



WATER-RIGHT DOCKET

Shiloh National Military Park

Docket No: 3

WELL, BENNY PROPERTY

Supporting Hydro Data

00-00-0000: water analysis

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER ANALYSIS

2GW

Location In Shiloh National Park, Tennessee County Hardin
Source Jet Depth (ft) 1907 Diam (in.) 4
Cased to (ft) _____ Date drilled 1955 Point of coll. Pressure tank after tank had been
Owner Shiloh Natl. Military Park / nearly empty.
Treatment _____ Use _____
WBF _____ WL 59.90 ft. Yield A few (est.)
Temp (°F) 57 Appear. when coll. Clear
Collected July 27, 1964 By D. Roman
Remarks This was formerly a domestic well but was retained when park purchased property.

	ppm	epm		ppm	epm
Silica (SiO ₂)	19		Bicarbonate (HCO ₃)	16	0.26
Aluminum (Al)			Carbonate (CO ₃)	0	.00
Iron (Fe)	.85				
Manganese (Mn)	.02		Sulfate (SO ₄)	4.4	.09
			Chloride (Cl)	3.0	.03
			Fluoride (F)	.0	.00
Calcium (Ca)	3.0	0.15			
Magnesium (Mg)	2.5	.20	Nitrate (NO ₃)	.2	.00
Sodium (Na)	2.0	.09			
Potassium (K)	.7	.02			
Total		.46	Total		.43

	ppm		
		Specific conductance (micromhos at 25° C)	41
Dissolved solids:		pH	6.0
Calculated	44	Color	5
Residue on evaporation at 180°C	39	<i>JH Curren estimated hardness at 25 ppm</i>	
Hardness as CaCO ₃	18		
Noncarbonate			

144 Federal Office Bldg.
Nashville, Tennessee 37203

September 21, 1964

Mr. Ivan Ellsworth, Superintendent
Shiloh National Military Park
Shiloh, Tennessee

Dear Mr. Ellsworth:

This letter constitutes an informal report and documentation of events, results of tests, and recommendations made during our visit to Shiloh Sept. 15-17, 1964.

The pumping test of well Edix-4 (Benny property) was not entirely satisfactory because the water level in the formation from which water was pumped could not be measured. The water level in the dug well through which the pumped well was constructed did not decline throughout the day of pumping. More than 2,000 gallons of water was pumped from the well without appreciable decline in yield which indicates very little water-level decline. The well is believed to be a very good one - quantity wise - especially when you consider the current severe drought condition in the area. The chemical quality appears to be similar to that of well Edix-3 (Benny area) and Edix-2 (HQ well). Iron content is generally troublesome in all Shiloh wells. Complete chemical analyses are due soon; field analyses are given below.

	Before filtration			
	Edix-2		Edix-3	Edix-4
	6-23-64	9-15-64	9-16-64	9-16-64
T (°F)	62	62	61	63
Specific conductance (micromhos)	42	42	-	-
pH	6.0	6.0	6.0	6.0
Fe (ppm)	1.5	1.5	2.0	5 (plus)
Hardness	17.1	17.1	24	17 (plus)
	After filtration			
	Edix-2	Edix-3	Edix-4	not filtered
T	68	70	73	
Sp. Cond.	132	-	-	
pH	6.5	6.5	7.0	
Fe	0.4	0.33	1.0	
Hardness	102.6	120	154	

Mr. Ivan Ellsworth 9-21-64

During the pumping test of the Esmey property well periodic measurements were made of the iron content. The iron content of water from the well (No. K-4) was more than 3 ppm at 10:00 a.m., 4.0 at 11:00 a.m., 3.0 at 1:00 p.m. and 2.0 at 3:00 p.m. The decreasing iron content with time seems to indicate that the tank and pipes were being washed free of iron. It is probable that the iron in the water in the formation is about the same as in other wells - less than 1.0 ppm but more than 0.3 ppm, the critical amount.

According to the field data, the filters for wells (K-2 and K-3) contribute to the mineralization of water by a factor of 8 or more. Note the considerable increase in hardness concentration from less than 20 to 120 parts per million or more. It is probable that a large part of the filter-recharging material is limestone which would cause the increase in hardness of water, and contribute to the unsatisfactory nature of the supply. From your comments and my personal experience, the treated water is distasteful but the untreated water is pleasant tasting.

Our analyses indicate the only trouble with the untreated water is the high iron content. The earlier recommendation of aeration and filtration for iron removal as the only treatment desired is still valid. Furthermore, aeration might tend to increase the pH which will make the water even less corrosive. Specifically, I would recommend that an aerator be built on top of the well house (at K-4 and the Picnic area) to derive the benefit of a stronger breeze and to have the unit above ground dust and trash. The sprinkler heads may be constructed over trays of coke and the entire unit set in a large copper pan resting on the flat roof of the well house. The copper pan may be filled with sand which will filter the precipitated iron. Construction should be such that the sand and coke could be changed easily when necessary. A high pressure stream of water will efficiently wash the sand while the wash water containing iron precipitate is drained to waste. Washing the sand will reduce the frequency of changes to fresh sand. Most municipal and industrial supplies in Tennessee use this method to remove iron from water. This method may be too expensive for one unit or small supplies because two pumps are required - one to pump the water from a well to the aerator and another to pump water to a storage tank or pressure tank.

There are several brands of iron treatment devices (pressure or closed system) on the market; some that remove the iron from the water and some that sequester the iron. Besides the name you are familiar with - Pharmatit(?), I can think of Culligan, Inc. and Calgon, Inc. The latter company uses the trade mark "Micromet" for its system of sequestering the iron in either large or small water systems. (See attached thermofax copy of booklet on Micromet).

Mr. Ivan Ellsworth 9-21-64

Rather than continuing the use of the "Sentrallite" system which makes the water so distasteful, I recommend that you discontinue the use of it and route the water directly to the storage tank until such time as an iron treatment system can be installed. Storage tanks and pipe lines may have to be cleaned before iron staining is stopped but this is not a very difficult operation. Weak acid, sodiumhexametaphosphate (Calgon) or tri-polyphosphate (less expensive than Calgon) may be used effectively for this purpose (see page 7 of the attached booklet).

You can use well Hdk-4 without further construction and "live" with the iron until an iron-removal system is put in service. When the pump, screen, pipes, or other equipment causes trouble, drillers should be contacted informally to determine cost of cleaning the well of all rusty pipes, screen, and other material; to raise the hole to insert a 4-inch screen and casing; surged and pumped to develop; then equipped with a submersible pump similar to the well at HQ. If you wish, you may call on this office for assistance in suggesting methods of well development, to electric-log the well to determine the exact placement of a screen and to conduct a pumping test to determine the adequacy of the well as to quantity of water.

Very truly yours,

J. H. Griner
For: ~~Director~~ District Hydrologist
Water Resources Division

cc: Al Vick
Richmond, Va.

Enclosure

Shiloh National Military Park Water Supply

Analyses by Geological Survey, United States Department of the Interior
(Parts per million)

Well no. <u>1</u> / Treatment Lab. no. Date of collection.....	Hd:K-2	Hd:K-2	Hd:K-3	Hd:K-3	Hd:K-4	
	Raw	Treated	Raw	Treated	Raw	
	32576	32738	32739	32740	32577	
	7-27-64	10-2-64	10-2-64	10-2-64	7-27-64	
Silica (SiO ₂).....	24	22	16	15	19	
Iron (Fe)..... <u>2</u>	1.1	.13	2.2	.47	.85	
Manganese (Mn).....	.02	.01	.1	.1	.02	
Calcium (Ca).....	3.8	41	2.4	50	3.0	
Magnesium (Mg).....	1.0	2.7	2.0	4.4	2.5	
Sodium (Na).....	2.4	2.3	1.8	2.0	2.0	
Potassium (K).....	1.2	1.2	.7	.7	.7	
Bicarbonate (HCO ₃).....	14	135	15	164	16	
Sulfate (SO ₄).....	4.0	7.0	7.6	7.6	4.4	
Chloride (Cl).....	2.0	1.0	3.0	3.0	3.0	
Fluoride (F).....	.0	.2	.0	.0	.0	
Nitrate (NO ₃).....	.2	.0	.1	.0	.2	
Dissolved solids.....	47	144	43	164	44	
Total hardness as CaCO ₃	16	115	16	151	22	
Specific conductance (Kx10 ⁵ at 25°C.).....	43	236	54	287	41	
pH... <u>(at time of analysis)</u>	5.8	7.0	5.9	7.4	6.0	
Temperature (°F) field	63	-	-	-	67	
Color	5	3	25	3	5	

1/ Hd:K-2 - Park headquarters well

Hd:K-3 - Picnic grounds well

Hd:K-4 - Benny property well

2/ In solution when collected

Shiloh National Military Park Water Supply

Analyses by Geological Survey, United States Department of the Interior
(Parts per million)

Well no. <u>1</u> / Treatment Lab. no. Date of collection.....	Hd:K-2 Raw 32576 7-27-64	Hd:K-2 Treated 32738 10-2-64	Hd:K-3 Raw 32739 10-2-64	Hd:K-3 Treated 32740 10-2-64	Hd:K-4 Raw 32577 7-27-64
Silica (SiO ₂).....	24	22	16	15	19
Iron (Fe)..... <u>2</u>	1.1	.13	2.2	.47	.85
Manganese (Mn).....	.02	.01	.1	.1	.02
Calcium (Ca).....	3.8	41	2.4	50	3.0
Magnesium (Mg).....	1.0	2.7	2.0	4.4	2.5
Sodium (Na).....	2.4	2.3	1.8	2.0	2.0
Potassium (K).....	1.2	1.2	.7	.7	.7
Bicarbonate (HCO ₃).....	14	135	15	164	16
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Hd:K-3 - Picnic grounds well

Hd:K-4 - Benny property well

2/ In solution when collected

22769

Docket Information

Number of Documents in Docket 6

Documents Dated from 9/21/1964 to 9/21/1964

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