DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

DRILLING DATA FROM EXPLORATION WELL 1, NE¼, SEC. 22, T. 2 N., R.32 E., BINGHAM COUNTY, IDAHO

By
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OPEN-FILE REPORT
79-1225

Drilling Data From Exploration Well 1

EXPLANATION

Silty clay | Rhyolite lava flow | Brecciated rhyolite

Vitrophyre | Basalt | No core recovered

Structures and Textures

- ○ Vesicular
- ⫽ Fractured
- ⊕ Spherulitic
- ⊷ Contact between lava flows

Mineral and Lithologic Variations

- A Alteration — undetermined mineralogy
- Ca Calcite
- Cl Clay (alteration product)
- F Iron oxide staining and alteration
- Py Pyrite
- S Silt and sand in fractures and openings within basalt flows
- V Vapor-phase crystallization

DISCUSSION

During the summer and fall of 1978, the U.S. Department of Energy, in cooperation with the U.S. Geological Survey, drilled three exploration wells on the eastern Snake River Plain, Idaho. The wells range in depth from 2,000 ft (610 m) to 3,000 ft (914 m). The wells were drilled to obtain relatively deep, subsurface, geologic information in three areas that have distinctly different types of geology.

Two of the wells are located on the Idaho National Engineering Laboratory, between Arco and Idaho Falls, Idaho (Doherty, 1979). The third well, located in Sugar City, Idaho, has been described by Embree and others (1978).

This preliminary report describes the lithology and shows the temperature distribution and geophysical logs of Well #1, located between East Butte and Middle Butte, in the NE 1/4, sec. 22, T. 2 N., R. 32 E., Bigham County, Idaho. This well was sited by the U.S. Geological Survey to obtain information on (1) the character and distribution of rhyolite rocks, (2) the structural relations of the rhyolite rocks with basalt lava flows, (3) the age of the rocks encountered in the well, (4) the nature and extent of alteration of the rocks, and (5) the heat flow in this area.

The geology of this area has been described briefly in earlier reports by Robertson and others (1974), Nace and others (1975), and Walker (1964). The geology of this area of the eastern Snake River Plain has recently been mapped by Kuntz and others (1979). K-Ar dates of the rhyolitic rocks of nearby East Butte are 0.6 ± 1 m.y. (G. B. Dalrymple, written commun., 1978), and the basalts capping Middle Butte are 1.9 ± 1.2 m.y. (Armstrong and others, 1975).

Continuing studies of rocks from this well will investigate their age, chemistry, and alteration. Drilling of Well #1 began June 15, 1978, and ended August 5, 1978; rhyolite was the predominant rock type encountered. The rhyolite is 1,327 ft (404 m) thick, covered by 388 ft (118 m) of basaltic lava flows and underlain by 285 ft (87 m) of dense, altered basaltic lava flows. The rhyolite is flow banded to flow brecciated, vitric to devitrified, vapor-phase crystallized, slightly altered, and mostly aphanitic. Vapor-phase crystallization includes growths of sanidine and cristobalite in fractures and vesicles. A spherulitic texture is developed where vesicles are filled by vapor-crystallization products. Alteration is common in the lower one third of the well and consists of yellow, green, and dark-blue clays along fractures and in vesicles. Olivine phenocrysts in the basalts are altered to serpentine near the bottom of the well.

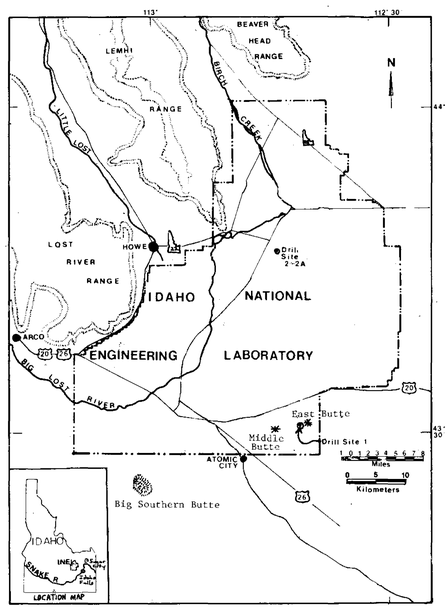
GEOPHYSICAL LOGS

Log No.	Type	Date Logged	Logged Interval Feet	Meters
1	Caliper[2]	8-5-78	820-1975	250-602
2	Temperature[1]	8-5-78	0-1925	0-587
3	Temperature[3]	9-10-78	0-1887.6	0-545
4	Spontaneous Potential[1]	8-5-78	925-1925	282-587
5	Resistivity[1]	8-5-78	925-1925	282-587
6	Neutron[2]	8-5-78	0-1982	0-604
7	Gamma-Gamma[1]	8-5-78	0-1925	0-587
8	Gamma[1]	8-5-78	0-1925	0-587

1/ Logged by EG&G, Idaho Inc., Idaho National Engineering Laboratory, Idaho Falls, Idaho 83401.

2/ Logged by the U.S. Geological Survey, Idaho National Engineering Laboratory, Idaho Falls, Idaho 83401.

3/ Logged by Charles A. Brott and David D. Blackwell, Institute for the Study of Earth and Man, Geothermal Laboratory, 253 Heroy Building, Southern Methodist University, Dallas, Texas 75275.



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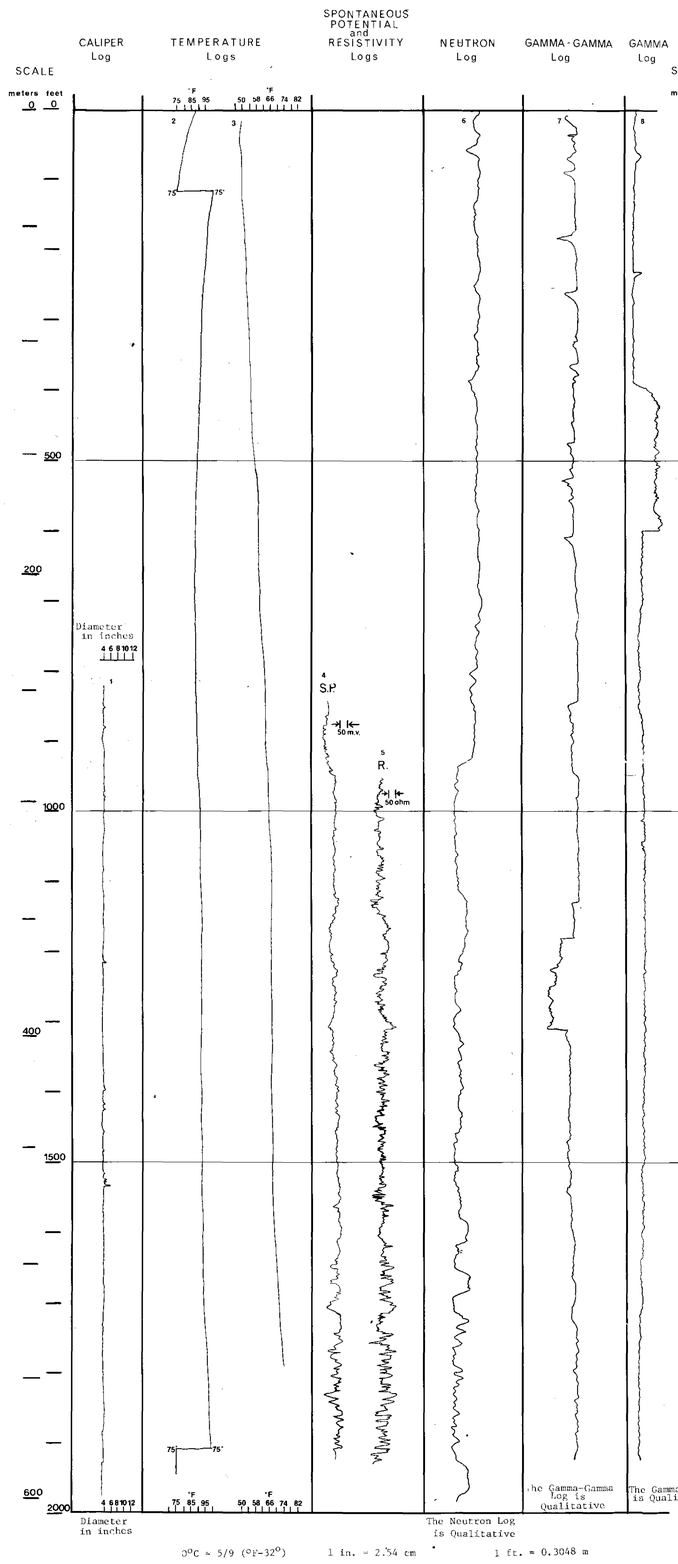

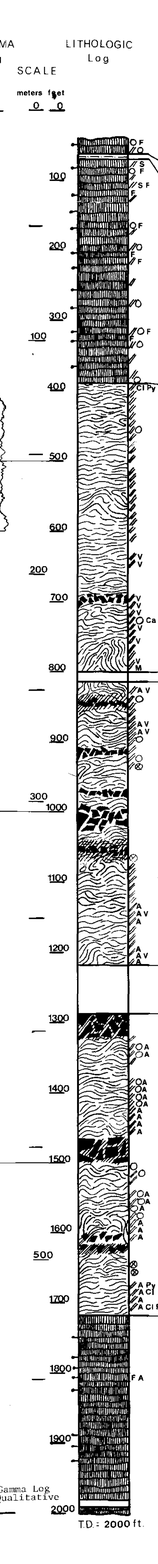

LITHOLOGIC Descriptions

Basalt: Dark to brownish-gray, fine-grained, vesicular, diktytaxitic, porphyritic olivine basalt. The vesicles are round to irregular in shape and range in size from 1 mm to 1 cm, making up 2-20 percent of the rock volume. Euhedral, lath-shaped phenocrysts of plagioclase average about 8 mm in size and constitute 20-30 percent of the modal volume of the rock.

Silty clay: Medium-brown, silty clay with 5-10 percent arkosic sand. The sand consists chiefly of medium-grained, well-sorted, subangular to subrounded grains of quartz and feldspar.

Basalt: Dark-brown to dark-gray, fine-grained, dense to vesicular, diktytaxitic, porphyritic olivine basalt. The vesicles are round to irregular, range in size from 1 mm to 2 cm, and constitute from 17 to 65 percent of the rock. Phenocrysts are randomly oriented, euhedral to subhedral, lath-shaped crystals of plagioclase, and brown to yellow-green, subhedral to anhedral crystals of olivine. The plagioclase phenocrysts range in size from 1 to 5 mm and make up 10-50 percent of the rock. The olivine phenocrysts range in size from 1 to 3 mm and make up from 1 to 7 percent of the rock volume. Several contacts between individual lava flows or flow units are marked by cindery or scoria zones stained by red-brown iron oxides.

Rhyolite: Light- to purplish-gray and brownish-gray, fine-grained, porphyritic, devitrified rhyolite; may be granular, dense to vesicular, flow-banded to flow-brecciated, and gas-phase crystallized in places. Some zones contain as much as 8 percent phenocrysts of subhedral bipyramids of quartz and subhedral sanidine. The phenocrysts are mostly from 0.5 to 2 mm in size. Products of gas-phase crystallization (cristobalite and sanidine) are common along flow planes, fracture surfaces, and small vesicles. Crystalline products of hydrothermal alteration, namely calcite, pyrolusite, and brown mica, are common along fractures between depths of 720 ft (219 m) and 835 ft (255 m). Vesicles are 1-5 mm in size and locally constitute 15 percent of the rock. The top 5 ft (1.5 m) of the rhyolite is weathered to a brown, limonitic clay.

Rhyolite: Black, orange to reddish-brown, dark- to medium-gray, and purplish-gray; fine-grained; vitric to devitrified; dense to vesicular; flow-banded to flow-brecciated; fractured; crystal-poor rhyolite. The rhyolite in this interval consists of obsidian breccia zones in a granular to slightly pumiceous, vitric to devitrified, flow-banded, gas-phase crystallized groundmass. Most of the fractures are lined with crystalline crusts, probably products of hydrothermal alteration. Minerals in the fracture linings and fillings include quartz, calcite, pyrolusite, and brown mica, typically 0.1-0.5 mm in size.

Rhyolite: Black, orange to reddish-brown, light- to purplish-gray, and dark-gray, crystal-poor rhyolite; may be fine-grained, vitric to devitrified, dense to vesicular, flow-banded to flow-brecciated, spherulitic, and fractured rhyolite. The rhyolite in this interval consists of vitric obsidian breccia with black, angular fragments of obsidian 5-10 cm in diameter in a red-brown to orange, vitric, granular matrix. Vesicles are common in the lower 200 ft (60 m) of this interval elongated in a subparallel orientation. The vesicles constitute from 2 to 60 percent of the rock volume and average about 3-5 mm in diameter.

Basalt: Dark- to medium-gray, grayish-black, and greenish-black; fine-grained; dense to vesicular; porphyritic; olivine-basaltic lava flows. Phenocrysts of vitreous, euhedral to subhedral plagioclase are sparse (1-5 percent). Locally the plagioclase phenocrysts make up 20 percent of the rock volume. A few 1 to 2-mm, altered, anhedral phenocrysts of green olivine are present throughout. Inclusions of pinkish-gray, devitrified, fine-grained rhyolite (as large as 5 cm in diameter) are common in the lower 100 ft (30 m) of the unit. Hydrothermal alteration products are common along the many fractures as thin films of blue-gray and greenish-gray, very fine grained clay minerals.

°C = 5/9 (°F-32°) 1 in. = 2.54 cm 1 ft. = 0.3048 m