GEOLOGIC MAP OF THE CRATER SPRINGS KNOWN GEOTHERMAL RESOURCES AREA AND VICINITY, JUAB AND MILLARD COUNTIES, UTAH

By

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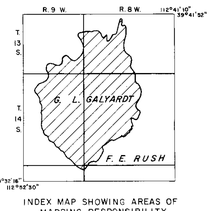
U. S. Geological Survey
OPEN FILE REPORT
This map has not been edited for conformity with Geological Survey editorial standards.

Base from U.S.Geological Survey, 1971

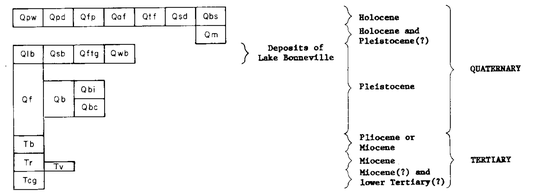
Geology by air photo and field reconnaissance methods. Field work by G.L. Galyardt, 1975 (assisted by James V. Roberts), and F. Eugene Rush, 1976

SCALE 1:24000
0 Mile
0 Kilometer

INDEX MAP SHOWING AREAS OF MAPPING RESPONSIBILITY



CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

ALLUVIAL AND EOLIAN DEPOSITS

Qpw WET PLAYA DEPOSITS (HOLOCENE)—Mostly light-brown water-saturated silt and clay, commonly flooded by runoff and rising ground water. Thin, light-tan clay crust (locally silty) may form on land surface during extended dry periods. Minor salt crust

Qpd DRY PLAYA DEPOSITS (HOLOCENE)—Light-tan to medium-brown silt and clay, generally saturated to land surface during winter and spring; occasionally flooded by runoff. Depth to saturation during summer and fall may be as much as 1 m; land surface firmest during early fall. Includes small areas of blow sand and small sand dunes

Qfp FLOOD-PLAIN DEPOSITS (HOLOCENE)—Mostly light-tan clay, sand, and silt; generally thin deposits. Occur in shallow channels of low to moderate gradient peripheral to Crater Bench. Deposited by ephemeral runoff from adjacent and upslope areas

Qaf ALLUVIAL-FAN DEPOSITS (HOLOCENE)—Light-tan clay, sand, and silt with some pebble- to boulder-size clasts of basalt and quartzite bedrock exposures. Formed as result of erosion of lake-sediment veneer during periods of emergence and by erosion of bedrock and bar and beach deposits

Qtf TORRENTIAL-FAN DEPOSITS (HOLOCENE)—Torrential deposits of alluvial fans and cones; composed entirely of or mantled by basalt boulders, cobbles, and pebbles, with admixed clay, silt, and sand matrix. Found along steep margins of the Hogback, Crater Bench, and locally along larger fault scarps

Qsd DUNE DEPOSITS (HOLOCENE)—Mostly fine- to coarse-grained quartz sand and silt and clay. Deposited as eolian dunes by prevailing southwesterly winds. Crossbedded dunes east of Crater Bench are dominantly silt and clay. Commonly 2–6 m high

Qbs BLOW-SAND DEPOSITS (HOLOCENE)—Similar to dune deposits, except blown from dunes, and accumulated as a layer, commonly less than 1 m thick, on flat areas downwind from dunes

HYDROTHERMAL-RELATED DEPOSITS

Qm SPRING-MOUND DEPOSITS (HOLOCENE AND PLEISTOCENE?)—Mostly light-gray clay, silt, and sand. Reddish, calcareous, manganese-rich, hot-spring-derived tufa at mound crest. Mound has a very shallow water table; deposits saturated to land surface during winter months and to slightly below land surface during summer months. Mound has accreted around hot springs owing to entrapment of eolian silt and clay by moist ground and vegetation. When dry, soil is fluffy. Locally dissected

DEPOSITS OF LAKE BONNEVILLE

Qlb LAKE SEDIMENTS (PLEISTOCENE)—Mostly tan clay, sandy silt, and sand; desert pavement of volcanic-rock fragments common; relatively undissected except in the eastern part of the area where dissection is extensive adjacent to low-altitude playas. Land surface nearly horizontal and varies from hard to soft. Light-tan crust with small desiccation cracks common

Qsb SANDBAR DEPOSITS (PLEISTOCENE)—Light-tan, fine- to medium-grained silty quartz sand and volcanic-rock fragments; deposits have low density. Surface partly covered with desert pavement of volcanic-rock fragments as much as 60 mm in diameter. Map unit consists of bars deposited on the northern and northwestern sides of Crater Bench. The highest (about 1,520 m) are offshore bars of Bonneville age; lower and smaller bars abut the western margin of the basalts of Crater Bench and are of Provo age. The larger of these near-shore bars extends about 3 m above the general land surface, at 1,465 m above mean sea level

Qffg REWORKED TERTIARY CONGLOMERATE DEPOSITS (PLEISTOCENE)—Fan-shaped surficial deposits along the Hogback. Material derived by wave erosion of the tuffaceous conglomerate (Tcg) underlying the basalt capping the Hogback. Fan shape is probably due to redistribution, by gravity and runoff, of wave-eroded material after lake emergence. Principally medium- to coarse-grained sand with pebbles and cobbles of pumice, silicified volcanic rocks, and basalt. Light tan, poorly sorted, unconsolidated

Qwb WAVE-BENCH DEPOSITS (PLEISTOCENE)—Basalt talus and intermixed fine-grained sediments of Lake Bonneville; less commonly, benches consist of thin, poorly cemented beach deposits of sand and gravel, formed at various elevations. The most prominent bench developed during the high stand of Provo age of Lake Bonneville at elevations of 1,450–1,465 m above mean sea level, and is a cut bench on older lake-sediment deposits, but is generally covered by basalt talus blocks; best developed around the Hogback. Only well-developed deposits mapped

PRE-LAKE DEPOSITS

Qf FLUVIAL DEPOSITS (PLEISTOCENE)—Interbedded and unconsolidated gravel, sand, silt, and clay. Sand is poorly sorted, ranging from very fine to very coarse grained. Gravel lenses consist of subangular to subrounded clasts as much as 30 cm in diameter with an average of 7 cm; clasts are volcanic and sedimentary rocks derived from nearby source areas to the west. Clay and silt underlying gravel and sand deposits may be lacustrine deposits

VOLCANIC DEPOSITS

Qb BASALTS OF CRATER BENCH (PLEISTOCENE)--Black, fine-grained, vesicular to nonvesicular, basalt flows; described by Hogg (1972) as "wavy fine aphyric basaltic andesite." Individual flows not mapped. The flow complex is about 11 km wide by 12 km long. In cross section it is shaped like an inverted saucer, with an estimated maximum thickness of about 180 m near Fumarole Butte. K-Ar age is 0.95±0.1 m.y. (Harald Mehnert, written commun., 1978)

Qbi Basalt—Black to dark-red, fine-grained, nonvesicular, very resistant. Intrudes the remnant cinder cone (Qbc)

Qbc Erosional remnant of a basalt cinder cone—Consists of two units. Unit 1 is composed of dark-red, densely welded cinders intruded by Qbi. Forms a topographically prominent knob (Fumarole Butte) with a remnant central summit depression. Unit 2 is the erosional remnants of a nonwelded cinder mantle once surrounding the central core (vent) of unit 1. Most of unit 2 has been removed by erosion

Tb BASALT OF THE HOGBACK (PLIOCENE OR MIOCENE)—Black, vesicular basalt with a maximum thickness of 45 m. K-Ar dated at 5.26± 0.42 m.y. (Harald Mehnert, written commun., 1978). Weathers to large angular blocks that obscure contacts with underlying mapped units. Forms the Hogback and adjacent ridges to the west. Mapped unit includes associated basalt talus

Tr RHYOLITE OF THE HOGBACK (MIOCENE)—Light-gray rhyolite with well-developed flow banding. Large phenocrysts of sanidine as much as 4 mm in length, and quartz. Lithophysae, as much as 2 cm in diameter, are filled with drusy quartz crystals. Mehnert, Rowley, and Lipman (1978) obtained a K-Ar age of 6.87±0.28 m.y. on a sanidine mineral separate. Differential weathering has given the flow a coarse, irregular, vuggy surface

Tv Vitrophyre—Black basal unit, porphyritic, poorly exposed

PREVOLCANIC ROCKS

Tcg CONGLOMERATE (MIOCENE? AND LOWER TERTIARY?)—Consists of two units. The upper unit (Miocene?) is a light-tan, tuffaceous, poorly consolidated, conglomeratic sandstone; contains boulders and cobbles of pumice, quartzite, rhyolite, and other volcanic debris. A bedded tuff 0.53 m thick near the top of the unit consists of subangular pumice fragments from 207 mm in length, cemented by chalcedony(?) and containing opal nodules 1–2 mm in diameter; weathers easily to become reworked material in Qffg unit; about 36 m exposed. The lower unit (lower Tertiary?) is dark-red, well-cemented, resistant conglomerate; clasts are as much as 0.8 m in diameter and composed of quartzite and volcanic rock; interbedded very coarse grained to coarse-grained sandstone; weathers to large angular blocks of clasts with attached matrix and individual rounded clasts. About 24 m of lower unit exposed

CONTACT—Approximate

LAKE BONNEVILLE SHORELINE—Usually dissected shoreline benches. Mapped where prominent along northwest side of mapped area

FAULT—Dashed where inferred; dotted where concealed; queried where uncertain. Ball and bar on downthrown side

LINEAMENT—From aerial photographs; of unknown origin

FISSURE—Open fissures in basalt, often fault-associated; dashed where approximately located; dotted where obscured or partially filled by Qlb deposits

STRIKE AND DIP OF BEDS

STRIKE AND DIP OF FLOW FOLIATION

HOT SPRING ORIFICE--Crater Hot Springs; also known as Baker and/or Abraham Hot Springs

INFERRED CURRENT DIRECTION—Sandbar deposits

VOLCANIC VENT

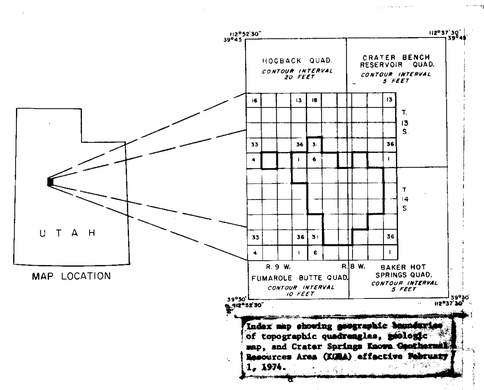
REFERENCES

Hogg, N. C., 1972, Shoshonitic lavas in west-central Utah: Brigham Young University, Geologic Studies, v. 19, pt. 2, p. 133-185.

Mehnert, H. H., Rowley, P. D., and Lipman, P. W., 1978, K-Ar ages and geothermal implications of young rhyolites in west-central Utah: Isochron West, no. 21, p. 3-7.

CONVERSION FACTORS FOR ENGLISH EQUIVALENTS

To convert METRIC UNIT	Multiply by	To obtain ENGLISH UNIT
Millimeter	0.03937	Inch
Centimeter	.3937	Inch
Meter	3.281	Feet



Index map showing geographic boundaries of topographic quadrangles, geologic map, and Crater Springs Known Geothermal Resources Area (KGRA) effective February 1, 1974.