 gal/min) or 6.94 x 10^6 m^3/yr (5625 acre-ft/yr) was obtained by adding together the flow rates of each of the 11 identified springs. The flow rate weighted average TDS content is 9954 mg/L. Therefore, the combined flow of salt for the 11 identified springs adds 69 053 metric tons/yr (75 958 tons/yr) of salt load to the Colorado River.

Table 2.—*Dotsero Springs sampling dates and number of samples*

Spring identity	Sample period	Number of samples analyzed
DOT-04	September 6, 1979 to November 7, 1979	1
DOT-05	May 31, 1972 to November 7, 1979	31
DOT-06	May 31, 1972 to November 11, 1979	31
DOT-07	September 6, 1979 to November 7, 1979	1
DOT-09	August 2, 1972 to November 11, 1979	28
DOT-10	April 20, 1972 to November 9, 1979	32
DOT-11	August 2, 1972 to November 9, 1979	29
DOT-20	April 20, 1972 to March 13, 1979	22
DOT-30	April 20, 1972 to March 13, 1976	21
DOT-40	April 20, 1972 to March 13, 1976	22
DOT-90	August 30, 1972 to November 11, 1979	10

Table 3.—*Chemical and physical characteristics of Dotsero Springs water*[1]

(1) Item	(2) Characteristic	(3) Units	(4) Dot 2/ 4	(5) Dot 5	(6) Dot 6	(7) Dot 7	(8) Dot 9	(9) Dot 10	(10) Dot 11	(11) Dot 20	(12) Dot 30	(13) Dot 40	(14) Dot 90	(15) Average	(16) RCRA EP 3/ limits	(1) Item
Samples analyzed			1	31	31	1	28	32	29	22	21	22	10	228		
Physical Properties																
1	Conductivity at 25 °C	mS/m	1 790	1 770	1 780	1 790	1 570	1 390	1 460	1 690	1 670	1 670	1 730	1 640		1
2	Flow	m^3/s	0.0028	0.0028	0.0028	0.0028	0.051	0.031	0.040	0.011	0.011	0.020	0.045	4/ 0.220		2
3	pH	-	7.7	7.6	7.6	7.5	7.2	7.5	7.4	7.3	7.2	7.2	7.4	7.4		3
4	TDS (total dissolved solids) 3/	mg/L	10 652	10 667	10 600	10 667	9 200	8 300	9 557	10 143	9 570	9 950	10 235	7/ 9 954		4
																5
5	Temperature	°C	23	26	26	32	32	29	31	32	32	32	32	5/ 32		6
6	Total suspended solids	mg/L	15						6					5/ 15		7
7	Turbidity	WTU	1.9						0.21					5/ 1.9		8
8	Water bearing unit	LL 6/												LL 6/		
Major Constituents																
9	Alkalinity $CaCO_3$ as $CaCO_3$	mg/L	340				345		320				371	344		9 10
10	Calcium	mg/L	301	251	239	250	255	254	253	259	258	252	253	7/ 254		11 12
11	Chloride	mg/L	5 936	5 766	5 837	5 825	4 937	4 412	4 640	5 607	5 537	5 486	5 604	7/ 5 073		13
12	Bicarbonate	mg/L	407	373	369	392	413	357	378	443	442	442	445	7/ 410		14
13	Magnesium	mg/L	63	59	55	53	56	54	54	61	60	61	64	7/ 58		15
14	Potassium	mg/L	57	63	68	57	38	35	37	44	44	43	53	7/ 42		16
15	Silica	mg/L	15				13		13				13	13.5		17
16	Sodium	mg/L	3 397	3 740	3 724	3 724	3 183	2 843	2 703	3 610	3 577	3 538	3 562	7/ 3 204		
17	Sulfate	mg/L	646	533	517	522	519	567	540	519	504	505	475	7/ 520		
Trace Metals 1/ [2]																
18	Aluminum	mg/L											0.100	0.1		18
19	Antimony	mg/L	0.010						0.011					0.01		19
20	Arsenic	mg/L	0.008						0.002					0.005	5.0	20
21	Barium	mg/L												1/ 0.05 [4]	100.0	21
22	Boron	mg/L												7/ 0.07 [4]		22
23	Cadmium	mg/L	0.010				0		0.010				0.002	0.001	1.0	23
24	Chromium	mg/L	0.020						<0.010				<0.060	0.03	5.0	24
25	Cobalt	mg/L	<0.060						<0.060				<0.060	<0.060		25
26	Copper	mg/L	0.040						0.040				<0.012	0.031		26
27	Fluoride	mg/L	0.7				0.3		0.4				0.6	0.5		27
28	Gallium	mg/L											<0.030	<0.03		28
29	Germanium	mg/L											<0.100	<0.1		29
30	Iodide	mg/L							<0.01					<0.01		30
31	Iron	mg/L	1.90				0.010		0.070				0.030	0.503		31
32	Lead	mg/L	<0.005						<0.005				<0.060	<0.023	5.0	32
33	Lithium	mg/L					0.080						0.100	0.09		33
34	Manganese	mg/L	0.050										0.020	0.035		34
35	Mercury	mg/L	<0.0001				0		<0.0001				0.0001	0.0001	0.2	35
36	Nickel	mg/L	<0.05						<0.05				<0.060	<0.053		36
37	Selenium	mg/L	<0.005				0						0	<0.005	1.0	37
38	Silver	mg/L	<0.020						<0.020				<0.006	<0.015	5.0	38
39	Strontium	mg/L							2.600					2.600		39
40	Tin	mg/L											<0.085	<0.085		40
41	Titanium	mg/L											<0.030	<0.030		41
42	Uranium	mg/L							0.003					0.003		42
43	Vanadium	mg/L											<0.030	<0.030		43
44	Zinc	mg/L	0.040				0.010		0.040				0.010	0.025		44
45	Zirconium	mg/L											<0.100	<0.100		45
Trace Anions 1/ [2]																
46	Ammonia	mg/L							<0.2					0.2		46
47	Nitrite	mg/L							<0.05					<0.05		47
48	Nitrate	mg/L							<0.05					<0.05		48
49	Nitrogen	mg/L					0.09						0.06	0.075		49
50	Orthophosphate	mg/L					0.02							0.02		50
51	Total phosphate	mg/L					0.06							0.06		51
Radioactivity 1/ [2]																
52	Gross alpha	pCi/L	41 ± 35						42 ± 27					44 ± 31		52
53	Gross beta	pCi/L	33 ± 44						39 ± 32					36 ± 38		53
54	Total Ra	pCi/L							10 ± 7					10 ± 7		54
55	228 Ra	pCi/L							2.8 ± 5					2.8 ± 5		55
56	40 K	pCi/L							5.7					5.7		56
57	90 Sr	pCi/L							0.0 ± 0.08					0		57
58	210 Bi	pCi/L							1.7 ± 1.6					1.7 ± 1.6		58
59	210 Pb	pCi/L							3.4 ± 2.1					3.4 ± 2.1		59
Organic Compounds 1/ [4]																
60	Total organics	mg/L												1/ 3 [4]		60
	Pesticide:															
61	Endrin	mg/L					8/ <0.0002							<0.0002	0.02	61
62	Lindane	mg/L					8/ <0.004							<0.0004	0.04	62
63	Methoxychlor	mg/L					8/ <0.10							<0.10	10.0	63
64	Toxaphene	mg/L					8/ <0.005							<0.005	0.5	64
	Herbicide:															
65	2,4-D	mg/L					8/ <0.10							<0.01	10.0	65
66	2,4-5 TP (Silvex)	mg/L					8/ <0.01							<0.01	1.0	66

1/ All data provided by Upper Colorado Region for water samples taken April 20, 1972 through November 7, 1979 except as noted from references [2] and [4].
2/ Number assigned to identified spring.
3/ The EP (extractable product) toxicity limits are for a 20:1 water extract of a solid waste.
4/ Summation of flow rate for 11 springs.
5/ Maximum measured values.
6/ All identified Dotsero Springs are located in Leadville limestone.
7/ Flow rate weighted averages.
8/ Analysis previously not reported.
9/ TDS by evaporation at 105 °C to constant weight.

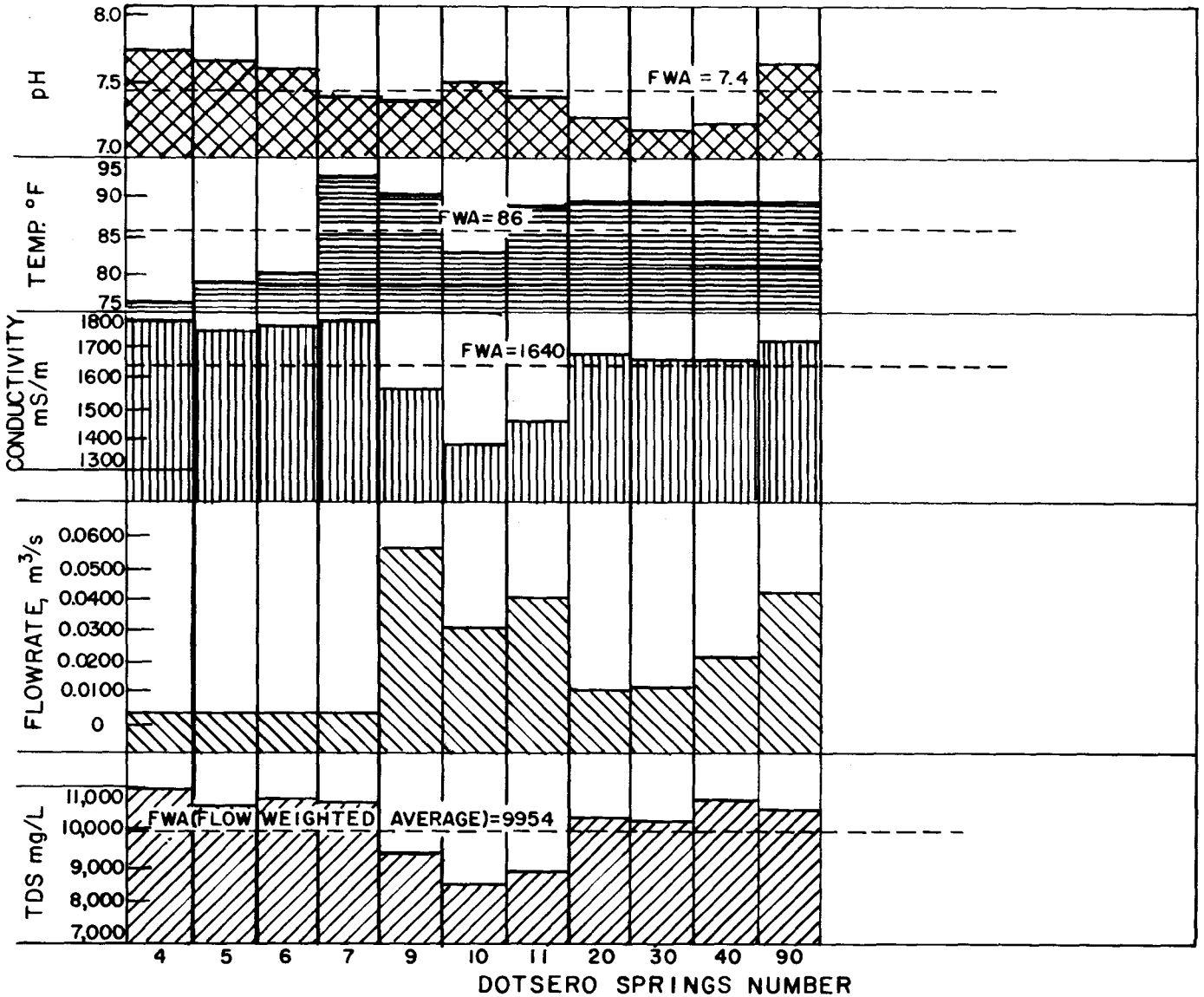

Figure 5.–Physical properties of Dotsero spring waters.

Table 4.—*Contribution of each Dotsero spring to the total flow*

Spring No.	Flow m^3/s	Flow ft^3/s	Percent flow
04	0.0028	0.099	1.2
05	0.0028	0.099	1.2
06	0.0028	0.099	1.2
07	0.0028	0.099	1.2
09	0.051	1.801	23.2
10	0.031	1.095	14.1
11	0.040	1.413	18.4
20	0.010	0.353	4.6
30	0.011	0.388	5.0
40	0.020	0.706	9.4
90	0.045	1.589	20.5
All	0.220	7.769	100.0

Major Constituents

Items 10 through 17 of table 3 are the average values for soluble salt cations and anions. Dissolved cation concentrations of each of the 11 identified springs are plotted in figure 6 and anion concentrations are plotted as figure 7. Cation and anion concentrations generally relate to three groupings of springs. The three groups include springs numbered DOT-04, -05, -06, and -07; DOT-09, -10, and -11; and DOT-20, -30, -40, and -90, and were designated groups I, II, and III, respectively. The TDS values for groups I and III were all above the average value while TDS values for group II were all below the average value of 9954 mg/L. Likewise, referring to figures 6 and 7, concentrations of sodium, magnesium, potassium, and chloride for groups I and III were above the values for group II. It is suspected that water from the spring sources for No. -09, -10, and -11 had been diluted by Colorado River water prior to collection at the points of sampling. Sulfate concentrations confirmed the grouping of springs; however, all concentrations were equally distributed around a flow rate weighted average of 520 mg/L. The grouping pattern was evident in the calcium and bicarbonate concentrations but the dilution effect was not evident. Because of the complex water chemistry between calcium, bicarbonate, and carbonate ions, the dilution effect was not expected to be discernible.

DS water had an average calcium concentration of 260 mg/L (12.96 meq/L). Based on a bicarbonate concentration of 410 mg/L (6.7 meq/L), 135 mg/L or 52 percent of the calcium was in the form of temporary hardness. Calcium could be reduced to 125 mg/L, bicarbonate could be reduced to 0 mg/L, and TDS could be reduced from 9954 to 9415 mg/L by neutralization with lime (calcium hydroxide). The remaining 125 mg/L of calcium was in solution with chloride ion and could be precipitated by treatment with soda ash (sodium carbonate) or ion exchange. Either process would increase TDS back to 9432 mg/L due to displacement of calcium ion from solution by sodium ion. Any further reduction in TDS would require desalting by evaporation, reverse osmosis, or electrodialysis.

Trace Metals

Items 18 through 45 of table 3 show the soluble trace metal cations found in DS water. All the average values in column 15 were less than 0.1 mg/L except for aluminum, fluoride, iron, and strontium. The concentrations of aluminum, fluoride, iron, and strontium were 0.1, 0.5, 0.503, and 2.6 mg/L, respectively. These concentrations are low when compared to most typical natural spring water analyses. In fact, DS water meets toxicity limits for drinking water. Soluble trace metals are compared to drinking water toxicity limits in table 5. All trace metals are lower than limits. Also, nitrate, pesticide, and herbicide values do not exceed limits.

Trace Anions

Except for ammonia with a concentration of 0.2 mg/L, trace anions (items 46 through 51 of table 3) showed concentrations of less than 0.1 mg/L. These anion concentrations are typical of natural spring water.

Radioactivity

Some of the radioactive constituents of DS water including alpha, beta, radium, and strontium, are shown as items 52, 53, 54, and 57, respectively, in tables 3 and 6. The gross alpha radioactivity was estimated as 22 mrem/yr, and the gross beta radioactivity as 18 mrem/yr. Both are well below the Federal Occupational Guide Limits [8] of 5000 mrem/yr. The raw DS water contains 44 pCi/L of gross alpha, 36 pCi/L of gross beta, 2.8 pCi/L of total radium, and 0 pCi/L of total strontium 90. The radioactivity limits for drinking water for these items are 15, 50, 5, and 8 pCi/L, respectively.

Although the gross alpha radioactivity of the raw water exceeds the drinking water limits, the water could be used as a source of drinking water. The treatment necessary to reduce Dotsero's TDS (total dissolved solids) concentration from 10 000 mg/L in the raw water to the 500 mg/L TDS drinking water limit would also remove about 95 percent of the radioactivity from the water.

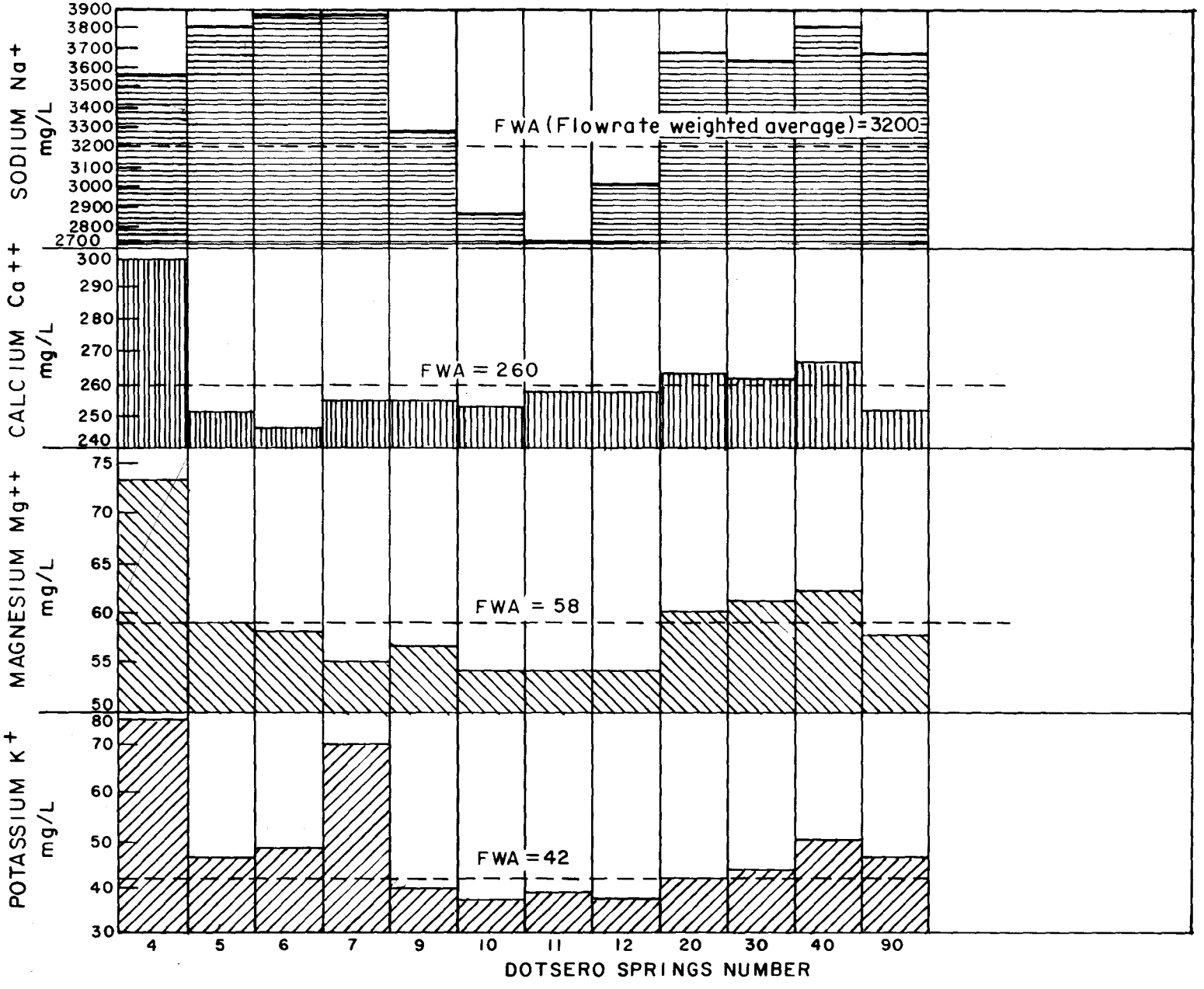

Figure 6.–Dissolved cation concentration of Dotsero spring waters.

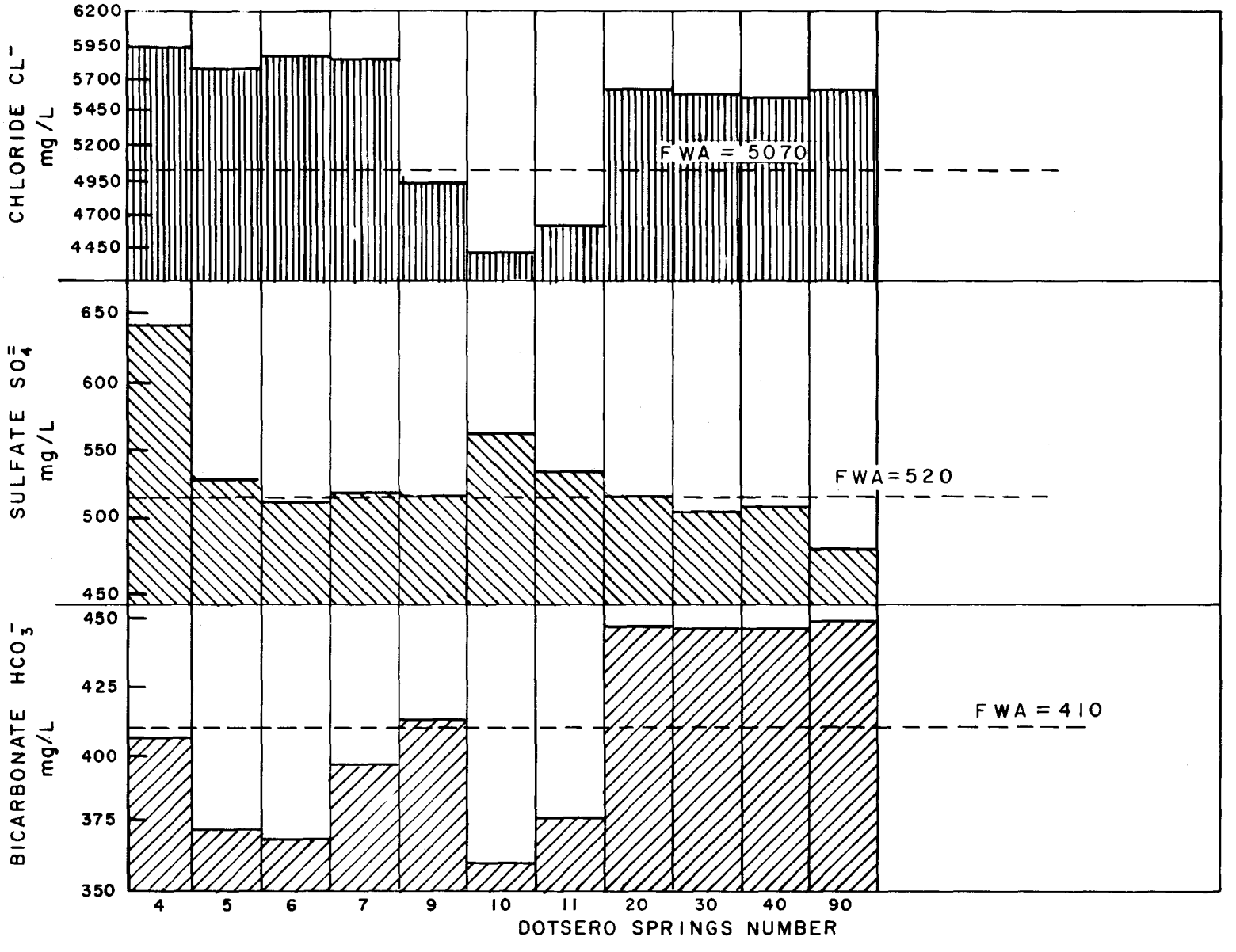

Figure 7.–Dissolved anion concentration of Dotsero spring waters.

Table 5.—*Toxicity levels of raw DS water compared to drinking water standards*

Parameter	Units	Table 1 column (15) values	Drinking water toxicity limits [7]
Arsenic	mg/L	0.005	0.05
Barium	mg/L	0.05	1.0
Cadmium	mg/L	0.001	0.010
Chromium	mg/L	0.03	0.05
Fluoride	mg/L	0.5	2.4
Mercury	mg/L	0.0001	0.002
Nitrates as N	mg/L	<0.05	10
Selenium	mg/L	<0.005	0.01
Silver	mg/L	<0.015	0.05
Endrin	mg/L	<0.0002	0.0002
Lindane	mg/L	<0.004	0.004
Methoxychlor	mg/L	<0.1	0.1
Toxaphene	mg/L	<0.005	0.005
2,4-D	mg/L	<0.1	0.1
2,4-5 TP (Silvex)	mg/L	<0.01	0.01

Table 6.—*DS water radioactivity data and guide limits*

	Activity pCi/L	Estimated yield mrem/yr	Federal Occupational Guide Limits [8] mrem/yr	Drinking water limits pCi/L
Gross alpha	44	22	5000	15
Gross beta	36	18	5000	50
Radium 226 and 228	2.8	–	–	5
Strontium 90	0	–	–	8

Disposal of DS water by evaporation ponding would result in increased radiation exposure to the environment. Assuming complete water evaporation, the salt and radioactivity in the raw water would be concentrated 99 times. If the gross alpha radioactivity concentration in the raw water was 44 pCi/L and if this radioactivity were increased 99 times in the dry salt, then the estimated accumulated body radiation exposure could reach 2180 mrem/yr. This exposure is still below the Federal Occupational Guide Limits of 5000 mrem/yr.

RCRA Considerations

The "Salinity Investigation of Glenwood-Dotsero Springs Unit Phase I Report" [5] proposed various plans for removing approximately 200 000 metric tons/yr (220 000 tons/yr) of salt from the Colorado River Basin. Some of these schemes would isolate and store essentially anhydrous salt from various water evaporation processes. Other schemes would involve lime neutralization of the bicarbonate content of the water with subsequent precipitation, isolation, and storage of calcium carbonate sludge. Since isolation of salts and sludges from DS water would greatly concentrate the toxic metals present in the raw spring water, consideration was given to the potential generation and storage of hazaradous waste covered by RCRA regulations.

The RCRA criteria for hazardous waste classification are compared in table 7 with pollutants that would be present in DS lime treatment sludges. Based on the bicarbonate content of 410 mg/L, partial lime treatment of DS water would precipitate 672 mg/L of calcium carbonate. For every 1000 parts of raw water processed, 1.12 parts of dewatered (60 percent solids) calcium carbonate sludge would result. Assuming all toxic materials coprecipitate with the calcium carbonate, they would concentrate

1000/1.12 or 893 times in the sludge. The EP (extractable product) toxicity limits in column 3 (table 7) are for a 20:1 water extract of a solid waste. Therefore, column 4 (table 7) for EP toxicity was derived by multiplying the values for the items in column 15 (table 1) by 893/20 or 44.7. All the values in column 4 (table 7) are well below the maximum RCRA limits. Consequently, calcium carbonate sludges recovered from lime treatment of DS water will not need to be stored or transported as an RCRA hazardous waste.

DS raw water contains an average TDS concentration of 9954 mg/L or approximately 10 g/1000 mL. The toxic materials in the raw water would be concentrated 1000/10 or 100 times in the 63 000 metric tons/yr (69 000 tons/yr) of dried salt recoverable from DS water. Isolation of all the TDS as 9954 mg/L of dried salt would concentrate toxic materials less than precipitation of only the dissolved 254 mg/L of calcium associated with dissolved bicarbonate as calcium carbonate. Consequently, calcium carbonate sludges and dried salts would not concentrate EP toxicity sufficiently to be classified as hazardous waste.

GLENWOOD SPRINGS WATER

From April 20, 1972, to November 7, 1979, the UCR-GJPO completed a sampling and analysis program to characterize the 15 Glenwood springs. Physical properties determined included pH, temperature, conductivity, TDS, and turbidity. Concentrations of soluble cations and anions were determined for calcium, magnesium, sodium, potassium, bicarbonate, chloride, and sulfate. Table 8 shows the sampling period and number of samples analyzed for each spring.

The mean values expressed in different measurement units are included in table 9. All other data in table 9 are from references [2] and [4]. The data shown are for the 15 identified springs although the average values shown in column 19 of table 9 were calculated from only 14 of these. The values for spring Glen-115 were not used.

Physical Properties

The PIQR [2] showed all GS springs are located in Leadville limestone strata. The values of items 1 through 5 are plotted on figure 8 for each spring. The pH ranged from 6.6 to 7.6 and averaged 7.0. Conductivity ranged from 2440 mS/m for Glen-80 to 3260 mS/m for Glen-90 and averaged 2870 mS/m. Temperature ranged 25 to 51 °C (77 °F to 124 °F).

Continuing to refer to figure 8 and item 2 (table 9), the flow rate ranged from 0.0028 m^3/s (44.4 gal/min) for Glen-30, -50, -76, and -78 to 0.096 m^3/s (1522 gal/min) for Glen-70. The

Table 7.—*Comparison of DS sludge and dried salt with RCRA maximum limits*

(1) Table 2 item	(2) Parameter	(3) RCRA hazardous waste criteria [9] (20:1 extract)	(4) Pretreatment sludge (20:1 extract)
EP Inorganic Toxicity (max. conc.), mg/L			
20	Arsenic	5.0	0.22
21	Barium	100.0	2.2
23	Cadmium	1.0	0.045
24	Chromium	5.0	1.3
32	Lead	5.0	<1.0
35	Mercury	0.2	0.005
37	Selenium	1.0	<0.2
38	Silver	5.0	<0.7
EP Organic Toxicity (max. conc.), mg/L			
61	Endrin	0.02	<0.009
62	Lindane	0.04	<0.02
63	Methoxychlor	10.0	<4.5
64	Toxaphene	0.5	<0.2
65	2,4-D	10.0	<0.45
66	2,4-5 TP	1.0	<0.45

Table 8.—*Glenwood Springs sampling dates and number of samples*

Spring identity	Sample period	Number of samples analyzed
Glen-10	April 20, 1972 to November 7, 1979	32
Glen-12	December 15, 1978 to November 7, 1979	4
Glen-20	April 22, 1972 to November 7, 1979	19
Glen-30	April 20, 1972 to February 23, 1977	23
Glen-40	April 20, 1972 to February 23, 1977	23
Glen-30 & -40	September 29, 1977 to November 7, 1979	7
Glen-50	April 21, 1972 to November 7, 1979	32
Glen-60	April 21, 1972 to November 7, 1979	32
Glen-70	April 21, 1972 to November 6, 1979	33
Glen-76	June 17, 1976 to November 6, 1979	19
Glen-78	September 7, 1979 to November 6, 1979	1
Glen-80	April 21, 1972 to November 6, 1979	28
Glen-90	April 21, 1972 to November 6, 1979	32
Glen-100	April 21, 1972 to November 6, 1979	31
Glen-115	April 20, 1972 to August 7, 1978	26

combined flow rate of the 14 identified springs was 0.296 m^3/s (4692 gal/min). The contribution of each spring to total flow has been summarized in table 10. Springs No. 60 and 70 contributed 61.2 percent of the total flow. Glen-70 is located on the right bank, and Glen-60 is located on the left bank of the Colorado River above the Roaring Fork confluence (fig. 4). Springs No. 30, 50, 76, and 78 are very slow flows and contribute only 4 percent to the total flows. Springs No. 10, 12, 20, 40, 30-40, 80, 90, 100, and 115 contribute the remaining 34.8 percent of the flow.

Referring to figure 8 and item 4 (table 9), the TDS ranged from 16 700 mg/L for Glen-70 and -80 to 21 800 mg/L for Glen-90. The other springs ranged in concentration from 18 100 to 20 200 mg/L. The flow rate weighted average value of TDS for 14 identified springs was 18 780 mg/L. Spring No. 115 emerged in the river and samples apparently were highly diluted with river water. Consequently, the TDS values and other values for spring No. 115 were not included in the average for the other 14 springs.

A combined flow of 0.296 m^3/s (4692 gal/min) or 9.34 x 10^6 m^3/yr (7570 acre-ft/yr) emerged from the 14 identified Glenwood springs and mixed with the Colorado River water. The flow rate weighted average TDS content was 18 780 mg/L or 0.0187 metric ton/m^3 (0.00583 ton/ft^3). Therefore, the combined flow of the 14 identified springs adds 174 700 metric tons/yr (192 170 tons/yr) of salt load to the Colorado River.

Major Constituents

Items 10 through 17 of table 9 are the average values for soluble salt cations and anions. Dissolved cation concentration of each of the 14 identified springs is plotted as figure 9, and anion concentrations are plotted as figure 10. Cation and anion concentrations do not relate to any spring location grouping as was the case of the Dotsero Springs. The flow weighted averages for all the spring flows are randomly distributed around the average values of springs Glen-60 and -70, which are apparent from examination of figures 9 and 10 and table 11.

GS water has an average calcium concentration of 470 mg/L. Based on a bicarbonate concentration of 706 mg/L, 49 percent of the calcium (232 mg/L) is in the form of temporary hardness. Calcium could be reduced to 238 mg/L, bicarbonate could be reduced to 0 mg/L, and TDS could be reduced from 18 780 mg/L to 17 836 mg/L by neutralization with lime. The remaining 238 mg/L of calcium in solution with chloride could be removed from solution by treatment with soda ash or ion exchange. Either process would increase TDS to 17 876 mg/L due to substitution for calcium in solution by sodium ion. Any further reduction in TDS would require desalting by evaporation, reverse osmosis, or electrodialysis.

Trace Metals

Items 18 through 45 of table 9 are the soluble trace metal cations found in GS water. All the average

Table 9.—*Chemical and physical characteristics of Glenwood Springs water*[1]

(1) Item	(2) Characteristic	(3) Units	(4) Glen 2/ 10	(5) Glen 12	(6) Glen 20	(7) Glen 30	(8) Glen 40	(9) Glen 30-40	(10) Glen 50	(11) Glen 60	(12) Glen 70	(13) Glen 76	(14) Glen 78	(15) Glen 80	(16) Glen 90	(17) Glen 100	(18) Glen 3/ 115	(19) Average	(20) RCRA EP 4/ limits	(1) Item
Samples Analyzed			32	4	19	23	23	7	32	32	33	19	1	28	32	31	26	316		
Physical Properties																				
1	Conductivity at 25 °C	mS/m	3 040	3 060	2 820	2 840	2 850	2 820	2 890	2 940	2 640	2 830	2 780	2 440	3 260	2 970	140	8/ 2 870		1
2	Flow	m^3/s	0.011	0.0084	0.022	0.0028	0.0057	0.0020	0.0028	0.085	0.096	0.0028	0.0028	0.0057	0.0085	0.014	0.0085	5/ 0.296		2
3	pH	-	6.9	6.6	6.8	7.0	7.1	6.9	7.0	6.6	7.2	7.3	6.7	7.4	7.0	6.8	7.6	7.0		3
4	TDS (total dissolved solids) 10/	mg/L	18 932	19 600	18 114	18 116	18 350	18 283	18 224	19 354	16 674	20 233	18 567	16 670	21 847	19 952	778	18 780		4
5	Temperature	°C	50	49	51	51	50	51	50	50	36	27	25	28	41	38	46	6/ 51		5
6	Total suspended solids	mg/L						12		18							5	6/ 18		6
7	Turbidity	NTU						0.96		0.30							0.96	6/ 0.96		7
8	Water bearing unit	LL 7/																LL 7/		8
Major Constituents																				
9	Alkalinity as $CaCO_3$	mg/L	632		611			617	610	632				583	769	720	2 485	620		9
10	Calcium	mg/L	468	477	448	455	455	442	443	494	419	713	670	8 227	11 167	10 204	8.7	8/ 470		10
11	Chloride	mg/L	10 357	10 646	9 895	9 890	9 955	9 842	9 822	10 904	9 064	10 460	9 240	499	711	711	298	8/ 706		11
12	Bicarbonate	mg/L	764	772	725	703	683	706	700	750	646	630	720	118	139	133	1.40	8/ 91		12
13	Magnesium	mg/L	85	86	83	83	83	78	73	82	78	136	119	140	185	167	7.1	8/ 169		13
14	Potassium	mg/L	185	200	163	162	164	156	160	162	151	167	201				4.1	29		14
15	Silica	mg/L	29		30			27	28	29				5 217	7 260	6 646	286	8/ 6 458		15
16	Sodium	mg/L	6 550	6 900	6 329	6 434	6 461	6 171	6 406	6 629	5 860	6 782	6 031	1 629	2 142	1 990	101	8/ 1 200		16
17	Sulfate	mg/L	1 088	1 191	1 069	1 153	1 136	1 319	1 119	1 146	1 052	1 977	1 772							17
Trace Metals 1/ [2]																				
18	Aluminum	mg/L			0.650			0.500		0.235							0.075	0.46		18
19	Antimony	mg/L						0.02		0.046							<0.005	0.033		19
20	Arsenic	mg/L						0.002		0.017							0.002	0.02	5.0	20
21	Barium	mg/L																1/ 0.12 [4]	100.0	21
22	Boron	mg/L																1/ 0.9 [4]		22
23	Cadmium	mg/L			0			<0.010	0	0.010							0.001	0.01	1.0	23
24	Chromium	mg/L			<0.090			0.050		0.06							0.033	0.067	5.0	24
25	Cobalt	mg/L			<0.090			0.080		0.055							0.033	0.075		25
26	Copper	mg/L			<0.020			0.040		0.050							0.023	0.037		26
27	Fluoride	mg/L	2.2		2.1			2.2	1.9	2.35							3.7	2.2		27
28	Gallium	mg/L			<0.040			0.040		<0.050							<0.003	0.043		28
29	Germanium	mg/L			<0.090			0.090		<0.100							<0.005	0.093		29
30	Iodide	mg/L						0.01		0.155							0.01	0.083		30
31	Iron	mg/L	0.030		0.030			0.070	0.080	0.059							0.16	0.054		31
32	Lead	mg/L			<0.090			0.048		0.053							<0.005	0.064	5.0	32
33	Lithium	mg/L			0.800			0.830	0.670	0.85							0.150	0.78		33
34	Manganese	mg/L	0.075		0.070			0.064	0.070	0.080							0.053	0.072		34
35	Mercury	mg/L			0			<0.0001	0	<0.0001							<0.0001	<0.0001	0.2	35
36	Nickel	mg/L			<0.090			0.075		0.055							0.028	0.073		36
37	Selenium	mg/L			0			0.011	0	0.013							<0.005	0.012		37
38	Silver	mg/L			<0.009			0.015		0.015							<0.020	0.013	1.0	38
39	Strontium	mg/L								9.2							0.220	9.2	5.0	39
40	Tin	mg/L			<0.090			<0.090		<0.150							<0.005	<0.11		40
41	Titanium	mg/L			<0.040			<0.040		<0.050							<0.003	<0.043		41
42	Uranium	mg/L						0.006		0.006							<0.001	0.006		42
43	Vanadium	mg/L			<0.040			<0.040		<0.050							<0.005	<0.043		43
44	Zinc	mg/L			0.010			0.035	0.020	0.030							0.007	0.024		44
45	Zirconium	mg/L			<0.140			<0.140		<0.200							<0.008	<0.14		45
Trace Anions 1/ [2]																				
46	Ammonia	mg/L						0.5		0.9							0.3	0.7		46
47	Nitrite	mg/L						<0.05		<0.05							<0.05	0.05		47
48	Nitrate	mg/L						<0.05		0.09							<0.05	0.07		48
49	Nitrogen	mg/L	0.01		0.01			0.07	0.1	0.01							0.06	0.02		49
50	Orthophosphate	mg/L	0.04		0.03			0.03	0.03	0.04							0.01	0.034		50
51	Total phosphate	mg/L	0.12		0.09			0.09	0.09	0.12							0.04	0.10		51
Radioactivity 1/ [2]																				
52	Gross alpha	pCi/L						85 ± 61		115 ± 66						100 ± 113	4 ± 3	100 ± 80		52
53	Gross beta	pCi/L						132 ± 76		195 ± 79						350 ± 140	8 ± 12	226 ± 98		53
54	Total Ra	pCi/L						28 ± 6		68 ± 7						24 ± 5		40 ± 6		54
55	226 Ra	pCi/L						28 ± 5		28 ± 5						9.0 ± 3.1	1.2 ± 0.17	22 ± 4		55
56	228 Ra	pCi/L						18 ± 3		40 ± 5						15 ± 4	0.65 ± 0.62	24 ± 4		56
57	Total K	pCi/L						140		140						140		140		57
58	40 K	pCi/L						120		120						120		120		58
59	90 Sr	pCi/L						0.4 ± 0.8		0.4 ± 0.7						0.4 ± 0.8		Nil		59
60	210 Bi	pCi/L						-1.1 ± 2.2		<1.3 ± 1.6						0.8 ± 1.7		Nil		60
61	210 Pb	pCi/L						0.1 ± 3.1		0.5 ± 2.0						0.5 ± 2.0		Nil		61
Organic Compounds 1/ [4]																				
62	Total organics	mg/L																	1/ 3 [4]	62
	Pesticide:																			
63	Endrin	mg/L						9/ <0.0002										<0.0002	0.02	63
64	Lindane	mg/L						9/ <0.004										<0.0004	0.4	64
65	Methoxychlor	mg/L						9/ <0.10										<0.10	10.0	65
66	Toxaphene	mg/L						9/ <0.005										<0.005	0.5	66
	Herbicide:																			
67	2,4-D	mg/L						9/ <0.10										<0.10	10.0	67
68	2,4-5 TP (Silvex)	mg/L						9/ <0.01										<0.01	1.0	68

1/ All data provided by Upper Colorado Region for water samples taken April 10, 1972 through November 7, 1979, except as noted for references [2] and [4].
2/ Number assigned to identified spring.
3/ Physical properties and major constituents not included in column (19).
4/ The EP (extractable product) toxicity limits are for a 20:1 water extract of a solid waste.
5/ Summation of flow rate for 15 springs.
6/ Maximum measured values.
7/ All identified Glenwood springs are located in Leadville limestone.
8/ Flow rate weighted averages.
9/ Analysis previously not reported.
10/ TDS by evaporation at 105 °C to constant weight.

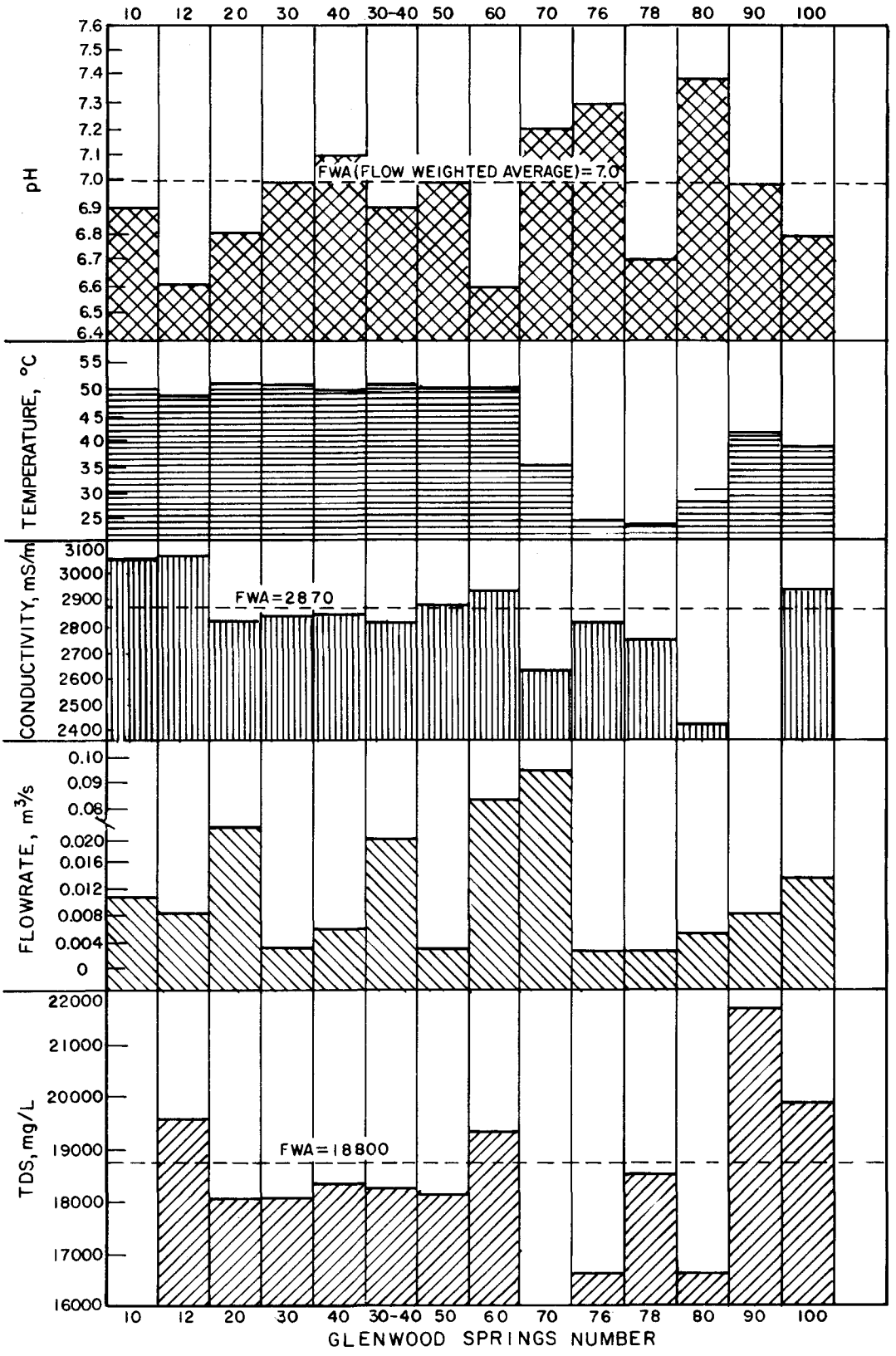

Figure 8.–Physical propertes of Glenwood spring waters.

Table 10.—*Contribution of each Glenwood Spring to the total flow*

Spring No.	Flow m^3/s	Flow ft^3/s	Percent flow
10	0.011	0.389	3.7
12	0.0084	0.297	2.8
20	0.022	0.777	7.4
30	0.0028	0.099	1.0
40	0.0057	0.201	1.9
30-40	0.020	0.707	6.8
50	0.0028	0.099	1.0
60	0.085	3.003	28.8
70	0.096	3.391	32.4
76	0.0028	0.099	1.0
78	0.0028	0.099	1.0
80	0.0057	0.201	1.9
90	0.0085	0.300	2.8
100	0.014	0.495	4.7
115[1]	0.0085	0.300	2.8
All	0.296	10.457	100.0

[1] Spring No. 115 is highly diluted with river water.

values in column 19 are less than 0.1 mg/L except for aluminum, barium, boron, fluoride, lithium, strontium, and zirconium. Zirconium concentration is suspected to be less than 0.1 mg/L but was detected at an analytical precision of less than 0.14 mg/L. These cation concentrations are low when compared to most typical natural spring water analyses. The GS water exceeds or approches drinking water toxicity limits for cadmium, chromium, fluoride, and selenium. However, this would not exclude processing GS water into drinking water. To meet drinking water standards for TDS limits, GS water will require considerable pretreatment and desalting. Lime-soda ash or lime-ion exchange followed by reverse osmosis or electrodialysis would produce water with cadmium, chromium, fluoride, mercury, and selenium well below drinking water toxicity limits (table 12).

Trace Anions

Except for ammonia with a concentration of 0.7 mg/L, trace anions, items 46 through 51 of table 9, are at concentrations of 0.1 mg/L or less. These anion concentrations are typical of natural spring water.

Radioactivity

Some of the radioactive constituents of GS water, including alpha, beta, radium, and stontium, are shown as items 52, 53, 54, and 59 of table 9 and in table 13. The gross alpha radioactivity was estimated as 50 mrem/yr, and the gross beta radioactivity as 112 mrem/yr. Both are well below the Federal Occupational Guide Limits [8] of 5000 mrem/yr. The raw GS water contains 100 pCi/L of gross alpha, 226 pCi/L of gross beta, 400 pCi/L of total radium, and a nil amount of strontium 90. The radioactivity limits for drinking water for these items are 15, 50, 5, and 8 pCi/L, respectively.

Although the gross alpha, gross beta, and radium radioactivity exceed the drinking water limits, the water could be used as a source of drinking water. The treatment necessary to reduce Glenwood's TDS concentration from 20 000 mg/L in the raw water to the 500 mg/L TDS drinking water limit would also remove about 97.5 percent of the radioactivity from the water.

Disposal of GS water by evaporation ponding would result in an increased radiation exposure to the environment. Assuming complete water evaporation, the salt and radioactivity concentration in the raw water would be concentrated 49 times. If the gross alpha radioactivity concentration in the raw water was 100 pCi/L and the gross beta concentration was 226 pCi/L, and if these were radioactivities increased 49 times in the dry salt, then the estimated accumulated body radiation exposure could reach 2450 mrem/yr for gross alpha and 5490 mrem/yr for gross beta. Dry salt produced directly from raw GS water could exceed Federal Occupational Guide Limits of 5000 mrem/yr for gross beta radioactivity.

RCRA Considerations

The "Salinity Investigation of Glenwood-Dotsero Springs Unit Phase I Report" [5] proposed various plans for removing approximately 180 000 metric tons/yr (198 000 t/yr) of salt from the Colorado River Basin. Some of these schemes would isolate and store essentially anhydrous salt from various water evaporation processes. Other schemes would involve lime neutralization of the bicarbonate content of the water with subsequent precipitation, isolation, and storage of calcium carbonate sludge. Isolation of salts and sludges from GS water would greatly concentrate the toxic metals present in the raw springs water. Handling and storage of these salts and sludges require consideration be given to generation and storage of hazardous waste covered by RCRA regulations.

The RCRA maximum criteria for hazardous waste classifications are compared in table 14 with pollutants that would be present in GS lime treatment sludges. Based on the bicarbonate content of

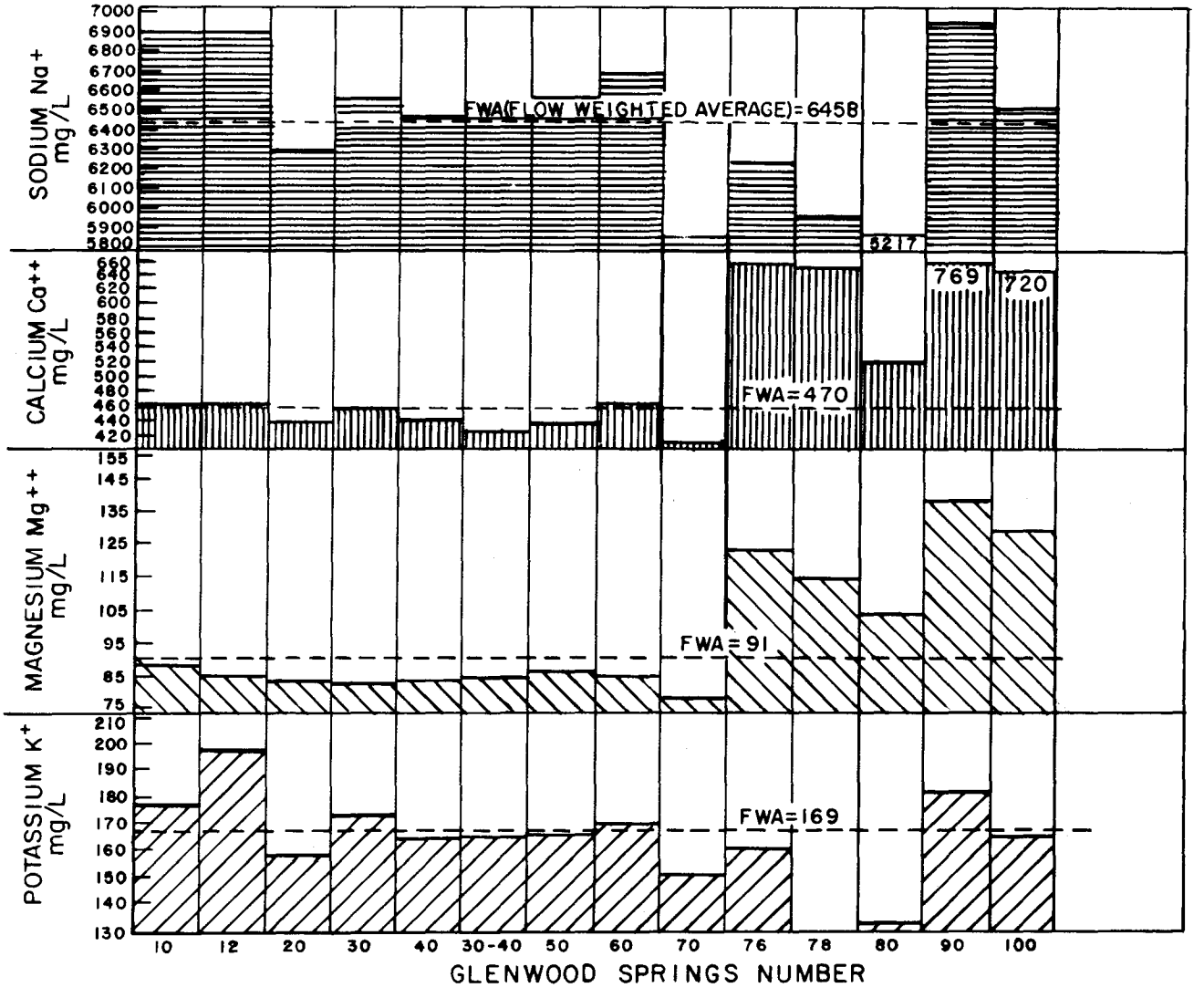

Figure 9.–Dissolved cation concentration of Glenwood spring waters.

706 mg/L, partial lime treatment of GS water would precipitate 1170 mg/L of calcium carbonate. For every 1000 parts of raw water processed, 1.95 parts of dewatered (60 percent solids) calcium carbonate sludge would result. Assuming all toxic materials coprecipitate with the calcium carbonate, they would concentrate 1000/1.95 or 513 times in the sludge. The EP (extractable product) toxicity limits in column 3 (table 14) are for a 20:1 water extract of a solid waste. Therefore, column 4 (table 14) for EP toxicity was derived by multiplying the values for the items in column 19 (table 6) by 513/20 or 25.7. All the values in column 4 (table 14) are well below the maximum RCRA limits in column 3 (table 14). Consequently, calcium carbonate sludges recovered from lime treatment of GS water would not need to be stored or transported as an RCRA hazardous waste.

GS raw water contains an average TDS concentration of 18 780 mg/L or approximately 20 g/1000 mL. If the TDS in GS water were isolated, approximately 174 700 metric tons/yr (192 170 t/yr) of dried salt would result, and the toxic materials in the raw water would be concentrated 1000/20 or 50 times. Isolation of all the TDS as 18 780 mg/L of dried salt would concentrate toxic materials less than precipitation of only the dissolved 470 mg/L of calcium associated with dissolved bicarbonate as calcium carbonate. Consequently, calcium carbonate sludges and dried salts are not RCRA hazardous waste.

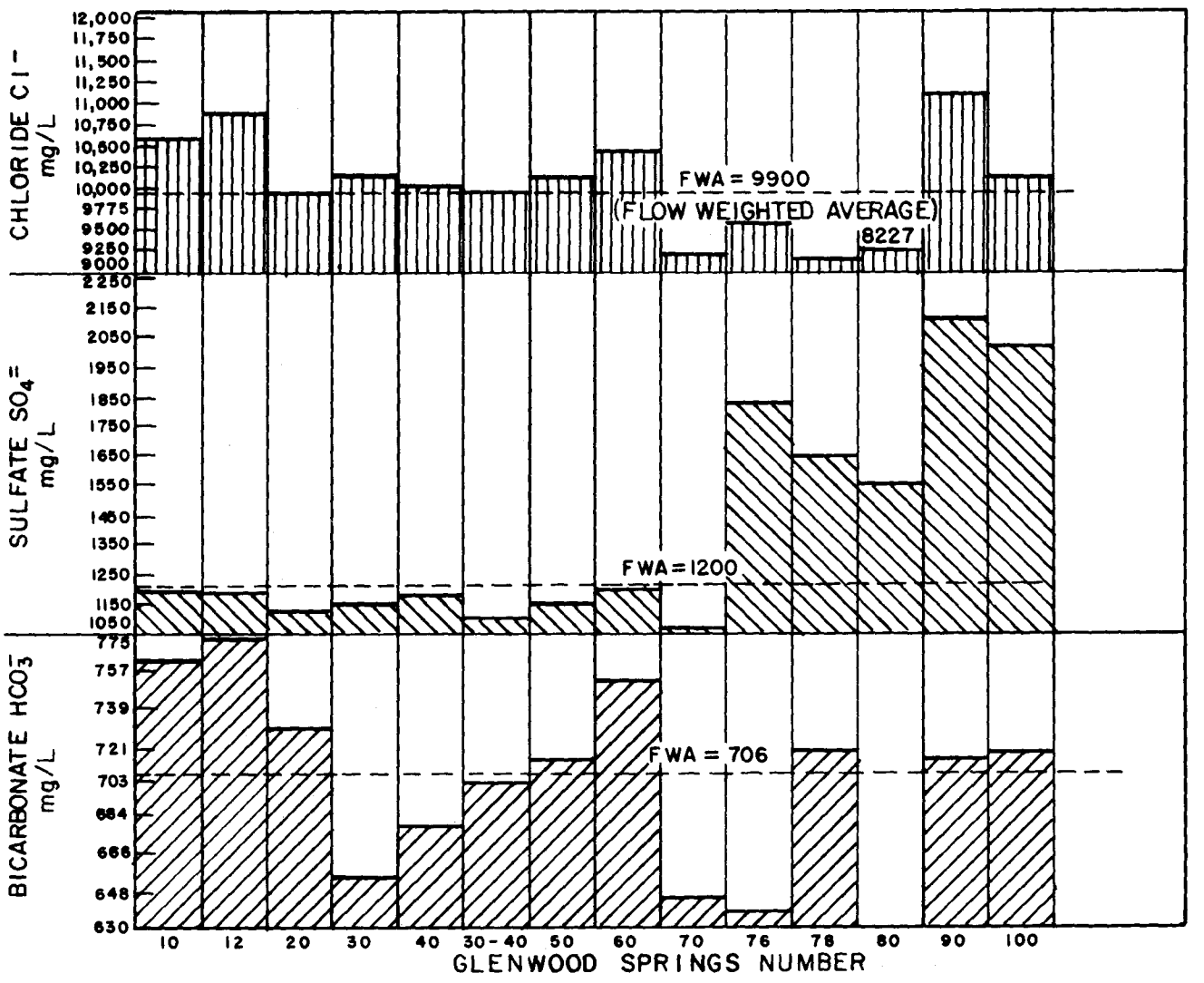

Figure 10.–Dissolved anion concentration of Glenwood spring waters.

Table 11.–*Flow weighted average values for major constituents, Glenwood Springs*

Parameter	Units	Spring Glen-60	Spring Glen-70	Flow weighted average
Calcium	mg/L	494	494	470
Chloride	mg/L	10 904	9 064	9 900
Bicarbonate	mg/L	750	646	706
Magnesium	mg/L	82	78	91
Potassium	mg/L	162	151	169
Sodium	mg/L	6 629	5 860	6 458
Sulfate	mg/L	1 146	1 052	1 200

Table 12.—*Toxicity levels of raw GS water compared to drinking water standards*

Parameter	Units	Table 9 column (19) values	Drinking water toxicity limits [7]
Arsenic	mg/L	0.02	0.05
Barium	mg/L	0.12	1.0
Cadmium	mg/L	0.01	0.010
Chromium	mg/L	0.067	0.05
Fluoride	mg/L	2.2	2.4
Mercury	mg/L	<0.0001	0.002
Nitrates as N	mg/L	0.07	10
Selenium	mg/L	0.012	0.01
Silver	mg/L	0.013	0.05
Endrin	mg/L	<0.0002	0.0002
Lindane	mg/L	<0.004	0.004
Methoxychlor	mg/L	<0.1	0.1
Toxaphene	mg/L	<0.005	0.005
2,4-D	mg/L	<0.1	0.1
2,4-5 TP (Silvex)	mg/L	<0.01	0.01

Table 13.-*GS water radioactivity data and guide limits*

	Activity pCi/L	Estimated yield mrem/yr	Federal Occupational Guide Limits mrem/yr	Drinking water limits pCi/L
Gross alpha	100	50	5000	15
Gross beta	226	112	5000	50
Radium 226 and 228	40	—	—	5
Strontium 90	nil	—	—	8

Table 14.—*Comparison of GS sludge and dried salt with RCRA maximum limits*

(1) Table 6 item	(2) Parameter	(3) RCRA hazardous waste criteria [9] (20:1 extract)	(4) Pretreatment sludge (20:1 extract)
EP Inorganic Toxicity (max. conc.), mg/L			
20	Arsenic	5.0	0.5
21	Barium	100.0	3.1
23	Cadmium	1.0	0.3
24	Chromium	5.0	1.7
32	Lead	5.0	1.6
35	Mercury	0.2	<0.003
37	Selenium	10	0.3
38	Silver	5.0	0.3
EP Organic Toxicity (max. conc.), mg/L			
63	Endrin	0.02	<0.005
64	Lindane	0.04	<0.01
65	Methoxychlor	10.0	<2.6
66	Toxaphene	0.5	<0.13
67	2,4-D	10.0	<2.6
68	2,4-5 TP	1.0	<0.3

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[3] "Glenwood-Dotsero Springs Unit, Colo., Plan Formulation Draft Appendix," Colorado River Water Quality Improvement Program, Bureau of Reclamation, Upper Colorado Region, Project Office, Grand Junction, Colo., December 1981.

[4] Eisenhauer, R. J., "Characteristics and Applications of Big Sandy, Glenwood Springs, and Dotsero Springs Waters in Energy Development," Report No. REC-ERC-82-12, Bureau of Reclamation, Denver, Colo., 27 pp., July 1982.

[5] URS Corporation, "Final Report Phase I Salinity Investigation of Glenwood-Dotsero Springs Unit," Contract No. 0-07-40-S1359, Bureau of Reclamation, Grand Junction, Colo., March 24, 1982.

[6] "Special Report – Saline Water Use and Disposal Opportunity," Colorado River Water Quality Improvement Office, Bureau of Reclamation, Denver, Colo., September 1981.

[7] "National Secondary Drinking Water Regulations," Environmental Protection Agency, Office of Drinking Water, Washington, D.C. 20460, EPA-570/9-76-000, 37 pp., July 1979.

[8] "Drinking Water Regulations–Radionuclides," Environmental Protection Agency, Federal Register, Friday, July 9, 1979.

[9] "Hazardous Waste and Consolidated Permit Regulations," Environmental Protection Agency, Federal Register, Monday, May 19, 1980.

Note: From November 1979 to May 1981, the Bureau of Reclamation was known as the Water and Power Resources Service; consider the names synonymous in this bibliography.

APPENDIX A

DOT-5
N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
5 31 72	7.70	85.	12000.	.0	10800.	.9		12.97	4.85	160.00	.90	0.00	.69	166.00	12.00
7 11 72	7.60	89.	18500.	.1	10800.	2.4		13.00	5.40	165.00	1.10	0.00	6.72	167.00	13.25
8 2 72	7.60	86.	17800.	.1	10600.	1.6		12.00	4.70	165.00	1.00	0.00	6.20	163.00	13.00
8 30 72	7.70	90.	17800.	.0	10600.	.4		12.60	4.90	163.00	1.10	0.00	6.56	163.00	11.25
10 4 72	7.60	89.	17800.	.0	10800.	.4		12.30	4.70	165.00	1.10	0.00	6.12	171.00	10.75
11 8 72	7.70	84.	17200.	.0	10600.	.4		12.00	4.80	164.00	1.20	0.00	5.77	160.00	12.40
12 4 72	7.80	81.	18100.	.0	10400.	.3		9.30	4.70	165.00	1.10	0.00	3.24	162.00	12.00
1 15 73	7.60	81.	17800.	.0	10500.	.3		12.50	4.50	160.00	1.20	0.00	6.66	165.00	11.25
2 13 73	7.80	85.	17600.	.0	10700.	.4		12.50	4.90	162.00	1.10	0.00	6.32	165.00	15.20
3 12 73	7.60	85.	17600.	.0	10500.	.4		12.80	4.70	161.00	1.00	0.00	6.76	163.00	10.30
4 9 73	7.60	84.	17700.	.0	10700.	.5		12.80	4.70	163.00	1.10	0.00	6.65	163.00	11.10
5 7 73	8.00	81.	17700.	.0	10500.	.4		9.30	4.70	170.00	1.10	0.00	3.13	165.00	11.40
6 22 76	7.60	90.	17451.	.1	10600.	1.7	.50	12.50	4.60	162.00	1.00	0.00	6.56	163.00	10.38
7 23 76	7.50	80.	17790.	.1	10700.	1.4	.41	12.70	4.60	160.00	1.00	0.00	6.60	161.00	11.77
8 20 76	7.50	88.	19170.	.0	10700.	1.2	.70	12.40	4.80	170.00	1.00	0.00	6.46	166.00	11.98
9 14 76	7.60	82.	18822.	.1	10600.	1.4	.50	11.80	4.80	170.00	1.00	0.00	6.44	164.00	12.20
10 28 76	7.70	72.	18403.	.1	10500.	2.3	1.00	12.60	4.90	173.00	1.20	0.00	6.50	175.00	9.84
11 11 76	7.60	74.	17037.	.0	10200.	.8	1.30	12.60	4.80	163.00	1.00	0.00	6.54	160.00	11.77
12 7 76	7.60	70.	17808.	.1	10700.	2.3	.50	12.20	4.80	166.00	.90	0.00	5.96	164.00	11.24
1 12 77	7.70	62.	17817.	.1	10500.	3.4	1.10	12.70	4.80	168.00	1.10	0.00	6.45	172.00	10.91
2 22 77	7.70	68.	18460.	.1	11000.	2.7	1.00	12.80	4.90	170.00	1.40	0.00	6.25	170.00	11.54
4 28 77	7.90	80.	18035.	.1	10700.	1.4		12.10	4.70	174.00	2.00	0.00	6.49	172.00	11.23
6 7 77	7.80	78.	17704.	.0	10000.	.5		12.40	4.90	162.00	1.20	0.00	6.26	172.00	11.12
7 27 77	7.40	78.	18182.	.0	10600.	.9		12.80	4.70	164.00	1.20	0.00	6.90	172.00	10.61
9 28 77	7.20	82.	17960.	.0	10600.	.9		12.80	5.00	162.00	1.00	0.00	6.29	168.00	12.69
1 10 78	7.60	66.	17730.	.0	10600.	.4		12.90	4.90	162.00	1.20	0.00	6.67	164.00	10.50
3 30 78	8.30	58.	17960.	.0	10800.	.6		12.80	5.00	164.00	1.20	0.00	6.59	168.00	10.40
5 8 78	7.40	60.	16801.	.0	0.	0.0									
8 4 78	7.60	70.	16728.	.0	0.	0.0									
10 5 78	7.10	66.	17902.	.1	11000.	1.5		13.30	4.80	162.00	1.40	0.00	8.46	170.00	10.40
12 14 78	7.20	46.	17593.	.0	10700.	.9		12.90	4.90	154.00	.80	0.00	6.86	157.00	11.75
3 13 79	7.20	70.	17593.	.1	10800.	1.5		12.90	4.80	164.00	1.20	0.00	7.41	164.00	10.40
5 21 79	7.04	79.	18161.	.0	0.	0.0									
7 6 79	7.80	88.	17544.	.1	0.	0.0									
9 6 79	7.50	80.	17893.	.1	10700.	1.4		11.60	4.80	166.00	2.20	0.00	5.28	168.00	10.82
11 7 79	7.70	88.	18215.	.1	0.	0.0									
MEAN	7.61	78.	17707.	.0	10629.	1.1	.78	12.35	4.81	164.48	1.16	0.00	6.12	165.90	11.47
STD DEV	.24	10.	1143.	.0	199.	.8	.33	.90	.16	4.20	.28	0.00	1.41	4.29	1.09
MIN	7.10	46.	12000.	.0	10000.	.3	.41	9.30	4.50	154.00	.80	0.00	.69	157.00	9.84
MAX	8.30	90.	19170.	.1	11000.	3.4	1.30	13.30	5.40	174.00	2.20	0.00	8.46	175.00	15.20
FLOW WEIGHTED MEAN					10665.			12.50	4.83	165.75	1.18	0.00	6.32	167.01	11.40

DOT-6
N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
5 31 72	7.80	75.	12400.	.0	11200.	1.0		12.57	4.55	172.00	1.00	0.00	.56	176.00	12.30
7 11 72	7.80	76.	18500.	.1	11300.	2.7		12.30	4.80	178.00	1.20	0.00	5.42	183.00	14.25
8 2 72	7.70	75.	18400.	.0	11100.	.6		11.50	4.80	175.00	1.10	0.00	5.91	176.00	12.25
8 30 72	7.70	87.	18100.	.0	10900.	1.3		11.10	4.90	169.00	1.20	0.00	5.03	174.00	12.50
10 4 72	7.80	83.	18100.	.0	11100.	1.2		12.20	4.90	170.00	1.20	0.00	6.16	177.00	11.75
11 4 72	7.50	82.	19500.	.0	10800.	.5		11.60	4.70	170.00	1.10	0.00	5.44	173.00	11.25
12 4 72	7.60	77.	17500.	.0	10500.	.1		11.40	4.70	166.00	1.10	0.00	5.67	163.00	11.25
1 15 73	7.60	76.	18100.	.0	10500.	.4		11.20	4.60	162.00	1.10	0.00	5.32	166.00	13.00
2 13 73	7.60	74.	17800.	.0	10700.	.3		11.60	4.90	164.00	1.10	0.00	5.47	168.00	11.60
3 12 73	7.80	74.	17900.	.0	10700.	.2		12.50	4.80	165.00	1.10	0.00	6.36	168.00	10.70
4 9 73	7.70	74.	17900.	.0	10800.	.6		12.00	4.80	165.00	1.10	0.00	5.84	170.00	10.60
5 7 73	7.70	73.	17800.	.0	10700.	.1		11.60	4.70	168.00	1.10	0.00	5.77	170.00	12.20
6 22 76	7.60	80.	17451.	.0	10600.	.4	.80	12.80	4.60	164.00	1.06	0.00	6.72	163.00	11.24
7 23 76	7.60	88.	17790.	.0	10600.	.4	.85	12.70	4.60	162.00	1.00	0.00	6.80	163.00	12.20
8 20 76	7.50	90.	18486.	.0	10500.	.4	4.50	12.60	4.60	165.00	1.10	0.00	6.78	164.00	10.49
9 14 76	7.30	88.	18161.	.0	10600.	.4	1.00	12.00	4.80	164.00	1.00	0.00	6.75	164.00	11.56
10 28 76	7.40	78.	17756.	.0	10600.	.6	1.00	12.60	4.80	171.00	1.00	0.00	6.76	173.00	10.49
11 11 76	7.40	78.	17966.	.0	10300.	.4	30.00	12.80	4.80	162.00	1.00	0.00	6.78	160.00	10.70
12 7 76	7.50	74.	17783.	.0	10600.	.9	.39	12.80	4.80	165.00	1.00	0.00	6.74	164.00	11.98
1 12 77	7.50	72.	17787.	.1	10500.	1.7	.15	12.70	4.80	167.00	1.10	0.00	6.65	174.00	10.91
2 22 77	7.60	80.	17552.	.0	10700.	.9	.90	12.70	4.70	166.00	1.40	0.00	6.65	165.00	10.92
4 28 77	7.50	76.	18035.	.0	10500.	.3		11.10	4.80	162.00	1.40	0.00	5.42	176.00	10.40
6 7 77	7.60	81.	17382.	.0	10200.	.3		12.40	4.80	162.00	1.20	0.00	6.70	16.80	10.71
7 27 77	7.50	86.	18182.	.0	10500.	.4		12.80	4.70	164.00	1.00	0.00	6.70	160.00	10.50
9 28 77	8.10	85.	17361.	.0	10600.	.4		13.00	4.80	162.00	1.20	0.00	6.68	160.00	11.86
1 10 78	7.50	70.	17730.	.0	10600.	.6		12.50	4.60	164.00	1.00	0.00	6.47	164.00	10.30
3 30 78	7.70	74.	17960.	.0	10700.	.3		12.70	4.90	162.00	1.20	0.00	6.54	168.00	10.61
5 8 78	7.50	74.	17077.	.0	0.	0.0									
8 4 78	7.50	84.	16728.	.0	0.	0.0									
10 5 78	7.40	82.	17902.	.0	10800.	.3		12.40	4.70	160.00	1.40	0.00	6.76	162.00	11.44
12 14 78	7.60	74.	17593.	.0	10600.	.4		12.70	4.80	158.00	.80	0.00	6.76	163.00	11.23
3 13 79	7.40	72.	17902.	.0	10700.	.9		12.70	4.60	168.00	1.00	0.00	6.66	168.00	10.50
7 6 79	7.70	80.	0.	.0	0.	0.0									
9 6 79	7.40	84.	17893.	.1	10600.	1.4		11.00	4.30	164.00	2.20	0.00	5.24	168.00	11.34
11 7 79	7.70	80.	18215.	.1	0.	0.0									
MEAN	7.59	79.	17764.	.0	10681.	.7	4.40	12.21	4.73	165.68	1.14	0.00	6.05	163.22	11.39
STD DEV	.17	6.	1076.	.0	240.	.6	9.69	.62	.13	4.37	.24	0.00	1.18	27.80	.90
MIN	7.30	70.	12400.	.0	10200.	.1	.15	11.00	4.30	158.00	.80	0.00	.56	16.80	10.30
MAX	8.10	90.	19500.	.1	11300.	2.7	30.00	13.00	4.90	178.00	2.20	0.00	6.80	183.00	14.25
FLOW WEIGHTED MEAN					10780.			12.21	4.73	167.74	1.20	0.00	5.84	168.72	11.73

DOT- 9
S. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
8 2 72	7.60	89.	15800.	.3	9500.	7.7		13.00	4.70	143.00	.90	0.00	6.75	143.00	11.75
8 30 72	7.70	90.	15800.	1.9	9440.	49.2		13.20	4.70	143.00	1.00	0.00	6.63	144.00	11.00
10 4 72	7.50	90.	15800.	1.9	9610.	50.3		13.10	4.60	144.00	1.00	0.00	6.69	144.00	12.25
11 9 72	7.50	90.	16100.	1.9	9660.	49.6		13.30	4.60	149.00	1.00	0.00	6.70	147.00	13.25
12 4 72	7.60	90.	15800.	1.8	9380.	46.1		12.80	4.60	144.00	.90	0.00	6.70	140.00	12.50
1 15 73	7.70	90.	16100.	2.0	9300.	49.2		11.40	4.50	140.00	1.00	0.00	5.10	146.00	11.50
2 13 73	7.80	90.	16100.	2.1	9640.	54.4		13.10	4.60	146.00	1.00	0.00	6.75	150.00	14.00
3 12 73	7.60	90.	16000.	2.3	9500.	57.7		13.10	4.60	142.00	.90	0.00	6.83	144.00	11.30
4 9 73	7.50	90.	15900.	2.1	9520.	53.7		13.00	4.70	143.00	1.00	0.00	6.72	146.00	10.90
5 7 73	7.50	90.	16000.	2.1	9520.	53.7		12.90	4.50	149.00	1.00	0.00	6.61	144.00	11.00
7 22 76	7.20	90.	15351.	2.0	9300.	50.2	.36	12.80	4.40	141.00	.90	0.00	6.36	141.00	10.91
8 23 76	7.10	90.	15926.	2.0	9040.	48.8	2.40	13.10	4.50	139.00	.90	0.00	6.81	138.00	10.91
9 14 76	7.10	94.	15451.	2.0	9200.	49.7	.35	12.20	4.60	142.00	.80	0.00	6.69	140.00	11.13
10 28 76	7.20	94.	15335.	1.5	9220.	37.3	2.00	12.90	4.70	144.00	.80	0.00	6.80	146.00	10.91
11 11 76	7.40	90.	15938.	1.9	9110.	46.7	.80	13.00	4.60	140.00	.90	0.00	10.80	134.00	10.70
12 8 76	7.30	90.	15492.	1.5	9300.	37.9	.45	13.00	4.60	142.00	.70	0.00	6.74	148.00	11.56
1 11 77	7.10	89.	15428.	1.5	8960.	36.3	.23	13.10	4.60	144.00	1.00	0.00	6.65	145.00	11.34
2 18 77	7.10	88.	15745.	2.3	9400.	57.6	1.10	13.00	4.50	144.00	1.20	0.00	6.65	142.00	14.25
4 28 77	7.50	92.	16903.	1.0	9240.	24.9		12.40	4.70	141.00	1.10	0.00	6.63	138.00	11.65
6 6 77	7.10	86.	15385.	1.0	8960.	24.2		12.70	4.60	140.00	1.20	0.00	6.72	144.00	11.44
7 26 77	7.00	90.	15873.	1.5	9310.	37.7		13.10	4.50	142.00	.80	0.00	6.55	140.00	11.13
9 26 77	7.80	89.	15547.	1.5	9360.	37.9		13.40	4.80	138.00	.80	0.00	6.53	144.00	12.48
1 3 78	7.80	88.	15645.	2.0	9440.	51.0		13.30	4.70	143.00	1.00	0.00	6.73	138.00	10.82
3 29 78	7.20	88.	15783.	2.0	9490.	51.2		13.10	4.80	142.00	1.00	0.00	6.63	148.00	10.92
5 5 78	7.40	86.	14881.	1.5	0.	0.0									
7 31 78	7.10	89.	15860.	1.0	0.	0.0									
10 3 78	7.10	89.	15461.	2.2	9660.	58.2		12.70	4.60	140.00	1.20	0.00	6.71	150.00	11.34
12 13 78	7.20	89.	14172.	2.0	9370.	50.6		13.20	4.80	140.00	.80	0.00	6.71	142.00	12.38
3 12 79	6.60	88.	16067.	1.8	9400.	45.7		13.10	4.40	138.00	1.00	0.00	6.71	140.00	10.82
9 4 79	7.60	88.	15905.	2.2	9410.	54.9		12.90	4.40	142.00	2.00	0.00	6.72	140.00	11.96
11 9 79	6.90	86.	15432.	1.0	0.	0.0									
MEAN	7.38	90.	15743.	1.8	9366.	45.4	.96	12.93	4.60	142.32	.99	0.00	6.77	143.07	11.65
STD DEV	.28	2.	448.	.4	193.	11.5	.82	.39	.11	2.71	.23	0.00	.85	3.89	.94
MIN	6.80	86.	14172.	.3	8960.	7.7	.23	11.40	4.40	138.00	.70	0.00	5.10	134.00	10.70
MAX	7.80	94.	16903.	2.3	9660.	58.2	2.40	13.40	4.80	149.00	2.00	0.00	10.80	150.00	14.25
FLOW WEIGHTED MEAN					9341.			12.93	4.60	142.40	1.00	0.00	6.78	143.15	11.67

DOT-10
S. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 20 72	7.30	57.	13500.	.8	8300.	16.8		13.50	4.00	121.00	.80	0.00	5.99	126.00	12.10
4 25 72	7.40	87.	13900.	.5	7950.	10.7		13.36	4.00	120.00	.96	0.00	5.98	126.00	11.80
7 11 72	7.30	87.	13800.	.3	8470.	7.9		13.29	4.46	127.00	.80	0.00	6.19	125.00	12.80
8 2 72	7.70	88.	14100.	.4	8410.	9.2		12.80	4.50	124.00	.80	0.00	6.16	124.00	13.25
8 30 72	7.60	83.	14400.	1.5	8400.	33.6		12.10	4.60	124.00	.90	0.00	5.19	125.00	12.75
10 4 72	7.70	77.	14200.	1.5	8480.	34.6		10.60	4.40	126.00	.80	0.00	3.87	131.00	11.25
11 9 72	7.80	78.	14200.	1.5	8450.	33.1		13.00	4.40	127.00	1.00	0.00	6.01	131.00	12.40
12 4 72	7.80	77.	14200.	1.5	8280.	34.2		12.70	4.50	128.00	.80	0.00	6.00	124.00	11.00
1 15 73	7.50	87.	14200.	.5	8320.	10.1		12.40	4.30	122.00	.90	0.00	5.62	125.00	13.25
2 13 73	7.80	84.	14200.	1.8	8470.	40.7		10.80	4.50	127.00	.90	0.00	3.94	130.00	13.00
3 12 73	7.80	85.	14000.	1.8	8300.	39.2		13.00	4.50	125.00	.90	0.00	6.05	127.00	11.30
4 9 73	7.80	81.	14100.	1.6	8510.	36.8		12.00	4.50	127.00	.90	0.00	5.10	127.00	11.40
5 7 73	7.70	87.	13700.	1.5	8290.	33.6		12.80	4.40	124.00	.80	0.00	5.99	123.00	12.40
6 23 76	7.20	80.	13145.	.3	7840.	5.3	.28	12.90	4.30	115.00	.70	0.00	6.06	113.00	11.45
7 22 76	7.20	90.	13248.	.3	8040.	5.4	.30	13.10	4.30	120.00	.70	0.00	6.08	119.00	11.77
8 23 76	7.20	90.	13621.	.5	7840.	10.2	3.00	12.80	4.30	118.00	.70	0.00	6.06	116.00	11.56
9 14 76	7.30	90.	13803.	.3	8040.	5.4	.35	12.20	4.40	120.00	1.00	0.00	5.98	120.00	12.41
10 28 76	7.30	88.	13678.	1.8	8000.	38.9	1.00	12.80	4.50	126.00	.60	0.00	6.06	126.00	11.56
11 11 76	7.70	88.	13724.	2.0	7530.	40.7	.50	13.10	4.50	121.00	.70	0.00	6.12	118.00	18.19
12 8 76	7.20	90.	13543.	2.1	8300.	46.0	.60	12.90	4.40	123.00	.60	0.00	6.08	120.00	11.98
1 11 77	7.50	80.	13674.	2.1	8260.	47.7	1.00	12.80	4.50	125.00	.80	0.00	6.02	127.00	11.45
2 18 77	7.50	82.	13905.	1.7	8390.	37.6	.80	13.10	4.40	126.00	1.20	0.00	6.67	122.00	11.44
4 28 77	7.80	88.	13947.	1.0	8360.	22.6		12.70	4.60	126.00	1.00	0.00	6.16	126.00	11.75
6 6 77	7.20	84.	14286.	.2	7920.	4.3		12.90	4.50	122.00	.80	0.00	6.27	124.00	10.92
7 26 77	7.30	87.	14286.	.2	8250.	4.5		13.10	4.40	124.00	.80	0.00	6.35	128.00	10.92
9 26 77	7.80	64.	13889.	1.0	8310.	22.4		12.00	4.60	123.00	1.40	0.00	4.90	122.00	11.34
1 3 78	7.30	80.	14376.	1.0	8520.	23.0		13.10	4.60	127.00	.80	0.00	6.09	125.00	11.32
3 29 78	7.50	83.	14468.	1.0	8650.	23.4		13.10	4.90	126.00	1.10	0.00	6.01	130.00	10.82
5 5 78	7.10	84.	14671.	.5	0.	0.0									
7 31 78	7.40	86.	13931.	.2	0.	0.0									
10 3 78	7.50	82.	13978.	2.3	8520.	51.8		12.60	4.40	122.00	1.00	0.00	6.16	130.00	11.54
12 13 78	7.50	78.	12755.	.5	8360.	11.3		13.00	4.50	128.00	.60	0.00	6.11	128.00	15.91
3 12 79	7.10	84.	14148.	1.0	8460.	22.8		13.00	4.40	126.00	1.20	0.00	6.05	128.00	11.13
5 17 79	7.02	86.	13989.	.2	0.	0.0									
9 4 79	7.40	85.	13917.	1.7	8260.	37.5		12.20	4.10	122.00	1.40	0.00	6.02	126.00	11.65
11 9 79	7.30	80.	13717.	.5	0.	0.0									
MEAN	7.49	83.	13903.	1.1	8265.	25.1	.87	12.68	4.43	123.81	.89	0.00	5.85	124.75	12.12
STD DEV	.23	6.	384.	.7	249.	15.0	.85	.64	.17	3.13	.20	0.00	.62	4.30	1.49
MIN	7.10	57.	12755.	.2	7530.	4.3	.28	10.60	4.00	115.00	.60	0.00	3.87	113.00	10.82
MAX	7.80	90.	14468.	2.3	8650.	51.8	3.00	13.50	4.90	128.00	1.40	0.00	6.67	131.00	18.19
FLOW WEIGHTED MEAN					8296.			12.58	4.45	124.47	.90	0.00	5.78	125.47	12.17

DOT-11
S. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
8 2 72	7.60	89.	14800.	.8	8830.	18.6		12.70	4.50	134.00	.80	0.00	6.34	135.00	13.25
8 30 72	7.70	89.	15100.	1.2	8800.	27.3		13.00	4.50	132.00	.90	0.00	6.39	136.00	11.25
10 4 72	7.50	89.	14800.	1.3	9010.	30.4		12.90	4.50	132.00	.90	0.00	6.20	138.00	12.50
11 9 72	7.60	90.	14600.	1.7	8730.	40.5		12.80	4.40	133.00	1.00	0.00	6.08	136.00	11.00
12 4 72	7.60	89.	15100.	1.2	8800.	29.0		12.80	4.50	133.00	.90	0.00	6.16	131.00	13.00
1 15 73	7.70	89.	14800.	1.6	8670.	38.2		12.80	4.40	130.00	.90	0.00	6.10	133.00	12.75
2 13 73	7.80	90.	14800.	1.4	8970.	32.7		12.80	4.50	134.00	1.00	0.00	6.28	135.00	11.40
3 12 73	7.60	89.	14600.	1.7	8790.	40.6		12.90	4.40	130.00	.90	0.00	6.14	132.00	11.10
4 9 73	7.80	89.	14700.	1.4	8770.	32.7		12.80	4.50	132.00	.90	0.00	6.16	132.00	11.00
5 7 73	7.30	89.	14400.	1.4	8760.	32.6		12.90	4.40	129.00	.90	0.00	6.31	135.00	11.60
6 23 76	7.10	80.	14256.	0.0	8360.	0.0	.33	12.80	4.30	125.00	.90	0.00	6.24	125.00	11.66
7 22 76	7.20	87.	13816.	2.0	8600.	46.4	.30	13.00	4.30	126.00	.80	0.00	6.20	123.00	11.56
8 23 76	7.10	90.	14459.	.5	8540.	11.5	2.50	12.80	4.30	127.00	.80	0.00	6.22	128.00	11.02
9 14 76	7.10	90.	14580.	1.0	8430.	22.8	.20	12.00	4.40	132.00	.80	0.00	6.05	132.00	12.84
10 28 76	7.20	88.	14459.	2.0	8400.	45.4	2.00	12.70	4.50	135.00	1.20	0.00	6.13	136.00	10.91
11 11 76	7.20	88.	14116.	2.0	8240.	44.5	.30	12.90	4.40	129.00	.70	0.00	6.16	124.00	13.91
12 8 76	7.10	96.	14503.	2.0	8600.	46.4	.70	13.00	4.50	134.00	.60	0.00	6.28	134.00	12.41
1 11 77	7.50	86.	14508.	1.8	8720.	42.4	.21	12.80	4.40	133.00	.80	0.00	6.14	135.00	11.77
2 18 77	7.30	86.	14276.	1.5	8760.	35.5		12.60	4.30	132.00	1.00	0.00	5.99	128.00	11.23
4 28 77	7.10	90.	15160.	1.0	8870.	23.9		12.40	4.60	128.00	1.10	0.00	6.30	134.00	10.92
6 6 77	7.80	88.	14706.	.5	8420.	11.4		12.70	4.50	132.00	1.00	0.00	6.31	132.00	11.44
7 26 77	7.00	89.	14925.	1.0	8670.	23.4		13.00	4.40	130.00	.80	0.00	6.20	128.00	10.92
9 26 77	7.60	88.	14269.	1.5	8830.	35.8		13.20	4.60	132.00	.80	0.00	6.19	136.00	12.69
1 3 78	7.80	88.	14984.	1.5	8910.	36.1		12.70	4.30	132.00	.80	0.00	6.24	128.00	11.34
3 29 78	7.40	87.	14881.	1.5	8900.	36.0		12.90	4.60	132.00	.90	0.00	6.08	134.00	10.82
5 5 78	7.30	86.	14671.	1.0	0.	0.0									
7 31 78	7.20	88.	13565.	1.0	0.	0.0									
10 3 78	7.20	88.	14577.	1.2	8900.	28.6		12.60	4.50	128.00	1.30	0.00	6.21	132.00	11.44
12 13 78	7.30	88.	13789.	1.5	8720.	35.3		12.70	4.40	132.00	.60	0.00	6.16	130.00	13.21
3 12 79	6.80	88.	14337.	1.5	8850.	35.8		12.90	4.50	126.00	1.20	0.00	6.15	128.00	10.71
9 4 79	7.80	87.	14955.	.4	8710.	9.4		12.40	4.20	131.00	1.40	0.00	6.16	138.00	10.40
11 9 79	7.00	88.	14815.	.6	0.	0.0									
MEAN	7.41	88.	14595.	1.4	8709.	31.9	.82	12.78	4.43	130.86	.92	0.00	6.19	132.00	11.73
STD DEV	.29	2.	351.	.5	192.	10.4	.91	.23	.10	2.64	.19	0.00	.09	4.07	.92
MIN	6.80	80.	13789.	.4	8240.	9.4	.20	12.00	4.20	125.00	.60	0.00	5.99	123.00	10.40
MAX	7.80	96.	15160.	2.0	9010.	46.4	2.50	13.20	4.60	135.00	1.40	0.00	6.39	138.00	13.91
FLOW WEIGHTED MEAN					8716.			12.81	4.44	131.14	.90	0.00	6.18	131.99	11.79

DOT-20
N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 20 72	7.20	90.	17000.	1.5	10700.	43.3		14.00	4.50	163.00	1.10	0.00	7.29	163.00	11.50
4 25 72	7.30	89.	16200.	1.5	9800.	39.7		13.20	5.04	161.00	1.28	0.00	7.12	159.00	10.50
7 11 72	7.30	90.	16900.	.8	10500.	21.3		12.99	5.41	164.00	1.10	0.00	7.46	160.00	12.75
8 2 72	7.60	89.	17500.	.3	10300.	8.1		13.00	5.10	160.00	1.00	0.00	7.44	159.00	12.50
6 22 76	7.10	90.	16869.	.3	10000.	8.1	2.00	12.90	4.80	154.00	1.00	0.00	7.41	159.00	10.27
7 23 76	7.50	90.	16870.	1.0	10200.	27.5	.30	13.20	4.80	160.00	.80	0.00	7.38	159.00	10.91
8 20 76	7.20	90.	16869.	.3	10000.	7.8	.20	13.00	4.90	154.00	1.00	0.00	7.36	154.00	10.38
9 14 76	7.20	90.	17546.	.5	9950.	13.4	.15	12.20	5.00	156.00	1.00	0.00	7.25	156.00	11.13
10 28 76	7.30	90.	17156.	.2	9990.	6.5	2.00	12.90	5.00	156.00	1.20	0.00	7.31	159.00	10.17
11 11 76	7.20	88.	14321.	.2	9750.	6.3	.45	13.10	5.00	155.00	.90	0.00	7.36	152.00	10.70
12 7 76	7.10	90.	17042.	.4	10200.	11.0	.20	12.90	4.90	159.00	.80	0.00	7.40	158.00	10.81
1 12 77	7.30	88.	16697.	.4	10200.	9.6	.14	12.90	5.10	160.00	1.10	0.00	7.22	160.00	10.17
2 22 77	7.80	90.	16995.	.4	10200.	9.6	.40	12.80	4.90	158.00	1.20	0.00	6.17	158.00	10.61
4 28 77	7.30	90.	17434.	.2	10200.	4.1		12.40	5.10	156.00	1.40	0.00	7.38	164.00	10.40
6 7 77	7.20	86.	17072.	.2	9900.	5.3		12.60	5.10	152.00	1.20	0.00	7.31	160.00	10.30
7 27 77	7.00	88.	17544.	.3	10000.	8.1		13.10	5.00	156.00	1.00	0.00	7.35	152.00	10.30
9 28 77	7.90	88.	16801.	.3	10200.	8.8		13.20	5.40	154.00	.80	0.00	7.33	156.00	11.65
1 10 78	7.10	88.	17159.	.1	10000.	3.2		12.90	4.80	156.00	1.20	0.00	7.25	152.00	10.19
3 30 78	7.40	87.	17077.	.1	10100.	2.7		12.80	5.10	154.00	1.10	0.00	7.08	158.00	9.88
5 8 78	7.00	86.	17077.	.2	0.	0.0									
8 4 78	7.20	88.	15944.	.2	0.	0.0									
10 5 78	7.20	88.	17593.	.3	10400.	7.9		12.60	4.80	154.00	1.40	0.00	7.31	160.00	10.09
12 14 78	7.20	86.	17007.	.2	10200.	5.5		13.00	5.00	156.00	1.00	0.00	7.26	156.00	11.34
3 13 79	7.10	88.	17007.	.2	10200.	5.5		12.80	4.80	158.00	1.40	0.00	7.25	164.00	10.40
MEAN	7.30	89.	16939.	.4	10136.	12.0	.65	12.93	4.98	157.09	1.09	0.00	7.26	158.09	10.77
STD DEV	.23	1.	668.	.4	221.	11.1	.77	.35	.20	3.19	.18	0.00	.26	3.48	.76
MIN	7.00	86.	14321.	.1	9750.	2.7	.14	12.20	4.50	152.00	.80	0.00	6.17	152.00	9.88
MAX	7.90	90.	17593.	1.5	10700.	43.3	2.00	14.00	5.41	164.00	1.40	0.00	7.46	164.00	12.75
FLOW WEIGHTED MEAN					10190.			13.12	4.93	159.05	1.08	0.00	7.26	158.93	10.98

DOT-30
N. BANK COLO. RIVWR

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 20 72	7.20	90.	16700.	.5	10600.	14.3		13.50	5.00	162.00	1.10	0.00	7.25	164.00	11.70
4 25 72	7.30	89.	14500.	.5	9650.	13.0		13.08	4.92	160.00	1.28	0.00	7.21	157.00	10.60
7 11 72	7.30	90.	17500.	.5	10400.	14.0		13.90	5.00	157.00	1.20	0.00	7.43	160.00	12.50
6 22 76	7.20	90.	16869.	.1	10000.	1.4	.30	13.00	4.80	153.00	.90	0.00	7.44	153.00	10.49
7 23 76	7.20	90.	16870.	.7	10200.	19.3	.15	13.40	5.00	158.00	.80	0.00	7.42	160.00	11.56
8 20 76	7.00	90.	16869.	.2	10000.	4.1	.50	13.00	4.90	157.00	1.10	0.00	7.30	158.00	9.95
9 14 76	7.10	90.	16970.	.5	10000.	13.5	.28	12.20	4.80	160.00	1.00	0.00	7.28	164.00	11.34
10 28 76	7.20	89.	17452.	.2	10100.	4.1	1.00	12.70	5.10	158.00	1.00	0.00	7.33	161.00	9.74
11 11 76	7.20	88.	14321.	.2	9790.	4.0	.95	13.00	5.00	154.00	1.10	0.00	7.36	152.00	9.52
12 7 76	7.10	90.	17042.	.2	10100.	4.1	.26	12.90	4.90	158.00	.90	0.00	7.40	160.00	10.61
1 12 77	7.50	88.	16970.	.3	10100.	9.0	.12	12.80	5.00	159.00	1.10	0.00	7.18	160.00	10.48
2 22 77	7.20	90.	16995.	.3	10200.	9.1	.40	13.00	4.90	160.00	2.00	0.00	7.24	156.00	10.61
4 28 77	7.10	90.	17148.	.2	10100.	5.5		12.50	5.00	160.00	1.40	0.00	7.36	156.00	10.19
6 7 77	7.00	82.	14059.	0.0	8340.	0.0		11.10	4.30	128.00	.80	0.00	6.39	126.00	8.94
7 27 77	7.00	88.	17544.	.3	10000.	8.1		12.90	4.90	154.00	1.00	0.00	7.40	156.00	9.78
9 28 77	7.60	86.	16801.	.6	10200.	17.1		13.00	5.00	158.00	1.20	0.00	7.28	164.00	10.61
1 10 78	7.20	88.	17159.	.8	10100.	21.5		12.80	5.00	152.00	1.20	0.00	7.15	148.00	10.30
3 30 78	7.70	87.	17361.	.4	10200.	11.0		13.00	5.30	154.00	1.10	0.00	7.12	158.00	10.19
5 8 78	7.00	86.	17361.	0.0	0.	0.0									
8 4 78	7.10	88.	16458.	.3	0.	0.0									
10 5 78	7.10	88.	17007.	.5	10500.	13.3		12.70	4.90	152.00	1.20	0.00	7.26	150.00	10.71
12 14 78	7.20	88.	17007.	.4	10200.	11.0		13.10	5.00	154.00	1.00	0.00	7.31	157.00	11.65
3 13 79	7.00	88.	17295.	.4	10200.	11.0		12.80	5.20	160.00	1.40	0.00	7.15	160.00	9.98
MEAN	7.21	89.	16688.	.4	10047.	10.4	.44	12.88	4.96	155.62	1.13	0.00	7.25	156.19	10.55
STD DEV	.19	2.	1030.	.2	444.	5.5	.32	.54	.20	7.00	.26	0.00	.22	8.16	.83
MIN	7.00	82.	14059.	.1	8340.	1.4	.12	11.10	4.30	128.00	.80	0.00	6.39	126.00	8.94
MAX	7.70	90.	17544.	.8	10600.	21.5	1.00	13.90	5.30	162.00	2.00	0.00	7.44	164.00	12.50
FLOW WEIGHTED MEAN					10166.			13.00	5.01	157.04	1.16	0.00	7.27	157.86	10.81

DOT-40
N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 20 72	7.20	90.	16700.	.5	10300.	13.9		13.40	4.90	163.00	1.10	0.00	7.28	167.00	11.70
4 25 72	7.40	89.	14300.	.5	10200.	13.8		13.24	5.00	161.00	1.28	0.00	7.31	158.00	10.60
7 11 72	7.30	90.	14000.	.5	8350.	11.3		11.70	5.30	127.00	.80	0.00	6.35	127.00	10.00
8 2 72	7.40	89.	17200.	.2	10400.	5.6		12.90	5.10	160.00	1.00	0.00	7.44	159.00	12.75
6 22 76	7.20	90.	16066.	0.0	8500.	0.0	.40	11.30	4.20	126.00	.80	0.00	6.49	129.00	8.99
7 23 76	7.20	90.	16870.	1.5	10300.	41.7	.40	13.20	4.80	156.00	.80	0.00	7.45	159.00	9.20
8 20 76	7.00	90.	17155.	1.0	9860.	26.6	.50	12.80	4.80	155.00	1.00	0.00	7.30	156.00	10.38
9 14 76	7.10	90.	17253.	1.5	9910.	40.1	.30	12.20	5.00	162.00	1.00	0.00	7.29	156.00	11.56
10 28 76	7.20	90.	17452.	1.0	9920.	26.8	1.00	12.90	5.10	158.00	.80	0.00	7.34	150.00	10.49
11 11 76	7.10	88.	14532.	.5	9910.	13.4	.38	12.90	5.00	155.00	1.20	0.00	7.36	158.00	9.74
12 7 76	7.20	90.	17013.	.8	10000.	21.6	.26	11.30	5.00	154.00	1.20	0.00	5.60	154.00	11.77
1 12 77	7.30	88.	16724.	1.1	10200.	30.3	.12	12.60	5.00	160.00	1.10	0.00	7.26	160.00	9.84
2 22 77	7.20	90.	16995.	1.1	18200.	54.1	.20	22.60	6.80	286.00	4.40	0.00	11.99	288.00	22.05
4 28 77	7.20	90.	17434.	.5	10300.	13.9		12.50	5.10	156.00	1.60	0.00	7.36	162.00	10.09
6 7 77	7.00	87.	17382.	.2	9800.	5.3		12.60	5.00	154.00	1.20	0.00	7.43	160.00	10.61
7 27 77	7.00	90.	17544.	1.0	10100.	27.3		13.00	5.00	156.00	1.00	0.00	7.40	160.00	10.30
9 28 77	8.00	88.	17361.	1.0	10100.	27.0		10.60	5.20	154.00	1.00	0.00	4.65	152.00	12.90
1 10 78	7.10	88.	16886.	.7	10000.	20.0		12.90	4.90	156.00	1.20	0.00	7.21	152.00	10.30
3 30 78	7.50	87.	17361.	.5	10200.	13.8		12.90	5.10	155.00	1.20	0.00	7.09	160.00	9.57
5 8 78	7.00	87.	16026.	0.0	0.	0.0									
8 4 78	7.10	88.	15461.	.5	0.	0.0									
10 5 78	7.20	88.	17007.	.6	10400.	15.4		12.80	5.00	154.00	1.00	0.00	7.26	154.00	10.30
12 14 78	7.30	88.	17007.	.5	10100.	13.6		12.90	5.10	152.00	1.20	0.00	7.26	157.00	10.61
3 13 79	7.00	88.	17295.	.5	10100.	13.6		12.90	4.90	158.00	1.40	0.00	7.25	160.00	9.78
MEAN	7.23	89.	16706.	.7	10325.	21.4	.40	13.01	5.06	159.91	1.24	0.00	7.24	160.82	11.07
STD DEV	.22	1.	1043.	.4	1835.	12.4	.25	2.26	.44	29.67	.73	0.00	1.26	29.94	2.66
MIN	7.00	87.	14000.	.2	8350.	5.3	.12	10.60	4.20	126.00	.80	0.00	4.65	127.00	8.99
MAX	8.00	90.	17544.	1.5	18200.	54.1	1.00	22.60	6.80	286.00	4.40	0.00	11.99	288.00	22.05
FLOW WEIGHTED MEAN					10607.			13.26	5.12	165.10	1.29	0.00	7.36	165.21	11.39

DOT-90
DT090 NORTH BANK COLO RIVER NR INTERSTATE HIWAY

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
8 30 72	7.70	90.	17200.	1.5	10200.	40.8		13.10	5.10	157.00	1.10	0.00	7.37	162.00	11.00
10 4 72	7.50	89.	17500.	1.6	10400.	44.6		13.00	4.90	158.00	1.10	0.00	7.34	165.00	11.00
11 8 72	7.70	89.	17500.	1.6	10400.	45.8		13.10	4.90	162.00	1.10	0.00	7.26	164.00	10.75
12 4 72	7.60	89.	17200.	1.7	10200.	45.7		12.70	4.90	158.00	1.00	0.00	7.16	159.00	11.00
1 15 73	7.60	89.	17200.	1.6	10100.	43.9		12.90	4.90	154.00	1.10	0.00	7.24	156.00	11.50
2 13 73	7.80	90.	17500.	1.4	10300.	40.0		13.10	5.00	158.00	1.10	0.00	7.25	162.00	11.40
3 12 73	7.70	90.	17200.	1.7	10400.	46.3		13.10	5.00	157.00	1.10	0.00	7.46	158.00	10.60
4 9 73	8.00	89.	17100.	1.5	10300.	40.9		12.90	4.90	159.00	1.10	0.00	7.25	159.00	10.20
5 7 73	7.40	89.	17200.	1.5	10300.	40.9		13.10	4.80	157.00	1.10	0.00	7.40	161.00	10.50
9 6 79	7.20	88.	17579.	2.0	10300.	56.7		9.30	2.80	156.00	1.60	0.00	7.26	152.00	10.82
11 7 79	7.10	88.	17361.	1.0	0.	0.0									
MEAN	7.62	89.	17318.	1.6	10290.	44.6	0.00	12.63	4.72	157.60	1.14	0.00	7.30	159.80	10.88
STD DEV	.22	1.	178.	.2	99.	4.9	0.00	1.18	.66	2.07	.16	0.00	.09	3.88	.39
MIN	7.20	88.	17100.	1.4	10100.	40.0	0.00	9.30	2.80	154.00	1.00	0.00	7.16	152.00	10.20
MAX	8.00	90.	17579.	2.0	10400.	56.7	0.00	13.10	5.10	162.00	1.60	0.00	7.46	165.00	11.50
FLOW WEIGHTED MEAN					10291.			12.53	4.66	157.56	1.15	0.00	7.30	159.54	10.88

DTOO7
DTOO7 NORTH BANK COLO RIVER NR INTERSTATE HIWAY

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
9 6 79	7.40	92.	17893.	.0	10700.	.9		12.70	4.50	166.00	1.80	0.00	6.42	172.00	11.02
11 7 79	7.60	92.	17637.	.0	0.	0.0									
MEAN	7.40	92.	17893.	.0	10700.	.9	0.00	12.70	4.50	166.00	1.80	0.00	6.42	172.00	11.02
STD DEV	0.00	0.	0.	0.0	0.	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN	7.40	92.	17893.	.0	10700.	.9	0.00	12.70	4.50	166.00	1.80	0.00	6.42	172.00	11.02
MAX	7.40	92.	17893.	.0	10700.	.9	0.00	12.70	4.50	166.00	1.80	0.00	6.42	172.00	11.02
FLOW WEIGHTED MEAN					10700.			12.70	4.50	166.00	1.80	0.00	6.42	172.00	11.02

DTOO4
DTOO4 NORTH BANK COLO RIVER NR INTERSTATE HIWAY

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
9 6 79	7.70	76.	17893.	.1	11000.	1.5		16.60	6.00	160.00	2.00	0.00	6.68	156.00	17.26
11 7 79	7.70	76.	17637.	.1	0.	0.0									
MEAN	7.70	76.	17893.	.1	11000.	1.5	0.00	16.60	6.00	160.00	2.00	0.00	6.68	156.00	17.26
STD DEV	0.00	0.	0.	0.0	0.	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN	7.70	76.	17893.	.1	11000.	1.5	0.00	16.60	6.00	160.00	2.00	0.00	6.68	156.00	17.26
MAX	7.70	76.	17893.	.1	11000.	1.5	0.00	16.60	6.00	160.00	2.00	0.00	6.68	156.00	17.26
FLOW WEIGHTED MEAN					11000.			16.60	6.00	160.00	2.00	0.00	6.68	156.00	17.26

APPENDIX B

GLEN-16
NICHOLAS & S. FORK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (x10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 20 72	6.80	122.	30360.	.5	20300.	27.4		25.00	7.30	314.00	5.30	0.00	12.81	320.00	25.70
4 26 72	7.00	123.	24900.	.3	19900.	16.1		24.60	7.50	309.00	5.20	0.00	12.69	308.00	24.40
7 11 72	7.30	124.	31600.	.5	20200.	27.3		24.95	6.93	313.00	5.60	0.00	13.04	309.00	28.00
8 3 72	7.00	124.	30600.	.3	20000.	16.2		25.00	7.25	306.00	4.50	0.00	13.03	309.00	24.75
8 31 72	7.50	124.	32700.	.3	20300.	16.4		24.80	7.60	306.00	4.30	0.00	12.36	313.00	26.00
10 5 72	7.20	124.	31600.	.3	20300.	16.4		24.30	7.20	304.00	4.60	0.00	12.62	317.00	25.50
11 7 72	7.30	124.	32700.	.3	20400.	16.5		24.80	7.30	312.00	4.40	0.00	12.69	313.00	25.50
12 5 72	7.30	124.	31600.	.3	20000.	16.2		24.70	7.30	290.00	4.40	0.00	12.63	301.00	26.00
1 16 73	7.30	124.	31600.	.4	19800.	21.4		24.20	7.10	296.00	4.50	0.00	12.78	306.00	25.75
2 14 73	7.20	124.	31300.	.3	19900.	16.1		24.20	7.20	306.00	4.60	0.00	12.62	304.00	25.75
3 13 73	7.30	124.	31100.	.3	20000.	16.2		24.50	7.25	306.00	3.60	0.00	12.84	316.00	25.75
4 10 73	7.50	124.	30600.	.3	20100.	16.3		23.00	7.20	308.00	4.60	0.00	11.21	310.00	27.00
5 8 73	7.50	124.	31100.	.3	20000.	16.2		24.40	7.00	302.00	4.60	0.00	12.99	308.00	24.80
6 21 76	6.50	120.	29769.	.3	18960.	15.3	1.40	23.00	6.80	292.00	4.20	0.00	12.58	284.00	23.54
7 23 76	6.80	120.	28779.	.5	19100.	25.8	.20	22.80	6.80	296.00	4.20	0.00	12.79	286.00	26.11
8 19 76	6.80	122.	31370.	.5	18600.	25.1	.30	23.60	7.00	296.00	4.00	0.00	12.56	300.00	23.54
9 13 76	6.70	98.	30447.	.2	18900.	7.7	4.00	22.40	7.00	300.00	4.20	0.00	12.68	300.00	23.54
10 27 76	7.00	120.	29771.	.6	19300.	31.3	.90	23.40	7.20	300.00	4.40	0.00	12.70	292.00	25.04
11 10 76	6.70	120.	30073.	.5	18700.	25.2	1.00	23.40	7.20	292.00	4.60	0.00	12.85	296.00	23.54
12 3 76	6.90	120.	30212.	.4	19200.	20.7	.73	23.20	6.80	300.00	4.20	0.00	13.01	290.00	28.68
12 29 76	6.70	124.	26908.	.3	18800.	15.2	.25	23.80	7.00	294.00	4.00	0.00	12.78	296.00	23.33
2 23 77	7.10	120.	29741.	.5	19200.	25.9	1.10	23.40	7.00	298.00	4.60	0.00	12.53	290.00	23.92
4 27 77	6.70	118.	29886.	.3	19100.	15.5		23.00	7.40	304.00	5.20	0.00	12.79	312.00	23.50
6 7 77	6.40	118.	30048.	.2	19000.	10.3		22.80	10.60	292.00	4.40	0.00	12.73	304.00	22.88
7 27 77	6.70	120.	30303.	.3	19100.	15.5		23.40	7.00	296.00	4.80	0.00	12.80	288.00	23.92
9 29 77	7.60	124.	28935.	.5	18900.	25.5		19.40	7.20	292.00	4.00	0.00	8.42	288.00	24.12
1 10 78	6.60	120.	30395.	.5	19100.	25.8		23.20	7.20	292.00	4.40	0.00	12.42	296.00	23.30
3 30 78	6.80	118.	30637.	.2	19200.	10.4		23.40	7.40	296.00	4.80	0.00	11.96	296.00	22.88
5 8 78	6.70	117.	29762.	.2	0.	0.0									
8 4 78	6.70	120.	26853.	.4	0.	0.0									
10 5 78	6.70	118.	30921.	.3	19600.	15.9		23.50	7.25	293.00	4.50	0.00	12.51	305.00	23.66
12 14 78	6.80	116.	30921.	.2	20100.	10.9		23.40	7.60	298.00	4.20	0.00	12.76	295.00	24.75
3 13 79	6.50	118.	30921.	.3	19700.	16.0		23.00	7.00	310.00	4.50	0.00	12.71	310.00	25.22
6 6 79	6.80	116.	30364.	.3	19900.	16.1		24.25	7.00	310.00	5.75	0.00	12.60	300.00	23.92
11 7 79	6.60	116.	30864.	.3	0.	0.0									
MEAN	6.97	121.	30378.	.4	19550.	18.5	1.10	23.65	7.27	300.72	4.54	0.00	12.52	301.94	24.82
STD DEV	.33	5.	1492.	.1	559.	5.8	1.17	1.08	.64	7.21	.46	0.00	.82	9.81	1.43
MIN	6.40	98.	24900.	.2	18600.	7.7	.20	19.40	6.80	290.00	3.60	0.00	8.42	284.00	22.88
MAX	7.60	124.	32700.	.6	20400.	31.3	4.00	25.00	10.60	314.00	5.75	0.00	13.04	320.00	28.68
FLOW WEIGHTED MEAN					19513.			23.61	7.20	300.58	4.54	0.00	12.48	301.18	24.92

GLEN-20
NICHOLAS 3 S. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 26 72	7.10	124.	23700.	.5	18400.	24.8		22.90	7.20	276.00	4.70	0.00	11.95	280.00	22.20
7 11 72	6.90	124.	28800.	.4	18300.	19.8		22.87	7.03	277.00	5.10	0.00	12.18	275.00	29.00
8 3 72	7.10	124.	28800.	.3	18000.	12.6		23.50	7.00	278.00	4.00	0.00	12.36	279.00	24.00
8 31 72	7.80	124.	28600.	.2	17800.	11.1		15.60	7.00	278.00	4.20	0.00	9.80	277.00	26.00
10 5 72	7.20	124.	28800.	.6	18300.	28.2		22.50	6.80	278.00	4.10	0.00	11.88	291.00	22.50
11 7 72	7.30	123.	28800.	.5	18300.	26.7		22.90	6.90	280.00	4.00	0.00	11.96	289.00	23.50
12 5 72	7.50	124.	28800.	.5	18000.	24.8		22.50	6.80	278.00	3.90	0.00	11.93	271.00	23.00
1 16 73	7.30	124.	28800.	1.5	18000.	71.4		22.00	6.90	272.00	3.90	0.00	11.95	271.00	23.75
2 14 73	7.40	124.	28800.	1.7	18200.	82.1		22.80	6.80	272.00	4.20	0.00	12.13	279.00	22.50
3 13 73	7.50	124.	28700.	1.5	18200.	71.7		23.00	6.75	266.00	3.20	0.00	12.16	286.00	23.75
4 10 73	7.10	124.	28600.	1.1	18100.	55.7		22.80	6.80	280.00	4.00	0.00	11.74	275.00	23.80
5 8 73	7.00	124.	28700.	1.5	18200.	73.7		23.00	6.60	274.00	4.20	0.00	12.22	280.00	23.40
9 29 77	7.80	124.	27412.	.5	17500.	23.6		22.20	7.20	268.00	3.60	0.00	11.98	272.00	22.88
1 10 78	6.60	124.	27278.	.7	17800.	33.6		22.40	7.00	272.00	3.60	0.00	11.91	280.00	21.42
3 30 78	6.80	120.	27412.	.5	17800.	24.0		22.00	7.20	274.00	4.20	0.00	11.73	276.00	22.46
5 8 78	6.60	120.	26709.	.4	0.	0.0									
8 4 78	6.90	122.	24888.	1.0	0.	0.0									
10 5 78	6.60	122.	28345.	1.0	18000.	48.6		22.00	7.00	270.00	4.25	0.00	11.96	270.00	23.66
12 14 78	6.80	120.	27579.	.5	18400.	24.8		22.20	7.20	274.00	4.00	0.00	12.01	280.00	24.34
3 13 79	6.40	120.	29155.	.5	18200.	24.6		22.25	7.00	288.00	4.00	0.00	11.96	290.00	22.88
9 6 79	7.20	120.	27833.	.5	18100.	24.4		21.75	6.50	280.00	5.50	0.00	11.95	285.00	24.96
11 7 79	6.80	122.	28490.	.4	0.	0.0									
MEAN	7.13	123.	28153.	.8	18084.	37.2	0.00	22.17	6.93	275.53	4.14	0.00	11.88	279.26	23.68
STD DEV	.39	2.	1227.	.5	236.	22.5	0.00	1.65	.20	5.08	.52	0.00	.53	6.48	1.66
MIN	6.40	120.	23700.	.2	17500.	11.1	0.00	15.60	6.50	266.00	3.20	0.00	9.80	270.00	21.42
MAX	7.80	124.	29155.	1.7	18400.	82.1	0.00	23.50	7.20	288.00	5.50	0.00	12.36	291.00	29.00
FLOW WEIGHTED MEAN					18104.			22.44	6.88	274.15	4.05	0.00	11.97	278.84	23.46

GLEN-30
NICHOLAS 2 S. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 20 72	6.90	122.	28500.	.3	18900.	15.3		23.70	6.60	289.00	4.70	0.00	12.09	286.00	23.70
4 25 72	6.90	124.	24300.	.0	18600.	1.0		24.00	7.30	289.00	4.70	0.00	12.08	286.00	22.90
5 31 72	7.00	124.	27200.	.1	18800.	4.6		23.76	6.83	282.00	4.60	0.00	1.24	289.00	22.90
7 11 72	7.00	124.	29700.	.0	18600.	1.7		23.56	6.83	279.00	5.20	0.00	12.39	285.00	29.00
8 3 72	7.20	124.	28800.	.0	18400.	2.2		23.75	7.00	282.00	4.00	0.00	12.36	289.00	24.00
8 31 72	7.60	124.	29700.	.0	18400.	1.0		22.80	7.20	280.00	4.40	0.00	11.68	285.00	22.50
10 5 72	7.30	124.	29700.	.0	18700.	1.0		21.90	6.90	282.00	4.20	0.00	11.18	291.00	26.00
11 7 72	7.40	124.	29700.	.0	18700.	1.3		22.20	7.00	296.00	4.20	0.00	11.48	288.00	24.00
12 5 72	7.40	123.	29700.	.0	18400.	.6		23.30	7.00	284.00	4.00	0.00	12.07	281.00	25.00
1 16 73	7.10	124.	28800.	.0	18400.	2.2		22.80	7.10	286.00	4.10	0.00	11.96	287.00	23.25
2 14 73	7.40	124.	29300.	.0	18500.	.3		22.80	6.80	280.00	4.40	0.00	12.08	285.00	23.50
3 13 73	7.30	123.	28900.	.0	18400.	2.0		23.25	6.75	280.00	3.20	0.00	12.23	290.00	24.25
4 10 73	7.30	123.	28900.	.0	18400.	2.2		23.00	7.00	286.00	4.20	0.00	11.68	285.00	23.80
5 8 73	7.10	124.	28900.	.0	18300.	2.2		23.20	6.60	284.00	4.20	0.00	12.36	284.00	23.00
6 21 76	6.80	120.	27355.	0.0	17900.	0.0	7.40	21.80	6.60	274.00	4.00	0.00	11.94	262.00	36.38
7 23 76	6.60	120.	27956.	0.0	17400.	0.0	.20	22.40	6.60	270.00	3.60	0.00	12.02	262.00	21.83
8 19 76	6.60	124.	27978.	0.0	17200.	0.0	.20	22.00	6.60	274.00	3.80	0.00	11.89	264.00	21.40
9 13 76	6.60	122.	29577.	0.0	17500.	0.0	5.00	20.80	7.00	274.00	4.00	0.00	11.92	272.00	22.47
10 27 76	6.90	124.	27352.	0.0	17500.	0.0	1.80	21.80	6.80	276.00	3.80	0.00	12.04	272.00	23.54
11 10 76	6.70	124.	28403.	0.0	17200.	0.0	.47	22.40	6.80	270.00	4.20	0.00	12.16	268.00	21.19
12 3 76	6.70	124.	27882.	0.0	17700.	0.0	.74	22.00	6.40	276.00	3.80	0.00	12.14	268.00	23.54
12 29 76	6.60	124.	27635.	0.0	17060.	0.0	.21	22.20	6.80	270.00	3.80	0.00	12.12	272.00	21.61
2 23 77	6.70	123.	27877.	0.0	17700.	0.0	.50	22.20	6.80	274.00	4.40	0.00	11.84	266.00	22.26
MEAN	7.00	123.	28440.	.1	18116.	2.7	1.84	22.68	6.84	279.87	4.15	0.00	11.52	279.00	24.00
STD DEV	.31	1.	1236.	.1	578.	3.6	2.59	.81	.22	6.78	.42	0.00	2.26	10.10	3.17
MIN	6.60	120.	24300.	.0	17060.	.3	.20	20.80	6.40	270.00	3.20	0.00	1.24	262.00	21.19
MAX	7.60	124.	29700.	.3	18900.	15.3	7.40	24.00	7.30	296.00	5.20	0.00	12.39	291.00	36.38
FLOW WEIGHTED MEAN					18677.			23.42	6.79	285.81	4.44	0.00	10.74	286.67	23.86

GLEN-40
NICHOLAS 1 S. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 20 72	6.90	122.	27700.	.3	18900.	15.3		23.40	6.90	288.00	4.80	0.00	12.05	287.00	24.60
4 25 72	7.50	122.	22600.	.2	18500.	11.5		23.70	6.90	283.00	4.80	0.00	12.18	284.00	22.90
5 31 72	6.90	124.	26700.	.3	18800.	13.2		23.46	7.23	283.00	4.40	0.00	1.23	288.00	24.60
7 11 72	6.90	124.	29700.	.4	18500.	21.1		23.66	6.73	283.00	5.10	0.00	12.23	280.00	26.50
8 3 72	7.10	124.	28000.	.5	18300.	24.6		23.75	7.00	280.00	4.00	0.00	12.48	283.00	24.50
8 31 72	7.60	124.	29500.	.4	18600.	21.1		23.40	7.20	286.00	4.40	0.00	12.10	283.00	26.00
10 5 72	7.20	124.	28800.	.4	18700.	22.2		23.10	6.90	282.00	4.20	0.00	12.00	281.00	24.50
11 7 72	7.50	124.	28800.	.4	18300.	21.7		20.20	6.90	286.00	4.10	0.00	9.54	286.00	23.50
12 5 72	7.20	124.	29700.	.4	18400.	18.9		23.20	6.80	282.00	4.00	0.00	11.88	283.00	22.50
1 16 73	7.00	124.	29700.	.4	18600.	19.1		23.00	7.20	284.00	4.00	0.00	11.92	281.00	23.00
2 14 73	7.70	124.	28900.	.3	18200.	16.7		18.80	6.80	278.00	4.20	0.00	7.89	279.00	24.25
3 13 73	7.30	124.	28400.	.3	18100.	16.6		23.00	6.75	274.00	3.20	0.00	12.13	284.00	25.25
4 10 73	7.10	124.	28900.	.3	18500.	13.0		22.80	7.00	280.00	4.20	0.00	12.04	285.00	23.00
5 8 73	7.20	124.	29100.	.3	18800.	17.3		23.20	6.60	282.00	4.40	0.00	12.38	282.00	23.40
6 21 76	6.60	120.	27355.	.0	18300.	.7	1.60	22.20	6.60	280.00	4.20	0.00	12.18	276.00	25.68
7 23 76	6.60	120.	27956.	.0	18100.	.7	1.10	23.00	6.60	274.00	4.00	0.00	12.24	274.00	22.47
8 19 76	6.60	118.	29577.	.0	18000.	.7	2.70	22.80	6.60	280.00	3.80	0.00	12.15	280.00	21.83
9 13 76	6.90	122.	29577.	.0	18500.	1.5	21.00	22.20	6.60	278.00	4.20	0.00	12.22	280.00	22.04
10 27 76	6.90	124.	29771.	.0	18000.	1.9	2.00	22.40	7.00	284.00	4.00	0.00	12.27	288.00	21.61
11 10 76	6.60	124.	28403.	.1	17800.	4.8	.40	22.80	7.00	276.00	4.40	0.00	12.40	272.00	21.61
12 3 76	7.40	124.	28693.	.1	18200.	4.9	1.00	22.20	6.60	282.00	3.80	0.00	12.34	270.00	23.96
12 29 76	6.70	102.	30162.	.1	17600.	4.8	.29	22.80	6.80	278.00	4.00	0.00	12.32	272.00	23.33
2 23 77	6.70	120.	27877.	.1	10200.	1.4	4.40	12.80	4.80	164.00	1.20	0.00	7.25	166.00	10.30
MEAN	7.05	122.	28516.	.2	17996.	11.9	3.83	22.26	6.76	275.96	4.06	0.00	11.19	275.83	23.10
STD DEV	.34	5.	1565.	.2	1730.	8.4	6.56	2.35	.47	24.67	.73	0.00	2.59	24.48	3.12
MIN	6.60	102.	22600.	.0	10200.	.7	.29	12.80	4.80	164.00	1.20	0.00	1.23	166.00	10.30
MAX	7.70	124.	30162.	.5	18900.	24.6	21.00	23.75	7.23	288.00	5.10	0.00	12.48	288.00	26.50
FLOW WEIGHTED MEAN					18385.			22.64	6.89	280.95	4.21	0.00	11.12	281.33	24.03

GLEN-50
MCFADDEN VAPOR CAVES N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 21 72	7.60	122.	29400.	.3	19100.	15.5		23.30	7.30	293.00	4.40	0.00	11.98	294.00	23.90
4 26 72	7.30	120.	21600.	.1	18600.	5.5		23.70	7.10	291.00	4.90	0.00	12.20	294.00	23.20
7 12 72	7.30	121.	28800.	.1	19700.	5.0		23.17	6.83	294.00	5.10	0.00	12.40	279.00	31.50
8 3 72	7.30	120.	28800.	.1	17900.	5.8		23.00	6.75	276.00	4.00	0.00	12.11	275.00	23.75
8 31 72	7.50	122.	30600.	.1	18900.	6.1		22.60	7.20	288.00	4.60	0.00	11.54	293.00	24.00
10 5 72	7.40	121.	29700.	.1	18700.	5.0		17.40	6.80	288.00	4.30	0.00	6.52	297.00	24.00
11 7 72	7.20	120.	29700.	.1	19800.	5.1		21.80	6.80	288.00	4.00	0.00	10.80	297.00	22.40
12 5 72	7.30	118.	31600.	.1	19700.	4.3		25.00	7.10	302.00	4.20	0.00	12.20	297.00	28.50
1 16 73	7.20	120.	30600.	.1	19100.	4.6		23.70	7.20	292.00	4.20	0.00	11.04	296.00	25.50
2 14 73	7.60	120.	29700.	.1	18500.	4.5		18.00	6.80	288.00	4.40	0.00	6.83	288.00	24.75
3 13 73	7.70	115.	27700.	.1	17500.	4.3		22.00	6.50	268.00	3.00	0.00	11.54	274.00	22.50
4 10 73	7.50	119.	28900.	.1	18500.	3.5		21.00	6.80	278.00	4.20	0.00	6.06	279.00	23.60
5 8 73	7.40	121.	29400.	.1	18800.	5.3		23.00	6.60	284.00	4.40	0.00	11.87	292.00	23.40
6 21 76	6.70	120.	27355.	.1	18700.	6.1	1.40	22.00	6.80	286.00	4.40	0.00	11.71	278.00	32.10
7 21 76	6.80	120.	28445.	.3	18300.	14.8	.30	22.60	6.60	282.00	3.80	0.00	12.32	286.00	22.47
8 19 76	6.90	122.	29577.	.2	18100.	7.3	.20	22.60	6.60	284.00	3.80	0.00	12.10	280.00	22.04
9 13 76	6.80	122.	29577.	.1	18800.	2.5	.50	22.60	6.80	278.00	4.20	0.00	12.38	284.00	23.33
10 27 76	6.90	120.	29771.	.0	18300.	2.0	2.00	22.60	7.00	286.00	4.00	0.00	12.29	288.00	23.11
11 10 76	7.20	120.	28403.	.1	18300.	5.4	.62	23.00	7.00	282.00	4.40	0.00	12.24	280.00	21.83
12 7 76	7.00	120.	29234.	.1	18400.	5.0	.35	22.80	7.00	296.00	4.00	0.00	12.34	284.00	24.18
1 12 77	6.90	116.	28439.	.1	17800.	5.3	.54	21.80	6.60	290.00	4.00	0.00	11.56	283.00	22.90
2 23 77	6.90	117.	27877.	.2	18300.	7.4	1.50	22.40	6.60	290.00	4.40	0.00	12.12	276.00	22.26
4 27 77	7.50	117.	29056.	.1	18400.	5.0		22.20	7.20	292.00	5.20	0.00	12.18	304.00	22.88
6 8 77	6.70	112.	25988.	.1	16700.	4.5		20.60	6.00	252.00	3.80	0.00	11.46	252.00	22.46
7 28 77	7.00	120.	29412.	.1	18300.	4.9		23.00	6.80	280.00	4.00	0.00	12.35	272.00	22.05
9 29 77	7.80	120.	28153.	.1	18300.	4.9		22.80	7.00	276.00	4.00	0.00	12.18	272.00	22.88
1 11 78	7.20	120.	31289.	.1	18700.	5.0		22.80	6.80	280.00	4.00	0.00	12.25	272.00	22.88
3 31 78	7.30	120.	28935.	.1	18600.	5.0		23.00	7.40	284.00	4.40	0.00	12.02	288.00	21.63
5 10 78	6.90	118.	28935.	.1	0.	0.0									
8 7 78	7.10	119.	26853.	.1	0.	0.0									
10 6 78	7.20	118.	30012.	.1	18800.	5.1		22.25	6.75	278.00	4.25	0.00	12.16	285.00	23.40
12 15 78	7.40	116.	27579.	.2	19100.	7.7		22.80	7.40	286.00	3.80	0.00	12.31	280.00	24.34
3 14 79	6.70	114.	28345.	.5	18500.	22.5		23.00	6.75	288.00	4.50	0.00	12.16	290.00	22.62
5 21 79	6.09	118.	29577.	.1	0.	0.0									
7 5 79	7.10	118.	30303.	.2	0.	0.0									
9 7 79	7.00	116.	29471.	.1	19000.	5.1		21.75	6.50	295.00	5.50	0.00	12.25	290.00	24.70
11 7 79	6.90	116.	29240.	.2	0.	0.0									
MEAN	7.19	119.	28857.	.1	18506.	6.3	.82	22.26	6.86	284.53	4.25	0.00	11.48	284.34	23.91
STD DEV	.31	2.	1748.	.1	538.	4.0	.64	1.43	.30	9.08	.47	0.00	1.69	10.40	2.45
MIN	6.70	112.	21600.	.0	16700.	2.0	.20	17.40	6.00	252.00	3.00	0.00	6.06	252.00	21.63
MAX	7.80	122.	31600.	.5	19700.	22.5	2.00	25.00	7.40	302.00	5.50	0.00	12.40	304.00	32.10
FLOW WEIGHTED MEAN					18518.			22.41	6.86	285.25	4.26	0.00	11.67	285.09	23.71

GLEN-50
HOT SPRINGS CAISSON N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 21 72	6.90	120.	30300.	2.3	19600.	119.1		25.00	7.60	308.00	4.50	0.00	12.45	310.00	26.00
4 26 72	7.10	119.	22600.	3.6	19500.	179.8		24.90	7.40	308.00	5.10	0.00	12.26	314.00	24.70
7 12 72	7.10	118.	29700.	3.2	19300.	165.2		24.35	6.83	286.00	5.40	0.00	12.57	293.00	30.50
8 3 72	7.20	116.	29700.	3.3	18300.	161.1		23.75	7.00	282.00	4.00	0.00	12.01	287.00	24.00
8 31 72	7.50	118.	31600.	2.5	19400.	129.9		24.40	7.40	294.00	4.60	0.00	12.16	295.00	24.50
10 5 72	7.50	118.	30600.	2.7	19500.	139.5		24.10	7.10	298.00	4.40	0.00	12.37	303.00	26.50
11 7 72	7.50	118.	31600.	3.1	19800.	165.7		24.20	7.30	306.00	4.40	0.00	12.15	310.00	24.50
12 5 72	7.60	118.	28800.	2.6	17700.	125.2		21.10	6.70	276.00	3.80	0.00	10.49	263.00	24.00
1 16 73	7.30	118.	30600.	2.5	19900.	134.3		24.30	7.50	306.00	4.30	0.00	12.14	306.00	24.75
2 14 73	7.50	118.	30400.	2.9	19500.	153.2		24.00	7.20	298.00	4.60	0.00	12.13	296.00	25.00
3 13 73	7.60	117.	30300.	3.0	19500.	159.5		23.50	7.25	286.00	3.40	0.00	10.99	304.00	26.00
4 10 73	7.30	119.	30600.	2.8	19500.	149.5		24.00	7.20	296.00	4.40	0.00	16.41	294.00	24.00
5 8 73	7.10	118.	30200.	3.1	19200.	162.8		24.40	7.00	294.00	4.40	0.00	12.50	296.00	24.20
6 21 76	6.80	110.	27355.	4.0	18300.	198.7	1.50	22.60	6.60	282.00	4.20	0.00	12.03	272.00	32.10
7 21 76	6.80	118.	27632.	3.0	18000.	145.8	.34	22.80	6.60	280.00	3.80	0.00	12.00	274.00	23.11
8 19 76	6.80	120.	28755.	3.0	17600.	142.6	.30	22.60	6.60	276.00	4.00	0.00	11.61	266.00	22.90
9 13 76	6.80	116.	28755.	3.5	19000.	179.6	.55	22.80	6.80	280.00	4.20	0.00	12.25	284.00	25.04
10 27 76	6.80	120.	29771.	3.5	19200.	181.4	1.00	23.60	7.40	304.00	4.20	0.00	12.68	304.00	23.33
11 10 76	6.90	120.	30073.	3.5	19200.	181.4	.73	24.20	7.20	296.00	4.60	0.00	12.83	300.00	23.54
12 7 76	7.30	116.	29393.	2.0	19100.	103.1	.92	23.20	7.00	294.00	4.00	0.00	12.54	292.00	25.25
1 12 77	7.30	114.	29662.	2.5	19000.	128.3	.71	23.60	7.20	300.00	4.20	0.00	12.16	299.00	23.75
2 23 77	6.90	114.	29426.	2.9	18900.	148.0	1.00	23.20	6.80	296.00	4.60	0.00	12.26	286.00	23.92
4 27 77	7.50	118.	31698.	3.0	19300.	156.3		22.80	7.40	300.00	4.80	0.00	12.74	296.00	23.30
6 8 77	7.00	116.	30048.	1.0	18300.	49.4		22.40	7.00	280.00	4.20	0.00	12.37	282.00	21.84
7 28 77	6.70	118.	29412.	1.5	17900.	72.5		22.60	6.60	272.00	4.00	0.00	12.15	264.00	22.67
9 29 77	7.80	118.	22163.	1.5	18200.	73.7		23.20	7.20	284.00	3.60	0.00	12.13	272.00	22.88
1 11 78	7.10	112.	29551.	4.4	19100.	227.4		23.20	7.00	292.00	4.40	0.00	12.44	296.00	23.30
3 31 78	7.60	118.	29762.	3.0	18600.	150.7		23.00	7.40	288.00	4.40	0.00	12.02	284.00	23.71
5 10 78	6.80	116.	28935.	4.9	0.	0.0									
8 7 78	6.80	116.	24295.	5.3	0.	0.0									
10 6 78	6.80	118.	30012.	5.0	18900.	255.2		23.25	7.25	285.00	4.25	0.00	11.96	295.00	25.48
12 14 78	7.00	116.	30012.	3.5	19500.	184.3		23.80	7.40	292.00	3.20	0.00	12.41	307.00	25.17
3 14 79	6.50	120.	30921.	4.0	19800.	213.8		24.00	7.00	300.00	4.75	0.00	12.56	305.00	24.18
7 5 79	7.40	114.	28571.	3.0	0.	0.0									
9 7 79	6.70	114.	28629.	3.8	18700.	190.3		22.75	7.00	275.00	5.25	0.00	11.85	275.00	23.92
11 7 79	6.60	120.	30030.	4.0	0.	0.0									
MEAN	7.13	117.	29376.	3.0	18947.	153.9	.78	23.49	7.09	291.06	4.31	0.00	12.30	291.38	24.63
STD DEV	.34	2.	2085.	.8	637.	43.0	.37	.83	.29	10.44	.48	0.00	.88	14.28	2.05
MIN	6.50	110.	22163.	1.0	17600.	49.4	.30	21.10	6.60	272.00	3.20	0.00	10.49	263.00	21.84
MAX	7.80	120.	31698.	5.0	19900.	255.2	1.50	25.00	7.60	308.00	5.40	0.00	16.41	314.00	32.10
FLOW WEIGHTED MEAN					18980.			23.51	7.09	291.30	4.34	0.00	12.30	292.36	24.79

GLEN-70
POOL OUTLET N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 21 72	7.20	92.	23700.	3.0	15900.	128.8		20.30	6.10	240.00	3.70	0.00	10.48	250.00	20.20
4 26 72	7.30	92.	24900.	5.7	15500.	237.7		21.20	6.10	248.00	4.10	0.00	10.77	254.00	20.90
6 1 72	7.10	94.	22700.	3.2	15200.	131.3		19.21	5.94	224.00	3.60	0.00	1.01	228.00	19.40
7 12 72	7.30	96.	22800.	1.6	14600.	63.9		19.40	5.64	219.00	4.00	0.00	10.20	212.00	23.00
8 3 72	7.30	99.	21300.	6.1	12800.	209.8		17.75	5.25	192.00	2.75	0.00	8.64	199.00	18.25
8 31 72	7.40	114.	30600.	4.0	19300.	209.5		24.40	7.40	288.00	4.60	0.00	12.14	300.00	26.50
10 5 72	7.60	98.	26500.	3.1	16800.	138.3		21.10	6.30	258.00	3.80	0.00	10.98	267.00	21.50
11 7 72	7.30	98.	28000.	3.8	17800.	182.1		20.20	6.80	278.00	4.20	0.00	9.18	281.00	22.80
12 5 72	7.70	92.	29700.	3.5	18000.	169.6		22.90	6.70	278.00	3.90	0.00	11.50	271.00	24.50
1 16 73	7.30	94.	28800.	2.8	18100.	134.4		21.00	6.90	276.00	3.90	0.00	10.20	277.00	23.50
2 14 73	7.60	92.	27300.	2.6	17400.	123.1		21.00	6.60	262.00	4.00	0.00	10.49	269.00	25.00
3 13 73	7.40	92.	28100.	3.6	17800.	171.6		22.25	6.75	264.00	4.00	0.00	11.37	272.00	21.00
4 10 73	7.50	85.	26500.	3.8	16700.	169.5		21.00	6.20	252.00	3.80	0.00	10.98	257.00	21.60
5 8 73	7.50	96.	27300.	3.6	17100.	166.7		21.40	6.20	260.00	3.80	0.00	11.31	258.00	22.20
6 21 76	7.00	100.	23538.	2.6	15100.	104.8	2.00	19.40	5.60	236.00	3.80	0.00	10.10	227.00	27.82
7 21 76	6.80	110.	27632.	4.0	17900.	193.3	.86	22.80	6.60	278.00	3.80	0.00	12.00	270.00	23.33
8 19 76	6.70	116.	29577.	3.4	18000.	164.3	1.00	22.80	6.60	280.00	3.80	0.00	11.79	280.00	22.47
9 13 76	6.90	98.	25544.	3.0	16400.	132.8	8.50	20.00	6.00	236.00	3.60	0.00	10.38	240.00	19.90
10 27 76	7.20	78.	21533.	2.5	13300.	89.8	5.00	17.60	5.60	210.00	3.00	0.00	9.59	216.00	16.69
11 10 76	7.20	78.	20450.	2.7	12000.	87.5	3.50	16.40	5.00	186.00	2.80	0.00	9.20	192.00	15.41
12 7 76	7.70	100.	27739.	2.5	17700.	119.5	.77	21.20	6.80	282.00	3.80	0.00	10.52	284.00	26.11
1 12 77	7.30	92.	27828.	2.1	17700.	100.8	1.00	22.20	6.80	282.00	3.80	0.00	11.51	275.00	22.26
2 23 77	7.20	96.	28630.	2.7	18200.	130.7	.80	23.00	7.00	280.00	4.20	0.00	11.66	278.00	20.80
4 27 77	7.10	86.	23773.	.5	14400.	19.4		18.80	6.10	224.00	3.40	0.00	10.58	228.00	18.10
6 8 77	6.90	110.	29138.	3.0	17400.	140.9		20.60	6.80	270.00	4.20	0.00	10.33	272.00	21.84
7 28 77	6.70	112.	28571.	4.0	18100.	195.5		22.00	6.60	272.00	3.60	0.00	11.80	272.00	22.64
9 29 77	7.60	102.	26042.	3.0	16100.	130.4		21.00	6.60	248.00	3.20	0.00	11.04	248.00	20.38
1 11 78	7.20	98.	28752.	7.0	17800.	336.4		22.40	6.60	272.00	4.00	0.00	11.62	272.00	22.46
3 31 78	7.30	100.	26709.	3.5	16600.	156.9		21.20	6.60	256.00	3.80	0.00	10.46	256.00	19.55
5 10 78	7.10	96.	26709.	2.0	0.	0.0									
8 7 78	6.80	104.	25510.	1.3	0.	0.0									
10 6 78	7.10	92.	25510.	3.0	16200.	131.2		20.00	6.25	240.00	4.00	0.00	10.86	245.00	21.06
12 15 78	7.20	94.	26853.	3.5	18100.	171.0		22.20	7.20	270.00	3.60	0.00	11.81	260.00	24.54
3 14 79	7.10	77.	25510.	2.5	16500.	111.4		20.00	6.00	258.00	3.75	0.00	10.81	255.00	20.80
5 23 79	6.09	107.	28755.	4.6	0.	0.0									
7 5 79	6.80	104.	27778.	2.5	0.	0.0									
9 7 79	6.80	104.	27833.	6.1	17400.	288.5		21.00	6.25	263.00	5.25	0.00	11.15	255.00	23.14
11 6 79	7.00	96.	26455.	2.5	0.	0.0									
MEAN	7.23	96.	26375.	3.4	16603.	152.8	2.60	20.64	6.36	254.00	3.80	0.00	10.50	255.15	21.81
STD DEV	.27	10.	2622.	1.3	1704.	60.7	2.66	1.71	.54	26.40	.47	0.00	1.90	25.44	2.68
MIN	6.70	77.	20450.	.5	12000.	19.4	.77	16.40	5.00	186.00	2.75	0.00	1.01	192.00	15.41
MAX	7.70	116.	30600.	7.0	19300.	336.4	8.50	24.40	7.40	288.00	5.25	0.00	12.14	300.00	27.82
FLOW WEIGHTED MEAN					16703.			20.99	6.37	255.23	3.85	0.00	10.55	256.45	21.88

GLEN-76
SEEP HIWAY YARD N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
6 17 76	7.30	90.	27355.	.1	17500.	5.7	2.50	31.40	9.20	248.00	3.60	0.00	10.75	239.00	42.80
7 21 76	7.40	100.	27632.	.2	17800.	9.6	2.00	30.25	9.25	265.00	3.50	0.00	8.12	258.00	35.31
8 19 76	7.20	94.	29577.	.2	19700.	8.0	1.10	33.40	10.20	292.00	4.20	0.00	9.38	280.00	40.02
9 13 76	7.30	92.	31370.	.1	20200.	6.5	7.30	34.00	10.40	284.00	4.20	0.00	10.14	288.00	40.23
10 27 76	7.30	84.	31626.	.1	20500.	5.5	4.00	35.80	11.40	302.00	4.40	0.00	10.72	312.00	41.94
11 10 76	7.30	86.	32984.	.1	20400.	5.5	1.30	35.80	11.20	298.00	4.40	0.00	10.03	296.00	40.66
12 7 76	7.30	80.	31256.	.2	20800.	8.4	1.00	35.00	11.20	312.00	4.20	0.00	9.12	296.00	42.37
1 12 77	7.40	72.	31275.	.1	20800.	7.3	.61	37.40	11.40	312.00	4.60	0.00	11.01	311.00	42.37
2 23 77	7.30	83.	31157.	.2	21200.	11.4	1.20	38.80	11.80	300.00	4.60	0.00	11.65	298.00	41.18
4 27 77	7.60	96.	33743.	.3	21700.	14.6		37.25	12.00	315.00	5.50	0.00	11.29	330.00	41.86
6 8 77	7.00	92.	32051.	.1	20600.	5.6		37.60	12.00	296.00	4.60	0.00	11.88	302.00	43.68
7 28 77	7.30	90.	32258.	.1	20600.	5.6		38.50	11.50	300.00	4.00	0.00	9.75	304.00	42.64
9 29 77	7.80	86.	29762.	.1	21000.	2.8		37.50	12.50	315.00	4.00	0.00	9.80	320.00	42.38
1 11 78	7.50	70.	30395.	.1	20900.	2.8		36.00	12.00	304.00	4.00	0.00	9.49	312.00	41.39
3 31 78	7.30	78.	30637.	0.0	19800.	0.0		35.20	11.80	282.00	4.40	0.00	9.60	280.00	39.31
5 10 78	7.20	72.	26709.	.1	0.	0.0									
8 7 78	7.30	79.	19623.	.2	0.	0.0									
10 6 78	7.00	76.	21711.	.1	14300.	3.9		24.50	7.50	200.00	3.25	0.00	12.76	197.00	28.60
12 15 78	7.30	54.	21259.	.1	13900.	3.8		24.80	7.60	196.00	2.80	0.00	11.21	197.00	27.66
3 14 79	7.00	59.	20825.	.2	13700.	5.5		24.25	7.00	200.00	4.25	0.00	11.06	190.00	26.52
5 23 79	7.05	72.	19532.	.2	0.	0.0									
9 7 79	7.30	74.	10891.	.1	6450.	1.7		10.90	3.40	94.00	1.90	0.00	8.30	92.00	12.69
11 6 79	8.20	68.	7077.	.1	0.	0.0									
MEAN	7.31	82.	28303.	.1	18518.	6.4	2.33	32.54	10.18	269.21	4.02	0.00	10.32	268.53	37.56
STD DEV	.19	12.	5747.	.1	3881.	3.2	2.13	7.02	2.35	58.02	.77	0.00	1.21	60.53	8.08
MIN	7.00	54.	10891.	.1	6450.	1.7	.61	10.90	3.40	94.00	1.90	0.00	8.12	92.00	12.69
MAX	7.80	100.	33743.	.3	21700.	14.6	7.30	38.80	12.50	315.00	5.50	0.00	12.76	330.00	43.68
FLOW WEIGHTED MEAN					18658.			32.69	10.13	271.50	4.12	0.00	10.39	270.43	37.69

GLEN-80
SEEP HIWAY YARD N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 21 72	7.40	80.	23700.	.5	15800.	21.3		27.90	9.00	221.00	3.30	0.00	7.81	228.00	31.20
4 26 72	7.40	73.	19800.	.3	12800.	8.6		25.80	8.20	192.00	3.20	0.00	8.29	196.00	27.40
6 1 72	7.50	70.	11700.	.5	7030.	8.9		14.80	4.00	99.00	1.68	0.00	6.76	99.60	14.80
7 12 72	7.40	88.	20000.	.2	12700.	6.1		21.00	6.80	181.00	3.36	0.00	8.14	184.00	30.00
8 3 72	7.40	89.	18500.	.3	11300.	8.2		20.25	6.25	162.00	2.25	0.00	7.52	165.00	24.00
8 31 72	7.60	88.	20400.	.2	12600.	8.4		20.80	7.20	182.00	2.80	0.00	6.77	179.00	26.50
10 5 72	7.40	84.	22300.	.2	14200.	7.3		22.10	7.70	208.00	3.10	0.00	5.98	205.00	32.00
11 7 72	7.60	78.	23300.	.2	14900.	6.4		24.70	8.50	222.00	3.20	0.00	6.89	222.00	30.25
12 5 72	7.30	70.	23300.	.2	15000.	6.1		26.00	8.60	212.00	3.20	0.00	6.91	219.00	29.25
1 16 73	7.30	74.	24500.	.2	15400.	6.7		25.50	9.20	222.00	3.20	0.00	7.05	217.00	32.00
2 14 73	7.40	73.	24300.	.2	16000.	7.3		27.60	9.60	222.00	3.40	0.00	6.87	233.00	32.25
3 13 73	7.40	68.	23400.	.2	14700.	7.1		24.50	8.75	214.00	3.00	0.00	5.13	214.00	31.00
4 10 73	7.30	79.	25700.	.1	16800.	6.4		28.80	9.80	240.00	3.40	0.00	7.28	241.00	32.20
5 8 73	7.30	84.	27100.	.1	17400.	6.6		30.60	10.20	244.00	3.80	0.00	7.05	256.00	35.60
11 10 76	7.20	90.	26218.	.2	17500.	7.1	1.50	30.20	9.80	254.00	4.00	0.00	9.21	248.00	34.67
12 7 76	7.20	86.	27251.	.2	18100.	7.3	1.20	31.20	10.00	268.00	3.40	0.00	9.12	256.00	38.09
1 12 77	7.50	82.	28755.	.1	18600.	7.0	.89	34.20	10.60	280.00	3.80	0.00	10.26	271.00	38.09
2 23 77	7.30	86.	28630.	.2	19300.	8.9	3.00	35.00	11.40	280.00	9.20	0.00	8.99	278.00	37.44
4 27 77	7.60	90.	30765.	.3	19300.	15.6		32.80	11.40	284.00	4.80	0.00	9.00	296.00	37.44
6 8 77	7.10	90.	30048.	.3	19100.	15.5		33.00	11.40	272.00	4.40	0.00	9.15	280.00	37.44
7 28 77	7.50	96.	30303.	.2	19500.	9.0		36.00	11.50	280.00	4.00	0.00	8.85	288.00	40.56
9 29 77	7.50	94.	30637.	.1	20500.	6.6		37.25	12.25	295.00	4.50	0.00	9.21	290.00	41.60
1 11 78	7.60	82.	32237.	.3	21000.	17.0		37.60	12.20	300.00	4.00	0.00	9.57	304.00	40.98
3 31 78	7.40	88.	31566.	.2	20900.	8.5		36.75	12.00	302.00	4.80	0.00	9.41	300.00	40.82
5 10 78	7.40	89.	32552.	.2	0.	0.0									
8 7 78	7.20	90.	20408.	.3	0.	0.0									
10 6 78	7.20	66.	10004.	.4	5960.	6.4		11.40	3.90	82.00	1.30	0.00	6.56	84.60	12.38
12 15 78	7.40	83.	22676.	.3	15400.	12.5		26.40	8.00	216.00	2.60	0.00	11.06	217.00	30.99
3 14 79	7.00	84.	26164.	.3	17000.	13.8		31.25	9.00	243.00	4.25	0.00	11.36	235.00	34.84
5 21 79	7.01	86.	19532.	.6	0.	0.0									
9 7 79	7.00	84.	18906.	.3	11900.	9.6		20.50	6.00	175.00	3.25	0.00	8.95	170.00	23.66
11 6 79	7.30	86.	23148.	.2	0.	0.0									
MEAN	7.36	82.	24363.	.2	15739.	9.4	1.65	27.64	9.04	226.86	3.61	0.00	8.18	227.72	32.05
STD DEV	.17	8.	5513.	.1	3795.	3.9	.94	6.74	2.27	55.48	1.37	0.00	1.52	55.48	7.20
MIN	7.00	66.	10004.	.1	5960.	6.1	.89	11.40	3.90	82.00	1.30	0.00	5.13	84.60	12.38
MAX	7.60	96.	32237.	.5	21000.	21.3	3.00	37.60	12.25	302.00	9.20	0.00	11.36	304.00	41.60
FLOW WEIGHTED MEAN					14916.			26.34	8.55	214.35	3.41	0.00	8.19	215.84	30.35

GLEN-90
GAMMA 2 N. BANK COLO RIVER

SAMPLE DATE	PH	TMP (F)	FC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 21 72	6.90	106.	30300.	.3	21800.	17.7		39.00	11.40	320.00	5.10	0.00	11.89	314.00	44.50
4 26 72	7.10	103.	30300.	.3	20500.	14.9		39.40	11.40	322.00	5.10	0.00	11.89	312.00	43.90
6 1 72	7.00	104.	31600.	.3	22000.	18.4		40.60	10.80	310.00	5.80	0.00	11.93	317.00	49.00
7 12 72	7.10	106.	32700.	.3	22000.	17.2		39.01	11.29	314.00	5.70	0.00	12.02	309.00	48.00
8 3 72	7.10	108.	33200.	.3	22300.	17.5		38.75	11.75	316.00	4.50	0.00	12.06	317.00	43.50
10 5 72	7.40	107.	33800.	.3	22500.	15.8		38.20	11.80	320.00	4.70	0.00	11.76	333.00	47.00
11 7 72	7.40	106.	33800.	.3	22400.	16.3		38.40	11.60	328.00	4.60	0.00	11.14	326.00	44.50
12 5 72	7.40	104.	33800.	.3	22700.	17.8		41.60	11.80	320.00	4.60	0.00	11.78	325.00	48.00
1 16 73	7.30	101.	32700.	.3	22400.	15.7		40.00	12.00	320.00	4.30	0.00	11.78	312.00	44.00
2 14 73	7.40	100.	32700.	.3	22100.	16.1		38.60	11.60	316.00	4.60	0.00	11.83	313.00	46.25
3 13 73	7.20	100.	33300.	.3	22200.	15.6		39.50	11.25	318.00	4.50	0.00	12.15	318.00	43.75
4 10 73	7.40	103.	33400.	.2	22300.	14.5		35.60	11.40	320.00	4.60	0.00	8.68	316.00	45.00
5 8 73	7.30	102.	33700.	.3	22300.	15.7		39.60	11.40	316.00	4.80	0.00	12.38	322.00	44.40
6 17 76	6.80	106.	32650.	.3	21900.	18.3	5.10	38.00	11.00	313.00	4.40	0.00	12.02	314.00	49.22
7 21 76	6.80	110.	32237.	.3	21700.	18.2	5.50	39.00	11.00	320.00	4.25	0.00	11.96	318.00	46.55
8 19 76	6.80	110.	33393.	.3	21600.	18.7	5.00	38.20	11.20	318.00	4.40	0.00	12.08	316.00	44.51
9 13 76	6.70	106.	31370.	.3	21100.	16.5	4.50	36.40	10.60	294.00	4.20	0.00	11.52	296.00	41.73
10 27 76	6.90	108.	32648.	.3	21600.	15.2	7.00	37.80	11.60	316.00	4.40	0.00	11.88	324.00	44.08
11 10 76	6.90	110.	32984.	.3	21700.	15.2	4.30	39.40	11.60	316.00	4.80	0.00	11.90	320.00	43.44
12 7 76	7.20	106.	31347.	.3	21400.	16.8	8.60	38.20	11.20	312.00	4.20	0.00	12.00	304.00	43.23
1 12 77	7.10	102.	33286.	.4	21800.	21.2	4.70	39.20	11.60	334.00	4.60	0.00	11.76	327.00	43.44
2 23 77	6.90	105.	32101.	.3	22000.	15.4	4.20	39.20	11.80	318.00	5.20	0.00	11.90	316.00	45.14
4 27 77	7.00	106.	32688.	.3	22000.	15.4		37.25	11.75	330.00	5.50	0.00	11.92	320.00	41.08
6 8 77	6.60	104.	32051.	.3	21400.	16.6		35.40	11.80	308.00	4.60	0.00	9.27	310.00	45.76
7 28 77	6.80	110.	33333.	.3	21500.	15.1		39.00	11.50	312.00	4.40	0.00	12.00	312.00	45.76
9 29 77	7.60	108.	32552.	.3	21500.	15.1		37.75	11.00	310.00	4.25	0.00	11.95	305.00	43.42
1 11 78	6.90	112.	32237.	.3	21700.	15.2		38.60	11.40	320.00	4.40	0.00	11.87	312.00	43.47
3 31 78	6.90	100.	32552.	.2	22000.	11.9		38.00	12.00	312.00	4.75	0.00	10.39	310.00	42.38
5 10 78	6.80	100.	33602.	.3	0.	0.0									
8 7 78	6.80	106.	29155.	.2	0.	0.0									
10 6 78	6.80	106.	32916.	.2	21700.	11.7		37.25	11.50	308.00	5.00	0.00	11.46	315.00	43.94
12 15 78	7.00	102.	31888.	.2	22200.	12.0		38.00	12.00	314.00	4.20	0.00	12.01	315.00	45.55
3 14 79	6.60	100.	32916.	.2	21900.	8.9		37.75	11.75	313.00	4.25	0.00	12.01	315.00	43.16
5 21 79	6.09	102.	32350.	.2	0.	0.0									
7 5 79	7.00	102.	33333.	.2	0.	0.0									
9 7 79	6.90	104.	32323.	.2	21400.	11.6		36.00	10.50	315.00	5.50	0.00	11.65	310.00	43.42
11 6 79	6.90	104.	32680.	.2	0.	0.0									
MEAN	7.04	105.	32587.	.3	21863.	15.7	5.43	38.40	11.45	316.34	4.69	0.00	11.65	315.41	44.72
STD DEV	.26	3.	900.	.0	448.	2.5	1.46	1.35	.39	7.14	.45	0.00	.78	7.25	1.96
MIN	6.60	100.	30300.	.2	20500.	8.9	4.20	35.40	10.50	294.00	4.20	0.00	8.68	296.00	41.08
MAX	7.60	112.	33800.	.4	22700.	21.2	8.60	41.60	12.00	334.00	5.80	0.00	12.38	333.00	49.22
FLOW WEIGHTED MEAN					21858.			38.46	11.43	316.59	4.69	0.00	11.67	315.54	44.82

GLEN-100
GAMBA 1 N. BANK COLO. RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 21 72	6.70	102.	27700.	1.0	19500.	52.7		35.70	10.70	295.00	4.40	0.00	11.42	288.00	40.60
4 26 72	6.80	100.	20200.	1.0	18600.	50.2		35.80	10.80	281.00	4.60	0.00	14.44	284.00	40.00
7 12 72	6.70	100.	28000.	.8	18400.	37.3		33.90	11.50	272.00	4.60	0.00	12.28	282.00	41.50
8 3 72	7.00	100.	27800.	.5	18400.	23.3		33.00	10.25	260.00	3.75	0.00	11.31	263.00	40.50
8 31 72	7.20	102.	28300.	.4	18900.	21.4		34.80	10.20	270.00	4.80	0.00	11.31	274.00	38.50
10 5 72	7.20	100.	29800.	.6	19200.	30.1		34.00	10.60	274.00	4.00	0.00	11.23	283.00	38.50
11 7 72	7.10	100.	28800.	.6	18600.	29.1		33.40	10.20	266.00	3.70	0.00	10.89	268.00	39.00
12 5 72	7.20	100.	28800.	.4	18600.	20.1		34.80	10.20	264.00	3.80	0.00	10.97	263.00	38.00
1 16 73	7.20	100.	28800.	.6	19100.	29.9		35.25	10.80	276.00	3.80	0.00	11.03	271.00	38.50
2 14 73	7.40	102.	30800.	.6	20200.	34.9		35.40	10.80	292.00	4.40	0.00	11.36	290.00	44.75
3 13 73	7.00	100.	30200.	.6	19900.	30.6		35.50	11.00	274.00	4.25	0.00	11.53	284.00	41.50
4 10 73	7.00	101.	29500.	.7	19500.	35.8		34.40	10.60	276.00	4.00	0.00	11.31	273.00	38.20
6 17 76	6.60	100.	31630.	.3	20400.	13.8	3.20	37.00	11.00	292.00	4.20	0.00	11.82	274.00	51.36
7 23 76	6.60	102.	29651.	1.0	20100.	54.3	1.50	37.25	11.00	295.00	4.00	0.00	11.84	293.00	40.93
8 19 76	6.60	102.	31370.	.4	20000.	21.6	1.00	35.60	10.80	292.00	4.00	0.00	11.95	280.00	40.66
9 13 76	6.50	100.	32350.	.5	20500.	27.7	6.00	35.80	10.00	286.00	4.20	0.00	11.76	288.00	41.52
10 27 76	6.60	104.	31626.	.5	20400.	27.5	3.00	36.20	11.60	310.00	4.20	0.00	11.78	308.00	41.52
11 10 76	6.60	104.	30073.	.5	20200.	27.3	1.00	37.20	11.20	294.00	4.40	0.00	11.84	292.00	41.09
12 7 76	6.60	104.	30989.	.5	20600.	27.8	.57	36.00	10.80	308.00	4.00	0.00	11.92	296.00	40.66
12 29 76	6.60	106.	30522.	.5	20000.	27.0	1.60	37.20	11.20	298.00	4.00	0.00	12.14	292.00	41.73
2 23 77	6.60	104.	32101.	.2	20700.	12.3	.90	37.40	11.60	308.00	4.80	0.00	11.92	298.00	43.26
4 27 77	6.70	102.	32686.	.4	20900.	22.6		37.00	11.75	315.00	5.50	0.00	12.10	320.00	44.20
6 7 77	6.20	100.	32051.	.3	20700.	14.0		36.00	11.60	298.00	4.40	0.00	12.06	298.00	41.60
7 28 77	6.50	104.	32258.	.5	20900.	28.2		38.50	11.50	300.00	4.00	0.00	12.15	304.00	43.68
9 29 77	7.80	102.	32552.	.5	21200.	28.6		37.75	11.50	305.00	4.00	0.00	12.10	310.00	43.42
1 11 78	6.50	104.	33245.	.5	21200.	30.9		37.40	11.60	300.00	4.40	0.00	12.01	296.00	42.43
3 31 78	6.80	100.	32552.	.4	21000.	22.7		37.75	11.75	305.00	4.75	0.00	11.60	300.00	41.86
5 10 78	6.80	100.	30637.	.5	0.	0.0									
8 7 78	6.60	100.	25510.	.4	0.	0.0									
10 6 78	6.60	100.	26164.	.4	17500.	18.9		30.75	9.75	247.00	3.75	0.00	10.86	240.00	35.10
12 15 78	6.80	96.	24295.	.4	16400.	17.7		29.40	8.80	226.00	3.60	0.00	10.51	232.00	32.49
3 14 79	6.40	98.	28345.	.5	19000.	25.7		33.25	9.75	275.00	3.75	0.00	11.21	275.00	38.48
9 7 79	6.60	98.	27081.	.4	17800.	19.2		30.75	9.25	253.00	5.25	0.00	10.90	250.00	36.14
11 6 79	6.60	100.	27778.	.5	0.	0.0									
MEAN	6.80	101.	29653.	.5	19626.	27.8	2.09	35.30	10.78	284.10	4.24	0.00	11.66	282.87	40.70
STD DEV	.34	2.	2788.	.2	1189.	10.3	1.73	2.20	.75	20.71	.45	0.00	.70	19.70	3.32
MIN	6.20	96.	20200.	.2	16400.	12.3	.57	29.40	8.80	226.00	3.60	0.00	10.51	232.00	32.49
MAX	7.80	106.	33245.	1.0	21200.	54.3	6.00	38.50	11.75	315.00	5.50	0.00	14.44	320.00	51.36
FLOW WEIGHTED MEAN					19576.			35.34	10.78	284.18	4.22	0.00	11.75	283.53	40.57

GLEN-115
S. CANYON CREEK

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
4 20 72	7.70	118.	1310.	.8	776.	1.6		.44	.36	12.00	.18	0.00	4.88	5.62	2.49
8 31 72	7.90	120.	1310.	.4	775.	.8		.36	0.00	12.00	.24	0.00	4.84	5.56	2.12
10 5 72	8.50	118.	1320.	.4	784.	.8		.36	.10	12.20	.21	.73	4.02	5.66	2.20
11 7 72	7.90	118.	1330.	.3	784.	.6		.35	.10	12.40	.20	0.00	4.84	6.30	2.12
12 5 72	7.90	112.	1330.	.3	783.	.6		.37	.11	12.10	.20	0.00	4.81	5.88	2.44
1 16 73	8.00	116.	1320.	.4	771.	.8		.37	.13	12.00	.20	0.00	4.78	5.63	2.24
2 14 73	8.10	117.	1310.	.3	772.	.6		.38	.11	12.10	.20	0.00	4.81	5.83	2.06
3 13 73	8.30	115.	1260.	.3	762.	.6		.45	.13	11.50	.20	.16	4.69	5.32	2.03
4 10 73	8.00	116.	1320.	.3	776.	.6		.48	.11	12.00	.20	0.00	4.94	5.47	2.43
5 8 73	7.80	116.	1310.	.3	768.	.6		.37	.10	12.20	.21	0.00	5.02	5.65	2.30
6 17 76	7.50	108.	1323.	.0	782.	.1	2.00	.40	.10	12.10	.20	0.00	5.02	5.94	2.20
7 23 76	7.50	120.	1305.	.4	773.	.8	.38	.05	.01	12.30	.18	0.00	4.94	5.37	2.35
8 19 76	8.00	110.	1344.	.3	770.	.6	1.40	.36	.11	12.60	.21	0.00	5.01	5.76	2.14
9 13 76	7.60	110.	1324.	.4	803.	.9	1.50	.36	.08	11.64	.21	0.00	4.91	5.66	2.18
10 27 76	7.70	110.	1341.	.3	793.	.5	4.00	.04	.01	12.50	.19	0.00	4.94	5.60	1.80
11 11 76	8.20	104.	1334.	.3	790.	.6	2.20	.39	.11	12.40	.21	0.00	4.97	5.62	2.76
12 8 76	7.70	90.	1323.	.4	793.	.9	1.50	.39	.11	12.30	.18	0.00	5.00	5.66	2.09
12 29 76	8.20	106.	1342.	.4	763.	.8	1.10	.39	.11	12.50	.21	0.00	5.07	5.60	3.10
2 23 77	7.70	114.	1324.	.5	740.	.9	1.90	.40	.12	12.40	.22	0.00	4.93	5.68	2.04
4 27 77	7.80	106.	1376.	.4	780.	.8		.37	.11	12.32	.21	0.00	5.00	5.62	2.16
4 28 77	7.90	106.	1310.	0.0	776.	0.0		.38	.12	12.40	.21	0.00	4.96	5.58	2.12
6 8 77	7.70	112.	1326.	.2	736.	.4		.36	.11	12.00	.20	0.00	4.95	5.70	2.08
7 28 77	7.80	110.	1333.	.3	760.	.5		.44	.11	11.90	.19	0.00	5.05	5.60	2.04
9 29 77	8.20	112.	1319.	.2	778.	.5		.35	.10	12.10	.20	0.00	5.05	5.70	2.08
1 11 78	7.70	108.	1330.	.4	789.	.9		.38	.12	12.40	.20	0.00	4.94	5.60	2.09
3 30 78	8.00	111.	1327.	.2	798.	.4		.37	.11	12.00	.21	0.00	4.80	5.65	2.05
5 10 78	7.50	102.	1302.	.2	0.	0.0									
8 7 78	7.50	110.	1307.	.2	0.	0.0									
MEAN	7.90	112.	1323.	.3	776.	.7	1.78	.36	.11	12.17	.20	.03	4.89	5.66	2.22
STD DEV	.25	6.	20.	.1	16.	.3	.99	.10	.06	.26	.01	.15	.20	.18	.26
MIN	7.50	90.	1260.	.0	736.	.1	.38	.04	.01	11.50	.18	0.00	4.02	5.32	1.80
MAX	8.50	120.	1376.	.8	803.	1.6	4.00	.48	.36	12.60	.24	.73	5.07	6.30	3.10
FLOW WEIGHTED MEAN					776.			.36	.13	12.16	.20	.04	4.88	5.65	2.25

GL012
GL012 SPRING NORTH BANK COLO RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
12 15 78	6.90	120.	30921.	.3	20100.	16.3		23.40	7.60	298.00	4.20	0.00	12.71	303.00	25.17
10 6 78	6.70	118.	30921.	.3	19400.	15.7		23.25	7.25	295.00	4.50	0.00	12.61	295.00	25.74
3 14 79	6.40	120.	30012.	.4	19600.	21.2		24.25	6.75	305.00	4.75	0.00	12.66	305.00	23.66
9 7 79	6.60	120.	30364.	.2	19800.	10.7		23.25	6.75	305.00	6.25	0.00	12.65	315.00	24.18
11 7 79	6.60	120.	31746.	.2	0.	0.0									
MEAN	6.65	120.	30555.	.3	19725.	16.0	0.00	23.54	7.09	300.75	4.93	0.00	12.66	304.50	24.69
STD DEV	.21	1.	447.	.1	299.	4.3	0.00	.48	.42	5.06	.91	0.00	.04	8.23	.94
MIN	6.40	118.	30012.	.2	19400.	10.7	0.00	23.25	6.75	295.00	4.20	0.00	12.61	295.00	23.66
MAX	6.90	120.	30921.	.4	20100.	21.2	0.00	24.25	7.60	305.00	6.25	0.00	12.71	315.00	25.74
FLOW WEIGHTED MEAN					19708.			23.62	7.09	300.75	4.80	0.00	12.66	303.67	24.64

GL 30840
NICHOLAS 1&2 SOUTH BANK COLO RIVER

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
9 29 77	7.60	124.	27412.	1.0	18300.	49.4		19.60	7.40	280.00	4.40	0.00	9.45	272.00	22.88
1 10 78	6.90	124.	28752.	1.0	17900.	48.3		22.40	6.80	272.00	3.60	0.00	11.76	280.00	22.26
3 30 78	7.10	121.	28153.	.5	18200.	24.6		22.60	7.20	288.00	4.60	0.00	11.83	276.00	22.67
5 8 78	6.90	120.	29762.	1.0	0.	0.0									
8 4 78	6.70	122.	26164.	.5	0.	0.0									
10 5 78	6.80	122.	27579.	.5	18400.	24.8		22.50	7.00	275.00	4.25	0.00	11.91	280.00	23.66
12 14 78	6.90	120.	27579.	.5	18900.	25.5		23.00	7.00	278.00	3.60	0.00	12.16	276.00	23.50
3 13 79	6.50	120.	28345.	.7	17900.	33.8		22.75	6.75	283.00	4.25	0.00	11.91	275.00	21.32
5 23 79	6.06	122.	28755.	.3	0.	0.0									
7 5 79	6.70	122.	29412.	.3	0.	0.0									
9 6 79	6.70	120.	29471.	.5	18600.	25.1		22.50	6.75	285.00	5.25	0.00	12.00	280.00	23.40
11 7 79	7.70	122.	29240.	.5	0.	0.0									
MEAN	6.93	122.	28184.	.7	18314.	33.1	0.00	22.19	6.99	280.14	4.28	0.00	11.57	277.00	22.81
STD DEV	.35	2.	745.	.2	363.	11.3	0.00	1.16	.25	5.64	.58	0.00	.95	3.11	.83
MIN	6.50	120.	27412.	.5	17900.	24.6	0.00	19.60	6.75	272.00	3.60	0.00	9.45	272.00	21.32
MAX	7.60	124.	29471.	1.0	18900.	49.4	0.00	23.00	7.40	288.00	5.25	0.00	12.16	280.00	23.66
FLOW WEIGHTED MEAN					18251.			21.96	7.00	279.38	4.22	0.00	11.38	276.70	22.70

GL078
GL078 SEEP HIWAY PARKING LOT NORTH BANK COLO RIVER NORTH FR UNDER BUILDING

SAMPLE DATE	PH	TMP (F)	EC (X10E6)	FLOW (CFS)	TDS (PPM)	TONS/ DAY	TRBDTY (NTU)	CA (EPM)	MG (EPM)	NA (EPM)	K (EPM)	CO3 (EPM)	HCO3 (EPM)	CL (EPM)	SO4 (EPM)
9 7 79	6.80	84.	27833.	.1	18400.	5.0		32.50	9.50	260.00	5.50	0.00	11.80	255.00	34.58
5 23 79	6.06	80.	25880.	.1	0.	0.0									
11 6 79	6.50	77.	28490.	.1	0.	0.0									
MEAN	6.80	84.	27833.	.1	18400.	5.0	0.00	32.50	9.50	260.00	5.50	0.00	11.80	255.00	34.58
STD DEV	0.00	0.	0.	0.0	0.	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN	6.80	84.	27833.	.1	18400.	5.0	0.00	32.50	9.50	260.00	5.50	0.00	11.80	255.00	34.58
MAX	6.80	84.	27833.	.1	18400.	5.0	0.00	32.50	9.50	260.00	5.50	0.00	11.80	255.00	34.58
FLOW WEIGHTED MEAN					18400.			32.50	9.50	260.00	5.50	0.00	11.80	255.00	34.58

GPO 841-591