EFFECTS OF EFFLUENTS FROM A COAL-FIRED, ELECTRIC-GENERATING POWERPLANT ON LOCAL GROUND WATER NEAR HAYDEN, COLORADO

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METRIC CONVERSION FACTORS

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

Multiply	*By*	*To obtain*
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
foot (ft)	0.3048	meter
foot per day (ft/d)	0.3048	meter per day
gallon (gal)	3.785	liter
gallon per minute (gal/min)	0.06308	liter per second
inch (in.)	25.40	millimeter
mile (mi)	1.609	kilometer

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

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ABSTRACT

Data were collected at the Hayden powerplant in northwest Colorado for about a year during 1978-79 to monitor the effects of effluent and raw-water storage ponds on the local ground water, Sage Creek, and the Yampa River. Ground water downgradient from the effluent ponds had average boron concentrations in excess of the Colorado Department of Health standard for agricultural use of water. The water from seeps located downgradient from the powerplant is probably the best indicator of downgradient water quality and had average concentrations of boron two times that of the Colorado Department of Health standard for agricultural use of water.

The Hayden powerplant uses seven principal ponds for the storage and disposal of effluents and raw water: An evaporation pond, an "intermediate-quality" pond, an "oil-skimmer" pond, a "high-quality" pond, two raw-water storage ponds, and a coal-pile runoff pond. Two theories may be used to explain the high boron content and high specific conductance of the water from wells and seeps downgradient from the evaporation, the intermediate-quality, the oil-skimmer, and the high-quality ponds. One theory is that all of the ponds are leaking; the other theory, suggested by Hayden powerplant personnel, is that a plume of ground water having high concentrations of boron and high values of specific conductance is responsible. This plume is the remnant of a plume resulting from the leakage of a fly-ash storage pond, which was converted to a raw-water storage pond in 1976. The data support the theory that the ponds are leaking or a combination of leaking ponds and the vestigial plume theory. The theory that a vestigial plume is responsible for the high boron content and high specific conductance of the water cannot be refuted.

It is estimated that about one-fourth of the flow past a representative cross section downgradient from the evaporation pond is leakage from the pond, and about three-fourths of the flow past a representative cross section downgradient from the intermediate-quality, the oil-skimmer, and the high-quality ponds is leakage from these ponds. Estimates of the amount of leakage from the ponds are based on the assumption that the ponds are the only sources of water high in boron.

Chemical analyses of water from wells and a ground-water discharge weir downgradient from the raw-water storage ponds indicate these ponds are leaking. The effect of this leakage is that the ground water downgradient from these ponds has a lower specific conductance and a lower boron concentration than the ambient ground water. The concentration of trace elements in the water from the wells and the discharge weir generally declined during the study, probably because of the decreasing effects of a plume from the raw-water pond previously used for fly-ash disposal.

The effluents from the Hayden powerplant lowered the specific conductance and the iron and manganese concentrations, increased boron concentration, and had little or no effect on the selenium concentration in Sage Creek. Sage Creek and the effluent from the Hayden powerplant had no discernible effect on the Yampa River because the volume of water in the Yampa River was so much greater than the volume of water in Sage Creek and the effluent from the powerplant.

INTRODUCTION

As of December 31, 1978, Colorado had 4,067.5 megawatts of electric-generating capacity. Of this capacity, about 76 percent was generated by the combustion of coal. In Colorado, the use of coal for generating electricity is expected to increase in the future as supplies of oil and natural gas decrease.

Associated with coal-fired, electric-generating plants are various environmental concerns, including fly ash, emissions from boilers, and effluents. The effluents, which include brines from water concentrators, cooling-tower blowdown water, and water that has been in contact with fly or bottom ash, commonly contain large concentrations of certain chemical constituents, including boron (Phung and others, 1979; Holland and Jones, 1978; and M. A. Hardy, U.S. Geological Survey, written commun., 1980). Evaporation ponds commonly are used to dispose of effluents; however, the effects of these ponds on the local ground water are not fully understood. Such an understanding is essential for the design of adequate effluent-disposal facilities at coal-fired, electric-generating plants.

The Hayden powerplant, located near the town of Hayden in northwest Colorado (fig. 1), owned and operated by the Colorado-Ute Electric Association, Inc., was selected as a site to study the effects of a coal-fired, electric-generating plant on the local ground water. Prior to April 30, 1976, effluents from the Hayden powerplant were discharged into Sage Creek, a tributary to the Yampa River. On April 30, 1976, discharge of effluents into Sage Creek ceased and effluents then were discharged into an evaporation pond. Studies done as part of the Yampa River basin assessment (J. W. Warner, U.S. Geological Survey, oral commun., 1980) indicated that ground water is discharging to the Yampa River in this area. Any water seeping from these ponds could possibly affect the quality and quantity of the local ground water. Thus, the ground water eventually could affect the water quality of the Yampa River.

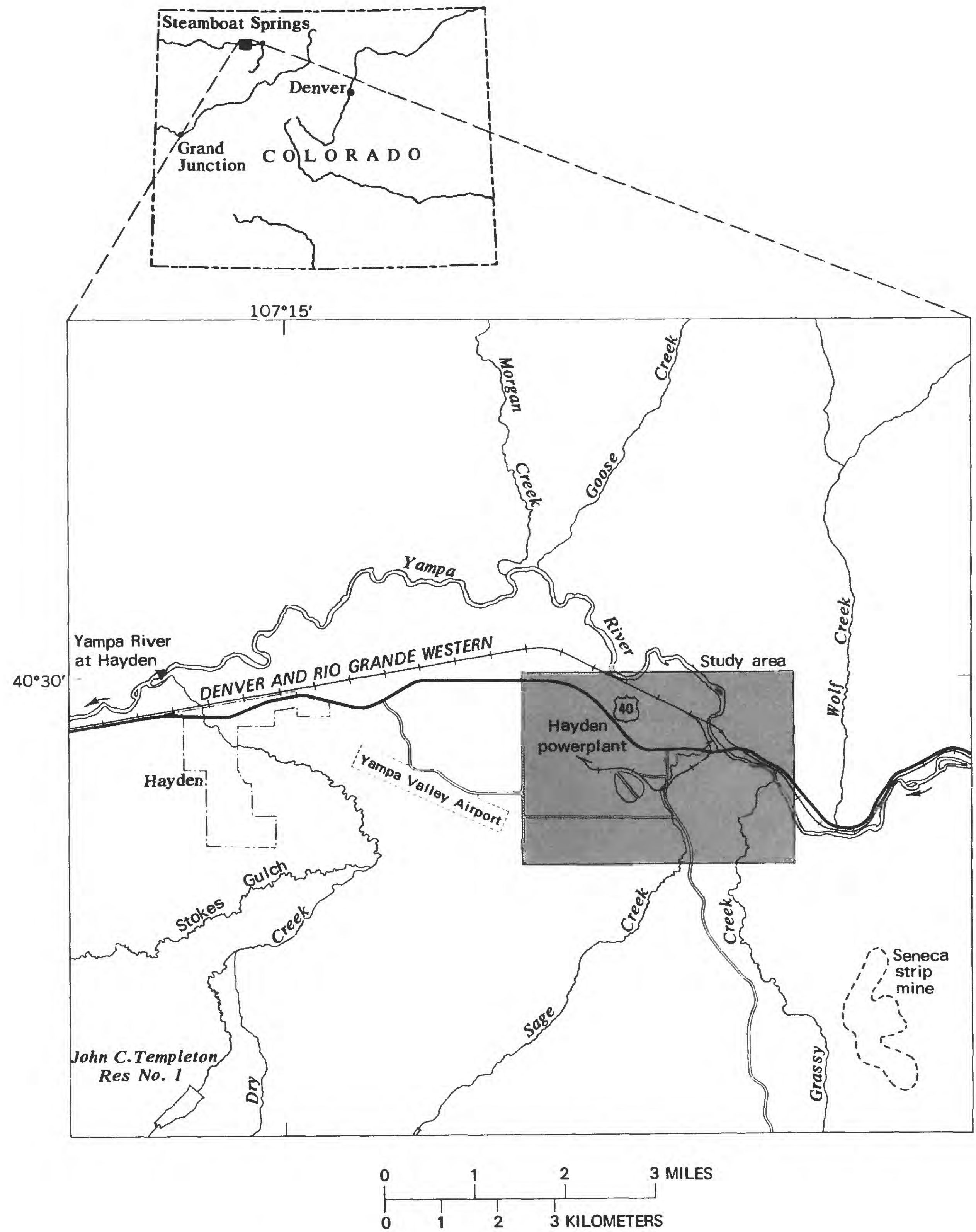

Figure 1.-- Hayden powerplant and local features.

Objectives

This study, which began in August 1978, was conducted by the U.S. Geological Survey for the U.S. Environmental Protection Agency. The objectives of the study were to: (1) Determine the ambient ground-water quality near the powerplant; (2) document the quality and quantity of effluents from the powerplant; (3) document the effect of boron on the ground water; and (4) determine the effects of the powerplant effluents on ground-water quality, quantity, and movement. The data and interpretation of data in this report may assist local agency planners, powerplant personnel, and designers to evaluate the effects of a coal-fired, electric-generating plant in semiarid areas with similar hydrology if the method of disposal of effluents is the same as the method used at the Hayden powerplant.

Acknowledgments

Appreciation is extended to Robert Heard, Environmental Field Supervisor, Hayden powerplant, for assistance in providing data on plant operations and in collecting data during the winter months. Colorado-Ute Electric Association, Inc., provided access to their property, permission to drill observation wells, and data on the plant site and land operation. F. R. Carpenter provided access to his property adjoining the Hayden powerplant and permission to drill observation wells on his property.

PLANT OPERATION

Construction of the Hayden powerplant began in April 1963. The first generator was placed in operation July 1, 1965, and a second generator was placed in operation September 1, 1976. The net generating capacity of the plant is about 450 megawatts. About 15 megawatts additional power is used in internal plant operations. About 5,000 tons of coal per day is supplied to the plant by the Seneca Mine (fig. 1), a strip mine located about 4 mi to the southeast.

The Hayden powerplant obtains its water supply from the Yampa River and has water rights for about 30 ft^3/s. The location of the intake pumping station is shown on plate 1. Preliminary data supplied by the powerplant operators indicate that an average of 9 ft^3/s is diverted from the Yampa River. Prior to November 1978, a single water-storage pond (raw-water storage pond no. 1) was used. A second pond (raw-water storage pond no. 2), used as a fly-ash disposal pond from 1965 to December 1974, was cleared of fly ash, lined with a 5-ft layer of locally obtained clay, and placed in operation as a water-storage pond during November 1978.

Prior to April 30, 1976, the plant discharged effluent into Sage Creek. In order to cease discharging effluents into Sage Creek, four principal ponds were built to the north of the plant. The ponds included an evaporation, an "intermediate-quality," a "high-quality," and an "oil-skimmer" pond (pl. 1). Construction of the ponds was started in late 1975, and they were placed in operation in April 1976. These ponds were lined with a 2-ft layer of locally obtained clay.

Two runoff-retention ponds (pl. 1) were constructed to retain surface runoff from the plant. Runoff-retention pond no. 1, located in a natural gully, receives local runoff from the northwest part of the powerplant. Runoff-retention pond no. 2 receives runoff via a small canal from the west side of the powerplant, where a scrap storage yard is located. The ponds are usually dry from late summer through winter and contain water only during the spring or early summer when surface runoff is above average. The runoff may be from either rainfall or snowmelt.

A preliminary water budget obtained from the Hayden powerplant operators is depicted in figure 2. This budget is based on older measurements that could not be updated or verified during this study because the flow gages in the control center had been rendered inoperable by a water overflow. It is known that about 9 ft^3/s--not 6.28 ft^3/s--of water is being withdrawn from the Yampa River and that 0.07 ft^3/s of effluent is being discharged into the evaporation pond (Colorado-Ute Electric Association, Inc., oral commun., 1980). Although the budget is not up to date, the diagram approximates the relative flow rates of the water used in the powerplant.

A subsurface drainage system, formerly used to discharge effluent into Sage Creek, discharges ground water into Sage Creek. This system, referred to as the discharge weir in this report, is depicted on plate 1 as a 30-in. reinforced concrete pipe (RCP) drain ending in a discharge weir. Visual inspection of the system indicates that ground water seeps into the pipes and is present from a point opposite well HS-15 to the discharge weir at the mouth of the pipe. At present (1980), the only water discharged into the pipe system is ground water. The system probably is collecting water that has infiltrated from the raw-water storage ponds, the coal-storage and runoff-pond area, and local ground water.

An important part of the plant operation is the evaporation of wastewater from the evaporation pond. Two studies were conducted to determine the evaporation rates. The first study was conducted by a consulting firm before the pond became operational, and the second study was conducted by Hayden powerplant personnel in 1979. Both studies concluded that about 32 in. are evaporated each year; the average precipitation at Hayden is about 15 in. per year, resulting in a net evaporation of about 17 in. per year (Hayden powerplant personnel, written commun., 1980). The studies also determined that most evaporation occurs from June through September, and little or no evaporation occurs during the remainder of the year (fig. 3) due to ice cover of the ponds.

GEOHYDROLOGIC SETTING

The Hayden powerplant is located on an alluvial terrace, which is approximately 100 ft above the present flood plain of the Yampa River. This terrace, lowest of several alluvial terrace remnants which were formed by the downcutting of the Yampa River, extends about 4 mi to the south of the plant. Underlying the alluvium terrace is the Lewis Shale of Late Cretaceous age, a relatively impermeable formation that inhibits ground-water movement (pl. 2).

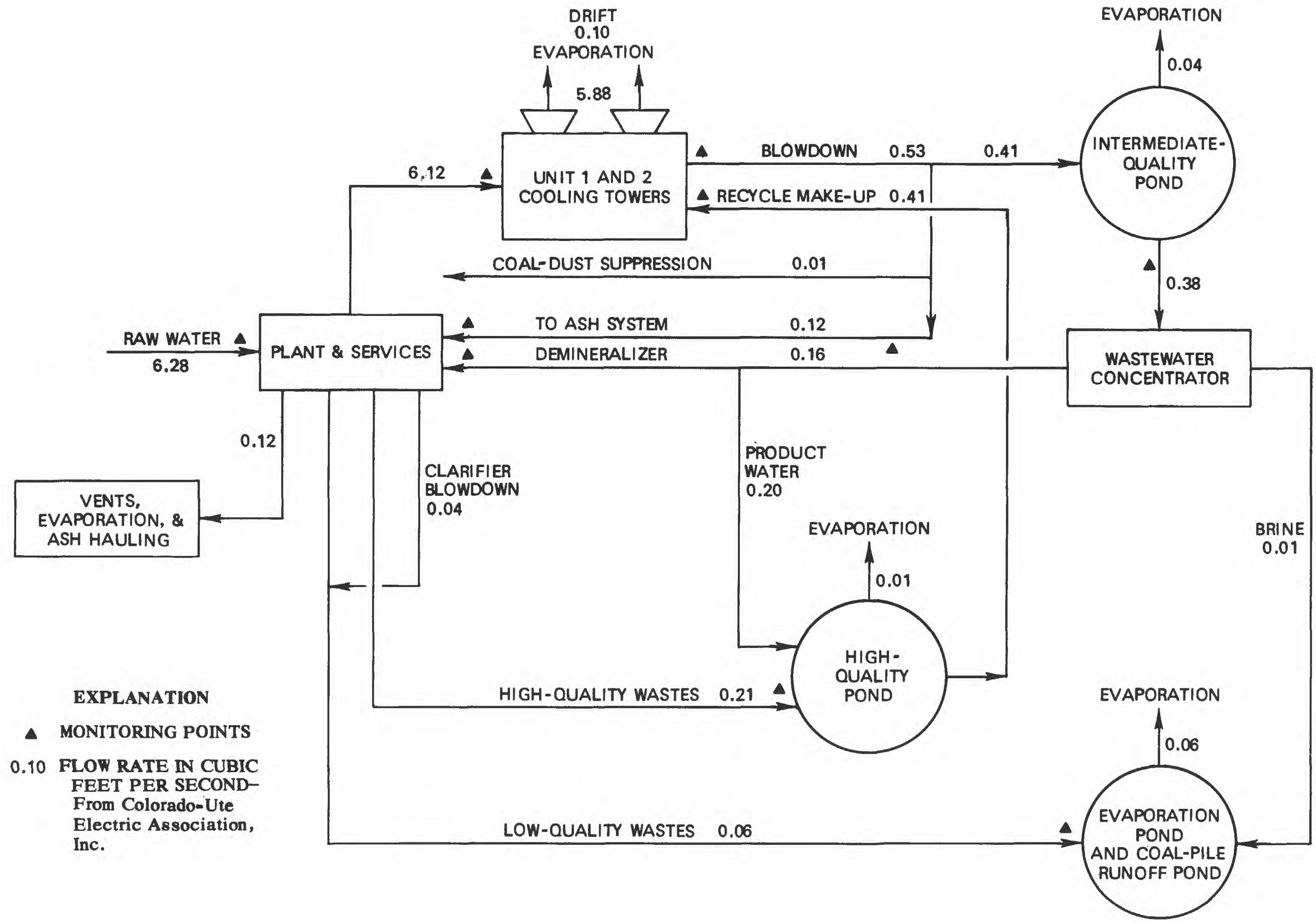

Figure 2.-- Preliminary water budget of the Hayden powerplant.(Diagram supplied by Colorado-Ute Electric Association, Inc.)

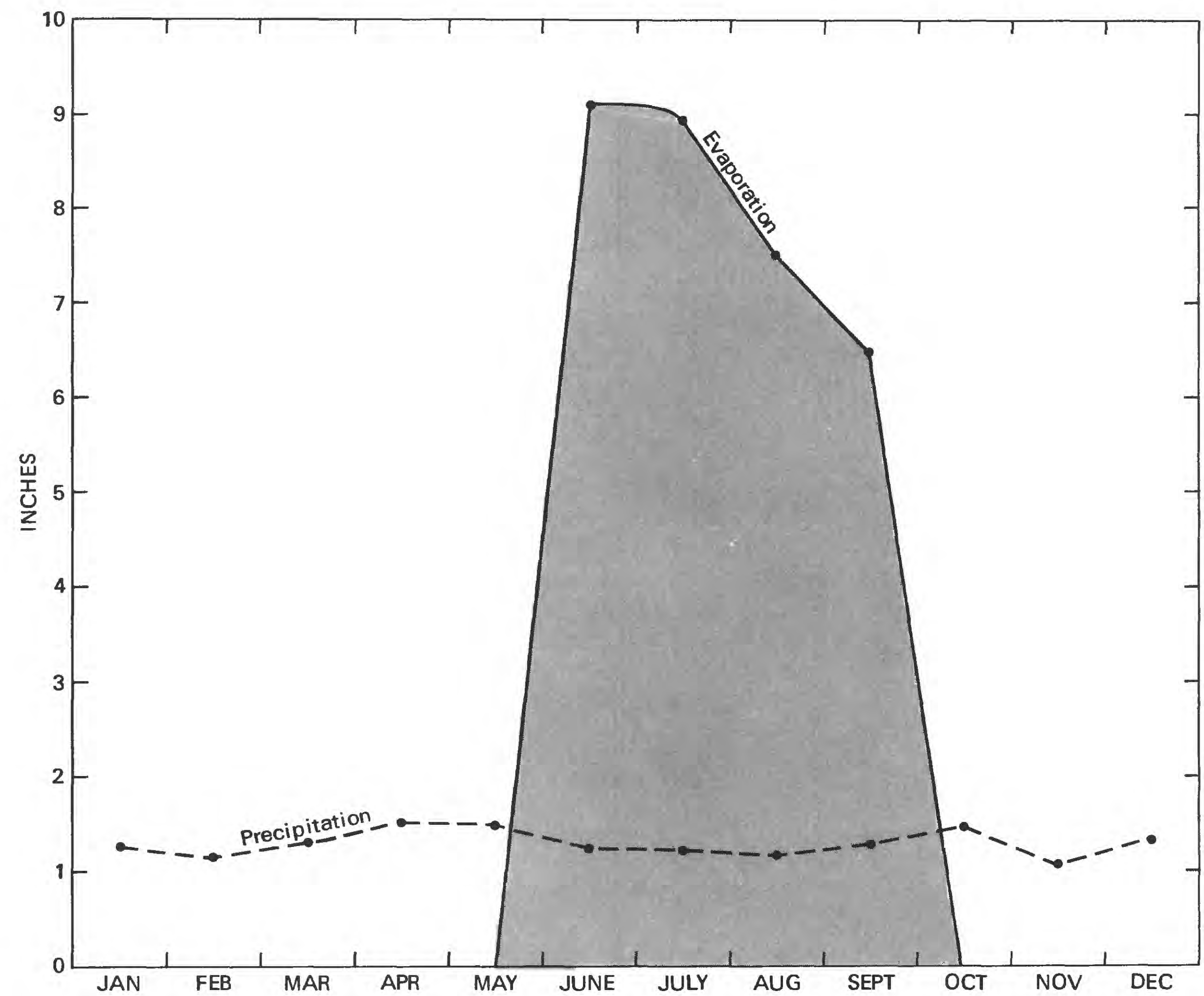

Figure 3.-- Monthly precipitation and evaporation at the Hayden powerplant. (From Colorado-Ute Electric Association, Inc.)

The terrace deposit is about 27 to 49 ft thick in the study area. The deposit is composed of alluvial sand and gravel and includes scattered thin layers of clay, caliche, and boulders. This alluvium supplies all of the well water because the Lewis Shale is not an aquifer in this area. Wells in the alluvium are used primarily for domestic purposes and yield less than 20 gal/min.

Seeps (pl. 1) may issue from the base of the alluvium where the stream has cut down into the Lewis Shale. Several seeps are present along the north and east faces of the terrace within 300 ft of the plant site. These seeps usually flow year round, but some go dry in late fall and winter. Information supplied by Hayden powerplant personnel and local residents indicates that the seeps were present prior to construction of the powerplant. However, residents claim that the discharge of the seeps has increased since the powerplant began storing effluents and Yampa River water in ponds.

DATA-COLLECTION NETWORK

Ponds

The Hayden powerplant uses seven principal ponds for the storage and disposal of effluents and raw water: The evaporation pond, the intermediate-quality pond, the oil-skimmer pond, the high-quality pond, raw-water storage ponds no. 1 and no. 2, and the coal-pile runoff pond. The evaporation pond is used for the storage of wastewater until it is evaporated. The evaporation pond receives wastewater from two sources--low-quality wastes from the powerplant and brine from the wastewater concentrator. The intermediate-quality pond receives blowdown water from the cooling towers and stores the water until it is recycled through the wastewater concentrator for reuse in the powerplant. The oil-skimmer pond is a small pond used to remove floating oil and grease from high-quality wastewater from the powerplant and high-quality water from the wastewater concentrator. The water from the oil-skimmer pond flows into the high-quality pond. The high-quality pond stores makeup water for use in cooling towers. The raw-water ponds store Yampa River water for use in the powerplant. The coal-pile runoff pond receives water only from precipitation and from runoff from the coal pile. The coal-pile runoff pond stores the water until it is evaporated. The location and interrelationship of these ponds are shown in figure 2 and on plate 1, except for the oil-skimmer pond, which is not shown in figure 2.

Powerplant personnel make weekly measurements of stage in the evaporation, the intermediate-quality, and the high-quality ponds. The fluctuations in water levels in the intermediate-quality and the evaporation ponds from October 1978 to January 1980 are illustrated in figure 4. The oil-skimmer and the high-quality ponds are connected by an underground pipe and therefore are at the same elevation. The stage of the high-quality pond was not measured during the winter when the pond was frozen. Because the intermediate- and the high-quality ponds are at about the same elevation, water-level data on the high-quality pond are not presented here, but are available at the Hayden powerplant.

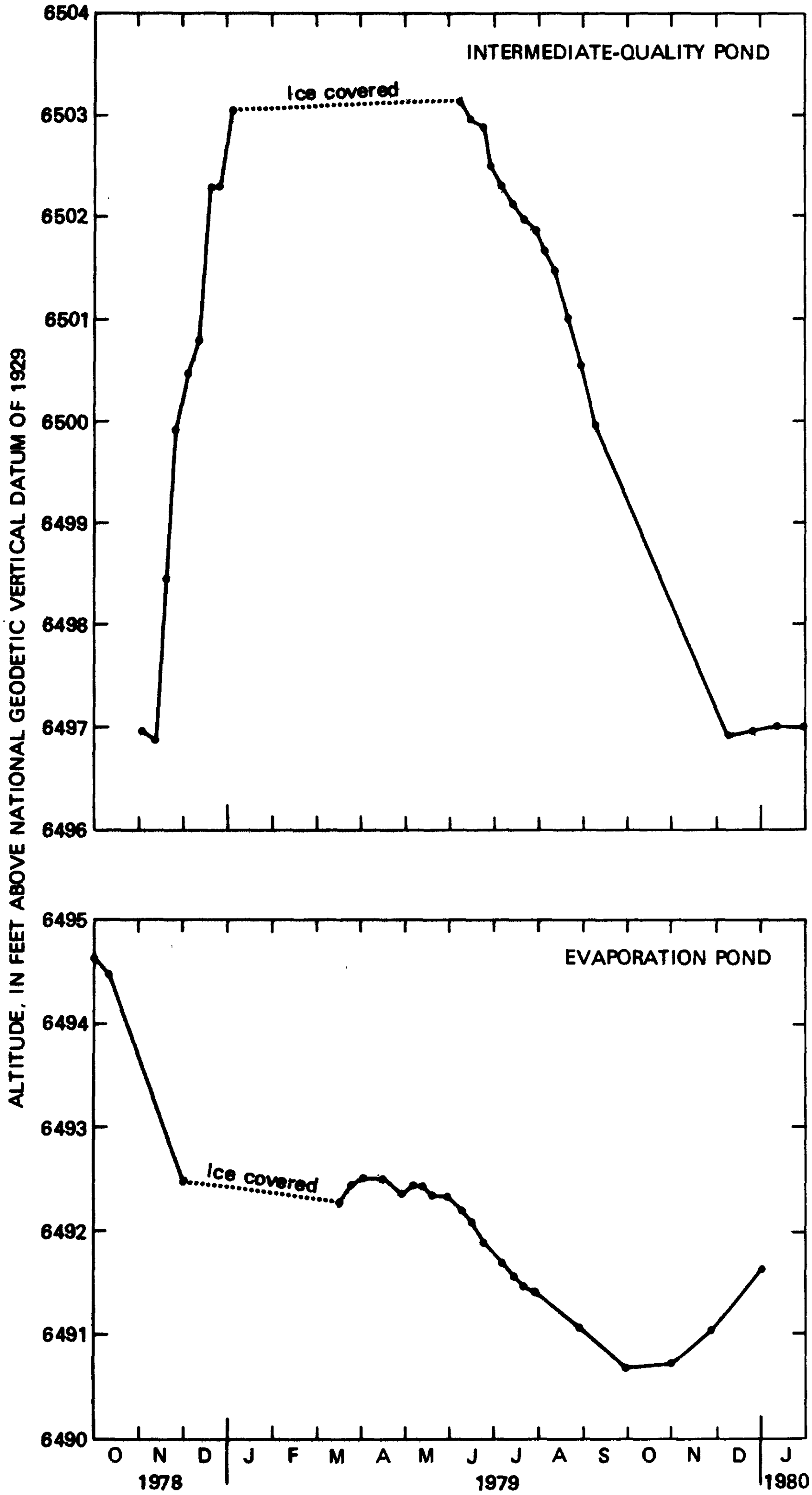

Figure 4.-- Water-level fluctuations in the intermediate-quality and the evaporation ponds, October 1978 to January 1980.

Water-quality samples were collected quarterly from December 1978 through October 1979 from all ponds except raw-water storage pond no. 2, which has the same source of water as raw-water storage pond no. 1. The initial samples were analyzed for a fairly complete set of trace elements and common constituents. The number of trace-element analyses was later reduced to include only those constituents whose concentrations tended to exceed the Colorado Department of Health (1977b) water-quality standards or were of local interest. The Colorado Department of Health (1977b) standards for uses of water are listed in table 1. The trace-element analyses subsequently performed included: Boron, iron, manganese, selenium, and zinc. Only two analyses for common constituents were made on water from the ponds. Results of all of the analyses are presented in the section on Water-Quality Data.

Wells

In order to determine any effects that effluents from the powerplant might have on the shallow ground water, 22 test wells were drilled near the plant (pl. 1 and table 2). Well HS-14 was drilled to provide information on the ambient ground water. Well HS-14 and one privately owned well completed in the alluvium, the Barnes well, were used as controls in the study. Well HS-14 and the Barnes well are not directly upgradient from the principal direction of natural ground-water flow beneath the plant, but lie to the west of the ground-water flow. Water in the wells is assumed to represent the ambient ground water because both wells receive water from the same alluvial fill as that upgradient from the powerplant. The other 21 wells were drilled downgradient from the plant and its storage ponds. The downgradient wells were used to monitor the effects of the plant and ponds on the quality and quantity of ground water.

Well HS-17 was found to have been drilled in an old spoils dump left over from plant construction. Although well HS-17 could not be used to monitor the effect of effluents from the plant, the analyses of water from the well did provide information on the influence of the dump on the local ground water. This well and the dump are not upgradient from any other monitoring well.

All 22 wells were drilled without fluids using a diesel hammer, reverse-air circulation Becker[1] drill. Each well was drilled through the alluvium 0.5 to 2 ft into the Lewis Shale. The wells then were cased with 3.25-in. outside diameter PVC pipe. The lower end of the casing was capped and the lowest 10 to 20 ft perforated. The wells were backfilled with gravel from the same alluvium in which they were completed. Each well was then sealed with cement and capped to prevent contamination from surface water. Levels were run for each well to determine the altitude above sea level.

[1]The use of the brand name in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey.

Water levels in all wells except the Barnes well were monitored for a year, from December 1978 through November 1979. The Barnes well has no access for measurement. Water levels were measured monthly to identify changes due to seasonal fluctuations, such as recharge from snowmelt and rainfall, pumpage from the aquifer, and the effects of lower pond levels. The water-level measurements are shown in table 2, and the water-level fluctuations in selected wells are illustrated in figures 5 and 6. Water-level contours at times of low-, medium-, and high-water levels are shown on plates 3, 4, and 5. The water-level contours tend to follow the outline of the evaporation, the intermediate-quality, and the oil-skimmer ponds, indicating a high ground-water level under these ponds. The shape of the water-level contours indicates the ponds are leaking, resulting in the elevated ground-water levels near the ponds.

Ground-water-quality data were collected quarterly from the test wells from December 1978 to October 1979. In addition, the Barnes well was sampled in June and October. Data from the Barnes well supplemented data from well HS-14 by providing additional information on the ambient ground-water quality. The initial samples were analyzed for a comprehensive set of trace elements and common constituents. The number of subsequent trace-element analyses was reduced to include only those constituents which exceeded the Colorado Department of Health (1977b) standards (table 1) or were of local interest. The trace elements analyzed for subsequent samples were: Boron, iron, manganese, selenium, and zinc. Two analyses for common constituents were made on the water from all wells, except the Barnes well, which had one analysis for common constituents made on the water from the well. Results of all these analyses are presented in the Water-Quality Data section.

Seeps

Seeps are present in the terrace cut along the north and east sides of the Hayden powerplant (pl. 1). Seeps occur for about three-quarters of a mile along the north face of the terrace. Eight representative seeps were chosen for water-quality sampling. All seeps except seep HS-8 are perennial. The seeps were developed by clearing the immediate area of vegetation, enlarging the outflow, and digging collection basins which were drained and allowed to refill prior to sampling. Estimates of flow were made prior to each sampling; these estimates were either visual or based on the time required to fill a given volume. The estimates may be in error because the seeps extend laterally.

Water-quality samples were collected from seeps HS-1 through HS-4 and the gravel-pit seep from January through October 1979 on a quarterly basis. Samples from seeps HS-5 through HS-7 were collected quarterly from March through October 1979, and samples from seep HS-8 were collected in March and June. Seep HS-8 was dry in October. The January samples were analyzed for nearly all trace elements, but subsequent analyses included only boron, iron, manganese, selenium, and zinc. The common constituents were analyzed during the January and March samplings and then discontinued. Results of the analyses and data on flow are presented in the Water-Quality Data section.

Table 1.--*Water-quality standards for water use in Colorado*

[From Wentz and Steele, 1980; value given is the maximum allowed, unless otherwise specified]

Water-quality variable	National (U.S. Environmental Protection Agency, 1976a; 1976b; 1977) and proposed Colorado (Colorado Department of Health, 1977a) drinking-water regulations	Proposed Colorado water-quality standards (Colorado Department of Health, 1977b)		
		Water supply[1]	Aquatic life[2]	Agriculture[3]
Physicochemical variables				
Temperature (°C)	------------	------------	[4]20	-------
pH (standard units)	[5]6.5≤pH≤8.5	[6]5.0≤pH≤9.0	6.5≤pH≤9.0	-------
Dissolved oxygen (mg/L)	------------	------------	[7]6.0	-------
Major inorganic constituents (mg/L)				
Magnesium	------------	125	----------	-------
Chloride	[5]250	250	----------	-------
Fluoride	[8,9]1.4-2.4	[9]1.4-2.4	----------	-------
Nitrate (as N)	[8]10	10	----------	[10]100
Sulfate	[5]250	250	----------	-------
Total dissolved solids	[5]500	------------	----------	-------
Trace elements (µg/L)				
Aluminum	------------	------------	[11]100	-------
Arsenic	[8]50	50	50	100
Barium	[8]1,000	1,000	----------	-------
Beryllium	------------	------------	10	100
Boron	------------	------------	----------	750
Cadmium	[8]10	10	.4	10
Chromium	[8]50	50	100	100
Copper	[5]1,000	1,000	10	200
Iron	[5]300	[11]300	[12]1,000	-------
Lead	[8]50	50	4	100
Manganese	[5]50	[11]50	1,000	200
Mercury	[8]2	2	.05	-------
Molybdenum	------------	------------	----------	150
Nickel	------------	------------	50	200
Selenium	[8]10	10	50	20
Silver	[8]50	50	.1	-------
Thallium	------------	------------	15	-------
Uranium	------------	5,000	30	5,000
Zinc	[5]5,000	5,000	50	2,000

Organic constituents (µg/L)				
Chlorinated pesticides				
Aldrin	------------	------------	0.003	-------
Chlordane	------------	------------	.01	-------
Dieldrin	------------	------------	.003	-------
DDT	------------	------------	.001	-------
Endrin	[8]0.2	0.2	.004	-------
Heptachlor	------------	------------	.001	-------
Lindane	[8]4	4	.01	-------
Methoxychlor	[8]100	100	.03	-------
Mirex	------------	------------	.001	-------
Toxaphene	[8]5	5	.005	-------
Orthophosphate pesticides				
Demeton	------------	------------	.1	-------
Endosulfan	------------	------------	.003	-------
Guthion	------------	------------	.01	-------
Malathion	------------	------------	.1	-------
Parathion	------------	------------	.04	-------
Herbicides				
2,4-D	[8]100	100	----------	-------
2,4,5-TP	[8]10	10	----------	-------
Other				
Polychlorinated biphenyl (PCB)	------------	------------	.001	-------
Phenol	------------	1	1	-------
Radiological variables (pCi/L)				
Alpha	[8,13]15	[13]15	[13]15	[13]15
Beta	(8,14)	[15]50	[15]50	[15]50
Cesium 134	------------	50	50	50
Plutonium 238, 239, and 240	------------	15	15	15
Radium 226 and 228	[8]5	[16]5	[16]5	[16]5
Strontium 90	------------	[16]8	[16]8	[16]8
Thorium 230 and 232	------------	60	60	60
Tritium	------------	20,000	20,000	20,000

Table 1.--*Water-quality standards for water use in Colorado*--Continued

Water-quality variable	National (U.S. Environmental Protection Agency, 1976a; 1976b; 1977) and proposed Colorado (Colorado Department of Health, 1977a) drinking-water regulations	Proposed Colorado water-quality standards (Colorado Department of Health, 1977b)		
		Water supply[1]	Aquatic life[2]	Agriculture[3]
		Biological variables		
Fecal coliforms (per 100 mL)------------------	[8,17]1	[18,19]0	-----------	[18]1,000
		Miscellaneous variables		
Ammonia (mg/L as N)--------	------------	[20]0.5	[21]0.02	---------
Chlorine (total residual; mg/L)--------------------	------------	----------	[22].002	---------
Color (color units)--------	[5]15	----------	-----------	---------
Cyanide (mg/L)-------------	------------	.2	.005	0.2
Foaming agents (mg/L)------	[5].5	----------	-----------	---------
Nitrite (mg/L as N)--------	------------	1.0	[23].05	10
Odor (threshold odor number)------------------	[5]3	----------	-----------	---------
Sulfide as H_2S (mg/L)------	[5].05	.05	.002	---------
Turbidity (TU)-------------	[8,24]1	[25]1.0	-----------	---------

[1]Includes uncontaminated ground water and ground and surface water requiring disinfection or standard treatment (raw water).

[2]Includes cold-water biota (inhabitants, including trout, of waters where temperatures do not normally exceed 20°C) and warm-water biota (inhabitants of waters where temperatures normally exceed 20°C). Trace-element standards apply to waters having total hardness from 0 to 100 mg/L as $CaCO_3$; standards for waters of greater hardness may be equal or greater. Total trace-element concentrations are given, unless otherwise specified.

[3]Includes irrigation and stock watering.

[4]Applies only to cold-water biota; standard for warm-water biota is 30°C. In addition, a maximum 3°C increase over a minimum 4-hour period lasting for 12 hours maximum from naturally occurring temperatures shall be allowed.

[5]Secondary maximum contaminant level. These "* * * are not Federally enforceable and are intended as guidelines for the States * * *" (U.S. Environmental Protection Agency, 1977).

[6]Applies only to ground and surface water requiring disinfection or standard treatment (raw water).

[7]Minimum allowed concentration. Applies only to cold-water biota; standard for warm-water biota is 5.0 mg/L. In addition, a 7.0-mg/L standard during periods of spawning of cold-water fish may be set on a case-by-case basis.

[8]Interim primary maximum contaminant level. Applies to all systems providing piped water for human consumption, "* * * if such system has at least fifteen service connections or regularly serves at least twenty-five individuals." (U.S. Environmental Protection Agency, 1976a; 1976b). Proposed primary drinking-water regulations (Colorado Department of Health, 1977a).

[9]The exact fluoride standard applicable is dependent on "* * * the annual average of the maximum daily air temperatures for the location in which the community water system is situated * * *" (U.S. Environmental Protection Agency, 1976a).

[10]Includes nitrite as N.

[11]Refers to soluble form.

[12]Refers to total concentration.

[13]Including radium-226, but excluding radon and uranium.

[14]"The average annual concentration of beta particle and photon radioactivity from manmade radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year." (U.S. Environmental Protection Agency, 1976b).

[15]Excluding strontium 90.

[16]Including naturally occurring or background contributions.

[17]Arithmetic mean of all samples examined per month. In addition, when fewer than 20 samples per month are examined, no more than 1 sample shall exceed 4 per 100 mL; and when 20 or more samples per month are examined, no more than 5 percent of the samples shall exceed 4 per 100 mL (U.S. Environmental Protection Agency, 1976a).

[18]Geometric mean.

[19]Applies only to uncontaminated ground water with or without disinfection; standard for ground and surface water requiring disinfection or standard treatment (raw water) is 1,000 fecal coliforms/100 mL.

[20]Proposed standard because of effect on chlorination.

[21]Nonionized. Applies only to cold-water biota; standard for warm-water biota is 0.10 mg/L.

[22]Applies only to cold-water biota; standard for warm-water biota is 0.01 mg/L.

[23]Applies only to cold-water biota; standard for warm-water biota is 0.5 mg/L.

[24]A value of 5 or fewer TU is allowed if it does not interfere with disinfection or microbiological determinations.

[25]Applies only to uncontaminated ground water.

Table 2.--*Data on test wells drilled at the Hayden powerplant*

Test well No.	Latitude and longitude[1]	Local well No.[1]	Depth to Lewis Shale (feet)	Land-surface altitude (feet above sea level)	Water levels (in feet below land surface) Dec. 5, 1978	Dec. 19-20, 1978	Jan. 11, 1979	Feb. 6, 1979	Mar. 1, 1979	Mar. 26-27, 1979	Apr. 25, 1979	May 22, 1979	June 12, 1979	July 30, 1979	Aug. 29, 1979	Oct. 2-3, 1979	Oct. 22, 1979	Dec. 4, 1979
HS-1	4029211071040	SB00608708CBD1	41	6,504.17	----	36.4	----	33.3	32.2	31.4	31.3	31.5	31.7	32.5	32.8	33.1	33.3	33.7
HS-2	4029221071040	SB00608708CBD2	39	6,501.96	----	33.8	----	32.5	31.6	31.0	31.0	31.2	31.3	32.0	32.2	32.4	32.5	32.8
HS-3	4029301071052	SB00608707DAA2	36.5	6,495.33	----	29.7	----	28.6	27.8	26.1	26.4	26.5	26.6	26.6	27.3	27.5	27.7	28.0
HS-4	4029301071051	SB00608707DAA1	35	6,495.09	----	29.4	----	29.4	28.8	28.2	27.7	27.6	27.8	28.3	27.4	28.6	28.7	28.9
HS-5	4029321071101	SB00608707ADC1	39.5	6,493.60	----	28.6	----	27.8	27.7	26.5	25.8	25.7	25.8	26.1	26.3	26.5	26.6	27.0
HS-6	4029331071102	SB00608707ADC2	33.5	6,490.75	----	29.8	----	28.2	24.9	23.7	23.0	23.0	23.0	23.4	23.5	23.8	23.9	24.1
HS-7	4029291071103	SB00608707DAB1	35.5	6,493.55	25.9	26.5	----	25.6	24.4	23.0	21.8	21.4	21.3	22.2	22.5	22.9	24.2	23.7
HS-8	4029331071107	SB00608707ADC4	28.5	6,485.62	----	20.3	----	23.0	19.2	18.2	17.2	16.8	16.8	17.2	17.4	17.9	18.2	18.3
HS-9	4029331071113	SB00608707ACD1	41	6,497.80	----	27.5	----	33.6	32.7	31.3	30.1	29.5	29.4	29.8	30.0	30.4	31.1	31.1
HS-10	4029321071120	SB00608707DBB1	48	6,499.63	----	35.5	----	35.4	35.8	32.7	31.9	31.4	31.3	31.7	31.9	32.4	32.6	33.0
HS-11	4029331071122	SB00608707ACC1	42.5	6,496.34	----	30.6	----	33.9	31.9	29.9	29.1	28.6	28.6	28.9	29.1	29.5	29.7	30.1
HS-12	4029241071120	SB00608707DBC1	38	6,493.92	----	28.2	----	30.6	26.6	25.4	23.9	23.1	23.1	23.6	23.9	24.4	24.7	25.1
HS-13	4029241071122	SB00608707DBC2	41.5	6,497.81	----	32.4	----	34.5	31.1	28.2	28.4	27.4	27.6	28.0	31.0	28.7	29.0	29.4
HS-14	4029121071124	SB00608707DCC1	44.5	6,506.15	38.1	38.2	38.2	38.2	36.9	35.6	33.2	31.9	31.9	32.7	33.1	33.7	34.1	34.7
HS-15	4029081071037	SB00608708CCD1	49	6,510.86	----	36.7	[2]27.9	[2]25.6	25.6	25.8	26.5	27.5	27.9	29.1	29.3	27.6	29.9	31.2
HS-16	4028581071025	SB00608717BAA1	27	6,506.46	----	----	24.3	[2]20.6	20.7	21.5	22.4	23.4	23.6	24.0	23.9	24.0	21.1	25.0
HS-17	4029021071018	SB00608717BAA1	27	6,472.62	----	14.3	13.8	12.7	12.9	11.8	12.2	12.1	12.6	13.3	13.1	13.2	13.9	14.5
HS-18	4029131071037	SB00608708CCD2	37	6,502.26	----	32.3	[2]29.9	[2]26.1	24.8	24.3	24.8	25.5	25.8	27.1	27.3	21.9	27.8	28.4
FC-1	4029331071107	SB00608707ADC3	34	6,490.38	----	26.1	----	27.5	25.2	24.5	23.5	23.0	23.0	23.3	23.3	23.6	23.7	24.1
FC-2	4029341071113	SB00608707ACD2	41	6,496.68	----	31.7	----	30.4	30.7	29.9	28.7	29.2	28.0	28.2	28.3	28.9	29.1	29.5
FC-3	4029371071114	SB00608707ACD3	34	6,487.13	----	24.0	----	27.1	23.7	22.1	22.0	21.4	21.2	21.3	21.5	21.7	21.8	22.1
FC-4	4029351071053	SB00608707ADD1	37	6,493.14	----	29.4	----	28.1	27.8	28.2	27.7	27.8	27.8	27.3	28.0	28.2	28.2	28.3

[1]See section on Systems of Locating and Numbering Wells and Springs.
[2]Water levels in wells HS-15, HS-16, and HS-18 reacting to filling of raw-water storage pond no. 2 in November 1978.

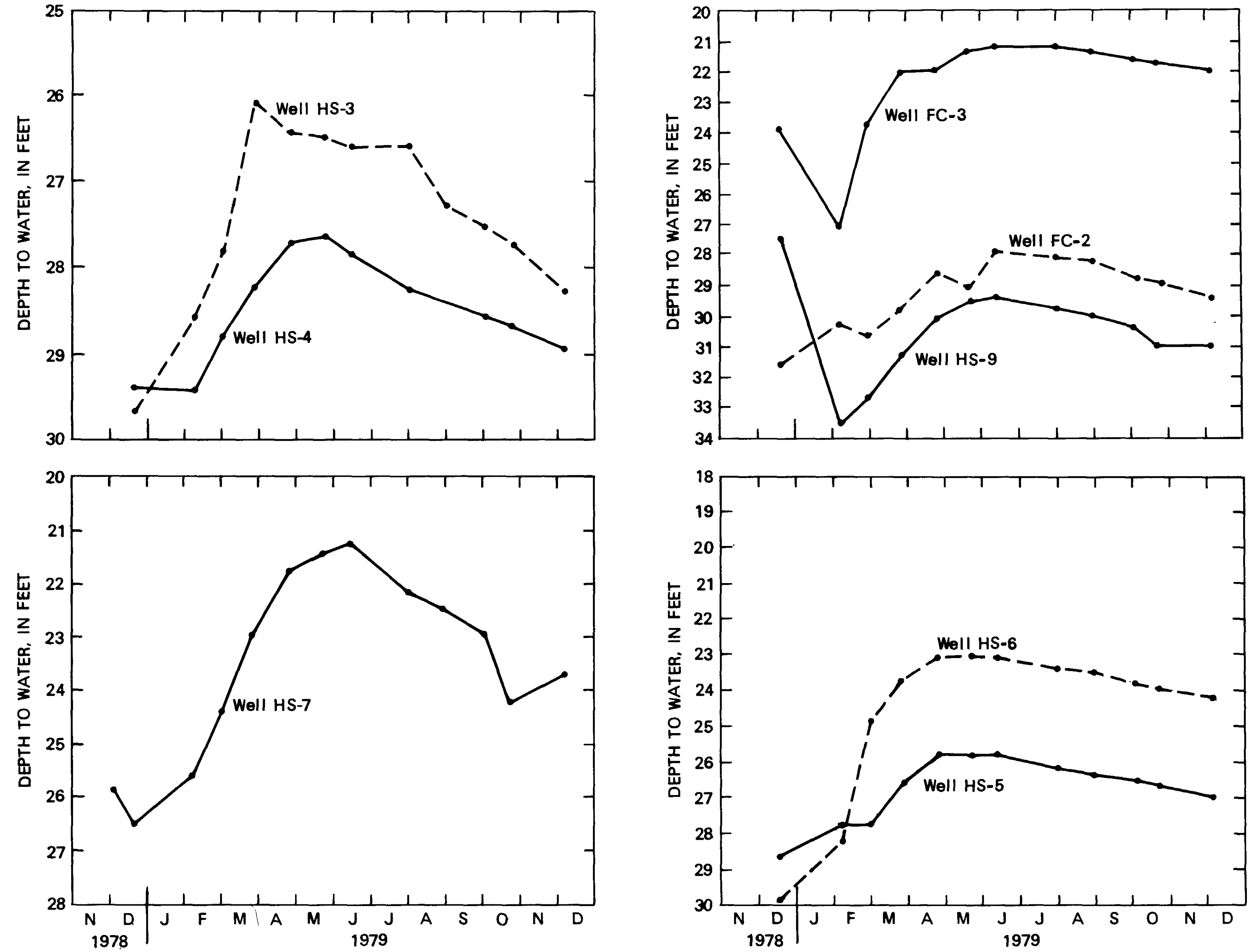

Figure 5.-- Water-level fluctuations in wells HS-3, HS-4, HS-5, HS-6, HS-7, HS-9, FC-2, and FC-3.

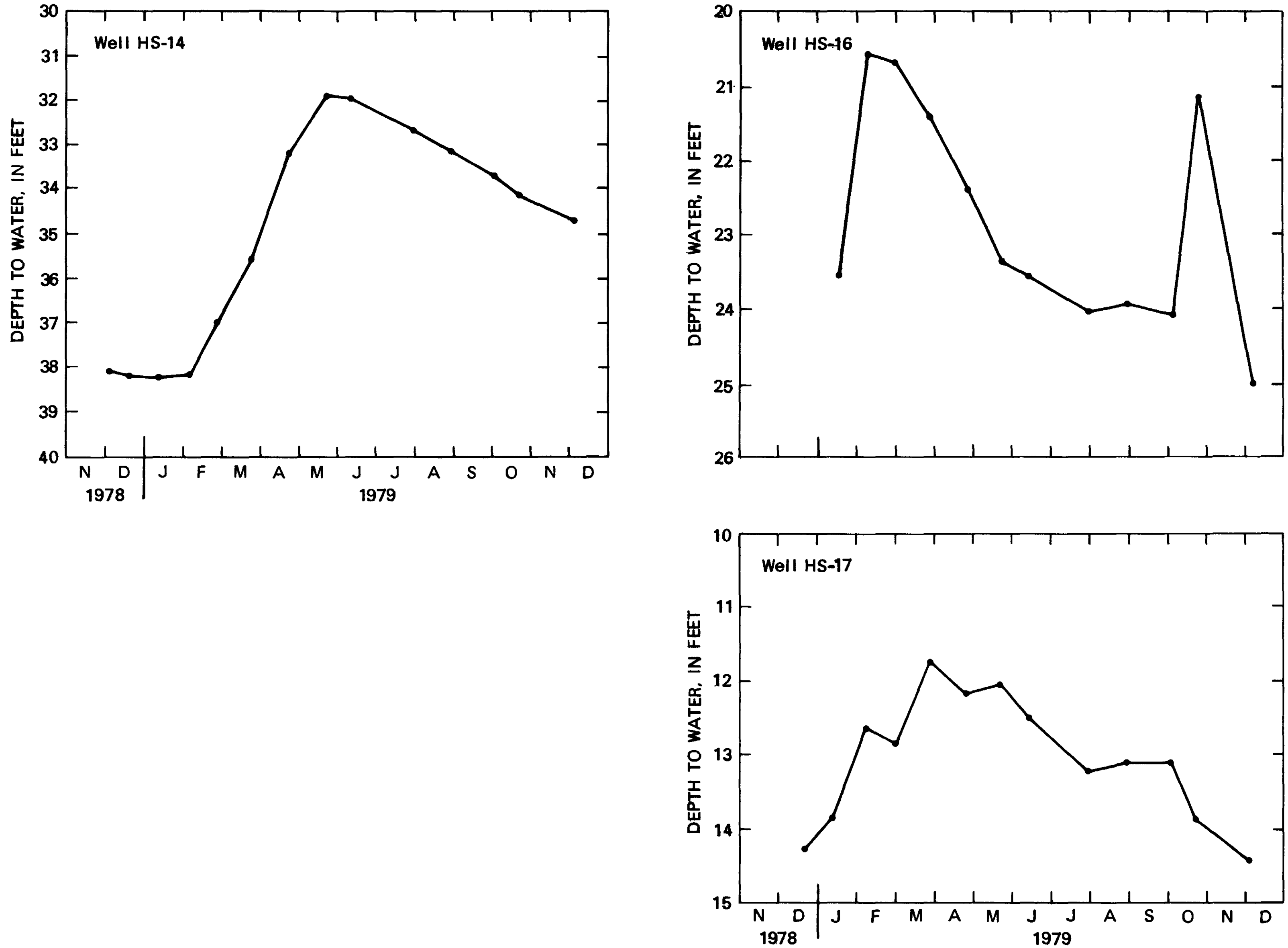

Figure 6.-- Water-level fluctuations in wells HS-14, HS-16, and HS-17.

Discharge Weir

The discharge weir is a concrete box containing a 90° V-notch weir used to measure the flow from the 30-in. RCP drain. The flow from the system, the largest single source of ground-water discharge in the area, is exceeded only by the combined flow from the springs along the lower (north) edge of the terrace. The average of four quarterly flow measurements made using the V-notch weir was about 0.40 ft^3/s, varying seasonally from 0.26 ft^3/s in January to 0.82 ft^3/s in March. Water-quality samples were collected from January through October 1979 on a quarterly basis. The same general analysis schedule was used for samples taken from the discharge weir as was used for the wells and seeps. Results of the water-quality analyses and flow rates are presented in the Water-Quality Data section in this report.

Streams

Streams monitored in the Hayden powerplant study include the Yampa River near Hayden (U.S. Geological Survey streamflow-gaging station 09244410), Sage Creek above the Hayden powerplant, Sage Creek at U.S. Highway 40, and the Yampa River at Hayden, where one low-flow sample was collected. Sage Creek above the Hayden powerplant is an ephemeral stream, and the other streams are perennial. Flow rates for the Yampa River near Hayden were obtained from stage-discharge relations. Flow rates for Sage Creek above the Hayden powerplant were estimated using visual methods. Flow rates for Sage Creek at U.S. Highway 40 were estimated using the estimated flow of Sage Creek above the Hayden powerplant and estimates of inflows between the two sites. This method of estimating the flow for Sage Creek at U.S. Highway 40 was necessary because the site was located in backwater from the Yampa River. The same general scheme of water-quality sampling used for the wells and seeps was used for these surface-water sites. The results of the water-quality analyses and flow rates are presented in the Water-Quality Data section.

AMBIENT GROUND WATER

Data on the movement of the ambient ground water near the Hayden powerplant were sparse and insufficient. Most of the wells in the area are domestic and usually have no means of access for measuring the water level. Water levels are available only from drillers' logs and these levels are outdated. Surface topography is the main indicator of water movement and indicates that the ground water moves in a north-to-northwest direction, except near Sage Creek where it may flow northeast. Drillers' logs indicate that the maximum capacity of most wells is less than 20 gal/min, and that the majority of the wells yield 10 gal/min or less.

Data on the quality of ground water near the plant were insufficient to define the ambient ground-water quality. Analyses of water sampled from well HS-14 indicated concentrations of nitrite plus nitrate larger than 10 mg/L (milligrams per liter). Well HS-14 is downgradient from a wheat field and may receive recharge from the field. Although well HS-14 is downgradient from the coal pile and the raw-water storage ponds, analyses of water from the well indicate that the quality of water is not influenced by water from either the coal pile or the raw-water storage ponds. Although the results of the analyses of other constituents probably are representative of the local ground water, a second control well--the Barnes well--was sampled in June and October for verification. The Barnes well (pl. 1) is a domestic well about 2 mi southwest of the Hayden powerplant. According to the drillers' log, this well penetrates the Lewis Shale, but it is screened in and receives all of its water from the alluvium.

Data from well HS-14 and the Barnes well were averaged in an effort to define the ambient ground-water quality. The averages were: Boron, 220 µg/L (micrograms per liter); iron, 55 µg/L; manganese, 35 µg/L; selenium, 8 µg/L; zinc, 40 µg/L; and specific conductance, 1,050 µmhos/cm (micromhos per centimeter). These concentrations do not exceed the Colorado Department of Health (1977b) standards for agricultural use of water, except for a sample from well HS-14 that contained 15 µg/L of selenium. None of the concentrations exceeded the standards for drinking-water supply except for nitrite plus nitrate (which averaged 19 mg/L) and one sample containing high selenium (15 µg/L). Data from well HS-14 and the Barnes well are presented separately in the Water-Quality Data section.

Data on ambient ground-water quality were obtained from two additional sources and compared with the data from wells HS-14 and the Barnes well. The first source of data was a ground-water-quality study (R. S. Williams, U.S. Geological Survey, oral and written communs., 1981) in which 21 wells were sampled in the Grassy Creek valley, located about 1 mi east of the Hayden powerplant (fig. 1). The aquifer system in Grassy Creek valley is about the same as that near the Hayden powerplant; the aquifer consists of alluvial terrace deposits underlain by a relatively impermeable shale. Williams sampled 21 wells and collected 78 samples of water for analysis of boron, manganese, selenium, and specific conductance. The average values for the 21 wells were: Boron, 140 µg/L; manganese, 165 µg/L; selenium, less than 1 µg/L; and specific conductance, 1,470 µmhos/cm. The highest values were: Boron, 440 µg/L; manganese, 2,000 µg/L; selenium, 1 µg/L; and specific conductance, 3,400 µmhos/cm.

The second source of data on the quality of the ambient ground water was the computer data files of the U.S. Environmental Protection Agency and the U.S. Geological Survey. The area considered for retrieval of the data from the computer files was from south of U.S. Highway 40 to the southern boundary of the area shown in figure 1 and from longitude 107°05'00" to longitude 107°15'00". The computer data files had data on six wells not included in the Williams ground-water-quality or the Hayden powerplant studies. There was a variable number of analyses for each constituent. Boron was determined in three analyses; manganese, in six analyses; selenium, in six analyses; and specific conductance, in six analyses. The average values were: Boron, 141 µg/L; manganese, 28 µg/L; selenium, 5 µg/L; and specific conductance, 1,500 µmhos/cm. The highest values were: Boron, 284 µg/L; manganese, 1,450 µg/L; selenium, 7 µg/L; and specific conductance, 2,950 µmhos/cm.

An analysis of the data from the Williams ground-water-quality study and the computer data files indicates the data from well HS-14 and the Barnes well are an acceptable indicator of ambient ground-water quality in the area. None of the wells had analyses in which the boron exceeded the Colorado Department of Health (1977b) proposed water-quality standard of 750 µg/L.

HAYDEN POWERPLANT EFFLUENT

Although a sample of the low-quality wastes was not obtained, one sample of Hayden powerplant brine effluent disposed of in the evaporation pond was supplied by powerplant personnel. The brine effluent sample, taken from the wastewater concentrator (fig. 2), was highly colored and contained flocculate after filtration through a 0.45-micron filter. An analysis indicated the following: Specific conductance, 75,000 µmhos/cm; carbonate, 240 mg/L; boron, 110,000 µg/L; iron, 1,700 µg/L; manganese, 37,000 µg/L; nickel, 300 µg/L; selenium, 220 µg/L; and pH, 6.2. The analytical dilution factor for selenium was 25; therefore, the value for selenium may be in error, even though several aliquots were analyzed and the average value reported.

Because we were able to obtain only one sample from the wastewater concentrator and no samples from the low-quality wastes, it is not known if this sample truly represents the inflow into the evaporation pond. However, it is the only available indicator of effluent quality.

EFFECTS OF BORON

Boron is of concern because it is a byproduct of coal burning and may be introduced into the local ground water by effluents from the Hayden powerplant. Whereas boron is important as a plant nutrient but is toxic to plants in high concentrations, a discussion of the occurrence, movement, effects, and recommended maximum levels is relevant. This discussion will be useful in assessing the effects of boron when the water is used for agriculture.

Boron usually is reported in terms of the element boron, and no effort is made to differentiate the species present. At the pH of natural water--less than pH 8.7--the predominant species would be H_3BO_3 (aqueous) and to a lesser degree, H_2BO_3. At pH 8.2 the ratio of H_3BO_3 (aqueous) to H_2BO_3 would be 10:1 (Hem, 1970). Boron has been identified in several complex mineral forms; colemanite and kernite are two which are found in evaporate deposits in California and Nevada. Boron also is found in simple forms--calcium, magnesium, and sodium borates. Organic forms of boron also have been identified; they are the result of micro-organisms and plants utilizing boron in their growth. The organic forms of boron usually are oxidized to the inorganic form when the micro-organisms and plants die (U.S. Department of Agriculture, 1957). Boron in natural water does not seem to conform to a simple solubility constant but is probably controlled by several factors that are not well understood (Hem, 1970).

Movement of boron in the soil column is a complex procedure, involving pH, soil type, and organic matter (U.S. Department of Agriculture, 1957). Boron is readily adsorbed onto clays and to a lesser degree onto silts. Little or no adsorption occurs on sand. The type of cation has little or no effect on the rate or amount of adsorption. An increase in pH will increase adsorption and a decrease will lower adsorption. The effects of pH are reversible; that is, an increase in pH will increase the amount of boron fixed in the soil, and if acid is used to lower the pH, the amount of boron fixed in the soil will decrease. This reaction is rapid and appears to be continuous. Organic matter appears to decrease the amount of boron fixed in the soil and release more boron into the water column to be available for uptake for life forms (U.S. Department of Agriculture, 1957).

Crops such as sugar beets, alfalfa, and clover are affected by a deficiency of boron in the soil. Boron is a necessary nutrient in the growth of legumes, especially alfalfa. Fertilizers that contain boron have been applied to crops for many years. The main results of boron deficiency are reduced growth, cellular change, and finally death. It is difficult to determine the amount of boron needed for growth by various plants because only a small fraction of the boron in the soil is in a form available for plant growth. Boron, as measured in the available form, is needed in concentrations of 0.5 mg/g (milligrams per gram) for satisfactory growth of alfalfa, sugar beets, red clover, and sweet clover (U.S. Department of Agriculture, 1957).

Boron, although a vital nutrient in plant growth, is a toxic substance when excess quantities are present. The problem of boron toxicity first became prominent during World War I, when potash salts, usually purchased from Germany, were mined from Searles Lake in California. Application of this potash resulted in damage to potatoes and vegetables. Analyses of the potash indicated that it contained more than 11-percent boron. The potash was then refined, the boron removed, and the problem was solved. Symptoms of boron poisoning are yellowish-brown spots on leaves (U.S. Department of Agriculture, 1957).

The problem of boron poisoning is not confined only to the application of fertilizer, but also to the application of irrigation water. Several plants, notably beans and fruit trees, are sensitive to boron. Crops such as alfalfa, sugar beets, clovers, and carrots are among the most tolerant crops. The relative tolerance of plants to boron in irrigation water is listed in table 3. The permissible limits of concentration of boron in several classes of water used for irrigation are shown in table 4. Irrigation water containing more than the recommended concentration of boron may not produce immediate harmful effects. Water containing as much as 2 mg/L of boron may be used on neutral and alkaline soils for some time without injury to sensitive plants. However, if the soils are acid, damage may occur rapidly [National Academy of Sciences and National Academy of Engineering, 1973 (1974)].

In Colorado, the maximum permissible limit of 750 µg/L for boron has been established by the Colorado Department of Health (1977b) only for waters for agricultural use. Limits have not been established for water supply, aquatic life, or other uses.

Gastrointestinal and pulmonary disorders have been observed in lambs when the concentration of boron is unusually high in both the soil and water supplies. If large amounts of boron are ingested by humans, some serious toxic effects may be produced (Gough and others, 1979). More information is needed on the possible effects of boron before standards may be established for the permissible concentration of boron in water used for drinking and public supply.

Table 3.--*Relative tolerance of plants to boron*

[In each group, the plants first named are the most tolerant and the last named are the least tolerant. From U.S. Department of Agriculture (1954)]

Tolerant	Semitolerant	Sensitive
Athel (Tamarix aphylla)	Sunflower (native)	Pecan
Asparagus	Potato	Black walnut
Palm (Phoenix canariensis)	Acala cotton	Persian (English) walnut
Date palm (P. dactylifera)	Pima cotton	Jerusalem-artichoke
Sugar beet	Tomato	Navy bean
Mangoes	Sweetpea	American elm
Garden beet	Radish	Plum
Alfalfa	Field pea	Pear
Gladiolus	Raggedrobin rose	Apple
Broadbean	Olive	Grape (Sultanina and Malaga)
Onion	Barley	Kadota fig
Turnip	Wheat	Persimmon
Cabbage	Corn	Cherry
Lettuce	Milo	Peach
Carrot	Oat	Apricot
	Zinnia	Thornless blackberry
	Pumpkin	Orange
	Bell pepper	Avocado
	Sweet potato	Grapefruit
	Lima bean	Lemon

Table 4.--*Permissible limits for concentrations of boron in several classes of irrigation water*

[Concentration of boron in mg/L. From U.S. Department of Agriculture (1954)]

Class of water	For crops that are		
	Sensitive	Semitolerant	Tolerant
Excellent------	Less than 0.33	Less than 0.67	Less than 1.0
Good-----------	0.33-0.67	0.67-1.33	1.0-2.0
Permissible----	0.67-1.0	1.33-2.0	2.0-3.0
Doubtful-------	1.0 -1.25	2.0-2.5	3.0-3.75
Unsuitable-----	More than 1.25	More than 2.50	More than 3.75

EFFECTS OF EFFLUENTS

The effects of effluents from the Hayden powerplant on the local ground water are presented for five categories: Ponds, wells, seeps, the discharge weir, and streams. Data on the concentrations of trace elements in analyzed samples of water from the ponds, seeps, the discharge weir, and streams, and the number of samples which exceeded the Colorado Department of Health (1977b) standards for agricultural use of water are given in tables 5 and 6. Trace-element data are given in tables 7 and 8.

Ponds

The ponds at the Hayden powerplant can be classified as either effluent (evaporation, intermediate-quality, oil-skimmer, and high-quality) or raw-water storage (raw-water storage ponds no. 1 and no. 2). Because the coal-pile runoff pond was dry during most of the study period due to evaporation, it was not considered to have a major effect on the ground water. The relationship of specific conductance and boron with time for water in selected ponds is shown in figure 7.

The evaporation pond had the highest average specific conductance (6,590 µmhos/cm) and the highest average boron concentration (4,800 µg/L) of the five ponds sampled. Concentrations of these constituents varied greatly during the study. The October 1979 sample contained the largest values of specific conductance (13,800 µmhos/cm) and boron (13,000 µg/L). The December 1978 sample contained the smallest value of specific conductance (1,850 µmhos/cm) and the June 1979 sample contained the smallest concentration of boron (530 µg/L).

A large discrepancy was found between the concentrations of selenium in the effluent entering the evaporation pond and in the water in the pond. The effluent contained 220 µg/L of dissolved selenium (see page 21 for discussion of effluent sample), whereas the pond samples had a maximum concentration of 14 µg/L and averaged 6 µg/L. The concentration of selenium in the pond decreased during the study. A sample of the bottom material from the evaporation pond analyzed for the following trace elements was found to contain: Boron, 560 µg/g; copper, 35 µg/g; manganese, 11 µg/g; selenium, none detected; and silver, 4 µg/g. The material was primarily fly ash, and material from the clay liner of the pond was not included. The analyses of the evaporation-pond water and the evaporation-pond bottom material (fly ash) did not indicate the presence of large amounts of selenium. The concentration of selenium in the downgradient wells was generally lower than in either the evaporation pond or the ambient ground water. Further study is needed to determine the fate of the selenium.

Seasonal evaporation, precipitation, and snowmelt will cause fluctuations in the quality of water in the evaporation pond. The water will probably reach its lowest annual concentration of constituents in early summer when runoff is greatest and reach its highest concentration in late summer. It is not possible to estimate the ultimate concentration of constituents in the evaporation pond, but the long-term trend is probably toward increasing concentration.

Table 5.--*Average concentrations of selected trace elements in water from ponds, seeps, streams, and the discharge weir and the percentages as compared to the concentrations of the same elements in the ambient ground water*

[NS=not significant; NA=not applicable; concentrations in microgram per liter, µg/L]

Site	Trace elements							
	Boron		Selenium		Manganese		Iron	
	µg/L	Percent	µg/L	Percent	µg/L	Percent	µg/L	Percent
Ambient ground water--	220	100	8	100	35	100	55	100
Evaporation pond------	4,800	2,200	5	NS	420	1,200	33	60
Intermediate-quality pond----------------	1,800	820	3	NS	63	180	37	67
Oil-skimmer pond------	1,800	820	6	NS	120	340	30	55
High-quality pond-----	1,300	590	3	NS	73	210	40	73
Raw-water storage pond no. 1----------	85	39	0	NA	30	86	230	420
Sage Creek at U.S. Highway 40-----	320	NA	57	NA	130	NA	100	NA
Sage Creek above Hayden powerplant---	250	NA	61	NA	740	NA	120	NA
Discharge weir--------	1,600	730	13	NA	130	370	---	---
Gravel pit seep-------	1,200	550	2	NS	810	2,300	260	470
Seep HS-1-------------	1,300	590	4	NS	12	34	70	130
Seep HS-2-------------	1,400	640	6	NS	33	94	180	330
Seep HS-3-------------	1,900	860	3	NS	33	94	130	240
Seep HS-4-------------	1,800	820	6	NS	47	130	90	160
Seep HS-5-------------	1,000	450	6	NS	5	14	5	9
Seep HS-6-------------	1,600	730	2	NS	40	110	40	73
Seep HS-7-------------	1,300	590	2	NS	15	43	40	73
Seep HS-8-------------	1,300	590	4	NS	35	100	40	73
Yampa River near Hayden---------	72	NA	0	NA	40	NA	123	NA
Yampa River at Hayden-----------	80	NA	0	NA	---	-----	---	---

Table 6.--*Number of samples of water from ponds, seeps, streams, and the discharge weir analyzed for boron and manganese compared with the number of samples exceeding the Colorado Department of Health (1977b) standards for agricultural use of water*

Site	Number of samples		Number of samples that exceeded Colorado water-quality standards for agricultural use	
	Boron	Manganese	Boron	Manganese
Evaporation pond	4	3	3	2
Intermediate-quality pond	4	3	4	0
Oil-skimmer pond	4	3	4	0
High-quality pond	4	3	4	0
Raw-water storage pond no. 1	4	3	0	0
Seep HS-1	4	3	0	0
Seep HS-2	4	3	4	0
Seep HS-3	4	3	3	0
Seep HS-4	4	3	3	0
Seep HS-5	3	2	3	0
Seep HS-6	3	2	3	0
Seep HS-7	3	2	2	0
Seep HS-8	2	2	1	0
Gravel-pit seep	4	3	4	2
Discharge weir	4	3	4	1
Sage Creek above Hayden	2	2	0	1
Sage Creek at U.S. Highway 40	3	2	0	1

Table 7.--*Average concentrations of selected trace elements in water from wells and the percentages as compared to the concentrations of the same elements in the ambient ground water*

[NS=not significant; concentrations in microgram per liter, µg/L]

Site	Trace elements							
	Boron		Selenium		Manganese		Iron	
	µg/L	Percent	µg/L	Percent	µg/L	Percent	µg/L	Percent
Ambient ground water--	220	100	8	100	35	100	55	100
Well HS-1-------------	960	440	4	NS	250	710	10	18
Well HS-2-------------	1,000	450	4	NS	500	1,400	13	24
Well HS-3-------------	1,200	550	1	NS	93	270	50	91
Well HS-4-------------	1,200	550	1	NS	360	1,000	40	73
Well HS-5-------------	1,500	680	2	NS	120	340	27	49
Well HS-6-------------	1,200	550	3	NS	370	1,100	27	49
Well HS-7-------------	1,100	500	4	NS	100	290	40	73
Well HS-8-------------	1,600	730	4	NS	290	830	10	18
Well HS-9-------------	1,700	770	5	NS	73	210	15	27
Well HS-10------------	1,300	590	6	NS	37	110	13	24
Well HS-11------------	1,000	450	5	NS	20	57	30	55
Well HS-12------------	1,800	820	10	NS	67	190	23	42
Well HS-13------------	1,600	730	10	NS	70	200	53	96
Well HS-15------------	670	300	3	NS	40	110	150	270
Well HS-16------------	2,700	1,200	12	NS	300	860	93	170
Well HS-17------------	510	230	3	NS	1,400	4,000	600	1,100
Well HS-18------------	960	440	4	NS	210	600	43	78
Well FC-1-------------	1,700	770	3	NS	110	310	130	240
Well FC-2-------------	1,700	770	6	NS	50	140	17	31
Well FC-3-------------	1,800	820	6	NS	110	310	20	36
Well FC-4-------------	1,200	550	2	NS	30	86	17	31

Table 8.--*Number of water samples analyzed for boron and manganese compared with the number of samples exceeding Colorado Department of Health (1977b) for agricultural use of water from wells*

Site	Number of samples		Number of samples that exceeded Colorado water-quality standards for agricultural use	
	Boron	Manganese	Boron	Manganese
Well HS-1	4	3	4	1
Well HS-2	4	3	4	1
Well HS-3	4	3	4	0
Well HS-4	4	3	4	2
Well HS-5	4	3	3	0
Well HS-6	4	3	2	2
Well HS-7	4	3	2	1
Well HS-8	4	3	3	1
Well HS-9	4	3	4	0
Well HS-10	4	3	4	0
Well HS-11	4	3	3	0
Well HS-12	4	3	4	0
Well HS-13	4	3	4	0
Well HS-14	4	3	0	0
Well HS-15	4	3	1	0
Well HS-16	4	3	3	1
Well HS-17	4	3	0	2
Well HS-18	4	3	3	1
Well FC-1	4	3	3	0
Well FC-2	4	3	4	0
Well FC-3	4	3	4	1
Well FC-4	4	3	2	0
Barnes well	2	1	0	0

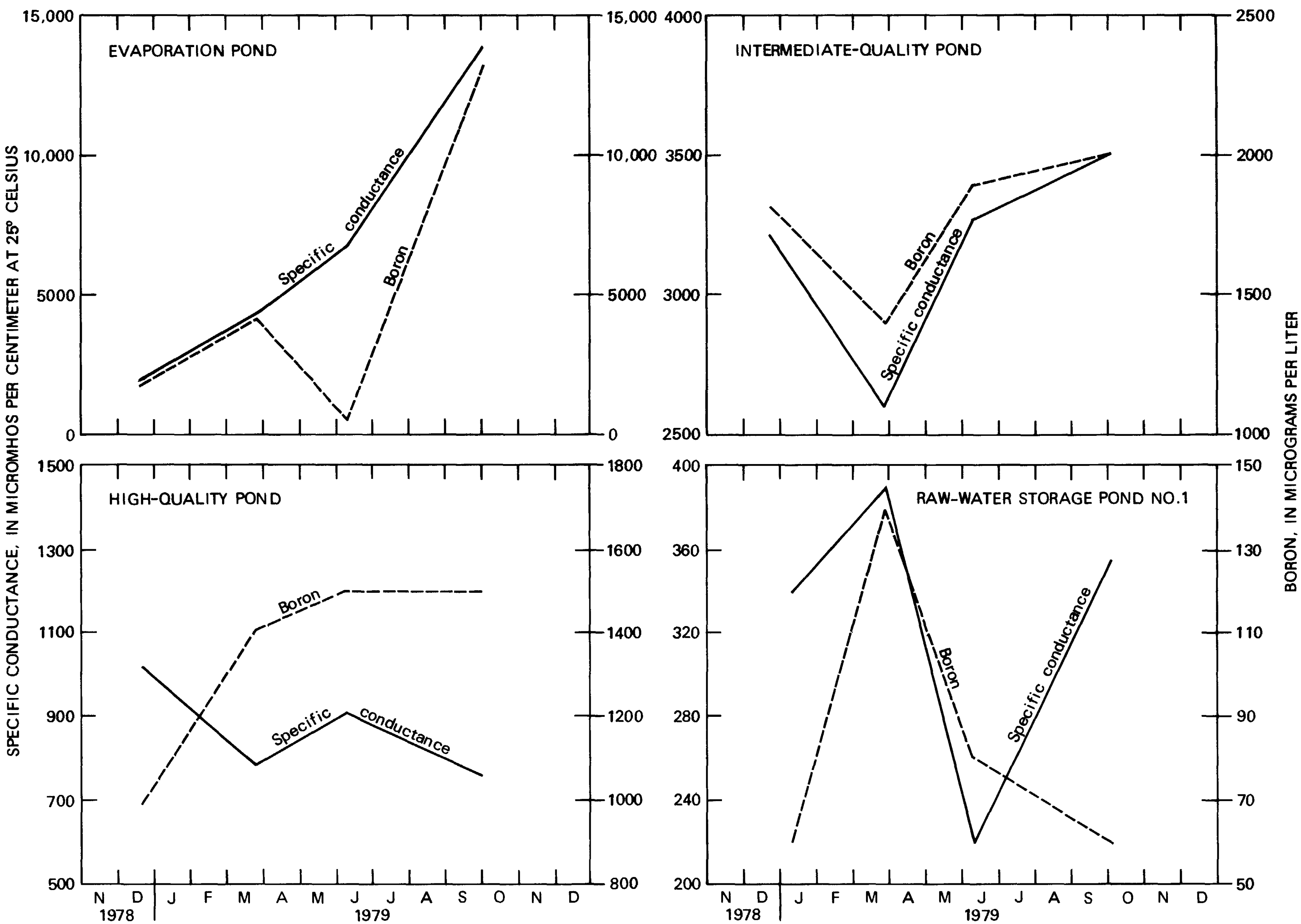

Figure 7.-- Values of specific conductance and boron for selected ponds.

The intermediate-quality pond had the most consistent water quality of all the ponds sampled. The average specific conductance was 3,140 μmhos/cm and varied only by about 500 μmhos/cm during the study. The average boron concentration was 1,800 μg/L. The quality of the pond was adequate for raising trout. Of the trace elements sampled, only boron exceeded the recommended Colorado Department of Health (1977b) standard for agricultural use of water. Only two samples--one high in copper, the other high in zinc--exceeded the recommended Colorado Department of Health (1977b) standards for aquatic life.

The average specific conductance in the oil-skimmer pond (the smallest pond sampled) was 1,560 μmhos/cm, and the average boron concentration was 1,800 μg/L. Boron was the only constituent that was in excess of the recommended Colorado Department of Health (1977b) standards for agricultural use of water. Of particular interest was the October 1979 sample, which had a pH of 3.0; this value was verified by repeated measurements in the field and by analysis in the laboratory. The sample did not contain excessive amounts of any other analyzed constituent. The pH increased to about 6.0 the following day. It was subsequently determined that this increase was due to an incomplete construction modification resulting in demineralized wastes being periodically discharged into the high-quality pond via the oil-skimmer pond, resulting in severe pH fluctuations. The problem has since been corrected, according to Hayden powerplant personnel (written commun., 1981).

The high-quality pond had the best water quality of any of the ponds, as defined by the lowest values for specific conductance and boron. The average specific conductance of the pond water was 863 μmhos/cm and the average boron concentration was 1,400 μg/L. The pond contained high-quality effluents from the wastewater concentrator and from high-quality wastes. The water quality was relatively constant, deviating only slightly about the mean; for example, the deviation about the mean for specific conductance was about 150 μmhos/cm and for boron was about 400 μg/L. The October 1979 sample from this pond had the lowest pH--6.8--and was affected by the same factors that lowered the pH in the oil-skimmer pond. Large variations in water quality of the high-quality pond are not expected in the future unless there is a spill or the inflow is altered.

Raw-water storage pond no. 1 has about the same water quality as the Yampa River, its source. The water quality of the pond varies less than that of the stream because the larger storage capacity of the pond acts as a buffer. The average specific conductance of the pond was 326 μmhos/cm and the average concentration of boron was 85 μg/L. The March 1979 sample from this pond had the highest concentration of boron--140 μg/L--whereas the sample from the Yampa River had 60 μg/L. The reason for the difference is not known. No sample contained any analyzed constituent in excess of the Colorado Department of Health (1977b) standards for agricultural use of water.

Raw-water storage pond no. 2, which was used as a fly-ash disposal pond from September 1965 to late 1978, contained water of the same quality as raw-water storage pond no. 1 from December 1978 through October 1979. While pond no. 2 was being used as an ash-disposal pond, leakage probably resulted in a plume of leachate moving downgradient from the pond. The movement, extent, and quality of this plume are not known. The concentrations of boron and the specific conductance of water in the plume would have been higher than those in the ambient ground water, but their values are not known. The plume would have caused boron to be adsorbed onto the clays and silts in the aquifer. Desorption of boron from the aquifer could have resulted in higher than ambient concentrations of boron in the ground water after the plume was probably displaced by leakage from the pond in late 1978.

Hayden powerplant personnel (oral and written communs., 1980) stated that the plume of water which originated when raw-water storage pond no. 2 was used for fly-ash disposal is presently underlying the Hayden powerplant. They also stated that the values of specific conductance and concentrations of boron in the plume are about the same as the values of specific conductance and concentrations of boron in the evaporation, the intermediate-quality, the oil-skimmer, and the high-quality ponds. While the rate of movement of this plume is not known, the Hayden powerplant personnel suggest that it may take years for the remnants of the plume to dissipate from the area of the Hayden powerplant.

The coal-pile runoff pond contains water only during periods of local runoff. Because it is dry most of the time, it was not sampled.

Wells

Wells were placed near the Hayden powerplant to monitor the effect of the ponds on the ground water. Wells HS-1 through HS-6 and FC-4 were used to monitor the effects of the evaporation pond; wells HS-8 through HS-13 were used to monitor the effects of the intermediate-quality, the oil-skimmer, and the high-quality ponds; wells HS-15 and HS-16 were used to monitor the effects of the raw-water storage ponds; and well HS-18 was used to monitor the effects of the coal pile and the coal-pile runoff pond. The same groupings of wells are used in the discussion of how the movement and quality of water are affected by the powerplant. The relationships of specific conductance and boron with time in selected wells are shown in figures 8 and 9.

Analyses of the water from wells HS-1 through HS-6 and FC-4 downgradient from the evaporation pond determined the following water-quality parameters and their average values: Specific conductance, 1,220 μmhos/cm; boron, 1,200 μg/L; iron, 26 μg/L; manganese, 250 μg/L; and selenium, 3 μg/L. The concentrations of iron in water samples from wells HS-1 through HS-6 and FC-4 probably are not related to the concentrations of iron in the ambient ground water or the evaporation pond, but are related to the reduction-oxidation potential in ground water. In an oxidizing environment, iron ions will be precipitated; in a reducing environment, the ions can be leached from the surrounding soil or transported by the ground water. The concentrations of iron in the wells were lower than the Colorado Department of Health (1977b) agricultural water-use standard of 200 μg/L and generally declined during the study. The concentrations of manganese generally exceeded the water-use standard of 200 μg/L during the initial samplings and then declined to values lower than the standard during subsequent samplings. The water sample in well FC-4 had the lowest average concentration of manganese--30 μg/L.

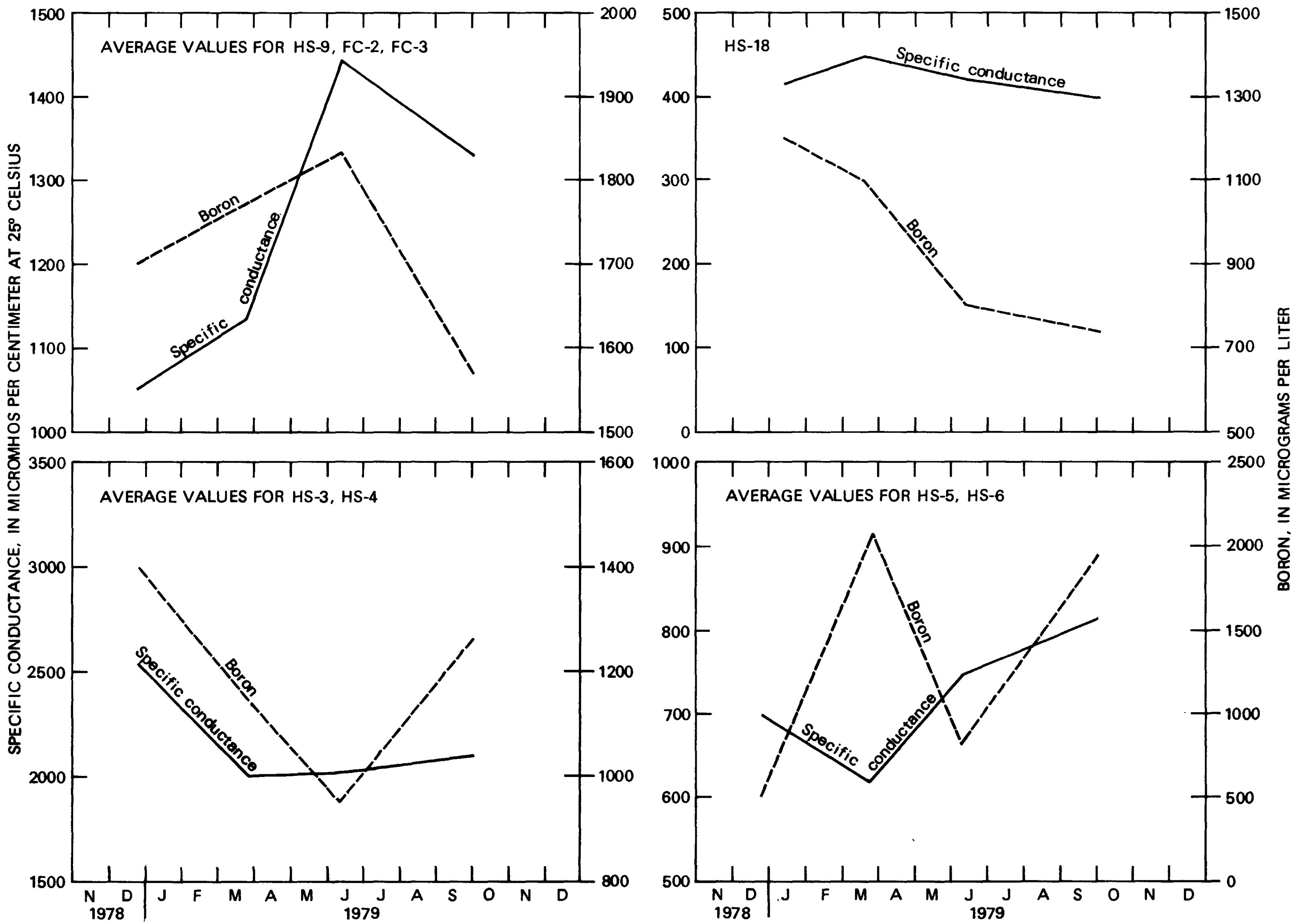

Figure 8.-- Values of specific conductance and boron for selected wells.

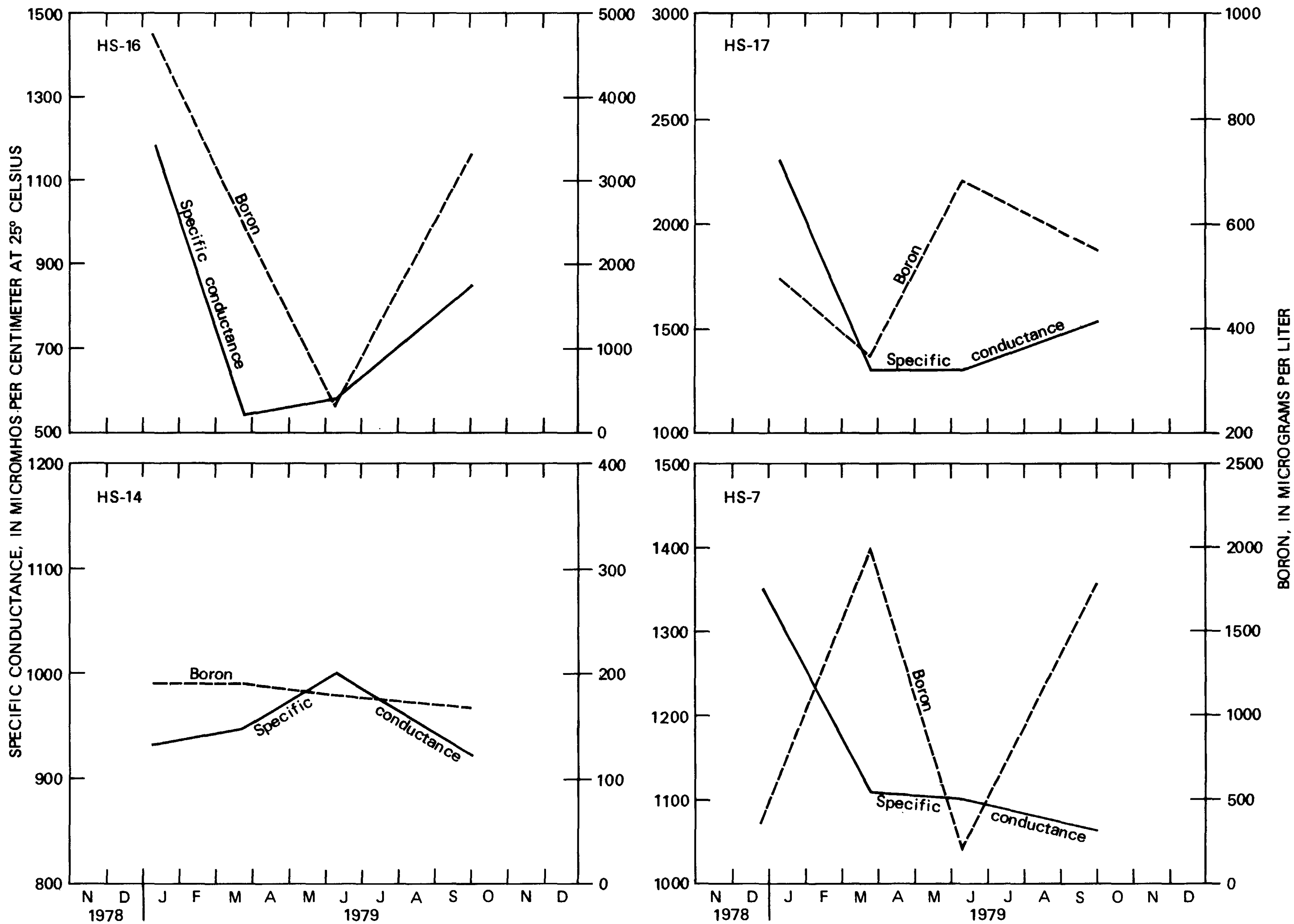

Figure 9.--Values of specific conductance and boron for selected wells.

The ground-water-flow system in the area of the evaporation pond is not a simple system receiving water only from the pond and ambient ground water. This is evident by the values of specific conductance of the water in wells HS-5 and HS-6 and, to a lesser degree, in wells HS-1, HS-2, and FC-4. The values at times were lower than those of either the evaporation pond or the ambient ground water. These anomalous values probably are due to local ground-water recharge from rainfall, snowmelt, runoff from the plant, or leakage from the raw-water storage ponds.

Analyses of water samples from wells HS-8 through HS-13 and FC-1 through FC-3 downgradient from the intermediate-quality, the high-quality, and the oil-skimmer ponds determined the following water-quality parameters and their average values: Specific conductance, 1,170 μmhos/cm; boron, 1,600 μg/L; iron, 34 μg/L; manganese, 92 μg/L; and selenium, 6 μg/L. All samples collected from wells HS-8 through HS-13 and FC-1 through FC-3 contained boron in excess of the Colorado Department of Health (1977b) standards for agricultural use of water, except for the December 1978 samples from wells HS-8 and FC-1 and the June 1979 samples from well HS-11. The lower concentrations of boron in these samples probably were due to recharge resulting from snowmelt and rainfall runoff. Well HS-11 is downgradient from run-off-retention pond no. 2, and during the June 1979 sampling period the pond contained water. Wells HS-8 and FC-1 probably receive local recharge from runoff-retention pond no. 1. Analyses of water samples from wells HS-8 through HS-13 and FC-1 through FC-3 indicate that the intermediate-quality, the oil-skimmer, and the high-quality ponds were probably leaking. Boron concentrations in water from the wells were higher than in the ambient ground water and approached the concentrations of boron in the water from the ponds. The boron concentrations in the ground water downgradient from the intermediate-quality, the oil-skimmer, and the high-quality ponds were therefore indicators the ponds were leaking.

Well HS-7 was drilled to monitor the effects of the evaporation, the intermediate-quality, the oil-skimmer, and the high-quality ponds. The average values of water-quality parameters for the water sample from well HS-7 were: Specific conductance, 1,160 μmhos/cm; boron, 1,100 μg/L; iron, 40 μg/L; manganese, 100 μg/L; and selenium, 4 μg/L. These results were compatible with the data on the wells monitoring the evaporation pond and the intermediate-quality, the oil-skimmer, and the high-quality ponds.

Wells HS-15 and HS-16 were drilled to monitor the effects of the raw-water storage ponds on the ground water. Raw-water storage pond no. 2 had been filled with fly ash prior to 1978, but was cleaned, reconditioned, and filled with Yampa River water prior to the January 1979 sampling. Before reconditioning, the pond probably recharged the alluvium penetrated by well HS-15 with water having a high specific conductance and a high boron concentration, possibly from the plume described previously. After the pond was filled with Yampa River water, infiltrate slowly leached boron from the soil, resulting in a lower boron level in the March, June, and October 1979 samples. This reduction in the concentration of boron in the water from well HS-15 will probably continue until the soil is in equilibrium with the raw water, which contains about 100 μg/L of boron. The Yampa River water infiltrating from the raw-water storage ponds also lowered the specific conductance of the water from well HS-15 to nearly that of the river water.

Well HS-16 did not react as quickly to the change in source of recharge as did well HS-15, probably because the aquifer penetrated is less permeable. Only about 4 ft of the aquifer is saturated, and this well yields less than 0.5 gal of water in 2 to 3 hours. The concentrations of boron in the water samples from well HS-16 have varied considerably, from 4,700 µg/L in January 1979, to 300 µg/L in June 1979, and to 3,300 µg/L in October 1979. Probably the high level of boron in the January and October samples was due to seepage from the old fly-ash disposal pond or to boron being leached from the aquifer.

The concentrations of manganese in the water from well HS-16 generally decreased as the sampling progressed. The concentration of iron in the water sample from well HS-16 probably is related to a reduction-oxidation potential in the ground water, as explained in the section on wells HS-1 through HS-6 and FC-4. In the water from well HS-16, the average concentration of selenium (12 µg/L) was higher than that in any other wells sampled. One-half of the samples from well HS-16 exceeded the Colorado Department of Health (1977b) standards for agricultural use and drinking water.

Well HS-17 was drilled in a spoils pile where coal and materials remaining from plant construction were buried. At present (1980), coal is buried upgradient, west of the well. Average values of water-quality parameters for well HS-17 were: Specific conductance, 1,620 µmhos/cm; boron, 520 µg/L; iron, 600 µg/L; manganese, 1,400 µg/L; and selenium, µg/L. The water samples smelled of hydrogen sulfide (H_2S) which is an indication of reducing conditions in the well. The H_2S probably is derived from the decay of coal buried in the spoils pile. The pH of the water samples from this well remained constant at about 7.3--the lowest of any of the wells sampled. Well HS-17 probably is an indicator of the quality of ground water downgradient from the spoils pile and, therefore, cannot be used to define the ground-water quality in other areas.

Well HS-18 was drilled to monitor the effects of the coal pile and the coal-pile runoff pond. Average values of selected water-quality parameters for well HS-18 were: Specific conductance, 420 µmhos/cm; boron, 960 µg/L; iron, 43 µg/L; manganese, 210 µg/L; and selenium, 4 µg/L. The value for specific conductance and the boron concentration suggest that the well is receiving recharge from a water source low in specific conductance and high in boron concentration in relation to the ambient ground water. Two possible sources of this recharge are leakage from the raw-water storage ponds and the coal-runoff pond. Because the boron concentrations decreased as the sampling progressed, and because the coal-runoff pond is dry most of the time, the source of recharge was probably leakage from the raw-water storage ponds.

The concentrations of selenium in water from well HS-18 were lower than in the ambient ground water and about the same or less than in water from the raw-water storage ponds. Concentrations of iron were less than 100 µg/L and generally declined during the sampling period. The concentrations of manganese declined from 500 µg/L during the January 1979 sampling, were not detected in the March sampling, and increased to 140 µg/L in June.

Seeps

Water from seeps HS-1 through HS-8 and the gravel-pit seep are indicators of the quality of the ground water downgradient from the Hayden powerplant. The combined average values of the water-quality parameters for seeps HS-1 through HS-8 were: Specific conductance, 943 μmhos/cm; boron, 1,500 μg/L; iron, 88 μg/L; manganese, 28 μg/L; and selenium, 4 μg/L. The gravel-pit seep is discussed separately because it contains H_2S, a reducing agent; therefore, the trace-element chemistry of the water from this seep differs from that of the other seeps, which do not contain H_2S. The relationship of specific conductance and boron with time in selected seeps is shown in figure 10.

Water from the seeps varied in quality. Water from seep HS-5 had the lowest average boron concentration (1,000 μg/L), seep HS-3 had the highest average boron concentration (1,900 μg/L), seep HS-5 had the lowest average manganese concentration (5 μg/L), and seep HS-4 had the highest average manganese concentration (47 μg/L). The average seep contained about seven times as much boron as did the ambient ground water. The average concentration of boron in the seeps is about two times the Colorado Department of Health (1977b) standard for agricultural use of water.

The gravel-pit seep smells of H_2S and locally is called a "sulfur spring." Two of the three samples from the seep contained manganese concentrations in excess of the 200-μg/L standard (Colorado Department of Health, 1977b) for agricultural use of water. The concentrations of other trace elements are lower than the standards.

Discharge Weir

The discharge weir is probably reacting to the leakage from the raw-water storage ponds. The values for specific conductance and concentrations of boron, iron, manganese, and selenium declined by at least one-half from the January 1979 to the October 1979 samplings. The January samples contained 20 μg/L of chromium, 15,000 μg/L of iron, 21 μg/L of nickel, 21 μg/L of selenium, and 60 μg/L of zinc, which were the highest concentrations from any sampling source in the study. The average values for the discharge weir were: Specific conductance, 900 μmhos/cm; boron, 1,400 μg/L; manganese, 130 μg/L; and selenium, 13 μg/L. An average value for iron is not relevant due to the large variation between the January to June 1979 sampling.

Streams

Sage Creek above the Hayden powerplant, the upper of the two sites located on Sage Creek, was sampled in March and June 1979 and was dry during the other sampling periods. Sage Creek at U.S. Highway 40, the lower site, was sampled in March, June, and October 1979. Sage Creek at the upper site had a higher specific conductance than the lower site, averaging 3,300 μmhos/cm versus 1,680 μmhos/cm; higher manganese, 740 μg/L versus 140 μg/L; lower boron, 240 μg/L versus 320 μg/L;

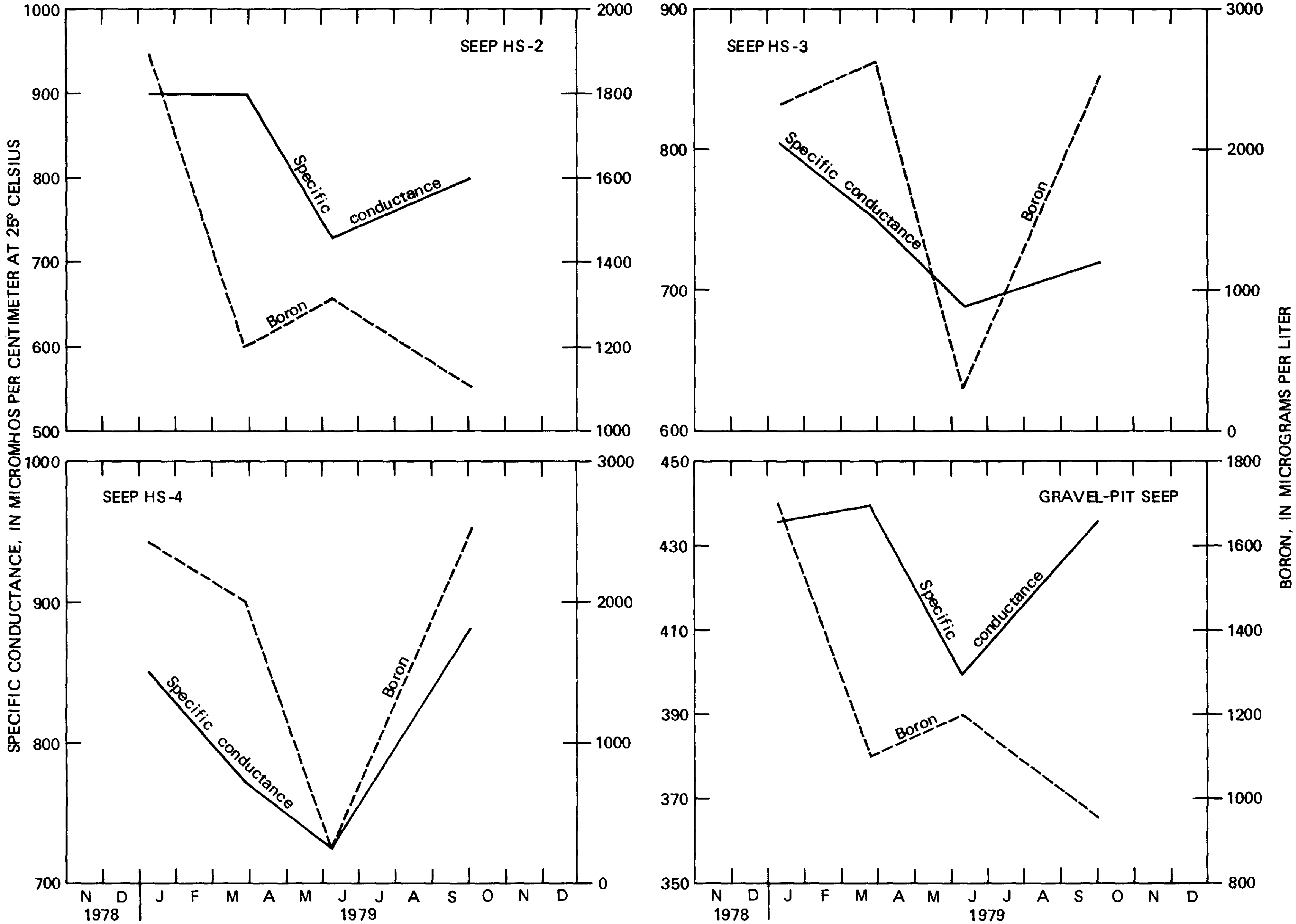

Figure 10.--Values of specific conductance and boron for selected seeps.

higher iron, 120 µg/L versus 70 µg/L; and about the same average value of selenium, about 60 µg/L. The March samples contained the highest concentrations of selenium collected at both sites on Sage Creek, 120 µg/L at the upper site and 110 µg/L at the lower site. These concentrations are about 11 to 12 times the standard for a water supply and 5 to 6 times the standard for agricultural use (Colorado Department of Health, 1977b). The selenium probably is not coming from the Hayden powerplant, but from some upstream source.

Water discharged from the Hayden powerplant affected Sage Creek by lowering the specific conductance and concentrations of iron and manganese; increasing the concentration of boron; and leaving the concentration of selenium essentially unchanged. Effluents from the powerplant entering Sage Creek had little effect on the Yampa River because the flow of Sage Creek averaged only about 0.2 percent of the Yampa River flow.

Four samples were collected at the streamflow-gaging station, Yampa River near Hayden, and one low-flow sample was collected for the Yampa River at Hayden. The Yampa River was sampled to determine the effects of the effluent from the Hayden powerplant on the river. The values of selected water-quality constituents at both sites were equal, within the error of analysis and sampling. Since low-flow conditions are the "worst case" in respect to the effect of effluents, at the present (1980), effluents from the Hayden powerplant are having no discernible effect on the Yampa River.

GROUND-WATER MOVEMENT AND QUANTITY

The direction of movement of the ambient ground water is not known but probably is about normal to the bedrock contours. The movement near the ponds can be depicted by drawing flow lines normal to the water-table contours. Ground-water flow lines in the immediate area of the Hayden powerplant for March 1979 are depicted on plate 6. The flow lines are, in general, normal to the downgradient sides of the ponds.

Empirical methods for estimating hydraulic conductivity, K, were used because boundary conditions near the observation wells precluded the use of aquifer testing by direct means. The method described by Robson (1978), which used an empirical correlation of particle grain size and sorting data obtained from core samples to estimate K, was applied to samples of the aquifer. The derived value of K was 6 ft/d. The value of K is about one-seventh the average value of K for sand and gravel aquifers (McWhorter and Sunada, 1977) but was within the range of values given for sand and gravel aquifers.

Two additional methods were applied to estimate K--the slug method and visual estimation by experienced personnel. In the slug method, a quantity of water is introduced into the well, the rate of decline of the water level in the well is measured, and K is estimated. The values of K obtained by these two methods ranged from 4 to 60 ft/d. The apparent difficulties in application of the slug and visual-estimation methods are the small diameter of the wells in relation to their depth, the wide range of particle sizes in the aquifer, and the horizontal layering of clay.

Because estimates of the K values ranged widely using these three techniques, the leakage rate from the evaporation pond could not be calculated. A chemical mass-balance equation was then used to estimate the proportion of ground-water flow downgradient from the evaporation pond that might originate as leakage from the pond. The data from March 1979 were chosen for the mass-balance equation because the local hydrologic conditions were relatively stable, and the water quality in the evaporation pond and downgradient wells were reasonably constant. The saturated thickness map was drawn (pl. 7) to verify the apparent stability of the ground-water flow downgradient from the evaporation pond, and the map showed no apparent flow discontinuities.

The following mass-balance equations were applied to estimate the leakage from the evaporation pond:

$$q_{ep}+q_{ug}=q_p, \qquad (1)$$

and

$$B_{ep}\times q_{ep}+B_{ug}\times q_{ug}=B_p\times q_p, \qquad (2)$$

where:

q_{ep}=leakage from the evaporation pond, in cubic feet per second;

q_{ug}=ambient ground-water flow, in cubic feet per second;

q_p=flow past the downgradient face of the evaporation pond, in cubic feet per second;

B_{ep}=boron concentration in the evaporation pond, in μg/L;

B_{ug}=boron concentration in the ambient ground water, in μg/L; and

B_p=boron concentration in the ground water passing the downgradient face of the evaporation pond (the average of analyses from wells HS-3 and HS-4), in μg/L.

The following knowns:

B_{ep}=3,900 μg/L,

B_{ug}= 190 μg/L, and

B_p=1,150 μg/L

are substituted in equations 1 and 2, which are then solved to yield:

$$q_{ug}\simeq 2.5q_{ep}.$$

Substituting into equation 1 yields:

$$q_{ep}+2.5q_{ep}=q_p,$$

$$3.5q_{ep}=q_p,$$

$$q_{ep}=0.29q_p.$$

According to the above results, the leakage from the evaporation pond is about one-fourth of the ground-water flow past the downgradient face of the evaporation pond. This calculation of leakage is subject to the following assumptions:

1. In the mass-balance equations:
   a. Boron is a conservative tracer, and
   b. The concentrations of boron in the water samples from the pond and well are the average concentrations present in the pond and aquifer.
2. The only source of boron higher in concention than the ambient concentration is the pond upgradient from the flow section.
3. The Lewis Shale is not a source of boron because it is not an aquifer in this area.

The same method and assumptions were used to estimate what percent of ground-water flow past a section along the north and west faces of the intermediate-quality, the oil-skimmer, and the high-quality ponds is leakage from the ponds. Calculations using the equations indicate that during the same period--March 1979--the entire flow through the section was leakage from the ponds. The concentration of boron in the March sample from the intermediate-quality pond (the largest pond) was the lowest of all the samples. The concentration of boron may have been low only for a short time when conditions were not average or stable. If the average concentration of boron was used in the calculations, then about three-fourths of the flow past the section would be leakage from the intermediate-quality, oil-skimmer, and high-quality ponds. To verify the results, October 1979 conditions were analyzed, and about three-fourths of the flow was calculated to be leakage from the ponds. Based on these data and calculations, the best estimate is that about three-fourths or more of the flow through the section is leakage from the ponds.

CONCLUSIONS

Water-quality data from the evaporation pond, the effluent inflow, and the bottom material indicate that the specific conductance and the concentration of boron in the evaporation pond probably will continue to increase and that the values of these parameters will fluctuate seasonally due to precipitation and evaporation. The only sample of the effluent disposed of in the evaporation pond contained a selenium concentration of about 220 μg/L. By comparison, the concentrations of selenium in the pond water, the bottom materials, or the downgradient ground water were less than 20 μg/L. Further study is needed to determine why these concentrations were drastically lower. The intermediate-quality, the oil-skimmer, and the high-quality ponds were relatively stable with respect to water quality and will probably remain so unless the inflows are changed chemically. The raw-water storage ponds reflect the water quality of the Yampa River, which is their source, and provide water low in boron concentration and low in specific conductance to the local ground water.

Analyses of the quality of water from the observation wells downgradient from the Hayden powerplant indicate that concentrations of boron in the ground water downgradient from the effluent ponds have increased to an average concentration that exceeds the Colorado Department of Health (1977b) standards for agricultural use of water. The boron concentration in water from wells HS-1 through HS-13 and FC-1 through FC-4 probably will not decrease below these standards in the near future.

Data from wells HS-15, HS-16, and HS-18 indicate the raw-water storage ponds are leaking. This leakage is resulting in boron concentrations of less than 500 µg/L, except in well HS-16 where less than 4 ft of the aquifer is saturated, and the water movement apparently is slower than at the other monitor wells. The trend for these concentrations is to decrease as the boron is leached from the unsaturated zone below the ponds.

Water from nine sampled seeps are the best indicators of the quality of the ground water downgradient from the Hayden powerplant. The average concentration of boron in the water from these seeps was 1,500 µg/L, about two times the Colorado Department of Health (1977b) standard for agricultural use of water. Concentrations of boron in the seeps vary seasonally, being lowest during the spring (highest recharge), and highest during the fall and winter (lowest recharge).

The discharge weir, which was in use until 1976 as part of a system to dispose of effluents, is now discharging ground water that is recovering from the effects of the effluents. The concentrations of selected trace elements in the water generally declined during the study. This decrease in the concentration of trace elements probably will continue, because the raw-water storage ponds are the major source of recharge to the ground water discharging over the weir. The discharge weir is also the largest single ground-water discharge point downgradient from the Hayden powerplant. The average flow over the weir is about 0.40 ft^3/s.

The effect on Sage Creek of the effluents from the Hayden powerplant was to lower the specific conductance and the concentrations of iron and manganese, to increase the concentration of boron, and to leave unchanged the concentration of selenium, as compared to the upstream water quality of Sage Creek. Sage Creek above the Hayden powerplant contained a high concentration of selenium during the March sampling--120 µg/L, 12 times the standard for a water supply and 6 times the standard for agricultural use (Colorado Department of Health, 1977b). This selenium probably is not coming from the Hayden powerplant, but from some upstream source.

The Yampa River near Hayden (above the powerplant) and Yampa River at Hayden (below the powerplant) were sampled in October during low flow. Analysis of the samples indicates that effluents from the Hayden powerplant had no discernible effect on the Yampa River, due to the large volume of the Yampa River in relation to the volume of effluents from the Hayden powerplant.

Two theories may be used to explain the high boron content and the high specific conductance of the water from wells and seeps downgradient from the evaporation, the intermediate-quality, the oil-skimmer, and the high-quality ponds. One theory is that all of the ponds are leaking; the second theory, suggested by the Hayden powerplant personnel (oral and written commun., 1980), is that a plume of contaminants has resulted from leakage of raw-water storage pond no. 2 when it was used for fly-ash disposal. The second theory also explains the high boron content and low specific conductance of the water from wells HS-15 and HS-18.

The concept of the leaking ponds or the plume theory can both be supported by water-quality data from wells downgradient from the evaporation, the intermediate-quality, the oil-skimmer, and the high-quality ponds. The water-level contours near these ponds tend to conform to the shape downgradient from the ponds, with a higher ground-water level nearest the ponds. Therefore, those water-level contours tend to support the concept that the ponds are leaking. The specific conductance in water samples from wells HS-15 and HS-18, which are downgradient from the raw-water storage ponds, declined during the study to a value near the specific conductance of the water in the raw-water storage ponds and to about one-half the value in the ambient ground water, which indicates that the raw-water storage ponds are leaking. The raw-water storage ponds and the evaporation, the intermediate-quality, the oil-skimmer, and the high-quality ponds are lined with the same type of locally obtained clay and are of similar construction. The raw-water storage ponds are lined with 5 ft of clay, and the evaporation, intermediate-quality, oil-skimmer, and high-quality ponds are lined with 2 ft of clay. If the raw-water storage ponds are leaking, the conclusion is that all ponds probably are leaking.

Data from wells HS-15 and HS-18 indicated decreasing values of specific conductance and concentrations of boron in the ground water downgradient from the raw-water storage ponds. This tends to support the concept of a remnant plume of water high in specific conductance and high in boron concentrations moving downgradient from the raw-water storage ponds. That is, if the raw-water storage ponds were leaking during 1978 and 1979, they were probably leaking when raw-water storage pond no. 2 was used for fly-ash disposal, resulting in a plume with high specific-conductance values and high boron concentrations.

Seep HS-8 was dry in October 1979 which was interpreted by Hayden powerplant personnel as an indication of minimal leakage from the intermediate-quality pond. Seeps HS-3 and HS-4, also downgradient from the intermediate-quality pond, were not dry during October 1979 and had concentrations of boron of 2,500 μg/L. The October flows and high concentrations of boron of seeps HS-3 and HS-4 indicate that the leakage from the intermediate-quality pond may be significant. The data for seeps HS-3, HS-4, and HS-8 during October 1979 is, however, inconclusive to quantitatively define leakage from the intermediate-quality pond.

Flow rates were calculated using a mass-balance equation to obtain the percent of the ground water leaking from the ponds. Calculations using the mass-balance equations were based on the assumption that the ponds were the only source of water containing high concentrations of boron. About one-fourth of the flow past a section downgradient from the evaporation pond was computed to be leakage from the pond. About three-fourths of the flow past a section downgradient from the intermediate-quality, the oil-skimmer, and the high-quality ponds was computed to be leakage from the ponds.

Although both theories can be used to explain the high concentrations of boron and the high values of specific conductance, the available data tend to support the leaking-ponds theory or a combination of the leaking-ponds and plume theories. To completely isolate the effects of the pond leakage from the plume would require further study, which would require the drilling of additional wells upgradient of the powerplant and wells between the raw-water storage ponds and the other ponds. In addition, hydraulic conductivity and porosity of the alluvium must be determined to facilitate reliable estimates of leakage rates from the ponds and the rate of movement of the plume.

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SYSTEMS OF LOCATING AND NUMBERING WELLS AND SPRINGS

Two systems are used to locate and number wells and springs. One system (fig. 11) uses the 14-character code of the U.S. Bureau of Land Management's land-subdivision system. The first character is an S, which indicates that the well or spring is located in the area covered by the Sixth Principal Meridian. The next letter denotes the quadrant formed by the intersection of the base line (parallel) with the principal meridian. The quadrants are designated A, B, C, or D in a counterclockwise manner with the northeast quadrant being A. The first three numbers designate the township, the next three designate the range, and the last two designate the section. Each section is then divided into quarters designated A, B, C, or D in a counterclockwise rotation, with the northeast quarter being A. This is done again for the quarter-quarter section and the quarter-quarter-quarter section. The three letters following the number designation of township, range, and section indicate the well or spring position first in the quarter section, then in the quarter-quarter section, and then in the quarter-quarter-quarter section. The final number is the order in which the well or spring in the designated quarter-quarter-quarter section was inventoried. A well or spring numbered SB00608717BAA1 would be the first one located in the NW¼NE¼NE¼ sec. 17, T. 6 N, R. 87 W.

The second system is a 15-digit number derived from latitude and longitude. The first six digits represent degrees, minutes, and seconds of latitude, and the next seven digits represent degrees, minutes, and seconds of longitude. The remaining two digits indicate the sequence in which wells or springs with the same latitude-longitude designations were inventoried.

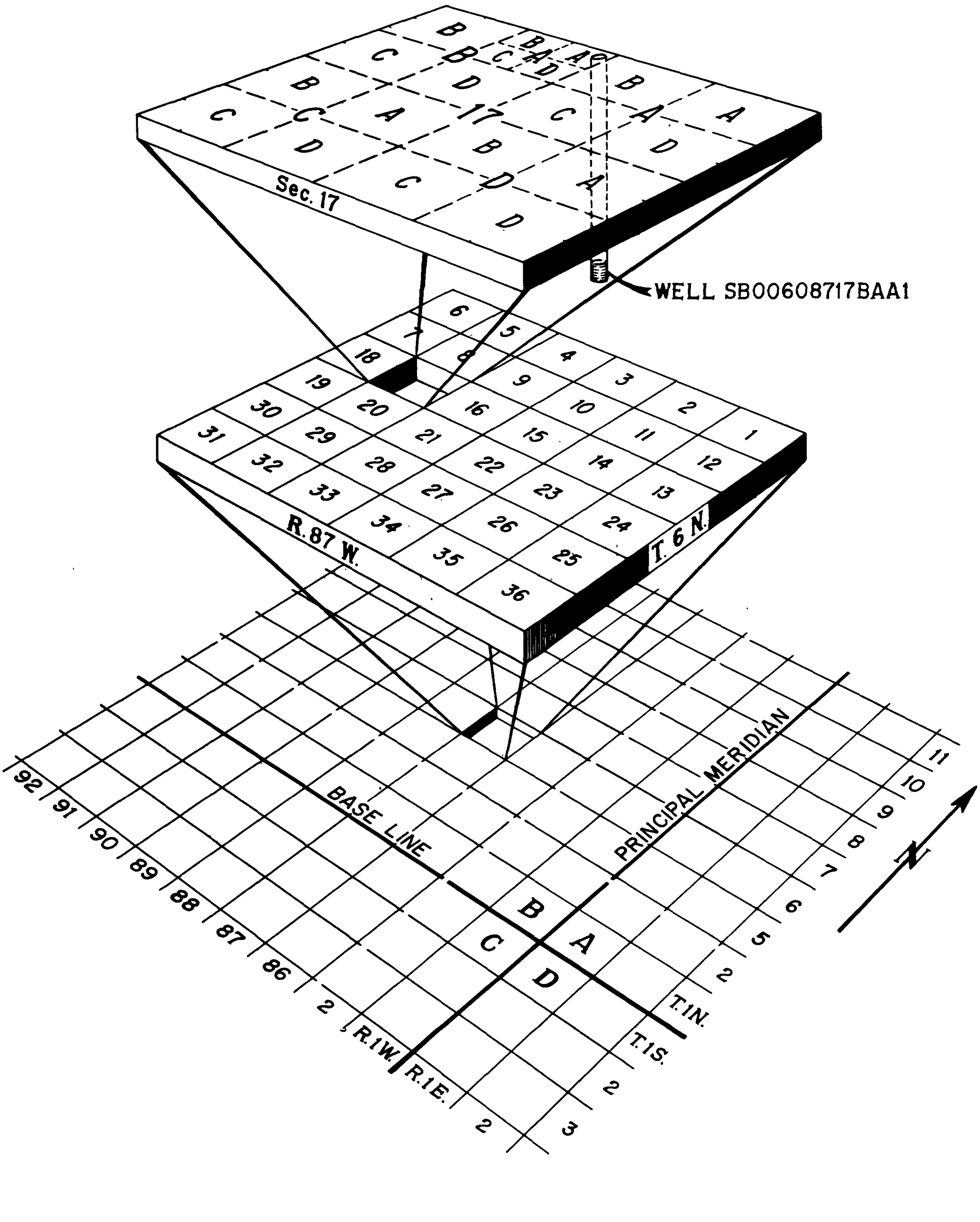

Figure 11.—Diagram showing system of locating and numbering wells and springs.

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WATER-QUALITY DATA

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WATER-QUALITY DATA FOR WELL HS-14, HAYDEN POWERPLANT, HAYDEN, COLO.

[DEG C=degree Celsius; CFS=cubic foot per second; MICROMHO=micromho per centimeter at 25° Celsius; MG/L=milligram per liter; UG/L=microgram per liter; TON PER AC-FT=ton per acre-foot]

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORT-O, DIS-SOLVED (MG/L AS PO4)
JAN , 1979										
11...	0900	--	80020	940	7.8	--	330	--	18	.00
MAR										
26...	1525	10.0	80020	950	7.7	--	330	--	18	.03
JUN										
12...	1535	14.0	80020	1000	7.6	13	260	320	20	--
OCT										
03...	1130	11.0	80020	925	7.6	--	360	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
JAN , 1979										
11...	.040	.00	320	0	64	40	90	2.2	37	3.8
MAR										
26...	.010	.01	360	29	73	43	90	2.1	35	3.9
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
03...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
JAN , 1979										
11...	22	96	.7	16	1	190	2	0	3	20
MAR										
26...	23	110	.8	15	--	190	--	0	--	170
JUN										
12...	--	--	--	--	--	160	--	--	--	10
OCT										
03...	--	--	--	--	--	170	--	10	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
JAN , 1979									
11...	6	50	9	40	8	--	611	.83	.0
MAR									
26...	--	40	--	10	8	--	637	.87	--
JUN									
12...	--	10	--	--	15	--	--	--	--
OCT									
03...	--	--	--	0	--	11	--	--	--

WATER-QUALITY DATA FOR BARNES WELL, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	ALKA-LINITY (MG/L AS CACO3)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)
JUN , 1979										
13...	1345	12.0	1460	8.3	290	.030	630	340	140	67
OCT										
03...	1710	15.0	1000	7.6	250	--	--	--	--	--

DATE	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)
JUN , 1979									
13...	1.8	83	160	.7	22	1	380	1	0
OCT									
03...	--	--	--	--	--	--	190	--	10

DATE	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	MERCURY DIS-SOLVED (UG/L AS HG)
JUN , 1979									
13...	5	20	2	10	5	50	2	743	1.0
OCT									
03...	--	--	--	--	--	100	1	--	--

WATER-QUALITY DATA FOR EVAPORATION POND, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)	PHOSPHORUS, DISSOLVED (MG/L AS P)
DEC , 1978											
22...	1325	--	80020	1850	7.6	2.4	49	60	.59	.00	.210
MAR , 1979											
26...	1500	4.0	80020	4200	7.1	--	11	--	1.2	.00	.160
JUN											
12...	1600	24.0	80020	6500	8.7	.1	21	26	--	--	--
OCT											
02...	1515	12.5	80020	13800	7.5	--	25	--	--	--	--

DATE	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)
DEC , 1978										
22...	.00	690	640	180	58	120	2.0	27	14	95
MAR , 1979										
26...	.00	1400	1400	240	190	450	5.3	41	42	310
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, SUSPENDED RECOVERABLE (UG/L AS FE)	IRON, TOTAL RECOVERABLE (UG/L AS FE)
DEC , 1978										
22...	780	1.8	27	4	1700	1	10	3	--	--
MAR , 1979										
25...	1900	3.8	25	--	3900	--	0	--	780	840
JUN										
12...	--	--	--	--	530	--	--	--	--	--
OCT										
02...	--	--	--	--	13000	--	20	--	--	--

DATE	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)
DEC , 1978										
22...	0	2	210	5	30	1	--	--	1300	1.77
MAR , 1979										
26...	60	--	1000	--	50	14	--	--	3180	4.32
JUN										
12...	40	--	40	--	--	4	--	--	--	--
OCT										
02...	--	--	--	--	80	3	0	3	--	--

WATER-QUALITY DATA FOR INTERMEDIATE-QUALITY POND, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978											
22...	1335	--	80020	3200	8.1	1.4	90	110	0	.07	--
MAR , 1979											
26...	1530	5.5	80020	2600	8.1	--	65	--	--	.82	1.4
JUN											
12...	1500	20.0	80020	3250	9.8	.0	68	83	--	--	--
OCT											
03...	1405	16.0	80020	3500	9.3	--	640	--	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
DEC , 1978											
22...	.040	--	1300	1200	290	140	330	4.0	35	35	210
MAR , 1979											
26...	.090	.47	1000	970	250	100	240	3.2	33	29	150
JUN											
12...	--	--	--	--	--	--	--	--	--	--	--
OCT											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)
DEC , 1978										
22...	1600	2.2	26	17	1800	0	0	20	60	1
MAR , 1979										
26...	1300	2.0	37	--	1400	--	10	--	30	--
JUN										
12...	--	--	--	--	1900	--	--	--	20	--
OCT										
03...	--	--	--	--	2000	--	10	--	--	--

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)	SAMPLE SOURCE
DEC , 1978										
22...	40	6	70	3	--	--	2690	3.66	.0	40
MAR , 1979										
26...	140	--	40	2	--	--	2150	2.92	--	--
JUN										
12...	10	--	--	5	--	--	--	--	--	--
OCT										
03...	--	--	40	3	1	[illegible]	--	--	--	--

WATER-QUALITY DATA FOR OIL-SKIMMER POND, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978											
22...	1350	--	80020	1500	7.4	4.3	55	67	0	.82	--
MAR , 1979											
26...	1545	24.0	80020	2050	7.2	--	30	--	--	3.1	.06
JUN											
12...	1505	17.0	80020	975	9.5	.0	38	46	--	--	--
OCT											
03...	1355	17.0	80020	1700	3.0	--	1	--	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
DEC , 1978											
22...	.170	--	630	570	170	49	98	1.7	25	13	65
MAR , 1979											
26...	.090	.02	860	830	230	69	170	2.5	30	13	67
JUN											
12...	--	--	--	--	--	--	--	--	--	--	--
OCT											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)
DEC , 1978										
22...	660	1.8	26	3	1400	<1	0	6	20	2
MAR , 1979										
26...	980	2.9	43	--	2700	--	0	--	60	--
JUN										
12...	--	--	--	--	1600	--	--	--	10	--
OCT										
03...	580	--	--	--	1500	--	20	--	--	--

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)	SAMPLE SOURCE
DEC , 1978										
22...	200	5	20	5	--	--	1120	1.52	[illegible]	40
MAR , 1979										
26...	140	--	20	11	--	--	1630	2.22	--	--
JUN										
12...	20	--	--	5	--	--	--	--	--	--
OCT										
03...	--	--	40	4	0	4	--	--	--	--

WATER-QUALITY DATA FOR HIGH-QUALITY POND, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)
DEC , 1978											
22...	1405	--	80020	1020	7.4	3.6	46	56	0	.29	--
MAR , 1979											
26...	1600	9.0	80020	780	7.5	--	38	--	--	1.0	.00
JUN											
12...	1520	22.0	80020	900	9.9	.0	28	34	--	--	--
OCT											
03...	1350	15.0	80020	750	6.8	--	1	--	--	--	--

DATE	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)
DEC , 1978											
22...	.250	--	340	300	92	27	82	1.9	34	8.5	37
MAR , 1979											
26...	.010	.00	310	270	83	25	55	1.4	27	6.4	31
JUN											
12...	--	--	--	--	--	--	--	--	--	--	--
OCT											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)
DEC , 1978										
22...	420	1.1	12	1	990	<1	0	8	30	2
MAR , 1979										
26...	330	1.5	15	--	1400	--	0	--	30	--
JUN										
12...	--	--	--	--	1500	--	--	--	60	--
OCT										
03...	--	--	--	--	1500	--	10	--	--	--

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	MERCURY DISSOLVED (UG/L AS HG)	SAMPLE SOURCE
DEC , 1978										
22...	130	6	20	2	--	--	710	.97	.0	40
MAR , 1979										
26...	80	--	20	4	--	--	576	.78	--	--
JUN										
12...	10	--	--	4	--	--	--	--	--	--
OCT										
03...	--	--	10	2	1	3	--	--	--	--

WATER-QUALITY DATA FOR RAW WATER STORAGE POND NO. 1, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
JAN , 1979										
11...	1530	--	80020	340	7.3	--	110	--	.20	.03
MAR										
27...	1415	3.0	80020	390	7.6	--	100	--	.54	.15
JUN										
13...	1315	22.0	80020	220	8.9	.2	61	74	--	--
OCT										
02...	1615	17.0	80020	355	8.9	--	91	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
JAN , 1979										
11...	.070	.01	120	9	31	10	20	.8	26	2.3
MAR										
27...	.050	.05	150	53	38	14	26	.9	27	2.4
JUN										
13...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
JAN , 1979										
11...	9.6	43	.2	13	1	60	<1	0	1	100
MAR										
27...	10	80	.2	11	--	140	--	0	--	430
JUN										
13...	--	--	--	--	--	80	--	--	--	160
OCT										
02...	--	--	--	--	--	60	--	0	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
JAN , 1979										
11...	2	30	4	<3	0	--	--	196	.27	.0
MAR										
27...	--	40	--	10	1	--	--	245	.33	--
JUN										
13...	--	20	--	--	0	--	--	--	--	--
OCT										
02...	--	--	--	0	0	0	0	--	--	--

WATER-QUALITY DATA FOR WELL HS-1, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	ACIDITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)
DEC , 1978											
22...	1147	8.0	80020	1900	7.6	6.8	139	140	170	0	1.6
MAR , 1979											
26...	1110	10.0	80020	740	7.7	--	160	--	--	--	3.7
JUN											
12...	1040	13.0	80020	790	7.6	8.4	170	--	210	--	--
OCT											
02...	1115	14.0	80020	550	7.8	--	150	--	--	--	--

DATE	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978											
22...	--	.050	--	850	710	190	90	150	2.2	28	5.9
MAR , 1979											
26...	.09	.050	.03	230	69	52	24	70	2.0	40	3.7
JUN											
12...	--	--	--	--	--	--	--	--	--	--	--
OCT											
02...	--	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
22...	150	800	.7	13	1	1100	0	0	4	0
MAR , 1979										
26...	29	160	.9	12	--	1000	--	0	--	10
JUN										
12...	--	--	--	--	--	880	--	--	--	20
OCT										
02...	--	--	--	--	--	860	--	10	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
DEC , 1978										
22...	2	650	12	20	0	--	--	1490	2.03	.0
MAR , 1979										
26...	--	40	--	20	4	--	--	464	.63	--
JUN										
12...	--	40	--	--	10	--	--	--	--	--
OCT										
02...	--	--	--	0	2	0	2	--	--	--

WATER-QUALITY DATA FOR WELL HS-2, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)
DEC , 1978											
22...	1155	7.5	80020	1950	7.5	8.6	140	170	0	1.4	--
MAR , 1979											
26...	1300	10.0	80020	750	7.8	--	160	--	--	3.1	.00
JUN											
12...	1050	13.0	80020	690	7.6	8.4	170	210	--	--	--
OCT											
02...	1130	13.0	80020	540	7.8	--	150	--	--	--	--

DATE	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)
DEC , 1978										
22...	.050	--	870	730	200	89	150	2.2	27	6.1
MAR , 1979										
26...	.030	.00	210	50	43	25	87	2.6	47	3.3
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)
DEC , 1978										
22...	150	810	.7	13	1	1100	1	10	4	20
MAR , 1979										
26...	31	190	1.0	12	--	1100	--	0	--	10
JUN										
12...	--	--	--	--	--	930	--	--	--	10
OCT										
02...	--	--	--	--	--	900	--	0	--	--

DATE	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	MERCURY DISSOLVED (UG/L AS HG)
DEC , 1978										
22...	2	1300	12	20	0	--	--	1510	2.05	.0
MAR , 1979										
26...	--	110	--	10	3	--	--	503	.68	--
JUN										
12...	--	100	--	--	12	--	--	--	--	--
OCT										
02...	--	--	--	10	3	0	3	--	--	--

WATER-QUALITY DATA FOR WELL HS-3, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978										
22...	1125	9.5	80020	2520	7.4	12	160	190	.94	--
MAR , 1979										
26...	1315	11.0	80020	1800	7.5	--	160	--	1.5	.06
JUN										
12...	1110	12.0	80020	2020	8.5	9.6	160	190	--	--
OCT										
02...	1150	13.0	80020	2180	7.7	--	160	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978										
22...	.070	--	1100	970	270	110	220	2.9	30	6.9
MAR , 1979										
26...	.060	.09	820	650	180	89	170	2.6	31	6.0
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
22...	190	1200	.7	14	1	1400	1	--	5	10
MAR , 1979										
26...	140	780	.8	12	--	1100	--	--	--	120
JUN										
12...	--	--	--	--	--	940	--	--	--	20
OCT										
02...	--	--	--	--	--	1300	--	0	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)
DEC , 1978									
22...	2	200	11	40	--	--	--	2110	2.87
MAR , 1979									
26...	--	40	--	20	2	--	--	1480	2.01
JUN									
12...	--	40	--	--	1	--	--	--	--
OCT									
02...	--	--	--	10	1	1	2	--	--

WATER-QUALITY DATA FOR WELL HS-4, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978											
22...	1140	8.5	80020	2540	7.5	9.6	160	190	0	1.1	--
MAR , 1979											
26...	1330	11.0	80020	2200	7.6	--	160	--	--	1.5	.03
JUN											
12...	1130	12.0	80020	2000	7.5	9.6	160	190	--	--	--
OCT											
02...	1200	12.0	80020	2000	7.6	--	160	--	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978										
22...	.060	--	1100	970	270	110	230	3.0	31	7.6
MAR , 1979										
26...	.040	.01	830	670	210	75	200	3.0	34	6.5
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
22...	200	1100	.7	14	1	1400	2	0	4	60
MAR , 1979										
26...	140	900	.8	13	--	1200	--	0	--	50
JUN										
12...	--	--	--	--	--	950	--	--	--	10
OCT										
02...	--	--	--	--	--	1200	--	10	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
DEC , 1978										
22...	2	450	15	40	0	--	--	2030	2.76	.0
MAR , 1979										
26...	--	510	--	20	--	--	2	1650	2.24	--
JUN										
12...	--	120	--	--	1	--	--	--	--	--
OCT										
02...	--	--	--	10	1	1	2	--	--	--

WATER-QUALITY DATA FOR WELL HS-5, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978										
22...	1030	9.0	80020	612	--	--	170	210	.85	--
MAR , 1979										
26...	1400	9.0	80020	560	7.6	--	150	--	1.1	.25
JUN										
12...	1310	13.0	80020	650	7.4	15	200	240	--	--
OCT										
02...	1400	12.0	80020	760	7.6	--	240	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978										
22...	.060	--	240	70	64	20	38	1.1	25	3.8
MAR , 1979										
26...	.100	.08	220	74	60	18	35	1.0	25	5.2
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
22...	28	110	.8	14	1	490	1	10	1	10
MAR , 1979										
26...	28	100	.7	13	--	1900	--	0	--	60
JUN										
12...	--	--	--	--	--	1500	--	--	--	10
OCT										
02...	--	--	--	--	--	2000	--	10	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
DEC , 1978										
22...	2	190	4	20	2	--	--	387	.53	.0
MAR , 1979										
26...	--	140	--	20	2	--	--	357	.49	--
JUN										
12...	--	30	--	--	2	--	--	--	--	--
OCT										
02...	--	--	--	10	3	0	3	--	--	--

WATER-QUALITY DATA FOR WELL HS-6, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978											
22...	1015	7.0	80020	782	7.3	18	180	220	0	.90	--
MAR , 1979											
26...	1415	10.0	80020	680	7.7	--	180	--	--	1.4	.12
JUN											
12...	1330	13.0	80020	845	7.6	8.4	170	210	--	--	--
OCT											
02...	1415	13.0	80020	880	7.6	--	240	--	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978										
22...	.010	--	260	83	66	24	42	1.1	25	4.8
MAR , 1979										
26...	.040	.04	280	100	74	23	41	1.1	24	3.9
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
22...	35	120	.8	13	1	510	1	0	2	70
MAR , 1979										
26...	35	120	.7	14	--	2300	--	0	--	0
JUN										
12...	--	--	--	--	--	230	--	--	--	10
OCT										
02...	--	--	--	--	--	1900	--	0	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
DEC , 1978										
22...	4	350	2	20	2	--	--	420	.57	.0
MAR , 1979										
26...	--	210	--	10	4	--	--	429	.58	--
JUN										
12...	--	50	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	10	4	0	4	--	--	--

WATER-QUALITY DATA FOR WELL HS-7, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978											
22...	1315	--	80020	1350	7.6	9.6	200	240	0	1.1	--
MAR , 1979											
26...	1515	10.0	80020	1110	7.5	--	220	--	--	1.7	.00
JUN											
12...	1340	13.0	80020	1100	7.4	13	170	210	--	--	--
OCT											
02...	1445	14.5	80020	1060	7.3	--	290	--	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978										
22...	.060	--	510	410	150	56	91	1.6	25	4.3
MAR , 1979										
26...	.030	.00	390	170	100	35	97	2.1	35	4.3
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
22...	80	450	.6	18	0	400	1	10	4	10
MAR , 1979										
26...	53	280	.5	19	--	2000	--	0	--	0
JUN										
12...	--	--	--	--	--	230	--	--	--	10
OCT										
02...	--	--	--	--	--	1800	--	0	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
DEC , 1978										
22...	2	210	5	30	4	--	--	974	1.32	.0
MAR , 1979										
26...	--	70	--	20	3	--	--	730	.99	--
JUN										
12...	--	20	--	--	3	--	--	--	--	--
OCT										
02...	--	--	--	10	5	0	5	--	--	--

WATER-QUALITY DATA FOR WELL HS-8, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	ACIDITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)
DEC , 1978										
21...	0930	9.0	80020	1620	7.3	15	160	--	190	2.2
MAR , 1979										
27...	0830	9.0	80020	1800	7.1	--	150	150	--	1.4
JUN										
12...	1340	13.0	80020	950	7.1	20	130	--	160	--
OCT										
03...	0900	11.0	80020	900	7.4	--	200	--	--	--

DATE	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT
DEC , 1978										
21...	--	.080	--	700	540	150	78	75	1.2	19
MAR , 1979										
27...	.01	.080	.06	830	680	230	63	100	1.5	21
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
03...	--	--	--	--	--	--	--	--	--	--

DATE	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
21...	7.1	120	820	.2	17	1	490	10	2	10
MAR , 1979										
27...	5.2	110	690	.4	16	--	2400	0	--	10
JUN										
12...	--	--	--	--	--	--	1600	--	--	--
OCT										
03...	--	--	--	--	--	--	1900	10	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MANGA-NESE (UG/L AS MN)
DEC , 1978										
21...	2	740	3	20	5	--	--	1370	1.86	--
MAR , 1979										
27...	--	70	--	20	4	--	--	1310	1.78	70
JUN										
12...	--	60	--	--	2	--	--	--	--	--
OCT										
03...	--	--	--	0	3	0	3	--	--	--

WATER-QUALITY DATA FOR WELL HS-9, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)
DEC , 1978											
21...	1110	5.0	80020	1070	7.6	11	230	280	0	2.1	--
MAR , 1979											
27...	0900	10.0	80020	1150	7.8	--	240	--	--	3.6	.03
JUN											
12...	1350	13.0	80020	1410	7.6	12	250	300	--	--	--
OCT											
03...	0945	11.0	80020	1400	7.6	--	300	--	--	--	--

DATE	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)
DEC , 1978										
21...	.040	--	480	250	95	60	77	1.5	26	3.9
MAR , 1979										
27...	.030	.01	550	310	110	67	78	1.4	23	4.5
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
03...	--	--	--	--	--	--	--	--	--	--

DATE	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)
DEC , 1978										
21...	48	350	.9	17	1	1600	1	10	3	20
MAR , 1979										
27...	59	350	.9	16	--	1700	--	10	--	20
JUN										
12...	--	--	--	--	--	1900	--	--	--	10
OCT										
03...	--	--	--	--	--	1400	--	10	--	--

DATE	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	MERCURY DISSOLVED (UG/L AS HG)
DEC , 1978										
21...	2	70	2	30	4	--	--	801	1.09	.0
MAR , 1979										
27...	--	110	--	20	6	--	--	848	1.15	--
JUN										
12...	--	40	--	--	4	--	--	--	--	--
OCT										
03...	--	--	--	0	4	0	4	--	--	--

WATER-QUALITY DATA FOR WELL HS-10, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)
DEC , 1978											
21...	1400	8.0	80020	1020	7.7	8.9	230	280	0	1.7	--
MAR , 1979											
27...	1000	10.5	80020	1380	7.8	--	210	--	--	1.5	.04
JUN											
12...	1430	13.0	80020	1950	7.7	6.4	160	200	--	--	--
OCT											
03...	1025	11.0	80020	2040	7.8	--	230	--	--	--	--

DATE	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)
DEC , 1978										
21...	.020	--	450	220	78	63	76	1.6	27	3.7
MAR , 1979										
27...	.040	.03	590	380	92	87	110	2.0	29	4.3
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
03...	--	--	--	--	--	--	--	--	--	--

DATE	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)
DEC , 1978										
21...	43	330	1.0	16	1	1700	1	10	3	10
MAR , 1979										
27...	71	510	1.2	14	--	1400	--	0	--	20
JUN										
12...	--	--	--	--	--	950	--	--	--	10
OCT										
03...	--	--	--	--	--	1300	--	10	--	--

DATE	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	MERCURY DISSOLVED (UG/L AS HG)
DEC , 1978										
21...	2	40	5	20	5	--	--	758	1.03	.0
MAR , 1979										
27...	--	40	--	10	7	--	--	1020	1.39	--
JUN										
12...	--	30	--	--	4	--	--	--	--	--
OCT										
03...	--	--	--	10	3	0	3	--	--	--

WATER-QUALITY DATA FOR WELL HS-11, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	ACIDITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)
DEC , 1978											
21...	1400	6.0	80020	1050	7.6	9.6	197	200	240	0	1.2
MAR , 1979											
27...	1030	9.5	80020	1200	7.6	--	160	--	--	--	1.2
JUN											
12...	1445	12.0	80020	540	7.7	4.5	110	--	140	--	--
OCT											
03...	1030	9.5	80020	900	7.6	--	190	--	--	--	--

DATE	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)
DEC , 1978											
21...	--	.090	--	430	240	98	46	76	1.6	27	4.9
MAR , 1979											
27...	.18	.030	.06	510	350	120	51	87	1.7	27	5.6
JUN											
12...	--	--	--	--	--	--	--	--	--	--	--
OCT											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)
DEC , 1978										
21...	41	330	.6	14	1	1500	1	10	3	0
MAR , 1979										
27...	53	450	.6	13	--	1300	--	0	--	20
JUN										
12...	--	--	--	--	--	410	--	--	--	40
OCT										
03...	--	--	--	--	--	960	--	10	--	--

DATE	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	MERCURY DISSOLVED (UG/L AS HG)
DEC , 1978										
21...	4	20	2	30	7	--	--	736	1.00	.0
MAR , 1979										
27...	--	20	--	10	5	--	--	683	1.20	--
JUN										
12...	--	20	--	--	2	--	--	--	--	--
OCT										
03...	--	--	--	0		1	5	--	--	--

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)
DEC , 1978										
21...	1440	8.0	80020	770	7.6	11	220	270	0	2.4
MAR , 1979										
27...	1100	11.0	80020	800	7.5	--	230	--	--	2.1
JUN										
12...	1440	13.0	80020	780	7.4	18	240	290	--	--
OCT										
02...	1045	11.5	80020	810	7.6	--	250	--	--	--

DATE	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT
DEC , 1978										
21...	--	.190	--	310	90	72	32	59	1.5	29
MAR , 1979										
27...	.43	.230	.14	330	96	76	33	58	1.4	27
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)
DEC , 1978										
21...	5.2	25	170	.7	16	1	1800	0	10	2
MAR , 1979										
27...	7.6	26	160	.7	15	--	1900	--	10	--
JUN										
12...	--	--	--	--	--	--	1600	--	--	--
OCT										
02...	--	--	--	--	--	--	1800	--	10	--

DATE	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	MERCURY DISSOLVED (UG/L AS HG)
DEC , 1978										
21...	0	2	80	2	30	10	--	526	.72	.0
MAR , 1979										
27...	50	--	70	--	20	11	--	526	.72	--
JUN										
12...	20	--	50	--	--	11	--	--	--	--
OCT										
02...	--	--	--	--	0	--	8	--	--	--

WATER-QUALITY DATA FOR WELL HS-13, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978										
21...	1500	6.0	80020	720	7.6	12	240	290	2.2	--
MAR , 1979										
27...	1045	10.0	80020	1190	7.5	--	150	--	1.5	.18
JUN										
12...	1450	13.0	80020	700	7.5	14	220	270	--	--
OCT										
03...	1100	11.0	80020	974	7.6	--	270	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978										
21...	.050	--	280	41	72	24	61	1.6	32	4.5
MAR , 1979										
27...	.130	.06	540	390	140	45	74	1.4	23	8.3
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
03...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)
DEC , 1978									
21...	23	150	.6	16	1	1400	1	10	2
MAR , 1979									
27...	50	430	.6	14	--	2000	--	10	--
JUN									
12...	--	--	--	--	--	1700	--	--	--
OCT									
03...	--	--	--	--	--	1400	--	10	--

DATE	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)
DEC , 1978									
21...	10	2	40	2	10	10	--	505	.69
MAR , 1979									
27...	130	--	30	--	20	6	--	861	1.17
JUN									
12...	20	--	140	--	--	14	--	--	--
OCT									
03...	--	--	--	--	10	--	10	--	--

WATER-QUALITY DATA FOR WELL HS-15, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
JAN , 1979											
11...	1030	--	80020	469	7.3	--	170	--	1.3	1.3	.03
MAR											
26...	1300	10.0	80020	340	8.1	--	110	--	--	.16	.09
JUN											
13...	0850	11.0	80020	360	8.1	1.8	110	140	--	--	--
OCT											
02...	1500	13.0	80020	340	8.0	--	130	--	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
JAN , 1979											
11...	.150	.01	180	13	42	42	19	27	.9	24	6.3
MAR											
26...	.050	.03	140	34	--	33	15	22	.8	25	2.5
JUN											
13...	--	--	--	--	--	--	--	--	--	--	--
OCT											
02...	--	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)
JAN , 1979											
11...	13	48	.7	11	2	1100	1	0	5	300	2
MAR											
26...	9.8	46	.8	8.2	--	680	--	0	--	20	--
JUN											
13...	--	--	--	--	--	610	--	--	--	120	--
OCT											
02...	--	--	--	--	--	300	--	10	--	--	--

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	MERCURY DIS-SOLVED (UG/L AS HG)
JAN , 1979										
11...	120	5	30	9	--	--	277	.38	1.7	.0
MAR										
26...	0	--	10	2	--	--	205	.28	--	--
JUN										
13...	0	--	--	1	--	--	--	--	--	--
OCT										
02...	--	--	0	1	1	2	--	--	--	--

WATER-QUALITY DATA FOR WELL HS-16, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
JAN , 1979										
12...	1155	--	80020	1170	7.3	--	530	--	2.6	--
MAR										
27...	1350	10.0	80020	520	7.1	--	180	--	1.2	.00
JUN										
13...	0900	13.0	80020	580	7.1	32	210	250	--	--
OCT										
02...	1545	15.0	80020	850	7.0	--	330	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
JAN , 1979										
12...	.090	--	500	0	98	63	72	1.4	23	9.1
MAR										
27...	.010	.00	230	53	52	25	33	.9	23	3.0
JUN										
13...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
JAN , 1979										
12...	28	87	.5	23	1	4700	<1	0	8	40
MAR										
27...	16	86	.6	16	--	2500	--	0	--	230
JUN										
13...	--	--	--	--	--	300	--	--	--	10
OCT										
02...	--	--	--	--	--	3300	--	10	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
JAN , 1979										
12...	5	720	9	40	1	--	--	716	.97	.0
MAR										
27...	--	160	--	10	27	--	--	348	.47	--
JUN										
13...	--	10	--	--	15	--	--	--	--	--
OCT										
02...	--	--	--	10	6	1	7	--	--	--

WATER-QUALITY DATA FOR WELL HS-17, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
JAN , 1979										
11...	1515	--	80020	2360	7.3	--	580	--	.11	.00
MAR										
27...	1400	10.0	80020	1300	7.3	--	310	--	6.8	.00
JUN										
13...	0910	13.0	80020	1300	7.3	39	400	490	--	--
OCT										
02...	1630	14.0	80020	1510	7.2	--	490	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
JAN , 1979										
11...	.090	.00	1100	560	260	120	160	2.3	25	10
MAR										
27...	.020	.00	660	350	160	64	62	1.0	17	5.1
JUN										
13...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
JAN , 1979										
11...	19	900	.2	15	2	490	0	0	0	1700
MAR										
27...	8.7	430	.5	12	--	340	--	0	--	90
JUN										
13...	--	--	--	--	--	690	--	--	--	30
OCT										
02...	--	--	--	--	--	550	--	20	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
JAN , 1979										
11...	2	3600	13	30	0	--	--	1860	2.53	.1
MAR										
27...	--	560	--	20	7	--	--	960	1.31	--
JUN										
13...	--	60	--	--	5	--	--	--	--	--
OCT										
02...	--	--	--	20	1	1	2	--	--	--

WATER-QUALITY DATA FOR WELL HS-18, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
JAN , 1979										
11...	1315	--	80020	415	8.0	--	150	--	.20	.09
MAR										
27...	1315	11.0	80020	450	7.8	--	180	--	1.3	.09
JUN										
13...	0840	13.0	80020	420	7.8	3.2	130	160	--	--
OCT										
03...	1430	11.0	80020	400	7.7	--	130	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
JAN , 1979										
11...	.120	.03	140	0	31	14	38	1.4	37	5.1
MAR										
27...	.060	.03	200	22	43	23	26	.8	22	3.0
JUN										
13...	--	--	--	--	--	--	--	--	--	--
OCT										
03...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
JAN , 1979										
11...	16	42	1.1	13	3	1200	<1	0	2	90
MAR										
27...	9.7	48	.8	11	--	1100	--	0	--	10
JUN										
13...	--	--	--	--	--	600	--	--	--	30
OCT										
03...	--	--	--	--	--	730	--	0	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
JAN , 1979										
11...	8	500	5	10	2	--	--	253	.34	.0
MAR										
27...	--	0	--	10	6	--	--	280	.38	--
JUN										
13...	--	140	--	--	3	--	--	--	--	--
OCT										
03...	--	--	--	0	3	0	3	--	--	--

WATER-QUALITY DATA FOR WELL FC-1, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	ACIDITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)
DEC , 1978											
21...	1030	5.0	80020	1410	7.3	15	156	160	190	0	1.7
MAR , 1979											
27...	0845	9.0	80020	1750	7.4	--	--	130	--	--	1.8
JUN											
12...	1345	13.0	80020	1000	7.4	10	130	--	160	--	--
OCT											
03...	0930	11.0	80020	910	7.5	--	210	--	--	--	--

DATE	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978											
21...	--	.090	--	680	520	180	55	59	1.0	16	4.5
MAR , 1979											
27...	.01	.080	.05	880	750	240	68	130	1.9	24	7.6
JUN											
12...	--	--	--	--	--	--	--	--	--	--	--
OCT											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
21...	80	520	.3	16	1	510	1	0	2	10
MAR , 1979										
27...	120	800	.2	19	--	2300	--	0	--	360
JUN										
12...	--	--	--	--	--	2000	--	--	--	10
OCT										
03...	--	--	--	--	--	2000	--	10	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
DEC , 1978										
21...	2	80	4	30	4	--	--	1020	1.39	.0
MAR , 1979										
27...	--	190	--	30	3	--	--	1470	2.00	--
JUN										
12...	--	60	--	--	2.	--	--	--	--	--
OCT										
03...	--	--	--	10	3	0	3	--	--	--

WATER-QUALITY DATA FOR WELL FC-2, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	ACIDITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)
DEC , 1978											
21...	1145	6.0	80020	1000	7.9	5.4	221	220	270	0	1.7
MAR , 1979											
27...	0915	10.0	80020	1250	7.6	--	230	--	--	--	2.6
JUN											
12...	1355	13.0	80020	1400	7.6	8.0	160	--	200	--	--
OCT											
03...	1000	11.0	80020	1380	7.6	--	300	--	--	--	--

DATE	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978											
21...	--	.030	--	440	220	94	49	67	1.4	25	4.1
MAR , 1979											
27...	.09	.030	.03	470	240	110	47	71	1.4	25	3.9
JUN											
12...	--	--	--	--	--	--	--	--	--	--	--
OCT											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
21...	41	310	.3	17	1	1700	2	0	4	10
MAR , 1979										
27...	48	330	.8	17	--	1800	--	0	--	30
JUN										
12...	--	--	--	--	--	1900	--	--	--	10
OCT										
03...	--	--	--	--	--	1500	--	0	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
DEC , 1978										
21...	4	80	5	20	7	--	--	725	.99	.0
MAR , 1979										
27...	--	60	--	10	7	--	--	779	1.06	--
JUN										
12...	--	10	--	--	4	--	--	--	--	--
OCT										
03...	--	--	--	10	4	0	4	--	--	--

WATER-QUALITY DATA FOR WELL FC-3, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978											
21...	1600	--	80020	1070	7.9	5.0	210	250	0	1.6	--
MAR , 1979											
27...	0930	10.5	80020	1000	7.6	--	210	--	--	1.5	.09
JUN											
12...	1405	13.0	80020	1480	7.6	7.6	160	190	--	--	--
OCT											
03...	0945	11.0	80020	1220	7.6	--	240	--	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978										
21...	.040	--	440	230	100	46	71	1.5	26	4.1
MAR , 1979										
27...	.020	.03	440	230	100	45	69	1.4	25	3.4
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
03...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
21...	45	320	.6	16	1	1800	1	0	6	50
MAR , 1979										
27...	44	290	.7	16	--	1800	--	0	--	0
JUN										
12...	--	--	--	--	--	1700	--	--	--	10
OCT										
03...	--	--	--	--	--	1800	--	0	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
DEC , 1978										
21...	4	290	5	30	4	--	--	736	1.00	.0
MAR , 1979										
27...	--	40	--	10	8	--	--	703	.96	--
JUN										
12...	--	0	--	--	6	--	--	--	--	--
OCT										
03...	--	--	--	10	4	0	4	--	--	--

WATER-QUALITY DATA FOR WELL FC-4, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
DEC , 1978											
22...	1045	6.0	80020	800	7.4	13	160	200	0	1.4	--
MAR , 1979											
26...	1345	10.0	80020	850	7.6	--	170	--	--	1.6	.00
JUN											
12...	1245	13.0	80020	800	7.6	7.2	150	180	--	--	--
OCT											
02...	1500	13.0	80020	700	7.7	--	240	--	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)
DEC , 1978										
22...	.010	--	360	200	88	35	50	1.1	23	4.5
MAR , 1979										
26...	.020	.00	380	210	92	36	50	1.1	22	5.0
JUN										
12...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)
DEC , 1978										
22...	45	230	1.0	14	1	440	1	0	3	0
MAR , 1979										
26...	41	230	1.0	14	--	2300	--	0	--	40
JUN										
12...	--	--	--	--	--	220	--	--	--	10
OCT										
02...	--	--	--	--	--	1900	--	0	--	--

DATE	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
DEC , 1978										
22...	4	20	6	20	0	--	--	573	.78	.0
MAR , 1979										
26...	--	30	--	20	2	--	--	581	.79	--
JUN										
12...	--	40	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	10	3	0	3	--	--	--

WATER-QUALITY DATA FOR HS SEEP 1, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)
JAN , 1979											
12...	1015	8.0	80020	E.05	1800	8.1	--	140	--	1.6	.00
MAR											
27...	1520	6.0	80020	E.10	1040	8.0	--	150	--	.91	.06
JUN											
13...	1010	14.0	80020	<.01	650	8.3	1.7	170	210	--	--
OCT											
03...	1445	12.0	80020	E.01	550	7.8	--	170	--	--	--

DATE	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)
JAN , 1979											
12...	.080	.00	740	600	170	76	160	2.6	32	4.6	130
MAR											
27...	.000	.02	480	330	150	25	46	.9	17	2.0	37
JUN											
13...	--	--	--	--	--	--	--	--	--	--	--
OCT											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)
JAN , 1979										
12...	730	.7	14	1	1200	4	0	4	60	5
MAR										
27...	370	.3	9.4	--	1700	--	0	--	10	--
JUN										
13...	--	--	--	--	1200	--	--	--	240	--
OCT										
03...	--	--	--	--	1100	--	10	--	--	--

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, DISSOLVED (TONS PER AC-FT)	MERCURY DISSOLVED (UG/L AS HG)
JAN , 1979										
12...	7	9	5	1	--	--	1380	.19	1.88	.0
MAR										
27...	0	--	10	4	--	--	736	.20	1.00	--
JUN										
13...	30	--	--	9	--	--	--	--	--	--
OCT										
03...	--	--	10	2	0	2	--	--	--	--

WATER-QUALITY DATA FOR HS SEEP 2, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)
JAN , 1979											
12...	1025	6.0	80020	<.01	900	8.1	--	160	--	.51	.00
MAR											
27...	1530	9.0	80020	E.01	900	8.2	--	150	--	2.7	.12
JUN											
13...	1110	14.0	80020	.02	725	8.2	2.1	170	210	--	--
OCT											
03...	1515	12.0	80020	<.01	800	7.3	--	160	--	--	--

DATE	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)
JAN , 1979										
12...	.020	.00	410	250	120	26	42	.9	18	2.4
MAR										
27...	.030	.04	300	150	68	31	88	2.2	39	2.7
JUN										
13...	--	--	--	--	--	--	--	--	--	--
OCT										
03...	--	--	--	--	--	--	--	--	--	--

DATE	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)
JAN , 1979										
12...	45	260	.8	14	1	1900	2	0	2	440
MAR										
27...	42	250	1.0	11	--	1200	--	0	--	10
JUN										
13...	--	--	--	--	--	1300	--	--	--	90
OCT										
03...	--	--	--	--	--	1100	--	10	--	--

DATE	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, DISSOLVED (TONS PER AC-FT)	MERCURY DISSOLVED (UG/L AS HG)
JAN , 1979										
12...	5	90	4	<3	2	--	611	--	.83	.0
MAR										
27...	--	0	--	10	7	--	597	.02	.81	--
JUN										
13...	--	10	--	--	10	--	--	--	--	--
OCT										
03...	--	--	--	0	--	3	--	--	--	--

WATER-QUALITY DATA FOR HS SEEP 3, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
JAN , 1979											
12...	1120	6.0	80020	<.01	802	7.3	--	160	--	.42	.00
MAR											
28...	0830	4.0	80020	E.01	750	7.6	--	160	--	.76	.00
JUN											
13...	1045	18.0	80020	<.01	690	7.7	7.7	200	240	--	--
OCT											
03...	1530	12.0	80020	<.01	720	7.7	--	210	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
JAN , 1979											
12...	.030	.00	300	140	68	31	53	1.3	28	3.5	49
MAR											
28...	.010	.00	290	130	64	31	51	1.3	28	3.1	35
JUN											
13...	--	--	--	--	--	--	--	--	--	--	--
OCT											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)
JAN , 1979										
12...	190	.6	15	1	2300	3	0	2	310	5
MAR										
28...	160	.6	11	--	2600	--	0	--	30	--
JUN										
13...	--	--	--	--	300	--	--	--	40	--
OCT										
03...	--	--	--	--	2500	--	10	--	--	--

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
JAN , 1979										
12...	20	4	6	3	--	--	511	--	.70	.0
MAR										
28...	20	--	10	6	--	--	458	.01	.62	--
JUN										
13...	60	--	--	1	--	--	--	--	--	--
OCT										
03...	--	--	0	1	0	1	--	--	--	--

WATER-QUALITY DATA FOR HS SEEP 4, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
JAN , 1979											
12...	1045	7.0	80020	E.10	850	7.7	--	180	--	2.1	.03
MAR											
28...	0845	3.0	80020	E.01	770	7.8	--	160	--	1.5	--
JUN											
13...	1030	17.0	80020	<.01	725	7.8	5.8	190	230	--	--
OCT											
03...	1525	12.0	80020	E.01	880	7.8	--	220	--	--	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
JAN , 1979											
12...	.060	.01	290	110	65	31	67	1.7	33	2.0	38
MAR											
28...	.050	--	290	130	67	30	61	1.6	31	2.0	38
JUN											
13...	--	--	--	--	--	--	--	--	--	--	--
OCT											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)
JAN , 1979										
12...	200	.4	17	1	2400	2	0	2	160	2
MAR										
28...	180	.5	12	--	2000	--	0	--	10	--
JUN										
13...	--	--	--	--	260	--	--	--	100	--
OCT										
03...	--	--	--	--	2500	--	10	--	--	--

DATE	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
JAN , 1979										
12...	40	4	9	9	--	--	541	.15	.74	.0
MAR										
28...	10	--	20	7	--	--	495	.01	.67	--
JUN										
13...	90	--	--	4	--	--	--	--	--	--
OCT										
03...	--	--	10	4	1	5	--	--	--	--

WATER-QUALITY DATA FOR HS SEEP 5, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)
MAR , 1979												
27...	1540	10.0	80020	E.01	440	--	--	160	--	1.6	.09	.030
JUN												
13...	1020	15.0	80020	<.01	460	7.9	3.8	160	190	--	--	--
OCT												
03...	1500	11.0	80020	<.01	410	7.5	--	120	--	--	--	--

DATE	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
MAR , 1979												
27...	.03	190	35	45	20	26	.8	22	2.0	9.0	43	.9
JUN												
13...	--	--	--	--	--	--	--	--	--	--	--	--
OCT												
03...	--	--	--	--	--	--	--	--	--	--	--	--

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	BORON, DIS-SOLVED (UG/L AS B)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	IRON, DIS-SOLVED (UG/L AS FE)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, SUS-PENDED TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)
MAR , 1979												
27...	11	1200	0	0	0	10	8	--	--	261	.01	.35
JUN												
13...	--	1100	--	10	10	--	7	--	--	--	--	--
OCT												
03...	--	710	0	--	--	0	2	4	6	--	--	--

WATER-QUALITY DATA FOR HS SEEP 6, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)	PHOSPHORUS, DISSOLVED (MG/L AS P)
MAR , 1979												
28...	0900	7.0	80020	E.10	1700	7.8	--	130	--	1.5	.15	.060
JUN												
13...	1120	15.0	80020	E.10	1650	8.0	3.0	160	190	--	--	--
OCT												
03...	1600	12.0	80020	E.01	2690	7.8	--	160	--	--	--	--

DATE	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM AD-SORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)
MAR . 1979												
26...	.05	600	470	130	68	170	3.0	38	4.5	120	670	1.0
JUN												
13...	--	--	--	--	--	--	--	--	--	--	--	--
OCT												
03...	--	--	--	--	--	--	--	--	--	--	--	--

DATE	SILICA, DISSOLVED (MG/L AS SIO2)	BORON, DISSOLVED (UG/L AS B)	CHROMIUM, DISSOLVED (UG/L AS CR)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, DISSOLVED (TONS PER AC-FT)
MAR . 1979												
28...	12	1400	10	10	10	20	2	--	--	1260	.34	1.71
JUN												
13...	--	1500	--	70	70	--	2	--	--	--	--	--
OCT												
03...	--	1800	0	--	--	120	1	0	1	--	--	--

WATER-QUALITY DATA FOR HS SEEP 7, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)	PHOSPHORUS, DISSOLVED (MG/L AS P)
MAR , 1979												
28...	0930	7.0	80020	E.01	1200	8.0	--	130	--	1.7	.12	.020
JUN												
13...	1100	16.0	80020	<.01	750	8.0	3.5	180	220	--	--	--
OCT												
03...	1555	12.0	80020	<.01	800	7.8	--	97	--	--	--	--

DATE	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)
MAR , 1979												
28...	.04	510	380	120	52	68	1.3	22	3.5	75	410	1.0
JUN												
13...	--	--	--	--	--	--	--	--	--	--	--	--
OCT												
03...	--	--	--	--	--	--	--	--	--	--	--	--

DATE	SILICA, DISSOLVED (MG/L AS SIO2)	BORON, DISSOLVED (UG/L AS B)	CHROMIUM, DISSOLVED (UG/L AS CR)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, DISSOLVED (TONS PER AC-FT)
MAR , 1979											
28...	14	2000	0	10	10	20	1	--	831	.02	1.13
JUN											
13...	--	250	--	70	20	--	2	--	--	--	--
OCT											
03...	--	1600	0	--	--	70	--	4	--	--	--

WATER-QUALITY DATA FOR HS SEEP 8, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)
MAR , 1979												
28...	0945	3.0	80020	E.01	1000	8.1	--	190	--	.23	.12	.030
JUN												
13...	1040	20.0	80020	<.01	810	8.3	2.2	220	270	--	--	--

DATE	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)
MAR , 1979											
28...	.04	470	280	130	36	57	1.1	21	3.8	39	320
JUN											
13...	--	--	--	--	--	--	--	--	--	--	--

DATE	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	BORON, DIS-SOLVED (UG/L AS B)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	IRON, DIS-SOLVED (UG/L AS FE)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)
MAR , 1979											
28...	.5	11	2200	10	40	30	10	6	715	.02	.97
JUN											
13...	--	--	310	--	40	40	--	1	--	--	--

WATER-QUALITY DATA FOR GRAVEL PIT SEEP, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)
JAN , 1979											
11...	1445	--	80020	--	436	6.9	--	150	--	.06	.06
MAR											
27...	1430	11.0	80020	--	440	8.0	--	150	--	--	.13
JUN											
13...	0920	16.0	80020	E.05	400	7.6	7.2	150	180	--	--
OCT											
02...	1530	17.0	80020	E.05	436	7.5	--	100	--	--	--

DATE	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)	PHOSPHORUS, DISSOLVED (MG/L AS P)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT
JAN , 1979											
11...	.74	.390	.24	160	13	44	44	13	22	.8	22
MAR											
27...	.03	.010	.01	190	37	--	50	15	22	.7	20
JUN											
13...	--	--	--	--	--	--	--	--	--	--	--
OCT											
02...	--	--	--	--	--	--	--	--	--	--	--

DATE	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)
JAN , 1979											
11...	3.0	9.1	46	.5	15	1	1700	3	0	0	450
MAR											
27...	3.1	17	56	.8	6.3	--	1100	--	0	--	130
JUN											
13...	--	--	--	--	--	--	1200	--	--	--	210
OCT											
02...	--	--	--	--	--	--	960	--	10	--	--

DATE	LEAD, DISSOLVED (UG/L AS PB)	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	NITROGEN, AMMONIA DISSOLVED (MG/L AS NH4)	MERCURY DISSOLVED (UG/L AS HG)
JAN , 1979											
11...	3	1800	4	3	0	--	--	248	.34	.08	.1
MAR											
27...	--	150	--	10	4	--	--	262	.36	--	--
JUN											
13...	--	490	--	--	2	--	--	--	--	--	--
OCT											
02...	--	--	--	10	2	0	2	--	--	--	--

WATER-QUALITY DATA FOR DISCHARGE WEIR, HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)
JAN , 1979										
11...	1400	--	80020	.26	1500	7.4	--	58	--	1.3
MAR										
27...	1500	8.0	80020	.82	375	8.1	--	120	--	.78
JUN										
13...	0930	13.0	80020	.26	390	8.0	2.4	120	150	--
OCT										
02...	1600	14.0	80020	.32	340	8.0	--	140	--	--

DATE	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT
JAN , 1979										
11...	--	.070	--	600	540	160	48	94	1.7	25
MAR										
27...	.15	.030	.05	160	40	36	17	23	.8	24
JUN										
13...	--	--	--	--	--	--	--	--	--	--
OCT										
02...	--	--	--	--	--	--	--	--	--	--

DATE	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)
JAN , 1979										
11...	11	59	660	3.3	24	1	2700	1	20	3
MAR										
27...	1.4	16	58	.7	8.6	--	820	--	0	--
JUN										
13...	--	--	--	--	--	--	1600	--	--	--
OCT										
02...	--	--	--	--	--	--	1100	--	0	--

DATE	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SELE-NIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	MERCURY DIS-SOLVED (UG/L AS HG)
JAN , 1979										
11...	15000	0	300	21	60	21	--	1120	1.52	.1
MAR										
27...	0	--	0	0	10	10	--	237	.32	--
JUN										
13...	310	--	90	0	--	14	--	--	--	--
OCT										
02...	--	--	--	--	0	--	7	--	--	--

WATER-QUALITY DATA FOR SAGE CREEK ABOVE HAYDEN POWERPLANT, HAYDEN, COLO.

DATE	TIME	TEMPER-ATURE (DEG C)	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	ALKA-LINITY (MG/L AS CACO3)	BICAR-BONATE (MG/L AS HCO3)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)
MAR , 1979												
27...	1510	7.5	80020	E3.0	4000	8.1	--	240	--	20	.58	.210
JUN												
13...	0940	11.0	80020	E.75	2600	8.2	5.1	420	510	--	--	--

DATE	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM PERCENT	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
MAR , 1979												
27...	.19	1500	1300	160	270	540	6.0	44	7.9	59	2300	.3
JUN												
13...	--	--	--	--	--	--	--	--	--	--	--	--

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	BORON, DIS-SOLVED (UG/L AS B)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	IRON, DIS-SOLVED (UG/L AS FE)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NICKEL, DIS-SOLVED (UG/L AS NI)	ZINC, DIS-SOLVED (UG/L AS ZN)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)
MAR , 1979											
27...	7.5	130	10	40	70	0	30	120	3580	48.3	4.87
JUN											
13...	--	300	--	210	1400	0	--	2	--	--	--

WATER-QUALITY DATA FOR SAGE CREEK AT U.S. HIGHWAY 40, HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)	PHOSPHORUS, DISSOLVED (MG/L AS P)
MAR , 1979												
28...	0800	3.0	80020	E3.0	3300	7.9	--	210	--	18	.37	.140
JUN												
13...	1300	22.0	80020	E1.0	1320	8.0	4.3	220	270	--	--	--
OCT												
03...	1630	17.0	80020	E.50	450	8.5	--	150	--	--	--	--

DATE	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)
MAR , 1979												
28...	.12	1200	960	140	200	410	5.2	43	6.6	47	1800	.4
JUN												
13...	--	--	--	--	--	--	--	--	--	--	--	--
OCT												
03...	--	--	--	--	--	--	--	--	--	--	--	--

DATE	SILICA, DISSOLVED (MG/L AS SIO2)	BORON, DISSOLVED (UG/L AS B)	CHROMIUM, DISSOLVED (UG/L AS CR)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, DISSOLVED (TONS PER AC-FT)
MAR , 1979											
28...	6.9	260	10	40	60	0	20	110	2820	22.8	3.84
JUN											
13...	--	570	--	100	210	--	--	4	--	--	--
OCT											
03...	--	130	0	--	--	--	70	--	90	--	.12

WATER-QUALITY DATA FOR YAMPA RIVER NEAR HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	ALKALINITY (MG/L AS CACO3)	BICARBONATE (MG/L AS HCO3)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4)	PHOSPHORUS, DISSOLVED (MG/L AS P)
JAN , 1979											
12...	1230	1.0	80020	172	310	7.4	100	--	.24	.09	.030
MAR											
28...	0810	2.5	80020	540	370	7.8	100	--	.27	.12	.03
JUN											
13...	1315	15.0	80020	7760	80	7.8	17	21	--	--	--
OCT											
03...	1625	15.0	80020	92	389	8.5	120	--	--	--	--

DATE	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)
JAN , 1979										
12...	.03	120	19	31	10	21	.8	27	2.1	9.2
MAR										
28...	.04	150	51	39	13	22	.8	24	2.5	8.7
JUN										
13...	--	--	--	--	--	--	--	--	--	--
OCT										
03...	--	--	--	--	--	--	--	--	--	--

DATE	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC DISSOLVED (UG/L AS AS)	BORON, DISSOLVED (UG/L AS B)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)
JAN , 1979										
12...	40	.2	15	1	90	<1	0	1	140	2
MAR										
28...	73	.2	9.9	--	60	--	0	--	90	--
JUN										
13...	--	--	--	--	70	--	--	--	140	--
OCT										
03...	--	--	--	--	70	--	10	--	--	--

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	NICKEL, DISSOLVED (UG/L AS NI)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, DISSOLVED (TONS PER AC-FT)	MERCURY DISSOLVED (UG/L AS HG)
JAN , 1979										
12...	40	4	3	0	--	--	190	88.2	.26	.0
MAR										
28...	60	0	10	0	--	--	230	335	.31	--
JUN										
13...	20	--	--	0	--	--	--	--	--	--
OCT										
03...	--	--	60	0	0	0	--	--	--	--

WATER-QUALITY DATA FOR YAMPA RIVER AT HAYDEN, COLO.

DATE	TIME	TEMPERATURE (DEG C)	AGENCY ANALYZING SAMPLE (CODE NUMBER)	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	ALKALINITY (MG/L AS CACO3)
OCT , 1979							
03...	1700	17.0	80020	E100	370	8.6	120

DATE	BORON, DISSOLVED (UG/L AS B)	CHROMIUM, DISSOLVED (UG/L AS CR)	ZINC, DISSOLVED (UG/L AS ZN)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, SUSPENDED TOTAL (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)
OCT , 1979						
03...	80	10	80	0	0	0

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