



WATER-RIGHT DOCKET

Hopewell Furnace National Historic Site

Docket No: 3

WELL NEAR GUM SPRING

Supporting Hydro Data

01-15-1970: unit price contract for drilling project of test well near gum spring: contract no. 14-10-7:993-472

Form 10-194 (Rev. 9/60)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

Hopewell Village N.H.S.
(Park)

Check One:
Monthly Estimate ☐
Final Estimate ☒

UNIT PRICE CONTRACT

ESTIMATE NO. 1	FOR (Period) January 06, 1970 - January 15, 1970	DATE January 15, 1970
CONTRACT NO. 14-10-7:993-472	COMPLETION DATE January 15, 1970	EXTENDED DATE ---
CONTRACTOR I. N. Petersheim & Son		ORIGINAL CONTRACT \$ 1980.00
PROJECT Drilling of Test Well near Gum Spring		CHANGE ORDERS* \$ ---
LOCATION Hopewell Village National Historic Site		TOTAL CONTRACT \$ 1980.00

ITEM NO.	CONTRACT QUANTITY	DESCRIPTION	QUANTITY TO DATE	UNIT PRICE	AMOUNT TO DATE
1	50 lf.	Drill hole to receive six-inch (6") inside diameter casing and two-inch (2") minimum grout ring and install casing and grout.	50	\$ 13.00	\$ 650.00
2	250 lf.	Drill six-inch (6") diameter open hole.	255	\$ 3.00	\$ 765.00
3	8 hr.	Pump testing for yield, drawdown, and recovery of well, including installation of 1" pipe for measuring water level.	8	\$ 30.00	\$ 240.00
4	8 hr.	Develop well by surging.	8	\$ 30.00	\$ 240.00
5	8 hr.	Standby time for crew and equipment.	0	0	0
6	Job	Plugging well hole which has been abandoned by direction of the Government through no fault of the Contractor.	0	\$100.00	0

RECOMMENDED (Project Supervisor) Garland Moore Hydraulic Engineer, Eastern Service Center	SUMMARY TOTAL TO DATE \$ 1895.00 LESS RETAINED AMOUNT..... --- NET..... 1895.00 LESS PREVIOUS PAYMENTS..... --- LESS LIQUIDATED DAMAGES..... --- DUE THIS ESTIMATE..... 1895.00 % COMPLETED TO DATE: 100%
APPROVED (Contracting Officer) Ralph R. Ross, Actg./Regional Chief, Div. of Property Management & General Services/Contracting Officer 01/15/70	

*Show Breakdown on Reverse (See Reverse for Distribution)

GROUND-WATER SUPPLY OF HOPEWELL VILLAGE
NATIONAL HISTORICAL SITE
PENNSYLVANIA

WATER-SUPPLY TEST WELL

O. B. Lloyd, Jr., and D. J. Growitz, Hydrologists

Prepared for the National Park Service
by the
U.S. Geological Survey

ADMINISTRATIVE REPORT FOR U.S. GOVERNMENT USE ONLY

1970

I. N. Petersheim & Son drilling company of Morgantown, Pa., completed drilling a water-supply test well for the National Park Service on January 9, 1970, at Hopewell Village National Historical Site (fig. 1). The physical characteristics of the well are as follows:

Borehole depth: 305 feet.

Borehole diameter: $11\frac{1}{4}$ inches to 50 feet, 6 inches from 50 to 305 feet.

Casing length: 52 feet.

Casing diameter: 6 inch (inside)

Grout: Annular space between $11\frac{1}{4}$ -inch borehole and 6-inch casing is filled with concrete.

A driller's log and time log were kept during drilling, and a lithologic log was prepared from a study of the rock cuttings that were collected at 5-foot depth intervals (table 1). The attached geologic map of the area (from Plate 1 in U.S. Geol. Survey Bull. 891) and the lithology of the drill cuttings indicate the well was drilled in the Stockton Formation of Triassic age.

Seven water-bearing zones were penetrated during drilling. The following table shows the approximate depth and yield of each zone, as determined during drilling:

<u>Zone number</u>	<u>Zone depth in feet below land surface</u>	<u>Zone yield in gallons per minute</u>	<u>Yield contribution of zone in percent</u>	<u>Cummulative yield in gallons per minute</u>
1	65	1	2	1
2	98	4	8	5
3	138	2.5	5	7.5
4	168	1.5	3	9
5	180	29	58	38
6	285	7	14	45
7	290	5	10	50

An 8-hour pumping test was made on the completed well on January 14, 1970. The well was pumped at about 70 gpm (gallons per minute), and the water level was lowered about 52 feet during the test. The water level recovered about 70 percent of the total drawdown 1 hour after pumping stopped, and had recovered to the prepumping level (85 feet below land surface) when measured 16.5 hours after pumping stopped (fig. 2 and table 2). Extrapolation of the pumping-test data indicate the well could be pumped at about 100 gpm for an 8-hour period without lowering the water level below the major water-bearing zone.

These extrapolated figures were calculated for a static water level of 85 feet below land surface. C. W. Poth noted in a March 1966 report to the National Park Service that water levels in the C.C.C. well (U.S. Geol. Survey well Be-523) at the Historical Site may be subject to annual fluctuations of 20 to 40 feet or more. Because the new well is at a higher elevation than the C.C.C. well, it was assumed that annual fluctuations at the new well would be about 50 feet. Extrapolation of the pumping-test data, assuming a static water level even as low as 135 feet, indicate the well could be pumped at about 50 gpm for an 8-hour period without lowering the pumping water level below the major water-bearing zone. Although it seems reasonable that 50 gpm for an 8-hour period is the minimum yield of this well, measurements of the static water level should be made at weekly or, at most, monthly intervals, and the rate at which the well is pumped should be adjusted so that the pumping water level does not fall below the major water-bearing zone.

Water samples were collected for field determinations of temperature, pH, specific conductance, and hardness during the pumping test (table 2). Specific conductance and temperature were determined about every hour. Specific-conductance values averaged 220 micromhos and ranged from 215 to 225 micromhos. Temperature values averaged 10.3°C and ranged from 10.0 to 10.5°C. Hardness and pH were determined near the end of the pumping test. At that time the hardness was 5 grains per U.S. Gallon and the pH was 6.9.

In addition, water samples were collected near the end of the test for chemical and bacteriological analysis in the laboratory. The results of the analyses (tables 3 and 4) indicate the water contains no coliform bacteria, is calcium bicarbonate in type, is moderately hard, and the concentration of iron is below the maximum recommended by the U.S. Public Health Service for drinking water standards.

When a pump is installed in the well, provision should be made to meter pumpage and to measure both the static and the pumping water level so that the performance of the well can be checked periodically.

Table 1.--Time, driller's, and lithologic logs for water-supply
test well (drilled January 9, 1970), Hopewell Village
National Historical Site

<u>Driller's and lithologic log</u>	<u>Drilling time (minutes)</u>	<u>Depth interval (feet)</u>
Soil-----		0 - 5
Rock, badly weathered. Clay, red and purple, some sand and silt-----	150	5 - 45
Sandstone and siltstone, red. Some feldspar in sandstone. Drills very hard-----	90	45 - 60
Siltstone and shale, red. First water at 65 feet, 1 gpm-----	---	60 - 70
Shale and siltstone, red-----	5	70 - 75
Shale and siltstone, red-----	3	75 - 80
Shale and siltstone, red-----	5	80 - 85
Shale and siltstone, red-----	6	85 - 90
Sandstone and siltstone, red-----	---	90 - 95
Sandstone and siltstone, red. Water at 98 feet, 5 gpm-----	15	95 - 100
Sandstone and siltstone, red-----	7	100 - 105
Sandstone and siltstone, red-----	5	105 - 110
Sandstone and siltstone, red-----	6	110 - 115
Sandstone and siltstone, red-----	5	115 - 120
Sandstone and siltstone, red-----	4	120 - 125
Sandstone and siltstone, red-----	5	125 - 130
Sandstone and siltstone, red-----	3	130 - 135
Sandstone and siltstone, red. Water at 138 feet, 7.5 gpm-----	10	135 - 140
Siltstone and shale, red-----	12	140 - 145
Siltstone and shale, red-----	7	145 - 150
Siltstone and shale, red-----	5	150 - 155
Siltstone and shale, greenish gray-----	4	155 - 160
Siltstone and shale, greenish gray-----	7	160 - 165
Siltstone and shale, greenish gray Water at 168 feet, 9 gpm-----	10	165 - 170
Sandstone, greenish gray. Weathered fractures---	10	170 - 175
Sandstone, greenish gray. Weathered fractures, Water at 180 feet, 38 gpm-----	15	175 - 180
Sandstone, greenish gray. Weathered fractures---	15	180 - 185
Sandstone, greenish gray-----	15	185 - 190
Sandstone, greenish gray-----	16	190 - 195
Shale, red-----	5	195 - 200
Shale, red-----	5	200 - 205
Shale, red-----	6	205 - 210
Shale, red-----	5	210 - 215
Shale, red-----	6	215 - 220

<u>Driller's and lithologic log</u>	<u>Drilling time (minutes)</u>	<u>Depth interval (feet)</u>
Shale and siltstone, red-----	6	220 - 225
Shale and siltstone, red-----	7	225 - 230
Shale and siltstone, red-----	8	230 - 235
Shale and siltstone, red-----	6	235 - 240
Shale and siltstone, gray-----	8	240 - 245
Shale, gray-----	6	245 - 250
Shale, gray-----	12	250 - 255
Sandstone, light gray to white, Very hard drilling-----	22	255 - 260
Sandstone, light gray to white. Very hard drilling-----	19	260 - 265
Sandstone, streaks of vein quartz, siltstone and shale. Hard drilling-----	15	265 - 270
Sandstone, streaks of vein quartz, siltstone and shale. Hard drilling-----	13	270 - 275
Sandstone, streaks of vein quartz, siltstone and shale. Hard drilling-----	18	275 - 280
Sandstone, streaks of vein quartz, siltstone and shale. Hard drilling. Water at 285 feet, 45 gpm-----	12	280 - 285
Sandstone, light tan-----	13	285 - 290
Sandstone, tan. Very hard drilling. Water at 290 feet, 50 gpm-----	21	290 - 295
Sandstone, tan. Very hard drilling-----	28	295 - 300
Shale, red purple-----	6	300 - 305

Table 2.--Data collected during pumping test made on water-supply test well
at Hopewell Village National Historical Site, Pa.

Pump on: 8:30 a.m.

Pump off: 4:30 p.m.

Static water level: 87.3 feet below measuring point

Measuring point: 2 feet above land surface

<u>Time since pumping began (minutes)</u>	<u>Water level below measuring point (in feet)</u>	<u>Drawdown (feet)</u>	<u>Yield (gallons per minute)</u>	<u>Remarks</u>
0.25	96.3	9.0		
.50	100.9	13.6		
.75	105.1	16.8		
1	107.3	20.0		
2	111.8	24.5		
2.5	113	25.7		
3	113.9	26.6		
4	115.2	27.9		
5	116.1	28.8		
6	116.9	29.6	75	
7	117.9	30.6		
8	118.3	31.0		
9	118.9	31.7		
10	119.6	32.3	75	
12	120.4	33.1		
14.5	121.4	34.0		
16	121.6	34.3		
20.5	123.0	35.7	75	
24	124.0	36.7		
27	124.5	37.2		
30	125.1	37.8		
35	127.0	39.7		
42	127.4	40.1	67	1/ SC = 225, Temp. = 10.5°C
45	127.8	40.5		
50	128.2	40.9		
60	129.3	42.0		
70	130.0	42.7	75	
80	130.9	43.6		
90	131.6	44.3		SC = 225, Temp. = 10.0°C
100	132.0	44.7	70	
120	133.0	45.7	70	
150	133.8	46.5	70	SC = 220, Temp. = 10.0°C
180	134.8	47.5	70	
210	135.4	48.1	70	SC = 220, Temp. = 10.5°C
248	135.8	48.5	70	
270	136.1	48.8	70	SC = 215, Temp. = 10.5°C
305	136.6	49.3	70	

<u>Time since pumping began (minutes)</u>	<u>Water level below measuring point (in feet)</u>	<u>Drawdown (feet)</u>	<u>Yield (gallons per minute)</u>	<u>Remarks</u>
330	136.8	49.5	69	SC = 220, Temp.=10.0°C
360	137.3	50.0	69	
390	137.4	50.1		
				Clear water samples taken: SC = 215, temp. 10.0°C, pH 6.9, hard. = 5 grains.
420	138.3	51.0	69	SC = 225, temp.=10.0°C
450	138.5	51.2	68	
480	138.6	51.3	68	

<u>Time after pumping ceased (minutes)</u>		<u>Water level recovery (in feet)</u>	
1.25	120.0	18.55	
60	102.2	36.35	This represents about 70% recovery.

On January 15, 1970, about 9:00 a.m. static water level = 87 feet below measuring point.

1/ SC: specific conductance

Table 3.--Bacteriological analysis of water from water-supply test well
(drilled January 9, 1970), Hopewell Village National Historical Site

Laboratory: U.S. Geological Survey, Harrisburg, Pa.

Collected by: Douglas Growitz

Date and time of collection: Jan. 14, 1970, 1:30 p.m.

Filtered by: James Barker

Date and time filtered ^{1/} Jan. 15, 1970, 10:30 a.m.

Sample size filtered: 200 ml

Coliform colony count: 0

Coliforms per 100 ml: 0

Remarks: The sample was free of coliform bacteria. One colony of the
non-coliform type was found.

^{1/} Sample was refrigerated from time of collection to filtration.

Table 4.--Chemical analysis of water from water-supply test well (drilledJanuary 9, 1970), Hopewell Village National Historical Site.

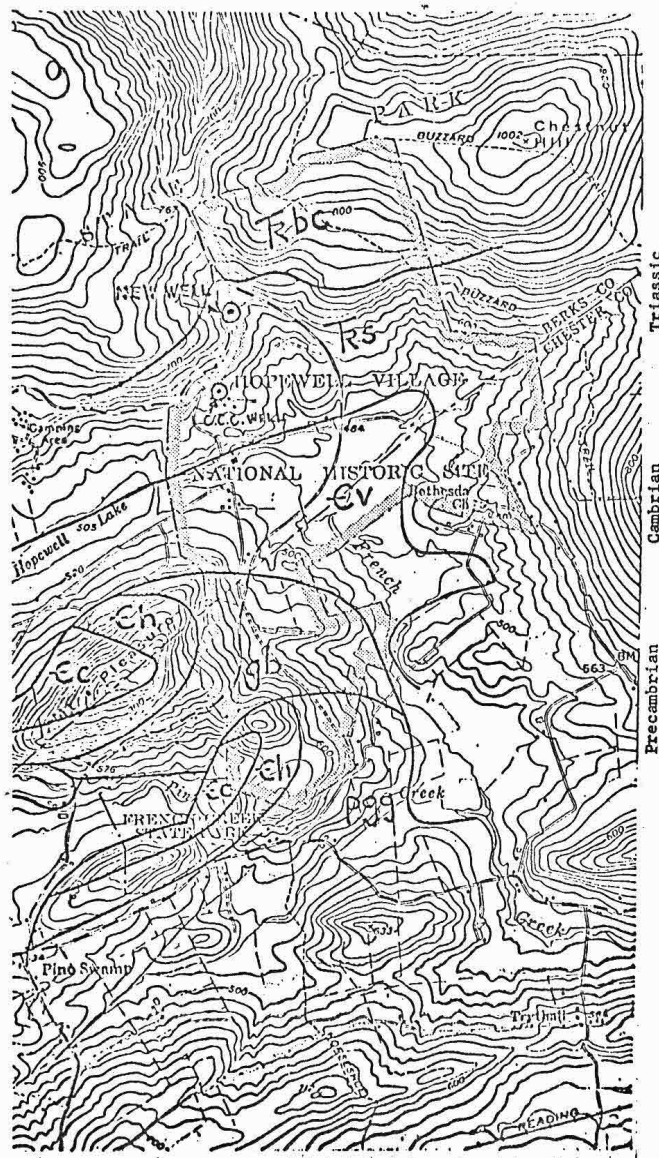
(Results in milligrams per liter, exceptions indicated)

Date and time of collection: Jan. 14, 1970 10:00 a.m.	
Silica (SiO ₂)	16.0
Iron (Fe)	.08
Manganese (Mn)	.03
Calcium (Ca)	23.0
Magnesium (Mg)	8.0
Sodium (Na)	7.5
Potassium (K)	2.0
Bicarbonate (HCO ₃)	130.0
Sulfate (SO ₄)	4.0
Chloride (Cl)	4.0
Fluoride (F)	.1
Nitrate (NO ₃)	.1
Hardness (as CaCO ₃) <u>1/</u>	
Total	91.0
Noncarbonate	0.0
Dissolved solids (sum)	129.0
Specific conductance	211 (micromhos at 25°C)

1/ USGS hardness classification:

0- 60 mg/l----soft
 61-120----- moderately hard
 121-180----- hard
 above 180----- very hard

Topography from 7½-minute Elvers quadrangle topographic map of the U.S. Geological Survey



EXPLANATION

Geology from USGS
Bull. 891 (Pl. 1).

Trbc: Brunswick Fm., hard dense sandstone and dark porcelanite where adjacent to intrusive diabase.

Trs: Stockton Fm., arkosic sandstone conglomerate and red shale; baked into hard dense porcelanite where adjacent to intrusive diabase.

Ev: Vintage Dolomite, thick bedded, dark glistening knotty dolomite.

Ec: Chickies Quartzite, Hellam Conglomerate Member (Ch) at base, vitreous quartzite above.

gb: gabbro, massive and lenticular bodies.

ppg: Pickering Gneiss, graphite-bearing sedimentary gneiss, where intruded by igneous rocks included with granodiorite.

Figure 1.--Map showing location of water-supply test well (drilled January 9, 1970) and geology and topography of Hopewell Village National Historical Site, Pa.

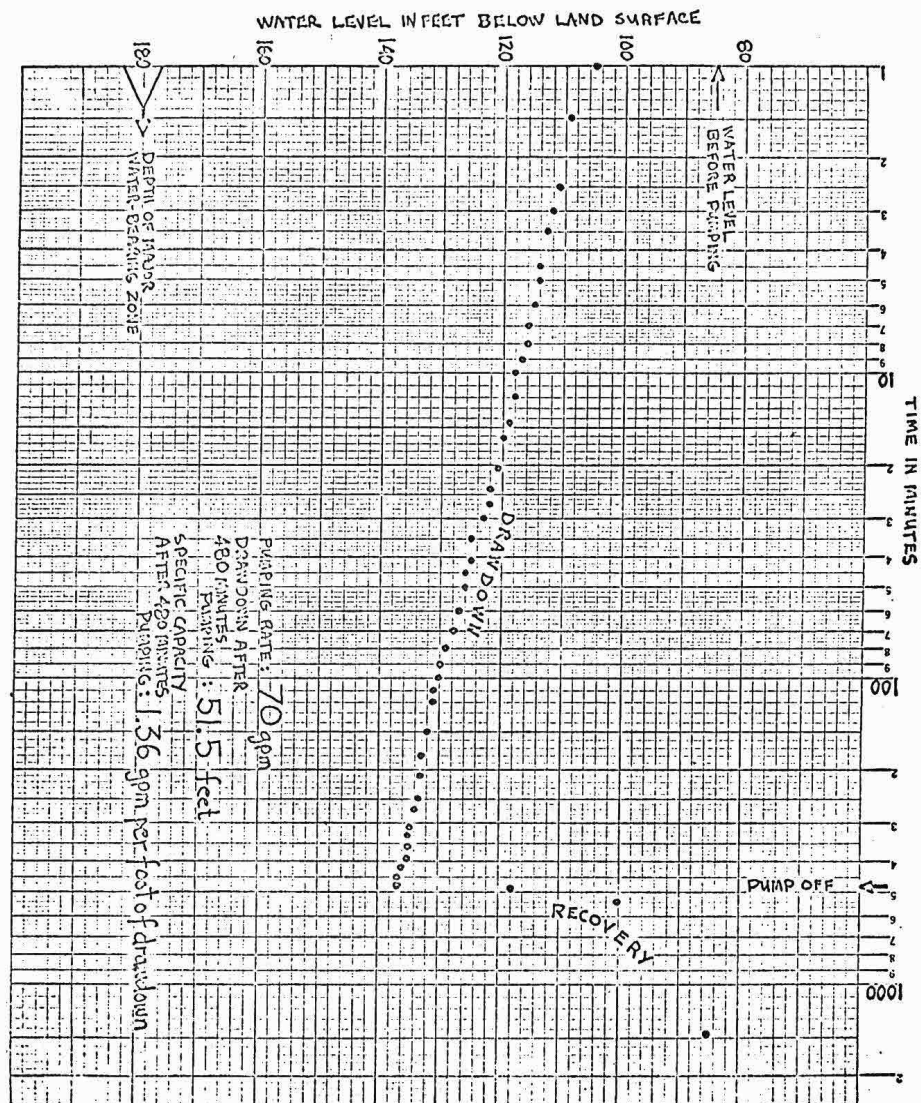


Figure 2.--Graph showing water level decline during pumping and recovery after pumping in the water-supply test well (drilled January 9, 1970) at Hopewell Village National Historical Site, Pa.

WATER SYSTEM DATA

- AREA Hopewell Village DATE June 15, 1957 COLLECTED BY Moore
1. Name of System: Gum Spring
2. Location: State Pennsylvania County Berks General Area Hopewell
Reference to permanent landmark _____
3. Source of Supply: Spring Capacity _____
(Well, Spring, Stream, Impoundment, etc.)
4. Type of System: Gravity
(Pumped, Gravity, etc.)
5. Treatment: Iron treatment - Airation and Sand filter
(Filtration, Chlorination, Airation, etc.)
6. Distribution Mains: Size 6" Length _____; Size _____ Length _____
Size _____ Length _____; Size _____ Length _____
Size _____ Length _____; Size _____ Length _____
7. Pump Unit: Make _____; Type _____; Model No. _____
None
Serial No: _____; Outlet _____ in.; Inlet _____ in.
(Size) (Size)
8. Power Source: _____ Motor: Make _____; HP _____;
None (Elec., Gas, Generator)
Serial No. _____; Voltage _____; Amps _____;
RPM _____; Type _____; Phase _____;
Cycles _____; Others _____; Stages _____
9. Control: Automatic Pressure; Manual _____;
Overflow (Float, Electrobe, Pressure, Time)
Other _____
(Explain)

Treatment Plant Installed May 17, 1957

Degasifier and Lime Contact Filter Types

GILBERT ASSOCIATES, INC.

ENGINEERS AND CONSULTANTS

LABORATORY DIVISION

LABORATORY
2249 FAIRVIEW STREET
READING, PENNSYLVANIA 19608

OFFICE
525 LANCASTER AVE., BOX 1498
READING, PENNSYLVANIA 19603

CERTIFICATE OF ANALYSIS

SAMPLE OF: RAW WATER

SAMPLED: May 26, 1967

LABORATORY NO: 230530

RECEIVED: May 26, 1967

YOUR NO:

REPORTED: June 9, 1967

SUBMITTED BY: Hopewell Village
R. D. 1
Elverson, Pa.

MARKED: GUM SPRING

		CaCO ₃ Equiv.	Ions
Calcium	ppm Ca	5.0	2.0
Magnesium	ppm Mg	4.0	1.0
Sodium	ppm Na	10.0	4.6
TOTAL CATIONS	ppm	19.0	
Bicarbonates	ppm HCO ₃	10.0	12.2
Sulfates	ppm SO ₄	4.0	3.8
Chlorides	ppm Cl	4.2	3.0
Nitrates	ppm NO ₃	0.8	1.0
TOTAL ANIONS	ppm	19.0	
Hydrogen Ion Conc.	pH		5.9
Conductivity	Mmho		27.0
M. O. Alkalinity	ppm CaCO ₃		10
Total Hardness	ppm CaCO ₃		9
Free Carbon Dioxide	ppm CO ₂		15.0
Silica - Soluble	ppm SiO ₂		5.8
Iron - Soluble	ppm Fe		0.07
Iron - Total	ppm Fe		0.11
Manganese	ppm Mn		0.05
Copper	ppm Cu		0.02
Iron & Aluminum Oxides	ppm R ₂ O ₃		0.2
Color	ppm		0
Turbidity	ppm		tr.
Suspended Solids	ppm		0.8
Soluble Solids	ppm		27
Total Solids	ppm		28

EMS

cc: John C. Riddle, Supt.(3)

Respectfully submitted,

W. J. Delp
W. J. Delp
Chief Chemist

Docket Information

Number of Documents in Docket 17

Documents Dated from 6/15/1957 to 6/15/1970

Docket Compiled: 4/11/2011