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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
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TEST WELL IN THE DEVIL'S GARDEN AREA,
ARCHES NATIONAL MONUMENT, UTAH

by

Ted Arnow, Geologist
U.S. Geological Survey

Prepared on behalf of the National Park Service

Administrative report
For U.S. Government Use Only

Salt Lake City, Utah
1963

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PURPOSE OF REPORT

The National Park Service needs a source of potable water at the campsite in the Devil's Garden area, Arches National Monument, Utah. Water for the campsite is hauled from the Monument headquarters, 12 miles to the south, but plans for enlargement of the campsite are predicated on the development of a water supply at or near the campsite.

At the request of the National Park Service, B. E. Lofgren of the U.S. Geological Survey made a reconnaissance of the Devil's Garden area in March 1954. Lofgren recommended that a test well be drilled within the road loop in the area. The well was drilled in the summer of 1962, and it was test-pumped under the supervision of R. G. Butler of the Geological Survey.

GEOLOGY

Dane (1935) described the geology of the northern part of Arches National Monument, and Wright, Shawe, and Lohman (1962) redefined some of the younger rocks in the area. The "fins" and other rocks that crop out in the Devil's Garden area are formed by the Slick Rock Member of the Entrada Sandstone (Upper Jurassic). The Slick Rock Member consists chiefly of fine-grained sandstone which dips gently toward the northeast. Precipitation that seeps into the rock percolates vertically

downward and downdip until it reaches a less permeable formation.

The Slick Rock Member is underlain by the Dewey Bridge Member of the Entrada Sandstone. The Dewey Bridge Member consists of siltstone, sandy siltstone, and very fine grained sandstone. The rocks of the Dewey bridge member are relatively impermeable, and they act as a barrier to the downward movement of ground water. Numerous springs and seeps bring water to the surface at the contact between the Dewey Bridge Member and the overlying more permeable Slick Rock Member.

The Dewey Bridge Member is underlain by the Navajo Sandstone (Triassic(?) and Jurassic). The Navajo consists of fine- to medium-grained sandstone which is relatively permeable. The Navajo is the source of water for the well at the Monument headquarters.

The Navajo is underlain by the Kayenta Formation (Upper Triassic(?)) which consists largely of thin sandstones interbedded with shale. The Kayenta is relatively impermeable, and it acts as a barrier to the downward movement of ground water.

The Kayenta is underlain by the Wingate Sandstone (Upper Triassic) which consists almost exclusively of fine-grained sandstone. Although fine grained, the Wingate is poorly cemented, and it does transmit ground water slowly to wells.

HYDROLOGY

The well drilled in the Devil's Garden area was started in July 1962 and was completed in October. The well, number (D-23-2)27bdc-1, was drilled to a total depth of 900 feet by the cable-tool method. It was cased with 8-inch pipe which was slotted from 819 to 900 feet. All work was done by Sexton Brothers Drilling Company of Cortez, Colo.

The well was dry until it encountered water in the Wingate Sandstone at 790 feet. According to Dr. Maurice Powers of the National Park Service, who examined the well cuttings, the well entered the Navajo Sandstone at 210 feet, the Kayenta Formation at 540 feet, and the Wingate at 765 feet. The water in the Wingate was under pressure, and it rose to a level of about 745 feet.

A pumping test on October 31, 1962, showed that the maximum yield of the well is about 4 gpm (gallons per minute). When pumped more than 4 gpm, the water level in the well declined below the intake which was at 867 feet. The test data indicate that the transmissibility of the Wingate Sandstone is about 10 gallons per day per foot. This very low transmissibility suggests that other wells drilled in the Wingate would not obtain significantly greater yields.

The chemical quality of a sample of water obtained during the pumping test is shown by the data in table 1. The water is hard, but otherwise it appears to be completely satisfactory for public supply.

CONCLUSIONS

Before the well was drilled in the Devil's Garden area, it was anticipated that water could be obtained from the Navajo Sandstone. The fact that the Navajo was found to be dry indicates that (1) very little water drains down to the Navajo through the Dewey Bridge Member of the Entrada Sandstone, and (2) what water does reach the Navajo moves out of the Devil's Garden area downdip toward the northeast.

Additional water supplies could be sought by (1) developing one or more of the springs that are at the contact between the Slick

Table 1.--Chemical analysis of water from well (D-23-2)27bcd-1.

	<u>Parts per million</u>
Silica	5.0
Calcium.	28
Magnesium.	18
Sodium and potassium	54
Bicarbonate.	163
Sulfate.	36
Chloride	62
Nitrate.	.3
Hardness as CaCO_3	
Total	142
Non-carbonate	8
Dissolved solids	289
(Residue at 180°C)	
Specific conductance	530
(Micromhos at 25°C)	
pH	7.3
Temperature.	61°F

Rock and Dewey Bridge Members of the Entrada Sandstone east and northeast of the Devil's Garden area, or (2) drilling an additional well to test the Navajo Sandstone about 1 mile northeast of the Devil's Garden area. The choice of method would be a decision based on the relative costs involved plus the consideration that the Navajo might not contain water.

REFERENCES CITED

- Dane, C. H., 1935, Geology of the Salt Valley anticline and adjacent area, Grand County, Utah: U.S. Geol. Survey Bull. 863.
- Wright, J. C., Shawe, D. R., and Lohman, S. W., 1962, Definition of members of Jurassic Entrada Sandstone in east-central Utah and west-central Colorado: Am. Assoc. Petroleum Geologists Bull., v. 46, no. 11, p. 2057-2070.

