

10/27/1950
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Report
~~General~~

Pajarito Canyon
Ancho Canyon

REPORT ON
WATER SUPPLY INVESTIGATION
IN
PAJARITO CANYON
LOS ALAMOS, NEW MEXICO

BLACK & VEATCH
CONSULTING ENGINEERS
KANSAS CITY, MISSOURI
1950

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CONSULTING ENGINEERS

TEL. WESTPORT 7474

4706 BROADWAY
KANSAS CITY 2, MISSOURI

October 27, 1950

Manager, United States Atomic Energy Commission
Santa Fe Operations Office
Los Alamos, New Mexico

Subject: Water Supply Investigation - Pajarito Canyon
Authorization No. 50-799-4

Attention: Mr. R. E. Cole, Director
Office of Engineering and Construction

Dear Sir:

In accordance with Planning Authorization No. 50-799-4, dated November 1, 1949, and amendment No. 1 thereto, dated March 16, 1950, an investigation of the possibilities of developing ground water supplies in the lower part of Pajarito Canyon and in Ancho Canyon has been completed and the following report is submitted. This investigation was authorized as a result of the successful development of a limited quantity of water in shallow gravel pits in the floor of Pajarito Canyon, located approximately 2-1/2 miles west of State Route No. 4, from which pits, during the summer and fall of 1949, sufficient water was pumped to complete the construction of access roads to laboratory sites south of this canyon.

In making this investigation, it was determined to be necessary to drill one or more test borings in each of these canyons to ascertain the character of the formations underlying the canyon floors, and pursuant to this decision, Contract No. AT-(29-1)-864, dated March 1, 1950, was executed with the Jenkins Drilling Company, for the construction and pump testing of one or more exploratory wells in Pajarito Canyon and one such well in Ancho Canyon. The work under this contract, as amended by modification No. 1, dated June 27, 1950, was completed on April 15, 1950. The exploratory wells completed under this contract, included two wells in Pajarito Canyon and one in Ancho Canyon. Their locations are indicated on the map

1800'd $\left\{ \begin{array}{l} 5780 - \text{floor of } P_{20} \\ 6700 - \text{floor of } P_{20} \end{array} \right.$
Log

attached hereto. The contract cost of the three wells was \$15,686.84. All test wells were drilled by means of a cable toolrig.

TEST WELL NO. 1. This test well, designated in the contract as TEST WELL NO. 2, and in the geologists log as Test Hole Pajarito No. 1, is located in the floor of Pajarito Canyon approximately two miles west of White Rock Construction Camp, and one mile west of paved State Route No. 4. At this location the valley fill - sand, silt and gravel - extended to a depth of 23 feet. A surface casing of 24-inch O. D. steel pipe was set to that depth. Drilling continued through the surface casing with an 18-inch bit, penetrating Bandelier Tuff to a depth of 160 feet, white to light gray pumice from 160 to 171 feet, and White Rock Canyon basalt from 171 to 263 feet-the total depth of the hole. No casing, other than the 24-inch surface casing mentioned above, was installed in the hole.

No water was encountered in the drilling of this test well. The drilling was stopped, and the hole abandoned, at the 263-foot depth, since it was considered that no water would be formed in the basalt formation, which, at this point, is several hundred feet thick. In abandoning the well, the 24-inch surface casing was left in place, in order that observations could be made of possible flow of perched water into the well in wet seasons; the hole was plugged below the bottom of this casing, and covered with a steel plate. The geologist's classification of the materials penetrated in this well is attached hereto.

TEST WELL NO. 2. This test well, designated in the contract as TEST WELL NO. 2A, and in the geologists log as Test Hole Pajarito No. 2, is located in the floor of Pajarito Canyon $1\frac{1}{4}$ miles west of Test Well No. 1. This hole was drilled to a total depth of 300 feet, penetrating valley alluvium to a depth of approximately 25 feet, and Bandelier Tuff from that level to the bottom of the hole at 300 feet. No casing was installed in the hole.

No water, other than a slight seepage at a depth of approximately 18 feet, was encountered in this test. The drilling was stopped at the 300-foot depth, since after penetrating 275 feet into the Bandelier Tuff it seemed certain that no water would be found in this formation. The hole was filled to the ground surface. The geologists log of materials penetrated in this well is attached hereto.

TEST WELL NO. 3. This test well, designated in the contract as TEST WELL NO. 2, and in the geologists log as Test Hole Ancho No. 1, is located in the floor of Ancho Canyon, approximately 100 feet south of State Route No. 4, and just west of the stream channel in Ancho Canyon. This test was drilled to a depth of 55 feet, penetrating 10

feet of Valley Alluvium, Bandelier Tuff from 10 to 45 feet depth, buff color plastic clay from 45 to 51 feet, and White Rock Canyon Basalt from 51 to 55 feet. No casing was installed in the hole.

No water was encountered in this test. The drilling was stopped at the 55 foot depth, since it was then certain that no water was to be found in the Bandelier Tuff nor in the upper part of the basalt. The hole was abandoned, and filled to the ground surface. The geologist's log of the materials penetrated in this well is attached hereto.

CONCLUSIONS. From the results obtained from the drilling of the exploratory wells described herein, as well as from an examination of the geology of the lower end of Pajarito Canyon, it is concluded that water in sufficient quantity to warrant developement for water supply use cannot be obtained in Pajarito Canyon, from shallow wells. The Canyon floor is filled to a depth of 20 to 25 feet with valley alluvium, at the base of which a thin zone of saturation may exist during wet seasons, although the whole alluvium stratum may become dry a short time after the end of a wet season. The valley fill is underlain by Bandelier Tuff, having a thickness of 200 to 250 feet, and the Tuff is in turn underlain by White Rock Canyon basalt, having a thickness of several hundred feet. Below the basalt is the Santa Fe formation of unknown thickness. It is not to be expected that the Tuff and the basalt will yield water in appreciable quantity. The Santa Fe formation is known to be a good aquifer, but to develop this formation by means of a well in the vicinity of Test Well No. 1, would require drilling to a depth of some 1500 feet, and the standing water level in such a well would be some 700 feet below ground surface. =>

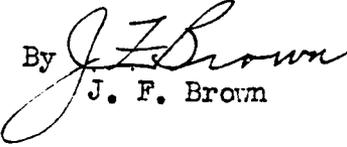
In Ancho Canyon, the underlying formations are the same as those in Pajarito Canyon. In Test Well No. 3, the top of the Bandelier Tuff was found only 10 feet below ground surface, and the top of the basalt 51 feet below ground. To develop water in Ancho Canyon in a quantity sufficient to supply Site TA-33, would require the construction of a well extending into the Santa Fe formation - below the basalt. It is estimated that such a well would be approximately 1200 feet deep, and that the standing water level would be 400 to 500 feet below ground surface.

It is recognized that the test wells constructed in Pajarito and Ancho Canyons were drilled during an unusually dry period, and that in periods of normal precipitation some water may be present in the more porous zones of the valley alluvium above the Bandelier Tuff. In fact it is definitely known that in the summer and fall of 1949, water for use in road construction in the amount of 50,000 to 100,000 gallons per day, was pumped from a pit approximately 100 feet by 35 feet in dimensions and 15 feet deep, located in Pajarito Canyon just north of the site of Test Well No. 2. The fact that no water was

found in the valley fill in the three wells indicates that a reliable supply cannot be developed in these areas in the upper formations.

Very truly yours,

Black & Veatch

By 
J. F. Brown

Encls:

Location Map

Geologists Log, Test Hole Pajarito No. 1

Geologists Log, Test Hole Pajarito No. 2

Geologists Log, Test Hole Ancho No. 1

Log of Test Hole Pajarito No. 1
Pajarito Canyon, Los Alamos County, New Mexico
Elevation: 6,592 feet

	Depth (feet)	
	From	To
Quaternary alluvium:		
Soil zone		
Sand, fine to medium, and silt. The sand consists of quartz, sanidine, and debris derived from the Bandelier tuff. The silt is chiefly tuffaceous debris from the Bandelier tuff.....	0	1.5
Valley fill		
Sand and gravel with some silt. The sand is medium to coarse and composed mainly of angular grains of quartz and sanidine (quartz crystals are rare). The gravel, with pieces ranging to 1/2 inch across, is composed of angular to sub-angular fragments of Chicoma volcanic rocks; welded Bandelier tuff; and gray, dense rhyolite. Some silt, composed chiefly of debris from the Bandelier tuff, is present throughout the zone..	1.5	23
Bandelier tuff (Pleistocene):		
Tuff, pinkish orange to buff, to light gray. The material apparently ranges from slightly welded to ashy(?) tuff and contains crystals and crystal fragments of quartz and sanidine, and traces of obsidian. Also present from 50 to 120 feet are some angular fragments of Chicoma volcanic rocks and gray, dense rhyolite. Some of these fragments may have caved from the valley fill.....	23	120±
Tuff, buff to light gray, and essentially as from 23 to 120± feet but containing some white to pale pinkish buff pumice and probably largely ashy.....	120±	160

Log of Test Hole Pajarito No. 1 (continued)

Depth
(feet)
From To

Pumice zone. White to very light gray, silky, lump pumice containing phenocrysts of quartz and sanidine. Also present are some minute fragments of dark gray, fine-grained, volcanic rock; and some ashy, tuffaceous material. This zone probably represents the Santa Clara pumice. 160 171

White Rock Canyon basalt (Pleistocene):

Basalt, very dark gray to black, moderately rich in olivine and containing a few small phenocrysts of plagioclase. From 171 to 220 and from 250 to 263 the basalt is vesicular. 171 263 T.D.

Note: No water was encountered and the hole was abandoned. Twenty-two feet of 24-inch conductor pipe was left in the hole.

Log of test hole Pajarito No. 2
Pajarito Canyon, Los Alamos County, New Mexico
Elevation: 6,698 feet

Depth
(feet)

From To

Quaternary alluvium

Soil zone

Sand, fine to coarse, and silt. The fine to medium sand consists of quartz, sanidine, and debris derived from the Bandelier tuff. The silt is chiefly debris derived from the Bandelier.

0 1.5

Valley fill

Sand and gravel, with some silt. The medium to coarse sand is composed chiefly of angular to sub-angular grains of quartz and sanidine (some quartz crystals are present). The gravel, with pieces ranging to 1 inch across, is angular to rounded and composed of fragments of Chicoma volcanic rocks, welded Bandelier tuff, and pinkish gray to gray rhyolite (Chicoma materials are predominant). Some silt, composed of debris from the Bandelier tuff, is present throughout the zone. . . .

1.5 25¹/₅

Bandelier tuff (Pleistocene):

Tuff, pinkish orange to buff to light gray, containing crystals and crystal fragments of quartz and sanidine, and traces of small fragments of obsidian. From 25¹/₅, to about 200 feet, the tuff is slightly welded. From 70 to 275¹/₅, it is slightly pumiceous. Also present in the samples are some angular to sub-rounded pieces of Chicoma volcanic rocks, and gray to pinkish gray, dense rhyolite. Most of this material probably caved from the valley fill.

25¹/₅ 275¹/₅

Log of test hole Pajarot No. 2 (continued

Depth
(feet)
From To

Tuff, light gray, ashy; and containing some light gray to pale pinkish gray, finely cellular pumice and a trace of small fragments of obsidian. Also present are some angular to sub-angular fragments of Chicoma volcanic rocks, and gray, dense rhyolite..... 275±5 300 T.D.

Note: A small (unmeasured) amount of water was present from about 15 to 25±5 feet. The hole was abandoned.

Log of test hole Ancho No. 1

Ancho Canyon, Los Alamos County, New Mexico

Elevation: 6,224 feet

	<u>Depth</u> (feet)	
	From	To
Quaternary alluvium:		
Soil zone		
Sand, fine to medium, and silt. The sand consists of angular to sub-angular grains of quartz and sanidine derived from the Bandelier tuff. The silt is chiefly tuffaceous material derived from the Bandelier.	0	1.5
Valley fill		
Sand with some gravel. Medium to coarse sand composed of angular to sub-angular grains of quartz and sanidine (quartz crystals are rare). The fine to medium gravel is composed mainly of angular to sub-angular fragments of Chicoma volcanic rocks, and gray, dense rhyolite. A trace of gray, glassy rhyolite, pinkish-buff pumice, and pumiceous glass are also present.	1.5	10
Bandelier tuff (Pleistocene):		
Tuff, pinkish orange to buff, ashy, and containing phenocrysts of quartz and sanidine. Also present in small amounts are angular fragments of Chicoma volcanic rock, gray, dense rhyolite (?), and pumiceous glass. Some of these latter materials may be caving.	10	45
Undifferentiated lake clay (Pleistocene):		
Clay, buff colored, plastic, and without sand and silt but containing small angular to sub-angular fragments of vesicular basalt, and Chicoma volcanic rocks. . . .	45	51
White Rock Canyon basalt (Pleistocene):		
Basalt, very dark gray to black, fine grained, vesicular and moderately rich in olivine. Buff colored, plastic clay fills some of the pore spaces.	51	55 T.D.

Note: No water was obtained and the hole was abandoned.

