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THE MINOR AND TRACE ELEMENTS, GAS, AND
ISOTOPE COMPOSITIONS OF THE PRINCIPAL
HOT SPRINGS OF NEVADA AND OREGON

By R. H. Mariner, T. S. Presser, J. B. Rapp, and L. M. Willey

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ABSTRACT

Current interest in the geothermal potential of hot spring areas in Nevada and Oregon makes all data on hot springs in these areas valuable. Tabulated here without interpretative comment are compositions of gases (oxygen plus argon, nitrogen, methane, and carbon dioxide), deuterium and oxygen (18) contents of the hot spring waters, trace and minor element chemical data for hot springs sampled in 1972 and 1973 in addition to the complete chemical analyses for several hot springs sampled in 1974.

INTRODUCTION

The purpose of this open-file release is to make available all of the chemical and isotopic data we have collected on the hot springs in Nevada and Oregon. This release supplements our open-file reports on the chemical composition of waters issued by hot springs in Nevada

(Mariner and others, 1974a) and Oregon (Mariner and others, 1974b). Data on the gas composition, isotope, trace element, and some minor element compositions were not available when the data on the major elements were released. These data are now complete and are presented along with the major element chemical data for hot springs sampled in these States during the 1974 field season. Although formal publication with interpretation is anticipated in the future, these data are being released in the present form because of the current interest in geothermally related data.

METHODS AND PROCEDURES

Water, collected in a 12-litre stainless steel pressure vessel at points as close to the orifices of the springs or wells as possible, was immediately pressure filtered through a 0.45 μm (micrometre) membrane filter using compressed nitrogen as the pressure source. Filtered water samples were collected and stored in plastic bottles which had been acid washed to remove contaminants prior to use. Samples for metal analyses were immediately acidified with concentrated nitric acid to a pH of 2 or less to insure that the metals would remain in solution. Ten millilitres of filtered sample were diluted to 100 millilitres with distilled deionized water to slow the polymerization of silica. Samples for aluminum analysis were filtered through a 0.1 μm membrane filter. Three samples of unfiltered untreated water were collected in 125-ml (millilitre) glass bottles with polyseal caps for stable isotope analysis. Samples of any gases escaping from the spring were collected in disposable plastic syringes

which were placed in a bottle of the native water for transport back to the laboratory. All samples collected prior to May 1974 were treated as described above. However, after May 1974, 0.1 μm membrane filters were used for all filtration.

Field determinations were made of barometric pressure, air temperature, water temperature, pH, alkalinity, sulfide, mercury, nitrate, and nitrite. Water temperatures were determined with a thermistor probe and a maximum reading mercury-in-glass thermometer. Detailed descriptions of the field determination of pH, alkalinity, ammonia, aluminum, and sulfide are given in Presser and Barnes (1974).

The pH was measured directly in the spring (using the method of Barnes, 1964). Alkalinity was measured immediately after the sample was withdrawn from the spring. Sulfide (total sulfides as H_2S) was determined by the iodometric titration method described by Brown and others (1970). Mercury was determined by a flameless atomic absorption technique (Environmental Protection Agency, 1971). Ammonia was determined by allowing the thermal spring sample to cool to ambient temperature, adding sodium hydroxide to raise the pH to approximately 12 and measuring the ammonia with an ammonia specific ion electrode. Nitrite was determined colorimetrically by the diazotization method described by Rainwater and Thatcher (1960) except that samples were visually compared to permanent color standards rather than measured with a spectrophotometer. Nitrate was reduced to nitrite by the cadmium-reduction method (American Public Health Association, 1971), the total was then determined as above and nitrate

calculated by difference. Water samples for aluminum were complexed with 8-hydroxyquinoline, buffered at pH 8.3, and extracted with methyl isobutyl ketone in the field as described by Barnes (1975). The organic extract was analyzed in the laboratory by atomic absorption (A. A.) at 309 nanometre wavelength.

Samples were sent to the U.S. Geological Survey's laboratory, Salt Lake City, Utah, for routine analyses of beryllium, arsenic, calcium, magnesium, strontium, barium, sodium, potassium, sulfate, chloride, bromide, iodide, phosphate, and selenium. Silica, lithium, rubidium, antimony, cadmium, cesium, cobalt, copper, gold, iron, lead, manganese, nickel, and silver were determined by direct aspiration on a double beam atomic absorption spectrophotometer in our laboratory. Boron was determined in our laboratory by either the Dianthrime method or the Carmine method (Brown and others, 1970), depending on the concentration range. Fluoride was determined in our laboratory by specific ion electrode using the method of R. B. Barnes (written commun., 1973).

Oxygen isotope analysis was by the CO_2 -equilibration method of Cohn and Urey (1938) and deuterium analysis by reaction with uranium at 800°C (Bigeleisen and others, 1952). $\text{O}^{18}/\text{O}^{16}$ and D/H measurements were made mass spectrometrically.

Gases were analyzed by gas chromatography as soon as possible after returning to the laboratory, always within two weeks of the date of sample collection. Linde Molecular Sieve 13X was used to separate and quantify ($\text{O}_2 + \text{Ar}$), N_2 , and CH_4 , while Porapak Q was used for CH_4 and CO_2 . The columns were run at room temperature with

helium as the carrier gas. The gases were detected by thermal conductivity.

SUMMARY

Tables 1 and 2 list the hot springs we have sampled in Nevada and Oregon. Figures 1 and 2 show the locations of the hot springs. Major element composition of springs sampled during 1974 (table 3), minor and trace element compositions (tables 4 and 5), gas analyses (tables 6 and 7), and isotopic compositions (tables 8 and 9), are tabulated on the following pages. The trace elements, beryllium, barium, antimony, gold, silver, cadmium, cobalt, and lead are not included in tables 4 and 5 because detectable amounts were not found. Detection limits in milligrams per litre (mg/l) for the direct aspiration of these elements on our instrument are: beryllium (0.1), barium (0.1), antimony (0.2), gold (0.1), silver (0.02), cadmium (0.01), cobalt (0.05), and lead (0.06). Nickel and selenium are not included in the tables because only a few spring waters contained detectable amounts. The detection limits for nickel and selenium were 0.05 mg/l and 0.003 mg/l, respectively. Detectable amounts of nickel were found in Oregon at Olene Gap Hot Spring (0.05 mg/l) and in Nevada at West Pinto Hot Spring (0.05 mg/l). Selenium in detectable amounts (0.003 mg/l or more) was found in Oregon at Hunters Hot Springs (0.008), and in Nevada at the steam geyser at Needle Rocks (0.006), Bog Hot Springs (0.004), and the unnamed hot spring in Jersey Valley (0.003).

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NEVADA

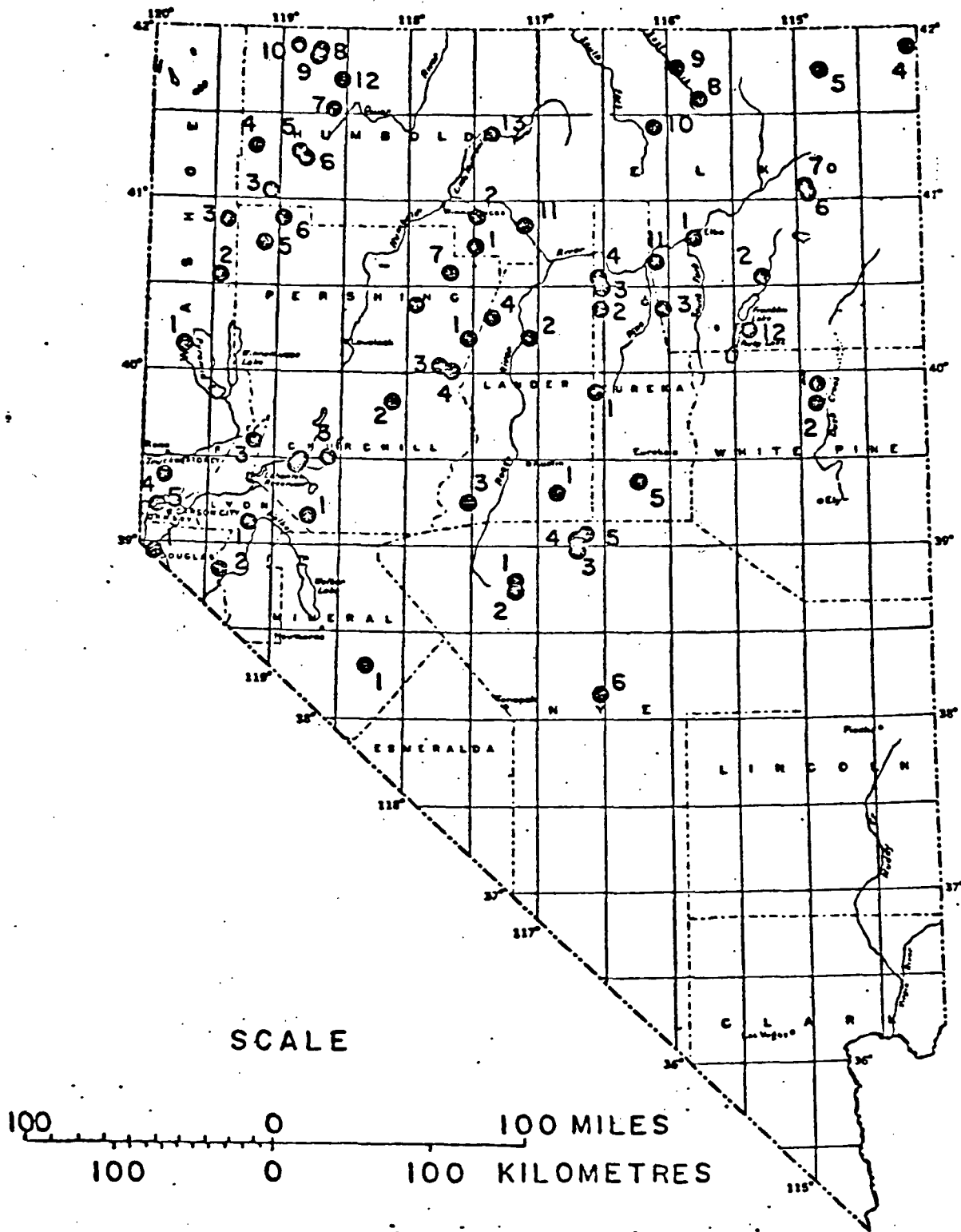


Figure 1. Map of the State of Nevada showing the location of sampled thermal springs and wells. The numbered dots correspond to sampled springs and wells listed by county in the tables.

Table 1.--Location and topographic map coverage of selected hot springs and wells in Nevada

Spring or well	Location	Topographic map coverage
Churchill County		
1 Lee Hot Springs	Unsurveyed (lat. 39°12' N., long. 118°43' W)	Allen Springs, Nev. (15'); Reno, Nev. (2°)
2 Dixie Valley Hot Springs	SE 1/4 sec. 5 and NE 1/4 sec. 8, T. 22N., R. 35E.	Dixie Hot Springs, Nev. (15'); Reno, Nev. (2°)
3 Flowing well in Stillwater	SW 1/4 sec. 7, T. 19N., R. 31E.	Stillwater, Nev. (15'); Reno, Nev. (2°)
4 Shallow research well (Soda Lakes)	SW 1/4 sec. 28, T. 20N., R. 28E.	Soda Lake, Nev. (15'); Reno, Nev. (2°)
5 Shallow research well (Soda Lakes)	NE 1/4, sec. 32, T. 20N., R. 28E.	Soda Lake, Nev. (15'); Reno, Nev. (2°)
Douglas County		
1 Valleys Hot Springs	NE 1/4 sec. 22, T. 13N., R. 19E.	Minden, Nev.-Calif. (7-1/2'); Walker Lake, Calif.-Nev (2°)
Elko County		
1 Hot Hole	NE 1/4 sec. 21, T. 34N., R. 55E.	Elko, west, Nev. (7-1/2'); Elko, Nev.-Utah (2°)
2 Sulphur Hot Springs	NW 1/4 sec. 11, T. 31N., R. 59E.	Lamoille, Nev. (15'); Elko, Nev.-Utah (2°)
3 Unnamed hot spring (Hot Creek)	NW 1/4 sec. 12, T. 28N., R. 52E	Pine Valley, Nev. (15'); Winnemucca, Nev. (2°)
4 Nile Spring	SW 1/4 sec. 30, T. 47N., R. 70E.	Goose Creek, Nev.-Utah-Idaho (15'); Wells, Nev.-Utah-Idaho (2°)
5 Mineral Hot Spring	sec. 16, T. 45N., R. 64E.	Delaplain, Nev.-Idaho (15'); Wells, Nev.-Utah-Idaho (2°)
6a Unnamed hot spring near Wells	sec. 20, T. 38N., R. 62E.	Oxley Peak, Nev. (7-1/2'); Wells, Nev.-Utah-Idaho (2°)
6b Unnamed hot spring near Wells	E 1/2 sec. 20, T. 38N., R. 62E.	Oxley Peak, Nev. (7-1/2'); Wells, Nev.-Utah-Idaho (2°)
6c Unnamed hot spring near Wells	SE 1/4 sec. 20, T. 38N., R. 62E.	Oxley Peak, Nev. (7-1/2') Wells, Nev.-Utah-Idaho (2°)
7a Unnamed hot spring near Wells	NE 1/4 sec. 17, T. 38N., R. 62E.	Oxley Peak, Nev. (7-1/2'); Wells, Nev.-Utah-Idaho (2°)
7b Unnamed hot spring near Wells	NE 1/4 sec. 17, T. 38N., R. 62E.	Oxley Peak, Nev. (7-1/2'); Wells, Nev.-Utah-Idaho (2°)
8' Unnamed hot spring (Wild Horse Reservoir)	SE 1/4 sec. 4, T. 43N., R. 55E.	Wild Horse, Nev. (15'); Wells, Nev.-Utah-Idaho (2°)
9 Unnamed hot spring (SSE Patsville)	Unsurveyed (lat. 41°5' N., long. 115°35' W)	Mountain City, Nev.-Idaho (15'); Wells, Nev. Utah-Idaho (2°)
10 Hot Sulphur Springs	NE 1/4 sec. 8, T. 41N., R. 52E.	Tuscarora, Nev. (15'); McDermitt, Nev.-Ore.-Idaho (2°)
11 Unnamed hot spring near Carlin	sec. 33, T. 33N., R. 52E.	Carlin, Nev. (15'); Winnemucca, Nev.(2°)
12 Unnamed hot spring near Ruby Marsh	NW 1/4 sec. 2, T. 27N., R. 58E.	Ruby Lake NW, Nev. (7-1/2'); Elko, Nev.-Utah (2°)
Eureka County		
1 Walti Hot Springs	SW 1/4 sec. 33, T. 24N., R. 48E.	Walti Hot Spring, Nev. (15'); Millet, Nev.(2°)
2 Hot Springs Point	NE 1/4 sec. 11, T. 29N., R. 48E.	Crescent Valley, Nev. (15'); Winnemucca, Nev. (2°)
3 Beovave "steam" well	NW 1/4 sec. 17, T. 31N., R. 48E.	Dunphy, Nev. (15'); Winnemucca, Nev. (2°)
4 Beovave Hot Spring	SE 1/4 sec. 8, T. 31N., R. 48E.	Dunphy, Nev. (15'); Winnemucca, Nev. (2°)
5 Bartholomae Hot Springs	SE 1/4 sec. 28, T. 18N., R. 50E.	Antelope Peak, Nev (15'); Millett, Nev. (2°)

Table 1.--Location and topographic map coverage of selected hot springs and wells in Nevada--Continued

Spring or well	Location	Topographic map coverage
Humboldt County		
1 Unnamed hot spring (Hot Springs Ranch)	SE 1/4 sec. 5, T. 33N., R. 40E.	Edna Mtn., Nev. (15'); Winnemucca, Nev. (2°)
2 Unnamed hot spring near Golconda	SE 1/4 sec. 29, T. 36N., R. 40E.	Edna Mtn., Nev. (15'); Winnemucca, Nev. (2°)
3 Double Hot Springs	sec. 4, T. 36N., R. 26E.	; Vya, Nevada-Oregon (2°)
4 Unnamed hot springs in Soldier Meadows	sec. 23, T. 40N., R. 24E.	; Vya, Nevada-Oregon (2°)
5 West Pinto Hot Spring (well)	Unsurveyed (lat. 41°20'N., long. 118°48'W)	; Vya, Nevada-Oregon (2°)
6 East Pinto Hot Spring	Unsurveyed (lat. 41°21'N., long. 118°47'W)	; Vya, Nevada-Oregon (2°)
7 Dyke Hot Spring	SE 1/4 sec. 25, T. 43N., R. 30E.	Duffer Peak, Nev. (15'); Vya, Nevada-Oregon (2°)
8 Flowing well near Baltazor Hot Spring	NW 1/4 sec. 13, T. 46 N., R. 28E.	Denio, Nev.-Ore. (15'); Vya, Nevada-Oregon (2°)
9 Baltazor Hot Spring	NW 1/4 sec. 13, T. 46N., R. 28E.	Denio, Nev.-Ore. (15'); Vya, Nevada-Oregon (2°)
10 Bog Hot Springs	NW 1/4 sec. 18, T. 46N., R. 28E.	Railroad Point, Nev.-Ore. (15'); Vya, Nevada-Oregon (2°)
11 Hot Pot	SW 1/4 sec. 11, T. 35N., R. 43E.	Hot Pot, Nev. (7-1/2'); Winnemucca, Nev. (2°)
12 Howard Hot Spring	NE 1/4 sec. 4, T. 44N., R. 31E.	Duffer Peak, Nev. (15'); Vya, Nevada-Oregon (2°)
13 The Hot Springs	NE 1/4 sec. 20, T. 41N., R. 41E.	Hot Springs Peak, Nev. (15'); McDermitt, Nev.-Ore.-Idaho (2°)
Lander County		
1 Spencer Hot Springs	Unsurveyed (lat. 39°49' N., long. 116°51' W)	Spencer Hot Springs, Nev. (15'); Millet, Nev. (2°)
2 Unnamed hot spring (Valley of the Moon)	NE 1/4 sec. 23, T. 27N., R. 43E.	The Cedars, Nev. (15'); Winnemucca, Nev. (2°)
3 Unnamed hot spring (Smith Creek Valley)	sec. 11, T. 17N., R. 39E.	; Millet, Nev. (2°)
4 Buffalo Valley Hot Springs	SE 1/4 sec. 23, T. 29N., R. 41E.	Buffalo Springs, Nev. (15'); Winnemucca, Nev. (2°)
Lyon County		
1a Wabuska Hot Springs	SE 1/4 sec. 16, T. 15N., R. 25E.	Wabuska, Nev. (15'); Tonopah, Nev. (2°)
1b Wabuska Hot Springs	SE 1/4 sec. 16, T. 15N., R. 25E.	Wabuska, Nev. (15'); Tonopah, Nev. (2°)
2 Nevada Hot Springs	SE 1/4 sec. 16, T. 12N., R. 23E.	Wellington, Nev. (15'); Walker Lake, Calif.-Nev. (2°)
3 Unnamed hot spring near Fernley	SW 1/4 sec. 18, T. 20N., R. 26E.	Two Tips, Nev. (15'); Reno, Nev. (2°)
Mineral County		
1 Soda Springs	SE 1/4 sec. 29, T. 6N., R. 35E.	Sodaville, Nev. (7-1/2'); Walker Lake, Calif.-Nev. (2°)

Table 1.--Location and topographic map coverage of selected hot springs and wells in Nevada--Continued

Spring or well	Location	Topographic map coverage
Nye County		
1 Darrrough "steau" well	sec. 8, T. 11N., R. 43E.	; Tonopah, Nev. (2°)
2 Darrrough Hot Springs	sec. 8, T. 11N., R. 43E.	; Tonopah, Nev. (2°)
3 Diana's Punch Bowl	SE 1/4 sec. 22, T. 14N., R. 47E.	Diana's Punch Bowl, Nev. (15'); Millet, Nev. (2°)
4 Hot spring near Diana's Punch Bowl	SE 1/4 sec. 22, T. 14N., R. 47E.	Diana's Punch Bowl, Nev. (15'); Millet, Nev. (2°)
5 Pott's Ranch Hot Spring	NE 1/4 sec. 2, T. 14N., R. 47E.	Diana's Punch Bowl, Nev. (15'); Millet, Nev. (2°)
6 Unnamed warm spring near Warm Springs	SW 1/4 sec. 20, T. 4N., R. 50E.	Warm Springs, Nev. (15'); Tonopah, Nev. (2°)
Pershing County		
1 Unnamed hot spring (Jersey Valley)	SW 1/4 sec. 28, T. 27N., R. 40E.	Mt. Moses, Nev. (15'); Winnemucca, Nev. (2°)
2 Kyle Hot Springs	SW 1/4 sec. 1, T. 29N., R. 36E.	Kyle Hot springs, Nev. (15'); Winnemucca, Nev. (2°)
3 Sou Hot Springs	SE 1/4 sec. 29, T. 26N., R. 38E.	Cain Mtn., Nev. (15'); Winnemucca, Nev. (2°)
4 Unnamed hot spring (Lower Ranch)	NW 1/4 sec. 16, T. 25N., R. 39E.	Cain Mtn., Nev. (15'); Winnemucca, Nev. (2°)
5 Unnamed hot spring near Trego	Unsurveyed (lat. 40°46' N., long. 119°7' W)	; Lovelock, Nev.-Calif. (2°)
6 Unnamed hot spring near Black Rock	Unsurveyed (lat. 40°57' N., long. 118°58' W)	; Lovelock, Nev.-Calif. (2°)
7 Leach Hot Springs	SE 1/4 Sec. 36, T. 32N., R. 38E.	Leach Hot Springs, Nev. (15'); Winnemucca, Nev. (2°)
Washoe County		
1 Steam Geyser (Needle Rocks)	Unsurveyed (lat. 40°9' N., long. 119°40' W)	The Needle Rocks, Nev. (7-1/2'); Lovelock, Nev.-Calif. (2°)
2 Great Boiling Spring	NW 1/4 sec. 15, T. 32N., R. 23E.	Gerlach, Nev. (15'); Lovelock, Nev.-Calif. (2°)
3 Flowing well near Gerlach	sec. 2, T. 34N., R. 23E.	; Lovelock, Nev.-Calif. (2°)
4 Steamboat Springs	NE 1/4 sec. 33, T. 16N., R. 20E.	Steamboat, Nev. (7-1/2'); Reno, Nev. (2°)
5 Bower's Hot Spring	NW 1/4 sec. 3, T. 16N., R. 19E.	Washoe City, Nev. (7-1/2'); Reno, Nev. (2°)
White Pine County		
1 Unnamed hot spring (Cherry Creek)	sec. 6, T. 23N., R. 63E.	; Ely, Nev. (2°)
2 Monte Neva	sec. 24, T. 21N., R. 63E.	; Ely, Nev. (2°)

Table 2.--Location and topographic map coverage of selected hot springs in Oregon

Spring	Location	Topographic map coverage
Baker County		
1 Radium Hot Springs (well)	NE 1/4 sec. 28, T. 78., R. 39E.	Haines, Ore. (7-1/2'); Baker, Oregon-Idaho (2°)
Clackamas County		
1 Austin Hot Springs	NW 1/4 sec. 30, T. 68., R. 7E.	Fish Creek Mtn. Ore., (15'); Vancouver, Ore.-Wash. (2°)
Deschutes County		
1 East Lake Hot Spring	sec. 29, T. 21S., R. 13E.	; Crescent, Oregon (2°)
Grant County		
1 Weberg Hot Spring	sec. 18, T. 18S., R. 26E.	; Burns, Oregon (2°)
2 Blue Mountain Hot Springs	S 1/2 sec. 13, T. 14S., R. 34 E.	Prairie City, Ore. (15'); Canyon City, Oregon (2°)
3 Ritter Hot Springs	NW 1/4 sec. 8, T. 8S., R. 30E.	Ritter, Ore. (15'); Canyon City, Oregon (2°)
Harney County		
1 Unnamed hot spring (Trout Creek)	sec. 16, T. 39S., R. 37E.	; Adel, Oregon (2°)
2 Hot Lake	sec. 15, T. 37S., R. 33E.	; Adel, Oregon (2°)
3 Unnamed hot spring (near Hot Lake)	sec. 15, T. 37S., R. 33E.	; Adel, Oregon (2°)
4 Alvord Spring (Indian Spring)	sec. 33, T. 34S., R. 34E.	; Adel, Oregon (2°)
5 Mickey Springs	sec. 13, T. 33S., R. 35E.	; Adel, Oregon (2°)
6 Unnamed hot spring (near Harney Lake)	sec. 36, T. 27S., R. 29-1/2E.	; Burns, Oregon (2°)
7 Crane Hot Springs	S 1/2 sec. 34, T. 24S., R. 33E.	Crane, Ore. (15'); Burns, Oregon (2°)
Klamath County		
1 Olene Gap Hot Springs	SW 1/4 sec. 14, T. 39S., R. 10E.	Merrill, Ore.-Calif. (15'); Klamath Falls, Ore.-Calif. (2°)
Lake County		
1 Fisher Hot Springs	NW 1/4 sec. 10, T. 38S., R. 25E.	Crump Lake, Ore. (7-1/2'); Adel, Oregon (2°)
2 Crump (Charles Crump's Spring)	sec. 27, T. 38S., R. 24E.	; Adel, Oregon (2°)
3 Barry Ranch Hot Springs	SE 1/4 sec. 27, T. 39S., R. 20E.	Lakeview NE, Ore. (7-1/2'); Klamath Falls, Ore.-Calif. (2°)
4 Hunters Hot Springs	NW 1/4 sec. 4, T. 39S., R. 20E.	Lakeview NE, Ore. (7-1/2'); Klamath Falls, Ore.-Calif. (2°)
5 Summer Lake Hot Spring	NE 1/4 sec. 12, T. 33S., R. 17E.	Slide Mtn. Ore. (7-1/2'); Klamath Falls, Ore.-Calif. (2°)

Table 2.--Location and topographic map coverage of selected hot springs in Oregon--Continued

Spring	Location	Topographic map coverage
Lane County		
1 Belknap Hot Springs	NE 1/4 sec. 11, T. 16S., R. 6E.	McKenzie Bridge, Ore. (15'); Salem, Oregon (2°)
2 Cougar Reservoir Hot Spring	sec. 7, T. 17S., R. 5E.	McKenzie Bridge, Ore. (15'); Salem, Oregon (2°)
3 McCredie Springs	NW 1/4 sec. 36, T. 21S., R. 4E.	Oakridge, Ore. (15'); Roseberg, Oregon (2°)
Malheur County		
1 Unnamed hot springs (near McDermitt)	sec. 23, T. 40S., R. 42E.	; Jordan Valley, Ore.-Idaho (2°)
2 Unnamed hot springs (at Three Forks)	sec. 3, T. 35S., R. 45E.	; Jordan Valley, Ore.-Idaho (2°)
3 Unnamed hot spring (near Riverside)	sec. 20, T. 24S., R. 37E.	; Burns, Oregon (2°)
4 Beulah Hot Springs	SE 1/4 sec. 2, T. 19S., R. 37E.	Beulah, Oregon (15'); Burns, Oregon (2°)
5 Real Hot Springs	NW 1/4 sec. 9, T. 18S., R. 43E.	Jamieson, Oregon (15'); Baker, Idaho-Oregon (2°)
6 Unnamed hot springs (near Little Valley)	NW 1/4 sec. 30, T. 19S., R. 43E.	Harper, Oregon (15'); Boise, Idaho-Oregon (2°)
7 Mitchell Butte Hot Spring	NE 1/4 sec. 12, T. 21S., R. 45E.	Mitchell Butte, Ore. (7-1/2'); Boise, Idaho-Oregon (2°)
8 Vale Hot Spring	SE 1/4 sec. 20, T. 18S., R. 45E.	Vale East, Ore. (7-1/2'); Boise, Idaho-Oregon (2°)
Marion County		
1 Breitenbush Hot Springs	NE 1/4 sec. 20, T. 9S., R. 7E.	Breitenbush Hot Spring, Ore. (15'); Canyon City, Ore. (2°)
Umatilla County		
1 Lehman Springs	NE 1/4 sec. 12, T. 5S., R. 33E.	Lehman Springs, Ore. (7-1/2'); Pendleton, Ore.-Wash. (2°)
Union County		
1 Medical Hot Springs	NE 1/4 sec. 25, T. 6S., R. 41E.	Flagstaff Butte, Ore. (7-1/2'); Grangeville, Idaho-Ore.-Wash. (2°)
2 Hot Lake	SE 1/4 sec. 5, T. 4S., R. 39E.	Craig Mtn., Ore. (7-1/2'); Grangeville, Idaho-Ore.-Wash. (2°)
Wasco County		
1 Kahneeta Hot Springs (Kah-Ne-Tah)	E 1/2 sec. 20, T. 8S., R. 13E.	Eagle Butte, Ore. (7-1/2'); Bend, Oregon (2°)

Table 3.—Major element composition of thermal springs and wells sampled in Nevada and Oregon after May, 1974
[Concentrations in milligrams per litre]

Spring name and identification number	Temperature (°C)	pH	Specific conductance	Silica (SiO ₂)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Alkalinity (as HCO ₃)	Sulfate (SO ₄)	Chloride (Cl)	Fluoride (F)	Boron (B)
Churchill County, Nevada														
2 Shallow research well (Soda Lake)	100	7.86	1,110	150	82	2.1	1,000	48	1.4	344	360	1,300	0.6	5.7
5 Shallow research well (Soda Lake)	22	9.20	978	6.6	25	4.3	180	8.2	0.65	134	210	110	.2	0.35
Elko County, Nevada														
6a Unnamed hot spring near Wells ^{1/}	90	7.0	1,760	84	49	13	390	41	.7	1,180	28	40	7.2	.77
6b Unnamed hot spring near Wells	36	6.30	1,740	76	31	13	340	36	.65	1,150	29	34	7.0	.80
6c Unnamed hot spring near Wells	60	6.58	1,730	110	78	36	300	30	.75	1,210	34	26	6.1	.77
7b Unnamed hot spring near Wells	35	6.60	1,820	86	48	13	370	44	.72	1,230	12	37	7.4	.73
10 Hot Sulphur Springs ^{1/}	90	7.3	753	165	12	.3	160	16	.8	345	61	22	10	1.2
Eyon County, Nevada														
12 Wabuska Hot Springs	94	8.06	1,610	110	39	0.1	300	14	.25	74	620	55	8.2	10
3 Unnamed hot spring near Fernley	86	7.05	3,530	150	70	1.3	620	38	1.6	100	400	820	4.2	5.4
Washoe County, Nevada														
5 Bower's Hot Spring	46	9.36	243	47	2.9	0.2	50	0.6	.09	76	38	6.3	2.8	.20
White Pine County, Nevada														
1 Unnamed hot spring (Cherry Creek)	61	7.77	692	105	12	.3	150	4.8	.65	380	1	16	1.2	.35
2 Bonte Hava	79	6.35	522	32	63	21	16	5.6	.07	300	24	5.0	1.0	.04
Deschutes County, Oregon														
1 East Lake Hot Springs	62	6.49	396	36	38	16	32	3.8	.01	184	58	0.4	0.2	.93
Lane County, Oregon														
3 McCredie Springs	73	7.29	6,730	79	460	.9	1,000	22	1.4	21	240	2,200	2.7	18
Mather County, Oregon														
8 Vale Hot Spring	73	7.67	1,530	130	19	.8	310	16	.28	143	100	360	6.1	9.4

^{1/} Chemical analyses and temperature reversed in original report (Mariner and others, 1974a).

Table 4.--Floor and trace elements for hot springs sampled in Nevada
 [Concentrations in milligrams per liter; dashes indicate the absence of data]

Spring name and identification number	Aluminum (Al)	Arsenic (As)	Boron (B)	Calcium (Ca)	Chlorine (Cl)	Copper (Cu)	Iron (Fe)	Manganese (Mn)	Mercury (Hg)
1 Lee Hot Springs	0.27	0.12	0.04	0.04	0.04	0.04	1.8	0.02	0.01
2 Dixie Valley Hot Springs	0.05	—	—	0.05	—	—	0.05	0.02	0.01
3 Flooding well in Silliker	—	3.4	—	—	—	—	5.7	—	—
4 Shallow research well (Soda Lake)	0.01	2.8	—	—	—	—	0.05	0.07	0.01
5 Shallow research well (Soda Lake)	0.00	0.30	—	—	—	—	—	—	0.01
Douglas County									
1 Bellows Hot Springs	0.02	0.12	0.04	—	—	—	0.30	—	0.01
Elko County									
1 Hot Hole	0.02	0.46	—	—	—	—	3.4	0.02	0.04
2a Sulphur Hot Springs	0.17	0.20	—	—	—	—	0.05	—	0.01
2b Sulphur Hot Springs	0.27	0.04	—	—	—	—	0.10	—	0.01
3 Diamond hot spring (Hot Creek)	0.01	—	0.04	—	—	—	0.20	—	0.02
6a Diamond hot spring near Wells	0.04	—	—	—	—	—	0.04	—	0.01
6c Diamond hot spring near Wells	0.01	—	—	—	—	—	—	—	0.01
7a Diamond hot spring near Wells	0.02	—	—	—	—	—	—	—	0.01
Eureka County									
1 Salt Hot Springs	0.05	0.08	0.01	0.02	0.07	0.08	0.60	—	0.07
2 Hot Springs Fork	0.08	3.2	0.01	0.02	0.02	0.13	1.3	—	0.04
3 Boevers "steam" well	—	0.12	0.10	0.05	0.1	0.46	0.07	—	0.01
4 Boevers Hot Springs	0.02	0.50	0.05	0.03	0.2	0.20	0.05	—	0.01
Humboldt County									
1 Diamond hot spring (Hot Springs Ranch)	—	0.40	0.04	0.08	0.1	0.18	0.6	0.18	0.07
2 Diamond hot spring near Golconda	0.02	0.30	0.04	0.02	0.02	0.09	0.73	—	0.03
3 Double Hot Springs	0.04	0.30	0.07	0.04	0.2	0.02	0.09	—	0.02
4 Diamond hot springs in Soldier Meadows	0.01	0.10	0.04	0.06	0.01	0.02	0.05	—	0.01
5 West Place Hot Spring (well)	0.030	0.50	0.04	0.08	0.1	0.28	0.57	—	0.03
6 East Place Hot Spring	0.024	0.80	0.04	0.07	0.1	0.04	0.08	—	0.01
7 Dixie Hot Spring	0.020	0.50	0.02	0.01	0.02	0.02	0.12	—	0.01
8 Flooding well near Balfador Hot Springs	0.022	0.20	0.07	0.01	0.2	0.04	0.15	—	0.02
9 Balfador Hot Spring	—	—	0.07	0.07	0.03	0.08	—	—	0.01
10 Bog Hot Springs	0.016	0.10	0.07	0.02	0.2	0.02	0.03	—	0.01

Table 4.—Aluminum and trace elements for hot springs sampled in Nevada—Continued

Spring name and identification number	Aluminum (Al)	Arsenic (as P)	Phosphate (as P)	Arsenic (As)	Bromide (Br)	Iodine (I)	Sulfide (S)	Cadmium (Cd)	Strontium (Sr)	Iron (Fe)	Manganese (Mn)	Copper (Cu)	Mercury (Hg)
Lander County													
1 Spencer Hot Springs	—	—	0.01	<0.01	0.1	0.02	0.15	0.1	1.8	0.06	<0.07	0.15	—
3 Damaged hot spring (Smith Creek Valley)	0.040	0.14	.08	—	—	—	.06	<1	.20	<0.02	<0.02	<0.01	0.0002
4 Buffalo Valley Hot	.010	1.7	.02	.01	.1	.02	.10	.2	2.4	.05	.06	.08	.0007
Lyon County													
19 Babcock Hot Springs	.017	—	—	—	—	—	.09	<1	—	<0.02	<0.02	<0.01	<.0001
2 Nevada Hot Springs	.004	—	.02	—	—	—	.02	<1	.20	.06	<0.02	<0.01	.0002
4 Damaged hot spring near Fernley	.004	—	—	—	—	—	.25	.2	—	.02	.06	.01	.0002
Mineral County													
1 Soda Springs	—	—	—	—	—	—	.08	.1	—	.07	.08	<0.01	—
Nye County													
1 Darrough "steam" well	—	—	—	.06	—	—	.03	<1	—	<0.02	<0.02	<0.01	.0001
2 Darrough Hot Springs	—	.15	.02	.06	.04	.009	.03	<1	.06	<0.02	<0.02	<0.01	.0004
3 Diana's Punch Bowl	—	—	<0.01	.01	.04	.02	.07	<1	1.0	<0.05	<0.02	.05	<.0001
4 Hot spring near Diana's Punch Bowl	.005	.10	<0.01	.02	.04	.01	.07	<1	.06	<0.02	<0.02	.06	<.0001
5 Peet's Ranch Hot Spring	—	.25	.01	.01	.05	.006	.06	<1	.00	<0.02	.02	.01	<.0001
Pershing County													
1 Damaged hot spring (Jersey Valley)	.044	.59	.03	.02	.1	.01	.26	.2	.76	.08	.28	.02	<.0001
2 Dyla Hot Springs	.015	.80	.02	—	—	—	.00	.5	.00	.20	.04	.01	.0021
7 Ranch Hot Spring	.009	.40	.07	<0.01	.06	.003	.12	.2	.29	<0.02	.02	.01	.0006
Valle County													
1 Steam Cipher (Fredd's Ranch)	.016	.20	.04	.02	.10	.2	.19	.2	.06	<0.02	<0.02	.01	<.0001
2 Great Boiling Spring	.011	.80	.10	.05	.6	.4	.04	.2	2.6	.02	.03	.08	<.0001
3 Plover well near Carlach	.009	.60	.04	<0.01	.9	.01	.10	.2	1.1	.15	<0.02	.03	<.0001
4 Steamboat Springs	.009	—	.22	—	—	—	.70	1.5	1.9	<0.02	.02	.01	.0005
5 Power's Hot Spring	.020	—	—	—	—	—	<0.02	<1	—	<0.02	<0.02	<0.01	.0002
White Pine County													
1 Damaged hot spring (Cherry Creek)	—	—	—	—	—	—	.08	.1	—	<0.02	.06	<0.01	<.0001
2 Monte Kern	—	—	—	—	—	—	.03	<1	—	.02	<0.02	.01	<.0001

Table 3.—Fluor and trace elements for hot springs sampled in Oregon
 [Concentrations in milligrams per liter; dashes indicate the absence of data]

Spring name and identification number	Aluminum (Al)	Ammonia (as N)	Phosphate (as P)	Arsenic (as As)	Bromide (Br)	Iodine (I)	Rubidium (Rb)	Caesium (Cs)	Strontium	Iron (Fe)	Manganese (Mn)	Copper (Cu)	Mercury (Hg)
Baker County													
1 Madison Hot Springs (well)	—	—	0.03	<0.01	0.01	0.007	<0.02	<0.1	<0.05	<0.02	<0.02	<0.01	0.0005
Clatsop County													
1 Astoria (Vasey) Hot Springs	—	—	.02	.39	2	.03	.03	<1	.33	<02	<02	<0.1	.0002
Washington County													
1 East Lake Hot Springs	—	—	—	—	—	—	<02	<1	.14	<02	.20	.01	.0003
Grant County													
1 Robert Hot Spring	—	—	.06	.06	.1	.1	.09	<1	2.10	.24	.06	.18	.0003
2 Blue Mountains Hot Springs	—	—	.04	<0.01	.04	.01	<02	<1	<05	<02	<02	<0.1	.0004
3 Elletts Hot Springs	—	—	—	—	—	—	<02	<1	<05	<02	<02	.01	.0005
Harney County													
1 Diamond Hot Spring (Tribut Creek)	0.002	0.02	.02	—	—	—	.10	.1	.20	.08	<02	.03	.0003
2 Hot Lake	—	—	.29	.01	2	.2	.23	.1	.43	<02	.03	.03	.0004
3 Diamond hot spring (near Hot Lake)	.020	.13	.29	—	—	—	.18	.1	.60	<02	.04	.01	.0006
4 Almond (Indian) Hot Spring	.003	.70	.14	.04	2	.09	.33	.2	.82	.12	.02	.05	.0001
5 Mickey Springs	.028	.20	.24	.01	1	.09	.20	.1	.15	<02	<02	.05	.0001
6 Diamond hot spring (near Harvey Lake)	.005	1.4	.07	.60	29	.2	.08	<1	.11	.05	.04	.02	.0001
7 Crown Hot Springs	.022	2.5	.03	.09	.1	.02	.03	<1	.06	<02	<02	.01	.0005
Wasatch County													
1 Olive Gap Hot Springs	—	—	.05	.09	.08	.01	.02	<1	.26	<02	<02	.01	—
Latah County													
1 Ylchert Hot Springs	.011	.14	.06	.10	.4	.03	.02	<1	.05	<02	<02	<0.1	<0001
2 Crump (Charles Crump's Spring)	.017	.47	.19	.46	.4	.1	.07	.1	.12	<02	.03	<0.1	.0004
3 Barry Knack Hot Springs	.014	1.4	.05	.07	1	.1	.04	<1	.17	<02	<02	<0.1	.0017
4 Buckert Hot Springs	.004	.24	.00	.06	.4	.08	.04	<1	.22	<02	<02	<0.1	.0004
5 Sumner Lake Hot Spring	—	—	.08	.02	1	—	<02	<1	.07	<02	<02	.02	—
Lane County													
1 Railway Hot Springs	—	—	.07	.33	33	.2	.05	<1	1.4	.02	.02	.01	<0001
2 Cougar Reservoir Hot Spring	—	—	—	—	—	—	.03	<1	2.0	<02	<02	<0.1	.0005
3 McCondie Springs	.010	.20	.20	—	—	—	.11	.1	—	.02	.10	.02	—

Table 3.-Minor and trace elements for hot springs sampled in Oregon--Continued

Spring name and identification number	Aluminum (Al)	Arsenic (as As)	Phosphate (as P)	Arsenic (as As)	Bromide (Br)	Iodine (I)	Rubidium (Rb)	Cesium (Cs)	Strontium (Sr)	Iron (Fe)	Manganese (Mn)	Copper (Cu)	Mercury (Hg)
Kathlamet County													
1 Diamond hot springs (near Madras)	0.013	0.08	0.02	0.05	0.4	0.008	<0.02	<0.1	<0.05	<0.02	<0.02	<0.01	0.0001
2 Diamond hot springs (at Three Forks)	--	--	--	--	--	--	<0.02	<1	.06	<0.02	<0.02	<0.01	--
3 Diamond hot springs (near Elsieville)	--	.40	.07	.04	.5	.03	.04	<1	.43	<0.02	<0.02	.04	.01
4 Benlah hot springs	.006	.30	.06	.21	.1	.03	<0.02	<1	.17	<0.02	<0.02	.03	.01
5 Seal hot springs	.008	.80	.07	.02	.5	.06	.09	.1	.16	<0.02	<0.02	.06	.02
6 Diamond hot springs (near Little Valley)	--	--	--	--	--	--	.02	<1	<0.05	<0.02	<0.02	<0.01	.0007
7 Mitchell hot springs hot spring	.015	.30	.04	<0.01	.2	.01	<0.02	<1	<0.05	<0.02	<0.02	<0.01	.0001
8 Vale hot spring	.017	.80	--	--	--	--	.09	<1	--	<0.02	<0.02	.04	<0.01
Kearney County													
1 Breitbach hot springs	--	--	.08	.51	5	.1	.18	.1	.73	.02	.22	.01	.0002
Bastille County													
1 Lohman Springs	--	--	.04	.02	.006	.001	<0.02	<1	<0.05	<0.02	<0.02	<0.01	.0003
Dalton County													
1 Medical hot springs	--	--	--	--	.8	--	.02	<1	.80	<0.02	<0.02	<0.01	.0004
2 Hot Lake	--	--	.03	.01	.4	.08	<0.02	<1	<0.05	<0.02	<0.02	.01	.0002
Wasco County													
1 Kahoe hot springs (Kah-wo-rah)	--	--	--	--	--	--	.02	<1	<0.05	<0.02	<0.02	<0.01	.0003

Table 6.--Chemical composition of gases escaping from hot springs in Nevada
 [Compositions are in volume percent]

Spring name and identification number	Oxygen (O ₂) + Argon (Ar)	Nitrogen (N ₂)	Methane (CH ₄)	Carbon dioxide (CO ₂)
Elko County				
2a Sulphur Hot Springs	6	93	1	<1
6b Unnamed hot spring near Wells	6	34	1	62
6c Unnamed hot spring near Wells	1	3	2	96
7b Unnamed hot spring near Wells	2	4	<1	93
Eureka County				
2 Hot Springs Point	9	31	<1	60
Humboldt County				
2 Unnamed hot spring near Golconda	4	58	1	38
3 Double Hot Springs	3	90	3	4
4 Unnamed hot springs in Soldier Meadows	7	93	<1	<1
10 Bog Hot Springs	9	91	<1	<1
Lander County				
1 Spencer Hot Springs	5	41	1	54
4 Buffalo Valley Hot Springs	4	35	2	60
Lyon County				
3 Unnamed hot spring near Fernley	11	81	2	6
Nye County				
5 Pott's Ranch Hot Spring	4	93	<1	5
Pershing County				
2 Kyle Hot Springs	1	7	2	90
Washoe County				
4 Steamboat Springs	2	6	<1	93
White Pine County				
2 Monte Neva	4	71	<1	26

Table 7.--Chemical composition of gases escaping from hot springs in Oregon
 [Compositions are in volume percent]

Spring name and identification number	Oxygen (O ₂) + Argon (Ar)	Nitrogen (N ₂)	Methane (CH ₄)	Carbon dioxide (CO ₂)
Deschutes County				
1 East Lake Hot Springs	6	30	9	56
Grant County				
1 Weberg Hot Spring	1	1	2	95
Harney County				
5 Mickey Springs	18	60	1	23
6 Unnamed hot spring (near Harney Lake)	1	91	1	9
Lake County				
2 Crump (Charles Crump's Spring)	5	75	6	14
3 Barry Ranch Hot Springs	2	54	42	2
Lane County				
3 McCredie Springs	1	98	<1	<1
Malheur County				
5 Neal Hot Springs	12	62	6	<u>1/</u>
Umatilla County				
1 Lehman Springs	4	94	<1	<1
Union County				
2 Hot Lake	2	90	9	<1

1/ Insufficient sample for analysis.

Table 8.--Deuterium and oxygen (18) data for hot springs sampled in Nevada^{1/}
 [Dashes indicate the absence of data]

Spring name and identification number	δD (‰)	δO^{18} (‰)
Churchill County		
1 Lee Hot Springs	-125.8	-13.21
2 Dixie Valley Hot Springs	-126.1	-15.89
3 Flowing well in Stillwater	-110.2	-12.36
4 Research well (Soda Lakes)	-109.3	-13.46
5 Research well (Soda Lakes)	-111.3	-14.56
Douglas County		
1 Walleys Hot Springs	-119.5	-15.55
Elko County		
1 Hot Hole	-144.7	-15.31
2a Sulphur Hot Springs	-130.1	-16.09
2b Sulphur Hot Springs	-126.1	-14.52
3 Unnamed hot spring (Hot Creek)	-126.7	-16.28
4 Nile Spring	-139.1	-18.24
5 Mineral Hot Spring	-139.0	-17.61
6a Unnamed hot spring near Wells	-135.4	-16.91
6b Unnamed hot spring near Wells	-138.3	-16.99
6c Unnamed hot spring near Wells	-134.7	---
7a Unnamed hot spring near Wells	-133.8	-16.52
7b Unnamed hot spring near Wells	-136.6	-16.95
8 Unnamed hot spring (Wild Horse Reservoir)	-140.2	-17.85
9 Unnamed hot spring (SSE Patsville)	-140.8	-18.21
10 Hot Sulphur Springs	-134.9	-16.78
11 Unnamed hot spring near Carlin	-132.7	-16.64
12 Unnamed hot spring near Ruby Marsh	-132.8	-16.24

Table 8.--Deuterium and oxygen (¹⁸O) data for hot springs in Nevada^{1/}--Continued

Spring name and identification number	δD (‰)	δO^{18} (‰)
Eureka County		
1 Walti Hot Springs	-129.8	-16.87
2 Hot Springs Point	-136.1	-15.97
3 Beowave "steam" well	-113.6	-11.07
4 Beowave Hot Spring	-130.0	-14.76
5 Bartholomae Hot Springs	-127.9	-16.28
Humboldt County		
1 Unnamed hot spring (Hot Spring Ranch)	-131.4	-15.74
2 Unnamed hot spring near Golconda	-125.5	-15.65
3 Double Hot Springs	-128.8	-15.93
4 Unnamed hot springs in Soldier Meadows	-129.9	-16.56
5 West Pinto Hot Spring (well)	-128.2	-14.13
6 East Pinto Hot Spring	-129.2	-14.48
7 Dyke Hot Spring	-128.0	-16.29
8 Flowing well near Baltazor Hot Spring	-125.8	-15.61
9 Baltazor Hot Spring	-125.3	-15.26
10 Bog Hot Springs	-124.3	-15.30
11 Hot Pot	---	---
12 Howard Hot Springs	-127.1	-16.17
13 The Hot Springs	-134.6	-16.44
Lander County		
1 Spencer Hot Springs	-135.8	-16.01
2 Unnamed hot spring (Valley of the Moon)	-127.8	-16.28
3 Unnamed hot spring (Smith Creek Valley)	-130.4	-16.68
4 Buffalo Valley Hot Springs	-131.6	-15.85

Table 8.--Deuterium and oxygen (18) for hot springs sampled in Nevada^{1/}--Continued

Spring name and identification number	δD (‰)	δO^{18} (‰)
Lyon County		
1a Wabuska Hot Springs	-131.5	-16.01
1b Wabuska Hot Springs	-129.7	-15.38
2 Nevada Hot Springs	-123.2	-16.01
3 Unnamed hot spring near Fernley	-121.5	-13.30
Mineral County		
1 Soda Springs	-130.3	-16.13
Nye County		
1 Darrough "steam" well	-118.8	-15.30
2 Darrough Hot Springs	-122.5	-15.50
3 Diana's Punch Bowl	-124.9	-16.24
4 Hot Spring near Diana's Punch Bowl	-124.8	-14.76
5 Pott's Ranch Hot Spring	-127.5	-16.28
6 Unnamed warm spring near Warm Springs	-113.7	-14.25
Pershing County		
1 Unnamed hot spring (Jersey Valley)	-129.5	-15.58
2 Kyle Hot Spring	-130.0	-15.50
3 Sou Hot Springs	-130.0	-16.24
4 Unnamed hot spring (Lower Ranch)	---	---
5 Unnamed hot spring near Trego	-124.5	-14.40
6 Unnamed hot spring near Black Rock	-122.2	-13.02
7 Leach Hot Spring	-128.6	-15.70
Washoe County		
1 Steam Geyser (Needle Rocks)	-106.5	-6.33
2 Great Boiling Spring	-100.5	-10.83
3 Flowing well near Gerlach	-120.7	-14.72
4 Steamboat Springs	-116.7	-12.16

Table 8.--Deuterium and oxygen (¹⁸) for hot springs sampled in Nevada^{1/}—Continued

Spring name and identification number	δD (‰)	δ ¹⁸ (‰)
Washoe County--Continued		
5 Bower's Hot Spring	-102.3	-14.79
White Pine County		
1 Unnamed hot spring (Cherry Creek)	-127.8	-16.20
2 Monte Neva	-127.8	-16.68

^{1/} Deuterium and oxygen (¹⁸) analyses were done in the laboratory of J. R. O'Neil by L. Adawi, S. J. Grigg, and T. S. Presser.

Table 9.--Deuterium and oxygen (18) data for hot springs sampled in Oregon^{1/}
 [Dashes indicate the absence of data]

Spring name and identification number	SD (‰)	SO ¹⁸ (‰)
Baker County		
1 Radium Hot Springs (well)	-138.3	-17.85
Clackamas County		
1 Austin (Carey) Hot Springs	-94.5	-12.22
Deschutes County		
1 East Lake Hot Springs	-76.2	-9.42
Grant County		
1 Weberg Hot Spring	-122.1	-15.14
2 Blue Mountain Hot Springs	-126.6	-16.13
3 Ritter Hot Springs	-119.0	-14.83
Harney County		
1 Unnamed hot spring (Trout Creek)	-127.4	-16.17
2 Hot Lake	-115.8	-11.57
3 Unnamed hot spring (near Hot Lake)	-125.4	-14.36
4 Alvord Spring (Indian Spring)	-123.6	-13.23
5 Mickey Springs	-124.3	-13.42
6 Unnamed hot spring (near Harney Lake)	-128.5	---
7 Crane Hot Springs	-133.5	-16.17
Klamath County		
1 Olene Gap Hot Springs	-113.3	-13.00
Lake County		
1 Fisher Hot Springs	-117.0	---
2 Crump (Charles Crump's Spring)	-115.5	-13.28
3 Barry Ranch Hot Springs	-119.4	-13.72
4 Hunters Hot Springs	-119.0	-14.32
5 Summer Lake Hot Spring	-115.0	-13.32

Table 9.--Deuterium and oxygen (18) data for hot springs sampled in Oregon^{1/}--Continued

Spring name and identification number	δD (‰)	δO ¹⁸ (‰)
Lane County		
1 Belknap Hot Springs	-95.8	-11.74
2 Cougar Reservoir Hot Spring	-92.5	-11.97
3 McCredie Springs	-94.0	---
Malheur County		
1 Unnamed hot springs (near McDermitt)	-134.6	-16.95
2 Unnamed hot springs (at Three Forks)	-127.4	-16.09
3 Unnamed hot spring (near Riverside)	-134.0	-15.15
4 Beulah Hot Springs	-131.7	-13.22
5 Neal Hot Springs	-138.7	-16.52
6 Unnamed hot springs (near Little Valley)	-139.7	-16.52
7 Mitchell Butte Hot Spring	-137.3	-16.68
8 Vale Hot Spring	-135.0	-15.18
Marion County		
1 Breitenbush Hot Springs	-97.5	-11.66
Umatilla County		
1 Lehman Springs	-121.3	-16.52
Union County		
1 Medical Hot Springs	-130.2	-16.99
2 Hot Lake	-127.7	-16.56
Wasco County		
1 Kahneeta Hot Springs (Kah-Ne-Tah)	-118.9	-14.75

^{1/} Deuterium and oxygen (18) analyses were done in the laboratory of J. R. O'Neil by L. Adami, S. J. Grigg, and T. S. Presser.