



WATER-RIGHT DOCKET

Great Smoky Mountains National Park

Docket No: 5

CHESTNUT BRANCH, BIG CREEK, RANGER STATION

Preliminary Docket Information

00-00-0000: see great smoky mountain docket no. 1 for map and preliminary map showing locations of water sources within the p

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

WATER RIGHTS DOCKET
Big Creek Ranger Station
Great Smoky Mountains National Park

Supporting Hydro Data

27.

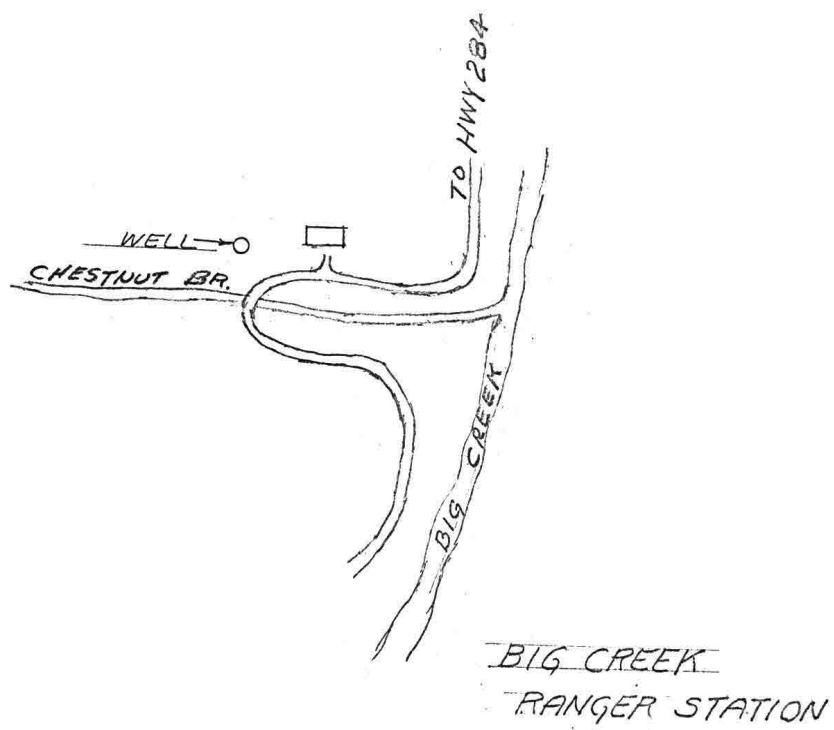
BIG CREEK RANGER STATION

Situation: This isolated area consists of a primitive campground and a ranger residence. The present water supply involves an open stream resulting in an expensive operation to maintain quality water.

Proposed: A deep well is needed and an estimate capacity of 10 g.p.m. would be adequate.

Progress to Date: This project is programmed for 1969 F.Y.

(09/28/67)



Drilling of Wells at Big Creek, Great Smoky Mountains National Park

The Big Creek facility, Great Smoky Mountains National Park, consists of a ranger's residence and primitive campground. A ground-water supply is desired for the residence and for the campground. An earlier effort in October, 1968, was unsuccessful in obtaining water at the campground (well 1, fig. 1).

A well was drilled at the residence Dec. 6-11, 1971, at a site about 50 ft SE of the house, in the only space accessible to the drill rig (well 2, fig. 1). Drilling was done by W. C. Smith, Parrottsville, Tenn., using an air rotary rig and a 6½-inch bit.

Overburden at this site consists of alluvial boulders, gravel, sand, and silt. The material is saturated between 24 and 53 ft and very unstable. A particularly difficult water-bearing gravel layer between 47 and 53 ft was finally cased off by driving extra-heavy 6½-inch casing. Below this gravel zone is a layer of impermeable silty clay, at 53-58 ft, which lies on top of bedrock. This material was so dry that it was ejected as dust during drilling. Closure of this material about the casing, which is seated at 60 ft, effectively sealed off the overlying water and no water entered the hole until at a depth of 100 ft a small water-bearing fracture was penetrated which yielded about 4 gpm. Bedrock at this site is medium blue-gray fine-grained siltstone of the Pigeon Siltstone. Another small water-bearing fracture at 120 ft yielded an additional 4 gpm. Drilling was stopped at 190 ft without penetrating other fracture openings. After blowing with air in order to clean the well, yield was about 10 gpm, more than adequate to supply the residence.

Because of the instability of the alluvial material the hole would not remain open to receive grout. Pulling the casing to re-ream would have resulted in hole collapse. It was evident that the casing was sealed by the clay zone. The casing is cement grouted to a depth of three feet to exclude surface drainage.

The well is located about 100 ft south of the septic field and about 15 ft higher in elevation. The natural water-table gradient should be about perpendicular to a line between well and septic field. Domestic use of this well is not expected to disrupt the gradient sufficiently to cause movement of the waste water toward the well but an extended period of pumpage could cause migration toward and into the well. For this reason it was decided not to run a pumping test. This well will yield 10 gpm. It is recommended that a 5- to 7- gpm pump be installed with the intake at a depth of about 120 ft. Static water level on Dec. 14, 1971, was 37 ft below ground surface. In order to preclude the possibility of contamination the well should not be pumped continuously for more than 2 hours, especially in the dry period of the year.

Well no. 3: Because 210 ft of drilling remained available under the contract it was decided to attempt another well near the campground. A site with no surface boulders was selected about 1000 ft NE of the campground entrance road and 100 ft SW of Leatherwood Branch. Drilling was done Dec. 11-14, 1971.

This well, located in the outcrop area of the lower part of the Rich Butt Sandstone, penetrates 45 ft of stable dry weathered material, and 47 ft of casing was grouted in. Bedrock is dark gray very fine-grained siltstone. Water-bearing fractures were penetrated at 90 ft (4 gpm) and at 205 (5+ gpm). Drilling was stopped at 210 ft and yield was measured at about 12 gpm after blowing for several minutes. Since the main water-bearing opening is at 205 ft it was considered desirable to attempt to gain additional water by drilling to 250 ft. The driller agreed to exchange 40 ft of drilling (total value \$140 under the contract) for the 8-hour pumping test (total price \$144 under the contract) and approval for the change was obtained from Park Headquarters. Unfortunately no other water-bearing openings were penetrated in drilling to 250 ft. After completion the well was blown until the water cleared and yield was measured at 11 gpm. This well will yield up to 10 gpm continuously. Static water level on Dec. 14 1971, was 45 ft below land surface. It is suggested that a 10-gpm pump be installed with the intake at about 210 ft, if this well yield is sufficient for service to the campground.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER ANALYSIS

2GW

Location Big Creek Campground near Waterville, North Carolina County Haywood
 Source Drilled well No. 3 Depth (ft) 250 Diam (in.)
 Cased to (ft) Date drilled Dec. 1971 Point of coll. 10' below water surface
 Owner National Park Service
 Treatment Use Public supply
 WBF WL Yield 10 gpm
 Temp (°F) 12.8 Appear. when coll. Clear, but with rust from casing
 Collected 1-12-72 By McMaster
 Remarks Water level 43.5 ft. below top of casing

	mg/l	mc/l		mg/l	mc/l
Silica (SiO ₂)	11		Bicarbonate (HCO ₃)	34	0.56
Aluminum (Al)			Carbonate (CO ₃)	0	.00
Iron (Fe)					
Manganese (Mn)	.02		Sulfate (SO ₄)	3.0	.06
			Chloride (Cl)	1.6	.04
			Fluoride (F)	.2	.01
Calcium (Ca)	7.8	0.39			
Magnesium (Mg)	1.1	.09	Nitrate (NO ₃)	.1	.00
Sodium (Na)	3.9	.17			
Potassium (K)	1.0	.02			
Total		.67	Total		.67

		Specific conductance (micromhos at 25° C)	70
Dissolved solids:		pH	6.5
Calculated	46	Color	7
Residue on evaporation at 180° C	51		
Hardness as CaCO ₃	24		
Noncarbonate	0		
Total alkalinity as CaCO ₃	28		

Lab. No. 42381

Field No.

Project

Summary of items, Big Creek wells, Dec. 6-14, 1971

Item 1	Well 2	190 ft
	Well 3	110 ft
	Total	<u>300 ft</u>

Item 2	Well 2	60 ft
	Well 3	47 ft
	Total	<u>107 ft</u>

Item 4 (drilling 40 ft in lieu of 8 hr pumping test)	40 ft
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Item 5	Well 2	4 hr
	Well 3	4 hr
	Total	<u>8 hr</u>

Item 8	Well 3	100 ft
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Total drilling (6½-in)	440 ft.
Total casing	107 ft
Total surging and developing	8 hr

This is to verify that I have agreed to drill a total of 440 ft at the Big Creek area, Great Smoky Mountains National Park, for \$1544.00. This represents a total of 400 ft of drilling at the contract price of \$3.50 per foot plus an additional 40 feet of drilling at a price of \$3.60 per foot. The additional 40 feet of drilling was done in lieu of an 8-hr pumping test (contract price \$18 per hour). Contract items other than drilling (items 1 and 8) and test pumping (item 4) are not affected by this agreement.

W. C. Smith, Owner
W. C. Smith Well Drilling Co.

W. C. Smith

Big Creek

As a part of the cooperative program between the U. S. National Park Service and the U. S. Geological Survey, a well site was selected in October 1968 near the seasonal ranger's residence at Big Creek area.

The Big Creek area consists of one residence, occupied seasonally by the ranger, and a picnic area and primitive campground about a mile south of the ranger's residence. The source of the existing water supply is the Chestnut Branch of Big Creek near the ranger's residence. Since the National Park Service plans to expand the picnic area and campground, a well site was selected near the picnic area, rather than the site near the seasonal ranger's residence which was described as the preferred site in our letter of October 17, 1968. The Park Service estimated that a minimum of ²⁵~~10~~ gpm are required to meet their future needs.

A well was drilled in November 1968 at the site (fig. 5.1) which is in the vicinity of an abandoned CCC Camp. The well is about 85 feet from the only remaining building--a black frame building labeled "Fire Cache"--about 0.15 mile north of the picnic area, and about one mile southwest of North Carolina Highway No. 284, and near Park Route No. 27.

The well site is on a stream terrace, about 275 feet west of Big Creek at an altitude of about 1,720 feet above mean sea level. The well site is about 25 feet above the creek bed.

(From Waterville, N. C. Quadrangle)

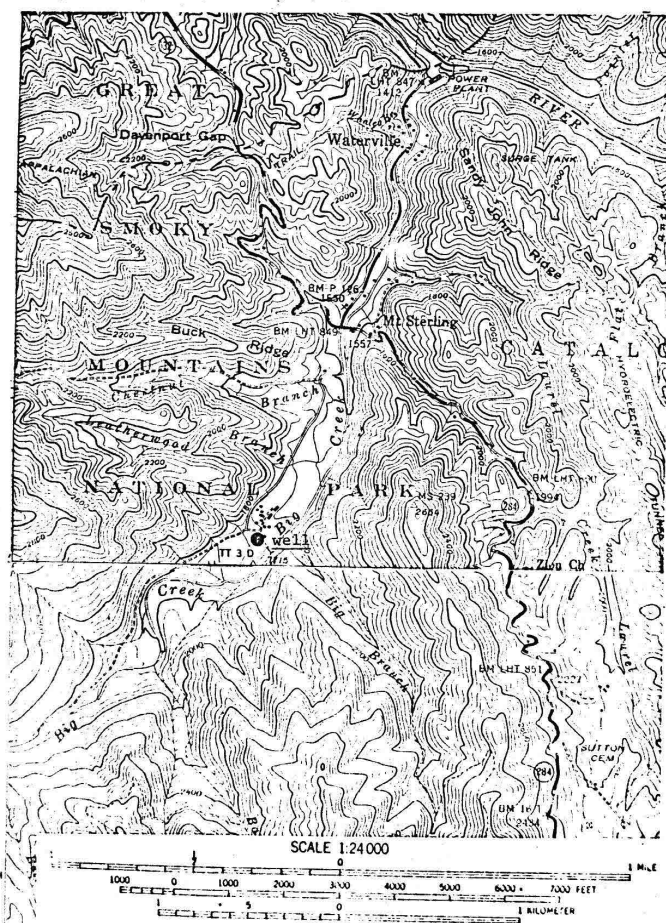
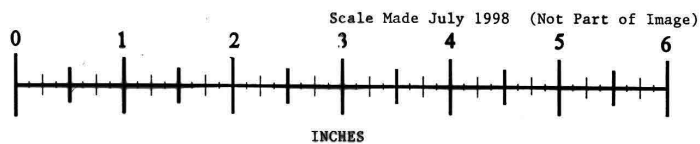


Figure 5.1.--Location of well at Big Creek.

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The Big Creek area is underlain by alluvium. Underlying the alluvium are rocks of the Rich Butt Sandstone of the Ocoee Series. The Rich Butt Sandstone consists mainly of light-colored feldspathic sandstone interbedded with contrasting silty or argillaceous units. Ground water moves in fractures in the rocks, and the potential yield of ground water is related to the number and sizes of the interconnected fractures.

A six-inch well was drilled, using an air-percussion type rotary drill, to a depth of 151 feet on November 25-26, 1968. A log of the well follows:

<u>Depth</u>	<u>Description</u>
0 - 19 feet	Alluvium. Boulder at 12-18 feet, coarse gravel at 19 feet.
19 - 40	Medium-grained, gray sandstone. Set 25 feet casing.
40 - 60	Fine- to Medium-grained gray sandstone. Trace of water.
60 - 80	Hard, gray feldspathic sandstone.
80 - 90	Phyllite and dark gray shale.
90 - 110	Dark gray, fine-grained sandstone.
110 - 120	Gneiss.
120 - 151	Hard phyllite. Yield 1 gpm.

Because of the low yield, this well was filled and abandoned.

NAME OF SYSTEM: Big Creek Ranger StationLOCATION: Park Route 27, About 0.25
miles from N.C. 284LOCATION: STATE: North Carolina COUNTY: HaywoodA. Source of SupplyLocation - Reference to Permanent LandmarkCoordinates

1. Chestnut Branch

Intake located approximately 1,300' upstream
Chestnut Branch from the intersection with
Big Creek.Lat. N 35°45'32"
Long. W 83°06'27"

This is a gravity flow system with loose rock dam (across stream bed) providing
impoundment. Water is stored in a 500 gallon block masonry reservoir. No
treatment is provided; this system serves a single seasonal ranger residence,
Quarters Number 2.

B. Consumption:

The system is not metered, but the consumption is estimated at 50,000 gallons per year.

C. Distribution Mains and Laterals:

<u>Size</u>	<u>Type</u>	<u>Length</u>
2"	Galvanized Iron	214 Lineal Feet
1"	Galvanized Iron	420 Lineal Feet
	TOTAL	634 Lineal Feet

D. Problems:

This is a low standard system serving a substandard house. Eventually both the system and house will be demolished, when we initiate development of the Big Creek Campground Area.

E. Proposed:

While in no current construction program, the ultimate development for this area will involve a 120-site campground, a 40-site picnic area, a ranger residence (replacing Quarters No. 2 but located in campground area) and a 3-unit seasonal apartment.

A six-inch well was drilled in the area in November 1968. The well was drilled to a depth of 151 feet, but no appreciable amount of water was found. The casing was pulled; the hole filled; and the well abandoned. Before ultimate development of the area, an additional water resources study (another well investigation) will probably be desirable. This area development is of low priority, and it may be many years before it is constructed. If an acceptable well is obtained, this supply will also eliminate the system now serving seasonal Quarters No. 2. A 25 gallon per minute well will be required.

Expected Usages

Maximum daily consumption -----12,500 gallons

Annual consumption ----- 1,500,000 gallons

(Big Creek Ranger Station - Addendum No. 1)



INTAKE STRUCTURE
THIS INTAKE PIPE CAN BE SEEN AS THE DARK LINE IN
CENTER OF PICTURE



500 GALLON RESERVOIR

Other Supporting Information

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
13. 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



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 6-7, 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.

775-7-17-65-

L54 SER (OLW)

SEP 14 1965

[Handwritten signature]
ERC
9/17
WRR

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

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. (D)	
Resource Studies Act.	

X *East Water*
Main

Memorandum

To: Regional Director, Southeast Region

From: Superintendent, Great Smoky Mountains *East Side*

Subject: Water Resources Investigations, Great Smoky Mountains National Park

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.

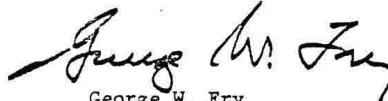
Further checks on other major supplies in the Park showed similar conditions but none as critical as that that exists in the Headquarters area. If at all possible, and if it can be worked into your Water Resources Investigation program as an emergency measure, we would like to suggest the programming 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.

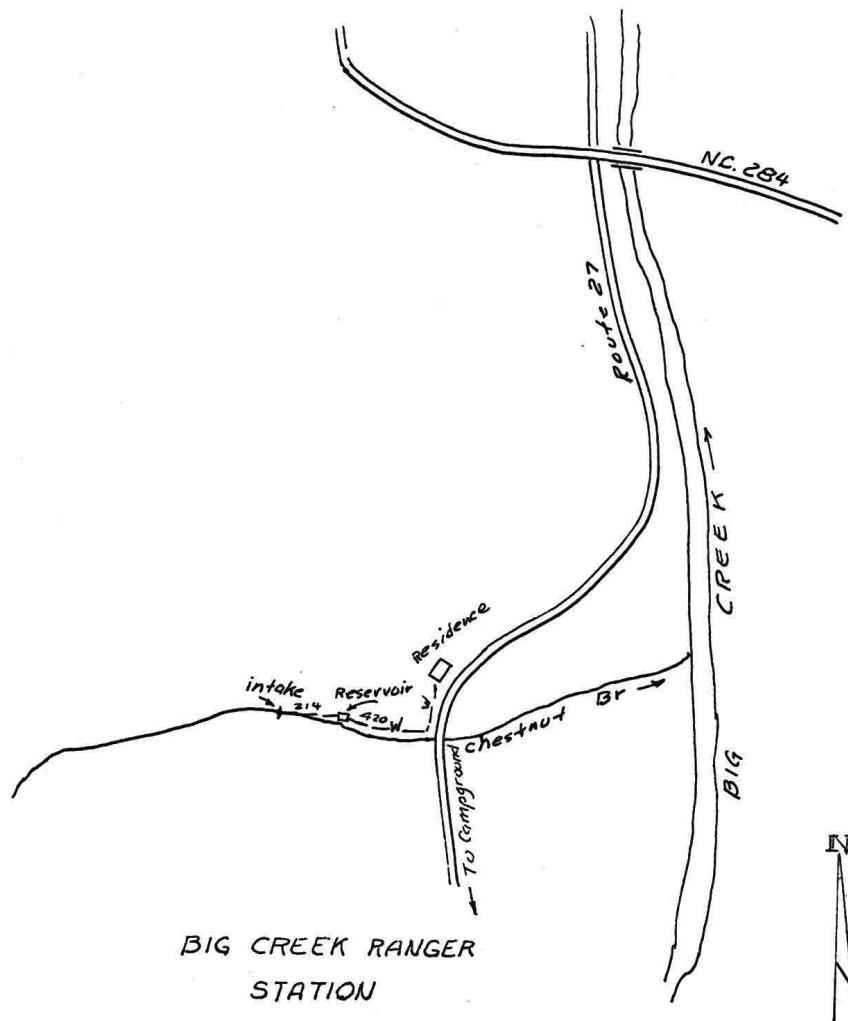
In an August 19 telephone conversation between Hydraulic Engineer Vick of your office and Chief of Maintenance Rowe, Mr. Vick had mentioned that he had put an over-ceiling item in his 1966 F.Y. Water Resources budget in the amount of \$24,000 to initiate a study of Park domestic water supply needs. We 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 26

Documents Dated from 8/23/1965 to 9/14/1967

Docket Compiled: 3/29/2011