United States

Department of the Interior

Geological Survey

Memorandum on location of proposed well 15 miles north of Crown Point, McKinley County, New Mexico

by

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Prepared in cooperation with

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As a part of an investigation of the ground-water resources of the Navajo and Hopi Indian Reservations, the Geological Survey was requested by the Bureau of Indian Affairs to study sites for proposed water wells and to make recommendations. In October 1949 the writers visited a site proposed for a well to supply domestic and stock water for several Indian families living in an area about 15 miles north of Crown Point, McKinley County, New Mexico. The results of this investigation are contained in this memorandum.

The site of the proposed well is in T. 19 N., R. 13 W., about 3 miles north of the Burnham ranch. The area lies about 2 miles west of the Crown Point-Lake Valley road, along a side road leading to Milk Lake. The well site is near the center of a broad valley which slopes gently northward. Several flat-topped buttes, capped by resistant sandstone, stand above the valley floor.

The rocks exposed in the area consist of several hundred feet of buff and gray, irregularly bedded sandstone interbedded with gray shale and a few thin seams of coal. The strata are Upper Cretaceous, and are considered to be the equivalent of the upper part of the Gibson coal member and, perhaps, a part of the overlying Allison barren member of the Mesaverde formation. The sandstones are weakly cemented, and consist of rounded quartz grains that are preponderantly coarse. None of the sandstones exceed 20 feet in thickness. The thinner sandstone strata commonly pinch out or grade laterally into sandy shale. The beds dip between 1° and 2° N.

The water-bearing properties of most of the sandstones appear to be favorable. The yield of sandstone beds that would be encountered in a well depends on the extent and thickness of the beds, and on the area of recharge. Ground water in the region is under artesian pressure, and flowing wells occur

in some places.

The investigation included a study of records of wells in the vicinity. A well (150 - 25b) on the side of a small hill half a mile southeast of the site of the proposed well, and approximately 75 feet higher stratigraphically, yields about 2 gallons per minute from a depth of 160 feet. A second well (150-25a), drilled 3 miles to the south at the Barnhart ranch, encountered water under artesian pressure at 240 and 420 feet. The well is 970 feet deep, and the lower 550 feet was drilled in blue shale without encountering any water-bearing strata. The altitude at this well is estimated to be approximately the same as that of the site of the proposed well. The well is reported to have flowed when completed.

Well 15-0-25, about 6 miles southeast of the site of the proposed well, yields about 3 gallons per minute from sandstone beds at depths of 255 and 460 feet. (See log, table 1.) This well flowed when drilled. The strata exposed in the vicinity of this well are about 300 feet higher stratigraphically than strata at the site of the proposed well.

If the water-bearing strata that supply the three wells described underlie the proposed site, water should be encountered at a depth ranging from 200 to 500 feet.

It is likely that water from a well at this site would be fairly highly mineralized. Analyses of water samples from four wells in the vicinity were available for study (table 2). These wells obtain water from beds similar to those that would be encountered in the proposed well. As shown by the analyses, ground water in this area contains over 1,000 parts per million of dissolved solids, is high in sodium, bicarbonate, sulfate, chloride, and fluoride, and is soft. It is suggested that Indians who drink water from wells in this

area be advised of the high fluoride content, so that they can obtain water for their children from a source that contains less than 1.0 part per million of fluorine. It would not be feasible to maintain fluoride-removal equipment at the wells in this area."

It is concluded that water would be encountered within a depth of 200 feet at the proposed site. A well at this site, however, should be drilled to a depth of about 500 feet to insure development of an adequate water supply. The water is likely to be under artesian pressure, although the well probably will not flow. The water is expected to be rather highly mineralized, but no more so than water from other wells in the vicinity.

Table 1. - Driller's log of well 150-25, 9 miles north of Crown Point and about 6 miles southeast of site for proposed well. Navajo Service, owner.

	Thickness (feet)	Depth (feet)
Blow sand - - - - - - - -	55	55
Gray shale - - - - - - -	40	95
Sandy shale - - - - - - -	170	265
Sand, water rose to 200'	15	280
Brown shale - - - - - - -	67	347
Gray sand, dry - - - - -	42	389
Sandy shale - - - - - - -	36	425
Coal - - - - - - - - - -	10	435
Shale - - - - - - - - - -	25	460
Sand, water rose to 200'	29	489
Hard limy shale - - - - -	26	515
Shale - - - - - - - - - -	305	820
Sandy shale - - - - - - -	13	833
Sand, water rose to 20'	194	1,027
Sandy shale - - - - - - -	113	1,140
Brown shale - - - - - - -	40	1,180
White sand - - - - - - -	30	1,210
Shale - - - - - - - - - -	20	1,230
TOTAL DEPTH		1,230

Casing record: 8-5/8-inch casing set at 820 feet. Well flowed when drilled; now pumped with windmill.

Table 2. - Analyses of water samples from wells in vicinity of site for proposed well. Analyses by Geological Survey. Parts per million except specific conductance.

Well no.	15D-25	15K-309	15B-25	15A-12
Location, miles from well site	6 SE	6E	10 NE	6 NW
Depth, feet	1,230	-	355	700
Date sampled	Aug. 3, 1949	Aug. 4, 1949	Sept. 15, 1949	Sept. 13, 1949
Specific conductance, micromhos at 25°C.	3,130	2,870	2,010	1,850
Silica (SiO_2)	-	-	-	14
Calcium (Ca)	6.5	6.2	-	4.0
Magnesium (Mg)	1.7	1.3	-	1.4
Sodium and potassium (Na/K)	756	696	-	450
Bicarbonate (HCO_3)	605	592	724	618
Sulfate (SO_4)	698	853	-	362
Chloride (Cl)	305	109	51	70
Fluoride (F)	4.5	3.1	-	4.2
Nitrate (NO_3)	2.8	6.2	-	1.3
Dissolved solids	2,070	1,960	-	1,210
Hardness as $CaCO_3$	23	21	-	16