



# WATER-RIGHT DOCKET

## Great Smoky Mountains National Park

**Docket No: 21**

***ASH HOPPER BRANCH. FALLS BRANCH, WELL-HEADQUARTERS SYSTEM***

**Preliminary Docket Information**

00-00-0000: intro: see grsm docket 1 for map and preliminary map showing water sources within the park

SEE GREAT SMOKY MOUNTAIN DOCKET NO. 1 FOR MAP  
AND PRELIMINARY MAP SHOWING LOCATIONS OF  
WATER SOURCES WITHIN THE PARK.

WATER RIGHTS DOCKET  
Headquarters Area  
Great Smoky Mountains National Park

B. Consumption:METER READINGS - 1969 OPERATING SEASON

Breakdown according to usages:

| Month (Consumption in 1,000 gal.) | <u>Jan</u>  | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> | <u>June</u> | <u>July</u> | <u>Aug</u> | <u>Sept</u> | <u>Oct</u> | <u>Nov</u> | <u>Dec</u> | <u>TOTALS</u> |
|-----------------------------------|-------------|------------|------------|------------|------------|-------------|-------------|------------|-------------|------------|------------|------------|---------------|
| Residences.....                   | 109         | 108        | 114        | 115        | 119        | 122         | 139         | 141        | 123         | 112        | 107        | 98         | 1,407         |
| Visitor Center.....               | 16          | 17         | 40         | 116        | 182        | 306         | 367         | 383        | 153         | 220        | 61         | 22         | 1,883         |
| Administration Building.....      | 22          | 23         | 25         | 24         | 26         | 25          | 31          | 30         | 30          | 36         | 30         | 27         | 329           |
| Dehumidifier.....                 | 51          | 46         | 77         | 138        | 124        | 121         | 242         | 200        | 185         | 147        | 82         | 25         | 1,438         |
| Unaccounted.....                  | <u>347*</u> | <u>6</u>   | <u>2</u>   | <u>3</u>   | <u>2</u>   | <u>26</u>   | <u>24</u>   | <u>2</u>   | <u>20</u>   | <u>16</u>  | <u>39</u>  | <u>29</u>  | <u>516</u>    |
| TOTALS.....                       | 545         | 200        | 258        | 396        | 453        | 600         | 803         | 756        | 511         | 531        | 319        | 201        | 5,573         |

METER READINGS - 1970 OPERATING SEASON

Breakdown according to usages:

| Month (Consumption in 1,000 gal.) | <u>Jan</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> | <u>June</u> | <u>July</u> | <u>Aug</u> | <u>Sept</u> | <u>Oct</u> | <u>Nov</u> | <u>Dec</u> | <u>TOTALS</u> |
|-----------------------------------|------------|------------|------------|------------|------------|-------------|-------------|------------|-------------|------------|------------|------------|---------------|
| Residences.....                   | 112        | 103        | 108        | 115        | 105        | 122         | 127         | 123        | 101         | 105        | 104        | 87         | 1,312         |
| Visitor Center.....               | 15         | 17         | 36         | 75         | 160        | 249         | 323         | 329        | 159         | 216        | 65         | 30         | 1,674         |
| Administration Building.....      | 22         | 23         | 25         | 24         | 26         | 25          | 31          | 30         | 30          | 36         | 30         | 27         | 329           |
| Dehumidifier.....                 | 20         | 16         | 15         | 74         | 216        | 247         | 325         | 333        | 271         | 171        | 81         | 15         | 1,784         |
| Unaccounted.....                  | <u>22</u>  | <u>4</u>   | <u>11</u>  | <u>3</u>   | <u>38</u>  | <u>2</u>    | <u>--</u>   | <u>6</u>   | <u>8</u>    | <u>--</u>  | <u>40</u>  | <u>29</u>  | <u>163</u>    |
| TOTALS.....                       | 191        | 163        | 195        | 291        | 545        | 645         | 806         | 821        | 569         | 528        | 320        | 188        | 5,262         |

\*On January 15, 1969, a major leak (estimated at 15 gallons per minute) was repaired. It appears that this leak is a major cause of unaccounted water that has existed on this system over the past 6 years.

(Headquarters - Addendum No. 2)

(2/8/71)

NAME OF SYSTEM: HeadquartersLOCATION: SugarlandsLOCATION: STATE: Tennessee COUNTY: SevierA. Source of SupplyLOCATION - Reference to Permanent LandmarkCoordinates

## 1. Ash Hopper Branch

.6 mile south of Sugarlands Visitor Center  
at elevation 1,740Lat. 35°40'49"N  
Long. 83°32'30"W

Gravity system complete with intake, two 15,000 gallons per day slow sand filters, two water storage reservoirs (50,000 and 25,000 gallons) at elevation 1,696 feet. Minimum flow capacity in August 1965 was recorded at 19 gallons per minute. Max. est. (180 gallons per minute)

## 2. Falls Branch

800 feet west of deep well.

Lat. 35°41'10"N  
Long. 83°32'14"W

Pump system utilized as supplement to Ash Hopper Branch gravity system. System includes hypochlorinator and 15 gallons per minute centrifugal pump housed in concrete pumphouse. Minimum flow capacity in August 1965 was recorded at 15 gallons per minute.

## 3. Deep Well

Approximately 1,000 feet north of Park  
Headquarters BuildingLat. 35°41'10"N  
Long. 83°32'14"W

Deep well drilled to depth of 150 feet, 8" diameter, 80 gallons per minute capacity, pumping water level - 1,396. pH - 6.6. Presently utilized for standby availability but will be developed for ultimate supply in future. Three phase power is available.

B. Consumption:

Maximum daily - 37,500 Maximum monthly - 1,450,000 gallons Maximum annual - 12,500,000 gallons

Breakdown according to usages

METER READINGS - 1966 OPERATING SEASON

| Month (Consumption in 1,000 gal.)   | <u>Jan</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> | <u>June</u> | <u>July</u> | <u>Aug</u> | <u>Sept</u> | <u>Oct</u> | <u>Nov</u> | <u>Dec</u> | <u>Totals</u> |
|-------------------------------------|------------|------------|------------|------------|------------|-------------|-------------|------------|-------------|------------|------------|------------|---------------|
| Residents (30-56) . . . . .         | 123        | 121        | 120        | 125        | 170        | 187         | 193         | 190        | 173         | 175        | 142        | 117        | 1,836         |
| Visitor Center (451,000 vis.) . . . | 31         | 43         | 50         | 119        | 144        | 261         | 340         | 366        | 165         | 215        | 33         | 28         | 1,795         |
| Administration Building . . . . .   | 20         | 19         | 19         | 21         | 25         | 25          | 31          | 30         | 30          | 31         | 30         | 25         | 306           |
| Dehumidifier . . . . .              | 135        | 120        | 115        | 128        | 215        | 268         | 315         | 354        | 359         | 252        | 167        | 150        | 2,578         |
| Unaccounted for* . . . . .          | <u>275</u> | <u>240</u> | <u>237</u> | <u>336</u> | <u>197</u> | <u>136</u>  | <u>108</u>  | <u>176</u> | <u>298</u>  | <u>262</u> | <u>427</u> | <u>230</u> | <u>2,922</u>  |
| TOTAL . . . . .                     | 584        | 543        | 541        | 729        | 751        | 877         | 987         | 1116       | 1025        | 935        | 799        | 550        | 9,437         |

Breakdown according to usages

METER READINGS - 1967 OPERATING SEASON

| Month (Consumption in 1,000 gal.)   | <u>Jan</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> | <u>June</u> | <u>July</u> | <u>Aug</u> | <u>Sept</u> | <u>Oct</u> | <u>Nov</u> | <u>Dec</u> | <u>Totals</u> |
|-------------------------------------|------------|------------|------------|------------|------------|-------------|-------------|------------|-------------|------------|------------|------------|---------------|
| Residences . . . . .                | 128        | 126        | 119        | 116        | 152        | 158         | 163         | 152        | 126         | 141        | 94         | 97         | 1,572         |
| Visitor Center (504,500 vis.) . . . | 21         | 16         | 58         | 81         | 157        | 259         | 353         | 356        | 161         | 182        | 32         | 20         | 1,696         |
| Administration Building . . . . .   | 33         | 30         | 19         | 21         | 25         | 25          | 31          | 30         | 30          | 36         | 30         | 27         | 337           |
| Dehumidifier . . . . .              | 106        | 55         | 118        | 178        | 194        | 115         | 370         | 579        | 319         | 168        | 10         | 28         | 2,240         |
| Unaccounted For.* . . . . .         | <u>472</u> | <u>407</u> | <u>589</u> | <u>538</u> | <u>731</u> | <u>858</u>  | <u>484</u>  | <u>198</u> | <u>469</u>  | <u>573</u> | <u>603</u> | <u>692</u> | <u>6,614</u>  |
| TOTALS . . . . .                    | 760        | 634        | 903        | 934        | 1259       | 1415        | 1401        | 1315       | 1105        | 1100       | 769        | 864        | 12,459        |

\*Leaky fixtures, leaky lines, open valves, etc.

(Headquarters - Addendum No. 1)

## B. Consumption: (Continued)

## Breakdown according to usages

## METER READINGS - 1968 OPERATING SEASON

| Month (Consumption in 1,000 gal.) | <u>Jan</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> | <u>June</u> | <u>July</u> | <u>Aug</u> | <u>Sept</u> | <u>Oct</u> | <u>Nov</u> | <u>Dec</u> | <u>Totals</u> |
|-----------------------------------|------------|------------|------------|------------|------------|-------------|-------------|------------|-------------|------------|------------|------------|---------------|
| Residences . . . . .              | 97         | 92         | 98         | 105        | 119        | 157         | 163         | 163        | 105         | 119        | 115        | 119        | 1,452         |
| Visitor Center (593,515 vis.) . . | 16         | 18         | 36         | 128        | 138        | 282         | 405         | 431        | 204         | 275        | 53         | 17         | 2,003         |
| Administration Building . . . . . | 33         | 30         | 19         | 21         | 25         | 25          | 31          | 30         | 30          | 36         | 30         | 27         | 337           |
| Dehumidifier . . . . .            | --         | --         | --         | 4          | 76         | 214         | 317         | 232        | 162         | 133        | 46         | --         | 1,184         |
| Unaccounted * . . . . .           | <u>588</u> | <u>554</u> | <u>594</u> | <u>649</u> | <u>626</u> | <u>521</u>  | <u>570</u>  | <u>286</u> | <u>349</u>  | <u>388</u> | <u>608</u> | <u>683</u> | <u>6,416</u>  |
| TOTALS . . . . .                  | 734        | 694        | 747        | 907        | 984        | 1199        | 1486        | 1142       | 850         | 951        | 852        | 846        | 11,392        |

\*Leaky fixtures, leaky lines, open valves, etc.

## Breakdown according to usages

## METER READINGS - 1969 OPERATING SEASON

| Month (Consumption in 1,000 gal.) | <u>Jan</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> |
|-----------------------------------|------------|------------|------------|------------|------------|
| Residences . . . . .              | 109        | 108        | 114        | 115        | 119        |
| Visitor Center . . . . .          | 16         | 17         | 40         | 116        | 182        |
| Administration Building . . . . . | 22         | 23         | 25         | 24         | 26         |
| Dehumidifier . . . . .            | 51         | 46         | 77         | 138        | 124        |
| Unaccounted . . . . .             | <u>347</u> | <u>6</u>   | <u>2</u>   | <u>3</u>   | <u>2</u>   |
| TOTALS . . . . .                  | 545*       | 200        | 258        | 396        | 453        |

\*On January 15, a major leak (estimated at 15 gallons per minute) was repaired. It appears that this leak is the major cause of unaccounted water that has existed on this system over the past six years.

(Headquarters - Addendum No. 1)

C. Distribution Mains and Laterals:

| <u>Size</u> | <u>Type</u> | <u>Length</u>     | <u>Size</u> | <u>Type</u> | <u>Length</u>     |
|-------------|-------------|-------------------|-------------|-------------|-------------------|
| 1/2"        | Galvanized  | 260 Lineal Feet   | 3"          | Galvanized  | 210 Lineal Feet   |
| 3/4"        | Galvanized  | 325 Lineal Feet   | 4"          | Cast Iron   | 820 Lineal Feet   |
| 1"          | Galvanized  | 915 Lineal Feet   | 6"          | Cast Iron   | 7,858 Lineal Feet |
| 1-1/4"      | Galvanized  | 115 Lineal Feet   | 8"          | Cast Iron   | 4,135 Lineal Feet |
| 2"          | Galvanized  | 1,025 Lineal Feet |             |             |                   |

TOTAL . . . . . 15,663 Lineal Feet

(Headquarters - Addendum No. 1)

E. Proposed Improvements:

It is becoming more and more apparent that the old gravity fed domestic water systems in the park are too vulnerable during extended drouth periods. Thus, in the fall of 1965, the park requested the consideration of a comprehensive Water Resources Study to cover both the Smokies and the Foothills Parkway. Under the program, a deep well was drilled in the Headquarters area in early 1966 that is capable of 90 gallons per minute continuous drawdown. As a temporary expedient, an 80 gallon per minute Jacuzzi Submersible pump has been installed in this well and has been connected to the main domestic system. In this way, this excellent supply is now available on an emergency basis as a supplement to the Ash Hopper Branch supply. There is a scheduled construction project which will complete the integration of this deep well into the overall system wherein it will ultimately be the sole supply with Ash Hopper gravity being retained as standby.

Benefits Expected From Above Proposed Improvements:

The number one benefit will be the availability of an adequate water supply commensurate with present and future development called for in the Park Master Plan. The Master Plan calls for an additional 7 residences and expansion of the present Visitor Center. This additional development along with normal increases in travel is expected to result in an ultimate annual water consumption of 12,000,000 gallons for this area. The present system which utilizes slow sand filtration and a water operated chlorinator in treatment is relatively expensive and domestic water at the reservoir is costing approximately 40¢/1,000 gallon. The new deep well system should result in a substantial reduction in this cost.

(Headquarters - Addendum No. 1)

F. Additional Information:

This well, as stated in Item E, has been used as an auxiliary supply during dry periods. In October 1968 it was noted that the well was not of the capacity originally shown on the pump test. Further checking revealed that the well capacity had been reduced to a maximum of 48 gallons per minute with a drawdown of 70 feet. On February 8, 1969, this well was surged and developed for a period of 8 hours in the hope of bringing the capacity back to its original capacity of 70 gallons per minute. After the cleaning operation was run, a new pumping test was conducted and the rate found to be 60 gallons per minute with a 60 foot drawdown. At 70 gallons per minute the drawdown was excessive. Chemical treatment was tried in an effort to bring the well back up to the original capacity. The integration of this well into the present Headquarters water system has been moved from 1968 F.Y. to 1970 F.Y. at which time the control lines will be run from the pump to the reservoir, a distance of 7,000 feet. At that time, the deep well supply will be the main domestic supply with the gravity system held for standby.

(Headquarters - Addendum No. 1)

Cost of operating Headquarters Water System for Fiscal Year 1966

Cost of water supply (doesn't include cost of mains, laterals, etc.)

**Supplies & Materials**

|                                          |           |
|------------------------------------------|-----------|
| HTH Tablets - 185 containers @ \$2.54    | \$ 469.90 |
| Katite - 20 gallons @ \$3.00/gal.        | 60.00     |
| Washed sand (filters) - 20 yds. @ \$8.00 | 160.00    |

**Personal Services**

|                                                      |                   |
|------------------------------------------------------|-------------------|
| Taking water samples - 24 @ \$1.80                   | 43.20             |
| Cleaned gravity intake - 12 times @ \$15.22 ea.      | 182.64            |
| Cleaned pump intake - 5 times @ \$10.00 ea.          | 50.00             |
| Serviced chlorinators                                |                   |
| at reservoir - 261 times @ \$4.76                    | 1,242.36          |
| at reservoir - 104 times @ \$5.25                    | 546.00            |
| at pump station - 17 times @ \$3.17                  | 53.89             |
| Checked pump & reservoir during supplemental pumping |                   |
| 34 times @ \$4.76                                    | 161.84            |
| Skimmed sand filters - 5 different times             |                   |
| 6 manhours X 5 = 30 manhours @ \$3.07                | 92.10             |
| Placing new sand in beds (2 occasions)               |                   |
| 30 manhours @ \$2.69                                 | 80.70             |
| Cleaning and painting reservoir                      | 43.04             |
| Annual leave (748 hrs. work) - 120 hrs. @ \$3.07     | 368.40            |
| Equipment rentals - 1,885 miles @ 5¢                 | 94.25             |
| Equipment amortization                               | 85.00             |
| Electric bills (supplemental pumping system)         |                   |
| Monthly standby at pumphouse 12 mo. @ \$2.50         | 30.00             |
| Power used - 2500 KWH @ \$.007                       | 17.50             |
| Misc. work on pump, reservoir, etc.                  | 244.00            |
|                                                      | <u>\$4,024.82</u> |

Note: plumber & maintenance man wage rates have gone up 12% this year. Thus since personal services amounted to \$2864 of the above estimate, it is safe to add \$300 for wage increases for this projected operation.

|                   |
|-------------------|
| 300.00            |
| <u>\$4,324.82</u> |

Thus, in 1967, we will assume that our water consumption will run 9,250,000 gallons at a cost of \$4300 or at a unit cost of 46¢/1000.

Pump tests on our deep well system at Headquarters shows that we can pump 250 gallons for one cent (for power costs). Projecting costs for a year with use of a deep well system, it appears that we can expect the following costs (based on 9,629,000 gallons):

|                                  |               |
|----------------------------------|---------------|
| Electric power cost - 26,900 KWH | \$ 423.60     |
| Overhaul pump annually           | 400.00        |
| Personal Services, misc.         | <u>200.00</u> |
|                                  | \$1,023.60    |

Cost would then be 10.6¢/1000 gallons and should result in an estimated annual saving of \$3,300.00.

The deep well system would require no filtration or chlorination.

HEADQUARTERS WELL PUMP TEST  
December 12, 1966

Static head at pump house 112 psi = 259'  
Pumping head..... 325'  
• Reservoir elevation - 1706  
Pumping water level in well - 1396  
Head loss in pumping @ 60 gpm  
130' of 2" pipe - 7.0'  
350' of 6" C.I. - 0  
4,100' of 8" C.I. - 0  
3.3

Losses in meter, fittings, etc. - 10

Water pumped in 8 hours - 28,640 gal.  
Gal/hour =  $28,640 \div 8 = 3,580$  gph  
= 59.7 gpm

Power consumed - 80 KWH  
Water/KWH =  $28,640 \div 80 = 358$  gal.

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$$\text{Eff.} = \frac{\text{head in feet} \times \text{gallons (thousands) pumped} \times .00315}{\text{KWH}}$$

$$= \frac{325 \times 28.64 \times .00315}{80} = 36.65\%$$

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Cost/million gallon/month

$$1,000,000 \div 358 \text{ g/KWH} = 2,800 \text{ KWH}$$

Power Cost

|                 |                |
|-----------------|----------------|
| Demand.....     | \$10.00        |
| Energy.....     | 29.65          |
| 1st 150 KWH -   | 3.75           |
| Next 400 KWH -  | 6.00           |
| Next 950 KWH -  | 9.50           |
| Next 1300 KWH - | 10.40          |
|                 | <u>29.65</u>   |
|                 | <u>\$39.65</u> |

HEADQUARTERS WELL PUMP TEST  
December 12, 1966  
Page 2

If 1,000,000 gal. cost \$39.65 we will receive 250 gallons/cent  
or will pay 4 cents/1000 gallons pumped.

We used a metered quantity of 8,000,000 gal. this past year and  
the cost of power for this would be \$320.

Estimated Water Consumption (Future)

|           | <u>Water Consumption</u> | <u>Power Consumption</u> | <u>Power Cost</u> |
|-----------|--------------------------|--------------------------|-------------------|
| January   | 600,000 gal.             | 1,675 KWH                | \$ 30.65          |
| February  | 600,000 "                | 1,675 "                  | 30.65             |
| March     | 550,000 "                | 1,550 "                  | 29.65             |
| April     | 730,000 gal.             | 2,050 "                  | 33.65             |
| May       | 750,000 "                | 2,100 "                  | 34.05             |
| June      | 875,000 "                | 2,450 "                  | 36.85             |
| July      | 950,000 "                | 2,650 "                  | 39.45             |
| August    | 1,116,000 "              | 3,110 "                  | 42.55             |
| September | 1,024,600 "              | 2,850 "                  | 40.05             |
| October   | 935,000 "                | 2,610 "                  | 38.10             |
| November  | 799,000 "                | 2,230 "                  | 36.10             |
| December  | <u>700,000 "</u>         | <u>1,950 "</u>           | <u>31.85</u>      |
|           | 9,629,600 gal.           | 26,900 KWH               | \$ 423.60         |

Cost/1000 gallon of water is 4.4¢

The study of the past season shows that we waste 2,750,000 gallons of water in the Visitor Center dehumidifiers which will cost us \$121 annually. Since cost of operation and upkeep of recirculating equipment plus water treatment would probably equal or exceed this cost, we will continue to waste this quantity.

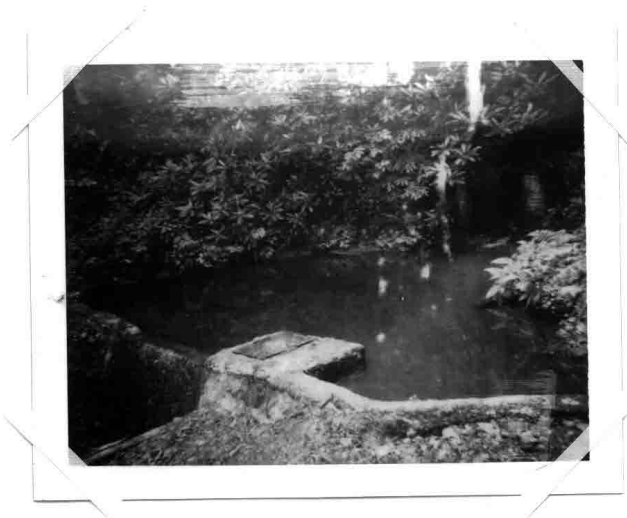
The study also suggests that we are wasting 2,850,000 gallons of water in leaks (approximately 5 gpm) which will cost us \$125 annually but because of the age of the line and minimal additional costs, we will not be too concerned and will accept this as a reasonable operational cost.

Of the estimated future usage of 9,629,000 gallons per annum,  
the following breakdown is pertinent:

|                                                                                                                                    |           |
|------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Visitor Center Dehumidifier. . . . .                                                                                               | 2,750,000 |
| Water is wasted into open stream.                                                                                                  |           |
| Visitor Center Operation . . . . .                                                                                                 | 1,850,000 |
| This is mainly in operation of public<br>comfort station. This Visitor Center had<br>an estimated 535,000 visitors this past year. |           |
| Residential Area . . . . .                                                                                                         | 1,869,600 |
| This residential area population<br>fluctuated from a low of 32 to a high of<br>56 persons during the year.                        |           |
| Administration Building. . . . .                                                                                                   | 310,000   |
| There are as high as 40 employees working<br>in this facility in a given day.                                                      |           |
| Water Unaccounted for. . . . .                                                                                                     | 2,850,000 |
| The majority of this water is lost in<br>minor leaks. Also included in this<br>quantity is water used in utility area, etc.        |           |



25,000 AND 50,000 GALLON RESERVOIRS AND SAND FILTER FOR  
HEADQUARTERS WATER SYSTEM



INTAKE DAM AND COLLECTION BOX FOR  
HEADQUARTERS WATER SYSTEM



PUMP HOUSE AND METER BOX  
FOR HEADQUARTERS WATER SYSTEM

Other Supporting Information

Final PaymentDrilling Park Headquarters Well

Purchase Order No. 17-292

Well drilling contractor: W. C. Smith  
 Route 2  
 Parrottsville, Tennessee

Schedule of Bid

| <u>Item</u>                                                                                                                                                | <u>Qty.</u> | <u>Cost</u>       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------|
| 1. For drilling one or more test holes at 6½" plus or minus in diameter, including collection of samples, recording & furnishing drillers log @ \$5.00/ft. | 150'        | \$ 750.00         |
| 2. Drilling or reaming out test hole or holes to a diameter of 8" for installing 8" ID casing if test hole is developed @ \$3.00/ft.                       | 125'        | \$ 375.00         |
| 6. Grouting and sealing two inch (2") annular space around the casings of production well @ \$.50/ft.                                                      | 21½'        | 10.75             |
| 7. Surge & develop well @ \$10.00/hr.                                                                                                                      | 13½ hr.     | 135.00            |
| 8. Pump Test @ \$22.00/hr.                                                                                                                                 | 4½ hrs.     | 99.00             |
|                                                                                                                                                            |             | <u>\$1,369.75</u> |

Project completed by well drilling contractor on 1/10/66.

OPTIONAL FORM NO. 10  
MAY 1962 EDITION  
GSA GEN. REG. NO. 27

5010-106

UNITED STATES GOVERNMENT

# Memorandum

TO : Mr. Garald Rowe, <sup>Chief</sup> Superintendent of Maintenance  
Great Smoky Mountains National Park <sup>RR</sup>  
Gatlinburg, Tennessee

FROM : W. M. McMaster, Geologist, USGS, WRD  
Knoxville, Tennessee

SUBJECT: Preliminary report on test well at Great Smoky Mountains National Park  
Headquarters

DATE: January 7, 1966

On September 27, 1965, B. J. Frederick and W. M. McMaster of the Knoxville office of the U. S. Geological Survey, Water Resources Division met with you, to locate three possible sites for drilling test wells to augment the water supply at Park Headquarters, as requested by NPS Regional Headquarters' memo of September 23, 1965.

Drilling of a 6 1/4-in. diameter test well began, at the first site selected, on December 22, by W. C. Smith of Parrottsville, Tenn., using a cable-tool rig. The site is about 1,000 feet north of Park Headquarters and at an altitude of approximately 1,430 ft. It is believed that the well is located directly on the trace of the Gatlinburg Fault, and it is thought that the aquifer is highly fractured rock of the fault zone. Rocks of pre-Cambrian age lie on either side of the fault: the Elkmont Sandstone to the west and the Roaring Fork Sandstone to the east. The rock through which most of the well is drilled is yellow-tan, very-fine-grained, and very soft. This lithology occupies a total of 80 feet of the 150 feet of well, and is the principal, and probably the only, aquifer. A lithologic log, made from samples collected during drilling, is attached.

When drilling had reached a depth of 110 feet a bail test was made, during which 500 gallons of water was removed in 11 minutes. The bailing rate of about 45 gpm (gallons per minute) caused a drawdown of about 15 feet, for a specific capacity of about 3 gpm per foot of drawdown.

The test well was completed at a depth of 150 feet on December 27. On december 30 and 31, the well was pumped for several hours in order to remove any mud from the crevices penetrated by the well. On January 3, 1966, the pump, a 2-hp submersible, was used for a 4.5-hour pumping test, discharging at a constant rate of 72 gpm. Water level before pumping began was 8.3 feet below the measuring point which was about one foot above ground surface. Rainfall of the previous day and night had caused a rise in water level from the 11.5-foot mark of the previous week. The pumping water level was essentially stable at about 37.5 feet below ground surface, for a specific capacity of 2.4 gpm/ft. A plot of the pumping test is attached.

A water sample was collected during the pumping test to be analyzed for chemical quality by the Survey's Quality of Water Branch. Water temperature was 56° F., pH was 6.6. Specific conductance was only 54, indicating low content of dissolved solids. Results of the complete chemical analysis will be forwarded to Park Headquarters as soon as received.

It is evident that the well will yield more than 72 gpm on a continuous basis, perhaps as much as 100 gpm. Another pumping test at a higher discharge is planned for the near future, so that the potential yield can be better evaluated.

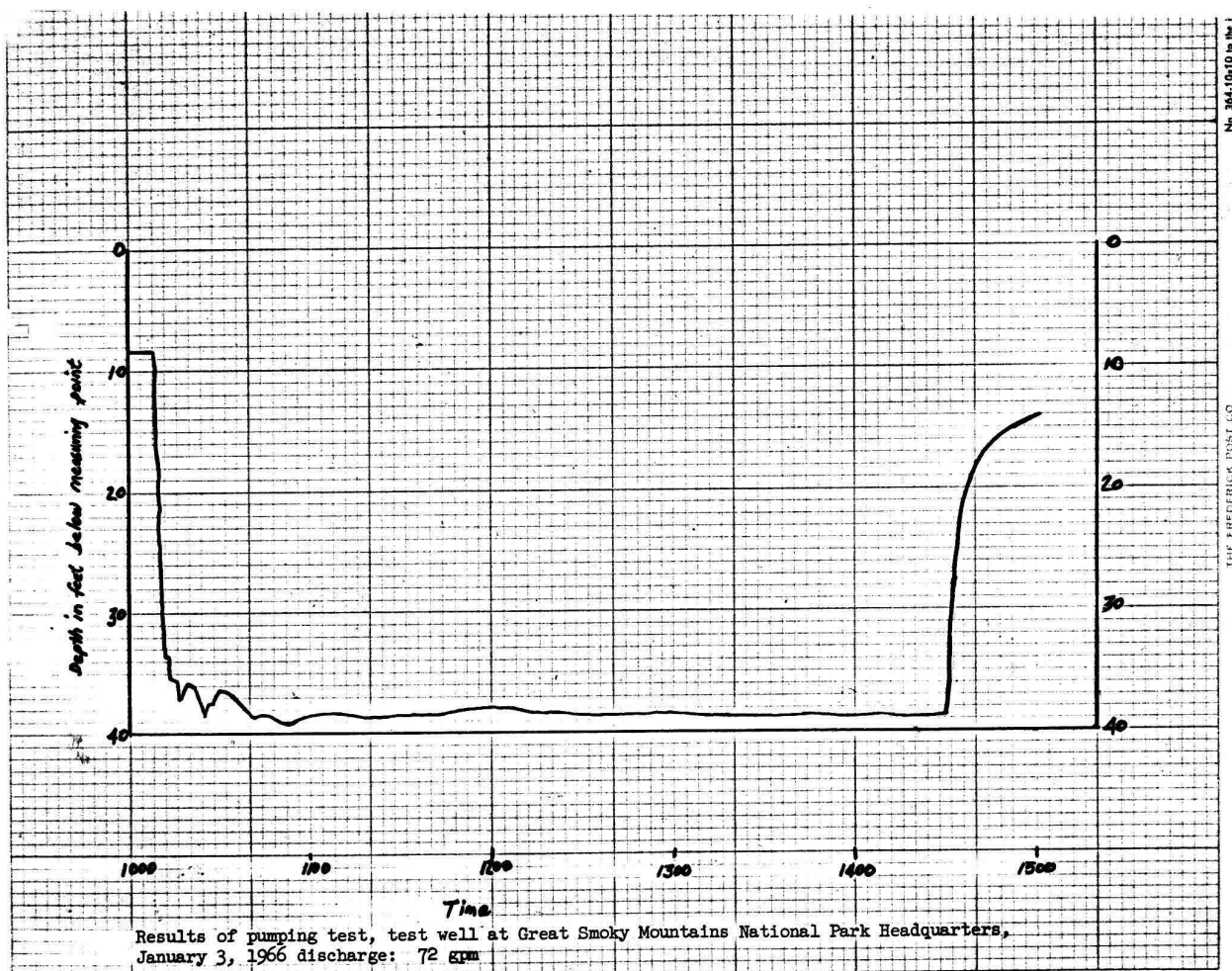
*William M. McMaster*

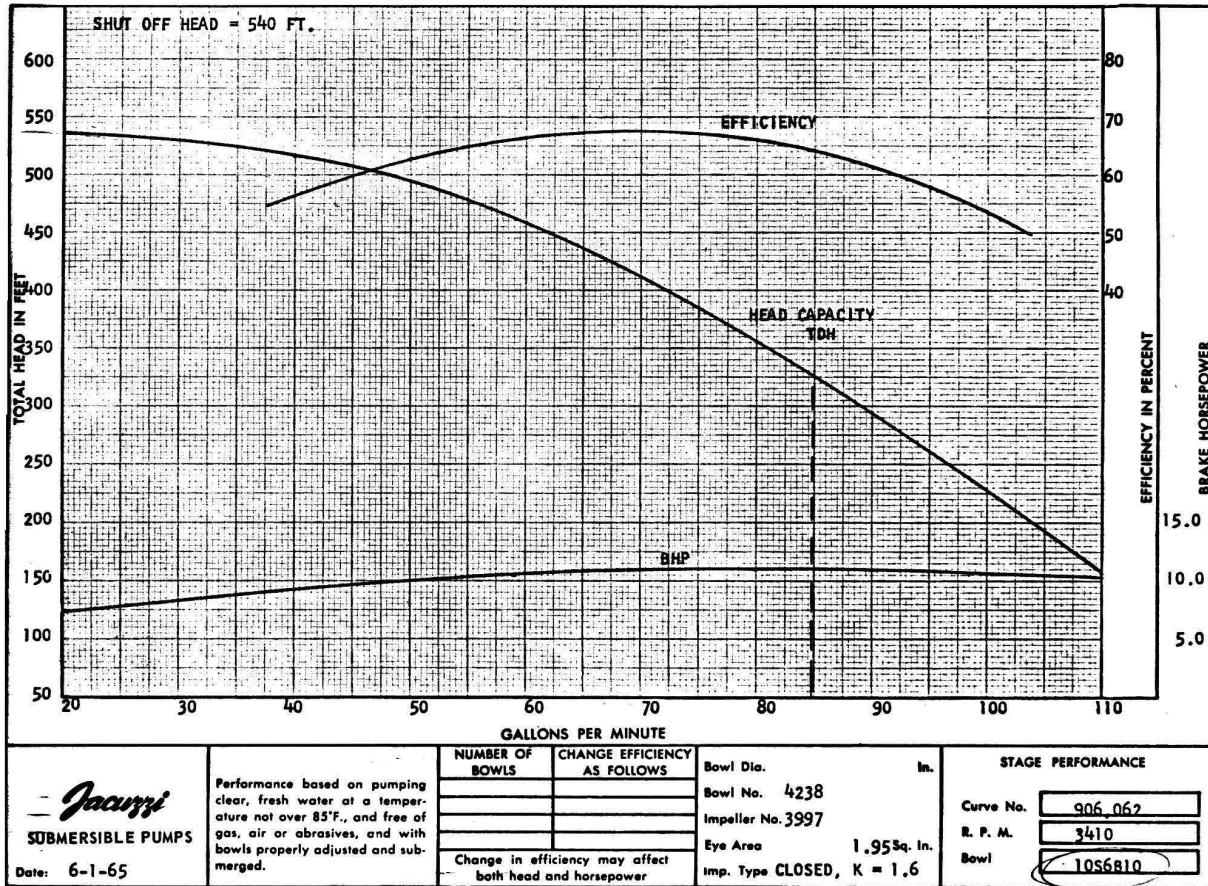
William M. McMaster

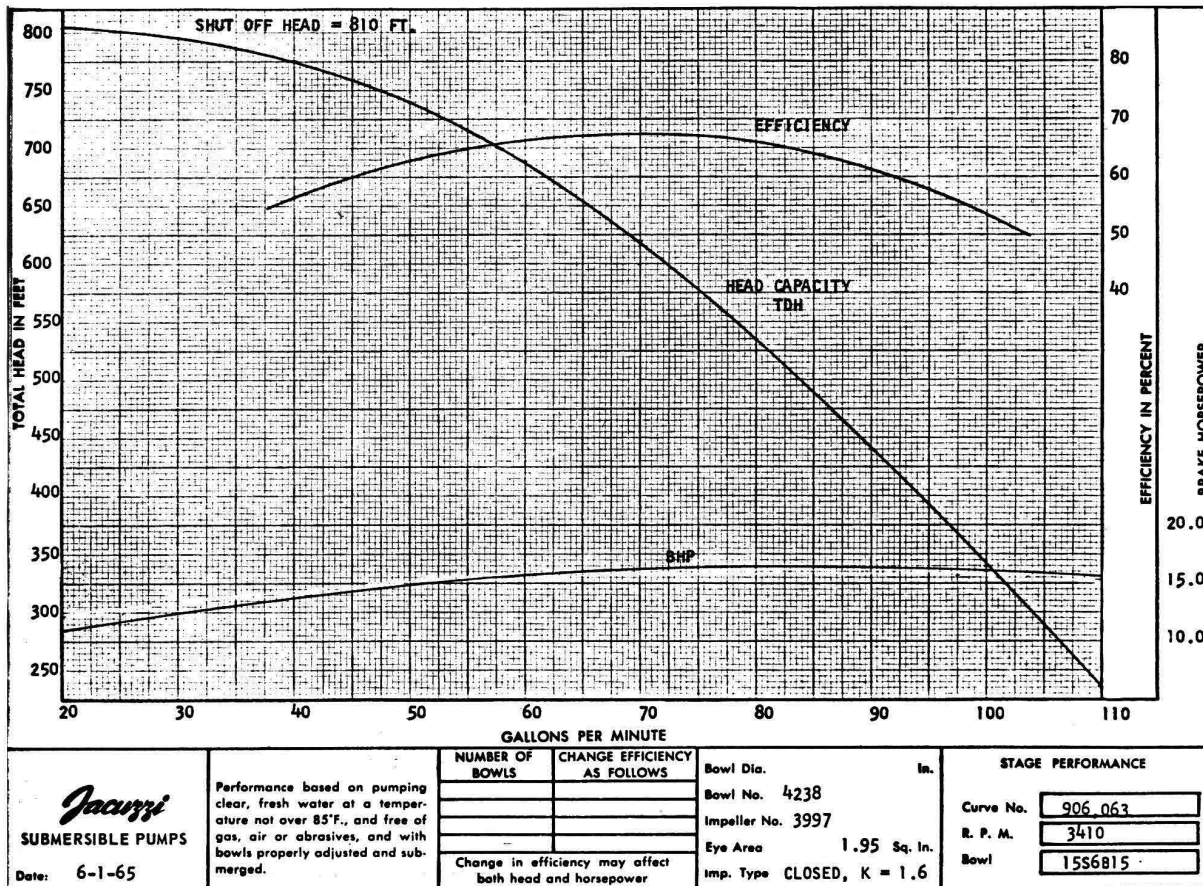
## LITHOLOGIC LOG

|                                                              |                |                                         |                  |
|--------------------------------------------------------------|----------------|-----------------------------------------|------------------|
| Owner: National Park Service                                 |                | WELL No:                                |                  |
| Driller: W. C. Smith                                         | Date: 12/27/65 | County: Sevier                          | State: Tenn.     |
| Logged by: W. M. McMaster                                    | Date: 1/6/66   | Location: 1000' N. of Park Headquarters |                  |
| Datum 1 ft above LSD                                         |                | Location No.                            |                  |
| Depth, hole: 150'                                            | dia: 6 1/4"    |                                         |                  |
| Depth, casing: 13'                                           | dia: 6 1/4"    |                                         |                  |
| Depth, screen: None                                          | dia:           | Alt. datum                              | Alt. LSD ~ 1430' |
| E. log: gamma: caliper: temp: 56° conductivity 54 flow meter |                |                                         |                  |

| AGE          | FORMATION             | LITHOLOGY                                                                         | Thick-<br>ness (ft) | Depth<br>(feet) |
|--------------|-----------------------|-----------------------------------------------------------------------------------|---------------------|-----------------|
| Recent       | Alluvium              | Brown silt, clay, fine gravel                                                     | 13                  | 13              |
| pre-Cambrian | ?                     | Very fine-grained yellow-tan to bronze<br>very soft foliated rock                 | 69                  | 82              |
| -do-         | Elkmont<br>Sandstone? | Fine-grained green-gray sandstone                                                 | 4                   | 86              |
| -do-         | ?                     | Very fine-grained yellow-tan to bronze<br>very soft foliated rock                 | 11                  | 97              |
| -do-         | Elkmont<br>Sandstone? | Fine-grained medium gray-green hard<br>sandstone contains some milky quartz veins | 41                  | 138             |
| -do-         | Elkmont<br>Sandstone? | Fine-grained medium gray to blue-gray<br>hard sandstone                           | 12                  | 150             |







UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

2GW

## WATER ANALYSIS

Smoky Mtns. Nat'l Park.

Location National Park Service Headquarters, Tennessee -/ County \_\_\_\_\_  
 Source Test well Depth (ft) \_\_\_\_\_ Diam (in.) \_\_\_\_\_  
 Cased to (ft) \_\_\_\_\_ Date drilled \_\_\_\_\_ Point of coll. Pump discharge  
 Owner National Park Service

Treatment \_\_\_\_\_ Use \_\_\_\_\_  
 WBF \_\_\_\_\_ WL \_\_\_\_\_ Yield 72 gpm

Temp (°F) 56 Appear. when coll. Clear  
 Collected January 3, 1966 at 1400 hours. By WMM

Remarks

|                            | ppm | epm  |                                 | ppm | epm  |
|----------------------------|-----|------|---------------------------------|-----|------|
| Silica (SiO <sub>2</sub> ) | 20  |      | Bicarbonate (HCO <sub>3</sub> ) | 32  | 0.52 |
| Aluminum (Al)              |     |      | Carbonate (CO <sub>3</sub> )    | 0   | .00  |
| Iron (Fe)                  | .03 |      |                                 |     |      |
| Manganese (Mn)             | .00 |      | Sulfate (SO <sub>4</sub> )      | 2.2 | .04  |
|                            |     |      | Chloride (Cl)                   | .4  | .01  |
|                            |     |      | Fluoride (F)                    | .2  | .01  |
|                            |     |      |                                 |     |      |
| Calcium (Ca)               | 6.1 | 0.30 |                                 |     |      |
| Magnesium (Mg)             | .2  | .02  | Nitrate (NO <sub>3</sub> )      | .0  | .00  |
| Sodium (Na)                | 4.8 | .21  |                                 |     |      |
| Potassium (K)              | .0  | .00  |                                 |     |      |
|                            |     |      |                                 |     |      |
| Total                      |     | .53  | Total                           |     | .58  |

|                                  | ppm |                                              |     |
|----------------------------------|-----|----------------------------------------------|-----|
|                                  |     | Specific conductance<br>(micromhos at 25° C) | 53  |
| Dissolved solids:                |     | pH                                           | 6.7 |
| Calculated                       | 50  | Color                                        | 0   |
| Residue on evaporation at 180° C | 45  |                                              |     |
| Hardness as CaCO <sub>3</sub>    | 16  |                                              |     |
| Noncarbonate                     | 0   |                                              |     |
|                                  |     |                                              |     |
|                                  |     |                                              |     |

Lab. No. 34433

Field No.

Project Tenn. WRD (Knoxville)

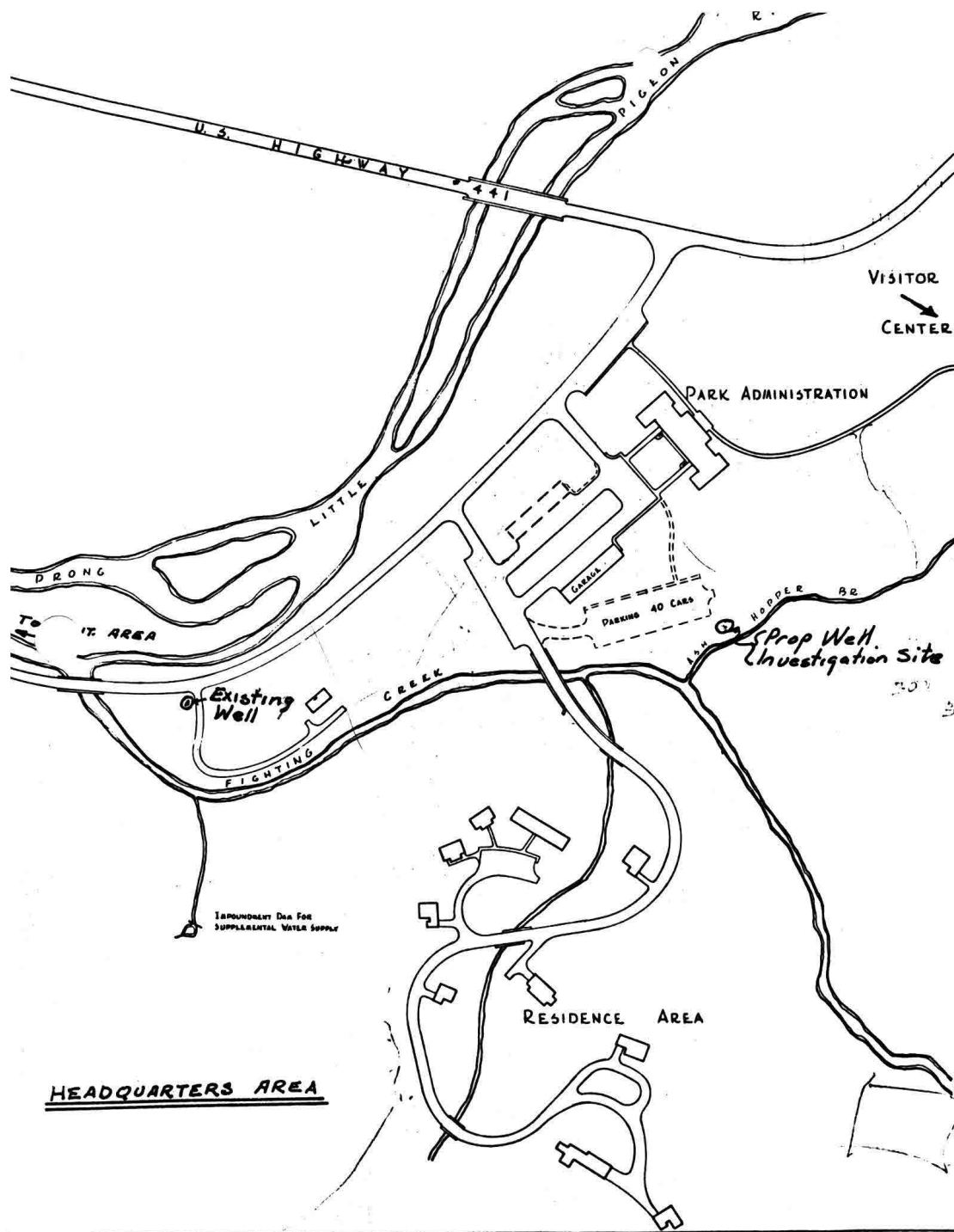
#### HEADQUARTERS

Situation: During the month of August 1965, an analysis was made of the available water supply for the Park Headquarters area. During this period, we found (by actual meter readings for 24-hour periods) that the Ash Hopper Branch gravity system was yielding a maximum of 19 gallons per minute. At the same time, the supplemental pump supply which is taken out of a branch of Fighting Creek yielded a maximum of 15 gallons per minute. Actual metered usage during the period in question involved 37,000 gallons per day (approximately 26 g.p.m.) while maximum available provided we pumped 24 hours per day was some 34 g.p.m. In view of this, it was quite apparent that an additional supply was needed.

Proposed: That we drill a deep well or combination of wells that would supply a minimum of 50 g.p.m. to supplement the Ash Hopper Branch gravity system.

Progress to date: An 8" well was drilled to a depth of 150' in December 1965. This well, which is located in the vicinity of the water pump-house (for Fighting Creek Branch supply), produced a minimum sustained yield of 90 g.p.m.

Proposed: There is a project in the tentative 1968 F.Y. construction program for integrating this well into the existing Headquarters water system.



PROPOSED SITES FOR WATER RESOURCES INVESTIGATION

1. Park Headquarters
2. Green Mountain (Foothills Parkway)
3. Newfound Gap
4. Cades Cove
5. Deep Creek
6. Smokemont
7. Abrams Creek
8. Twin Creeks
9. Collins Creek
10. Metcalf Bottoms
11. Cataloochee
12. Elkmont
13. Cosby
14. Chimneys
15. Rocky Mountain (Foothills Parkway)
16. Webb Mountain (Foothills Parkway)
17. Little Greenbrier
18. Greenbrier
19. Sinks
20. Towstring
21. Indian Camp Creek
22. Tremont Ranger Station
23. Round Bottom Campground
24. Balsam Mountain Campground
25. Main Oconaluftee Residential Area
26. Old Oconaluftee Residence Area (Ravensford)
27. Big Creek Ranger Station
28. Cataloochee Ranger Station
29. Cataloochee Maintenance Area
30. Twentymile Ranger Station
31. Cherokee Orchard
32. Sugarlands

(09/28/67)

MAY 1962 EDITION  
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

## *Memorandum*

TO : Gerald Rowe, Chief of Maintenance  
Great Smoky Mountains National Park  
Gatlinburg, Tennessee 37738

DATE: September 7, 1967

FROM : W. M. McMaster, USGS, WRD  
Knoxville, Tennessee

SUBJECT: Summary of work plans for study of water resources of Great Smoky Mountains  
National Park, North Carolina and Tennessee Districts

As I promised you on August 11, I am sending you our plans for the study of water resources of Great Smoky Mountains National Park that have been modified as a result of a meeting between North Carolina and Tennessee U. S. Geological Survey personnel July 6-7, 1967.

*W. M. McMaster*  
W. M. McMaster  
Hydrologist

cc: Edward J. Kennedy, Chief, Tenn. District  
Ralph C. Heath, Chief, N. C. District



5010-108

*Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan*

Summary of work plans for study of water resources of Great Smoky Mountains  
National Park, North Carolina and Tennessee Districts

Sept. 7, 1967

At a meeting in Knoxville during July 6-8, 1967, North Carolina and Tennessee personnel discussed modification of plans in the study of water resources of the Great Smoky Mountains National Park. Those who attended the meeting were: Ralph C. Heath, North Carolina District Chief; Edward J. Kennedy, Tennessee District Chief; D. R. Rima, Assistant District Chief for Tennessee; Nat Thomas, G. C. Goddard, and E. F. Hubbard of North Carolina; and W. M. McMaster of Tennessee.

At the meeting it was agreed that the effort in both districts should be combined under leadership of one individual; McMaster was delegated project leadership. McMaster will be responsible for ground water interpretive aspects of the study and Hubbard will be responsible for surface water interpretive aspects.

The final product will be a hydrologic atlas of the Smokies area, published by the Geological Survey, that will consist of the 1:125,000 base map upon which will be delineated ground water and surface water information. Ground water occurrence and availability will be shown as a series of patterns, each defining a range between a minimum, a maximum, and an average of expected well yields within the area covered by the pattern. These areas are expected to be established by topographic criteria, geologic location, estimated soil thickness, and background information provided by test wells drilled during the course of the study. If a test well appears capable of yielding the desired quantity of water for water supply at the drilling site, a pumping test will be run.

Surface water information will be indicated by isopleths of minimum flow in cubic feet per second per square mile at the 2-year 7-day recurrence interval, based on a series of low-flow measurements made during the course of the study, at a total of about 100 sites throughout the Park distributed so as to define variations in flow with location and altitude. It is hoped that these sites can be measured a total of 6-8 times following periods of about 7 days of no rainfall.

Ground water and surface water chemical quality will be described, based on results of analysis of water from test wells and samples collected from streams. A series of coliform analyses of stream water is planned to define possible areas of contamination.

An explanatory text and supplementary illustrations will be included. The atlas is expected to provide the NPS engineer a basis for planning future developments of any kind in the Park for which knowledge of water resources is required.

Consideration will be given to popular-type brochure for distribution to Park visitors, describing and illustrating the occurrence of water in the area and its role in shaping the mountains.

Test drilling and reporting will continue to be handled by the District in which the site is located.

Plans are to complete the text of the final report by May 1969 for transmission through final review prior to publication. However, if insufficient opportunities to collect low-flow measurements occurs during the remaining time through November 1968, it is hoped that supplementary funds will be available from NPS to make additional measurements during the following year.

725-9-17-65-

LS4 SER(OLW)

SEP 14 1965

*Read*  
*ARC 9/17*  
*WAA*

Memorandum

To: Superintendent, Great Smoky Mountains

From: Acting Assistant Regional Director, Operations,  
Southeast Region

Subject: Water Resources Investigations, Great Smoky Mountains  
National Park

We will be glad to assist you in developing a detailed water resources study at Great Smoky Mountains National Park during the 1966 fiscal year as requested in your memorandum of August 23. The results produced from such a study should provide us with the basis for a full and most effective development of all water resources located within the Park boundaries. It is evident that new sources of water are needed to meet the demands of future and existing Park facilities.

We believe the investigative work should include the following:

(1) The first and most pressing problem involves the need to expand several water supply systems in order to provide more water to take care of a greater number of Park visitors and increased Park uses. This requires an evaluation of the probable capacity of the present sources of supply and the locating of possible new sources of water supply of acceptable quality for increased demands of the future and (2) The second phase of the project (extending over a period of several years) would be to conduct surface and ground water studies throughout the Park in order to obtain a general knowledge of all water resources. With such information at hand, the Park staff will be able to plan efficiently for new or expanded developments.

An over-ceiling item was included in the 1966 F.Y. Regional Water Resources Program in the amount of \$26,000 to initiate a study of domestic water supply needs and test well drilling work at the Park. Mr. E. W. Reed, Chief, Water Resources, has recently advised that at present the Washington Office reserve contains sufficient funds to finance this study.

We agree a meeting and field reconnaissance should be held at the Park between representatives of the U. S. Geological Survey, the Regional Office and the Park staff to properly formulate a logical approach to this water resources project. In early October, we will take the necessary action to firm up a satisfactory date for the meeting with all those concerned.

(SIGNED)

W. Mikell

cc:

Director, w/c of inc.  
Chief, EODC (2), w/c of inc.



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
NATIONAL PARK SERVICE

Great Smoky Mountains National Park  
Gatlinburg, Tennessee 37738

Y REFER TO:

L54

August 23, 1965

Memorandum

To: Regional Director, Southeast Region  
From: Superintendent, Great Smoky Mountains  
Subject: Water Resources Investigations, Great Smoky Mountains  
National Park

| SOUTHEAST REGION        |    |
|-------------------------|----|
| AUG 26 1965             |    |
| Regional Director       |    |
| Asst. Reg. Dir. (A)     | 26 |
| Asst. Reg. Dir. (CA)    |    |
| Asst. to Reg. Dir. (PA) |    |
| Asst. to Reg. Dir. (DI) |    |
| Resource Studies        |    |

*X* *Land & Water*  
*Main*

Over the past couple of years, continued increases in demands on the numerous surface water supplies have gradually developed into a problem that needs immediate attention. While it is recognized that in the past we have shown little or no interest in water resources investigations, it now appears that well supplies may not only be a desirability but a necessity. During periods of prolonged drouth such as we are now experiencing in the Park, the surface supplies diminish to the point of nearly drying up, and supplemental supplies of low quality water are heavily treated and pumped into the supply lines.

During USPHS Engineer Henderson's recent trip to the Park, we had occasion to closely observe several of our major supplies. For example, we found that the Ash Hopper Branch gravity supply that ordinarily supplies headquarters was providing 19 gallons per minute (actual meter readings) over a period of a week. The consumption at this time was metered at 35,000 to 37,000 gallons per day and so, needless to say, we had to pump a supplemental supply out of a branch of Fighting Creek which runs through the residential area. We actually were only able to obtain a maximum of 15 gallons per minute from this supply. Incidentally, this creek pumping station is only a couple of hundred feet from the first domestic user and less than 1,000 feet from our major development area which definitely does not allow the desired chlorine retention time for safe water treatment. Also, when you realize that our actual usage exceeded an average of 25 gallons per minute and all available water in the system amounted to 34 gallons per minute, it is easy to see there is little margin for any emergency whether it be a leak in the line, any type of fire drawdown or allowance for any consideration of lawn sprinkling. If either of these supplies decrease further, we do have several alternatives in order to retain a minimum supply on hand.

By metering, we have determined that we are wasting 13,000 gallons per day through our Visitor Center dehumidifier system. This is quite a luxury and one that needs some study as to the possibility of re-circulation of this water. If our present supply should decrease any further, we would of course have to shut down the dehumidifier system which would have rather detrimental effects on artifacts storage as well as causing the Visitor Center to be rather uncomfortable.

Further checks on other major supplies in the Park showed similar conditions but none as critical as that that exists in the Headquarters area. If at all possible, and if it can be worked into your Water Resources Investigation program as an emergency measure, we would like to suggest the programming of an exploratory well for this fall. While we have little information on the characteristics of wells in this area, Mr. Henderson felt that a well programmed for 100-foot depth with rotary drill method (possible heavy river boulder sub-surface) should provide a plentiful supply for the area. On this basis, it appears that funds in the construction amount of \$2,500 would be needed to drill, case and test the well.

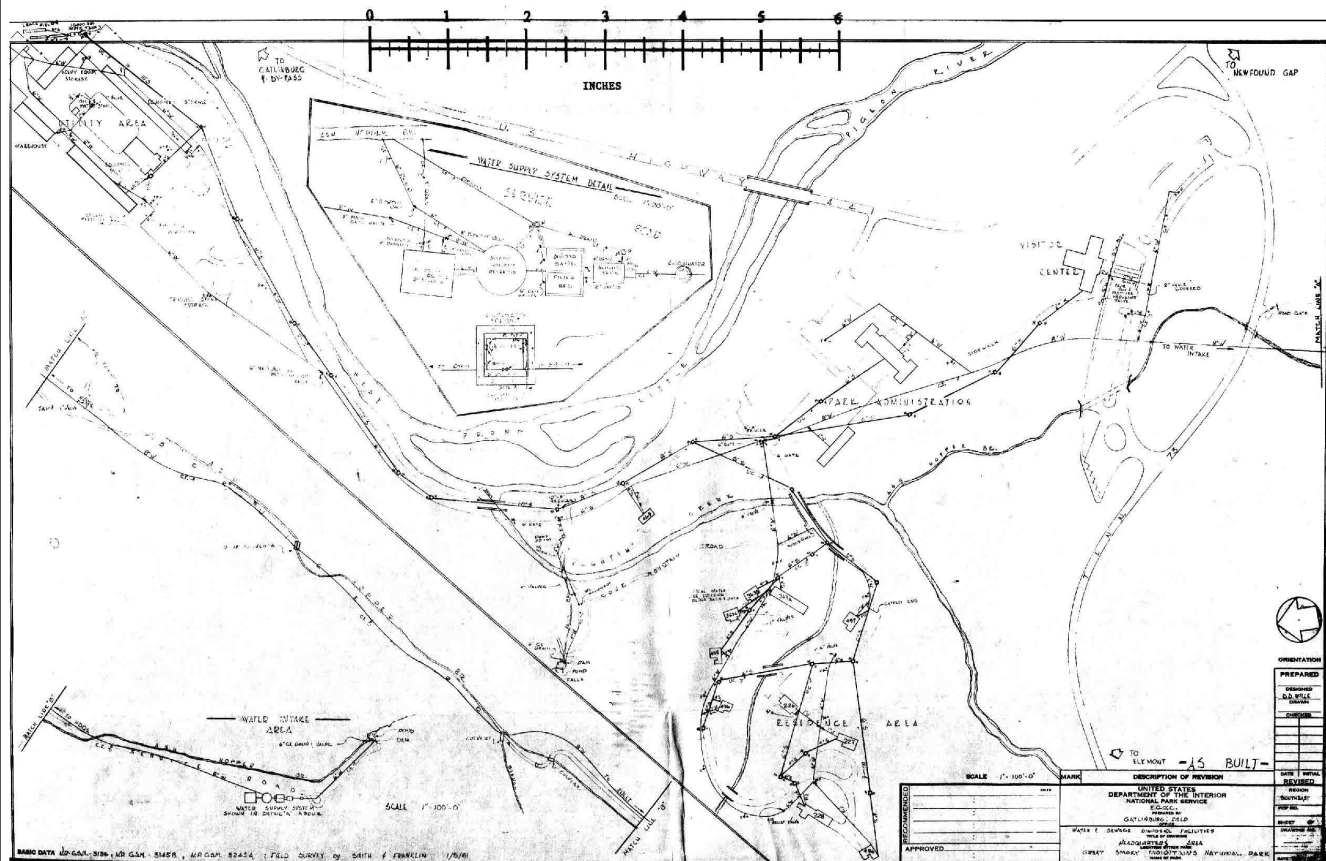
In an August 19 telephone conversation between Hydraulic Engineer Vick of your office and Chief of Maintenance Rowe, Mr. Vick had mentioned that he had put an over-ceiling item in his 1966 F.Y. Water Resources budget in the amount of \$24,000 to initiate a study of Park domestic water supply needs. We support this program whole-heartedly and hope that a necessary field inspection involving personnel from the USGS, the Regional Office, and the Park can be set up for the month of November. | |

As suggested to Mr. Vick in the abovementioned telephone call, the following listing is a tentative priority list of well investigations which we would like to see programmed:

1. Headquarters -- As soon as possible.
2. Green Mountain Picnic Area, Foothills Parkway -- 1967 F.Y.
3. Cades Cove -- 1967 F.Y.
4. Cataloochee -- 1967 F.Y.
5. Rocky Mountain -- 1967 F.Y.
6. Chilhowee, Foothills Parkway -- 1968 F.Y.

7. Cades Cove -- 1968 F.Y.
8. Deep Creek -- 1968 F.Y.
9. Smokemont -- 1968 F.Y.
10. Chimneys -- 1969 F.Y.
11. Elkmont -- 1969 F.Y.
12. Cosby -- 1969 F.Y.
13. Webb Mountain, Foothills Parkway -- 1969 F.Y.

  
George W. Fry



### Docket Information

Number of Documents in Docket 37

Documents Dated from 8/23/1965 to 9/28/1967

Docket Compiled: 3/30/2011