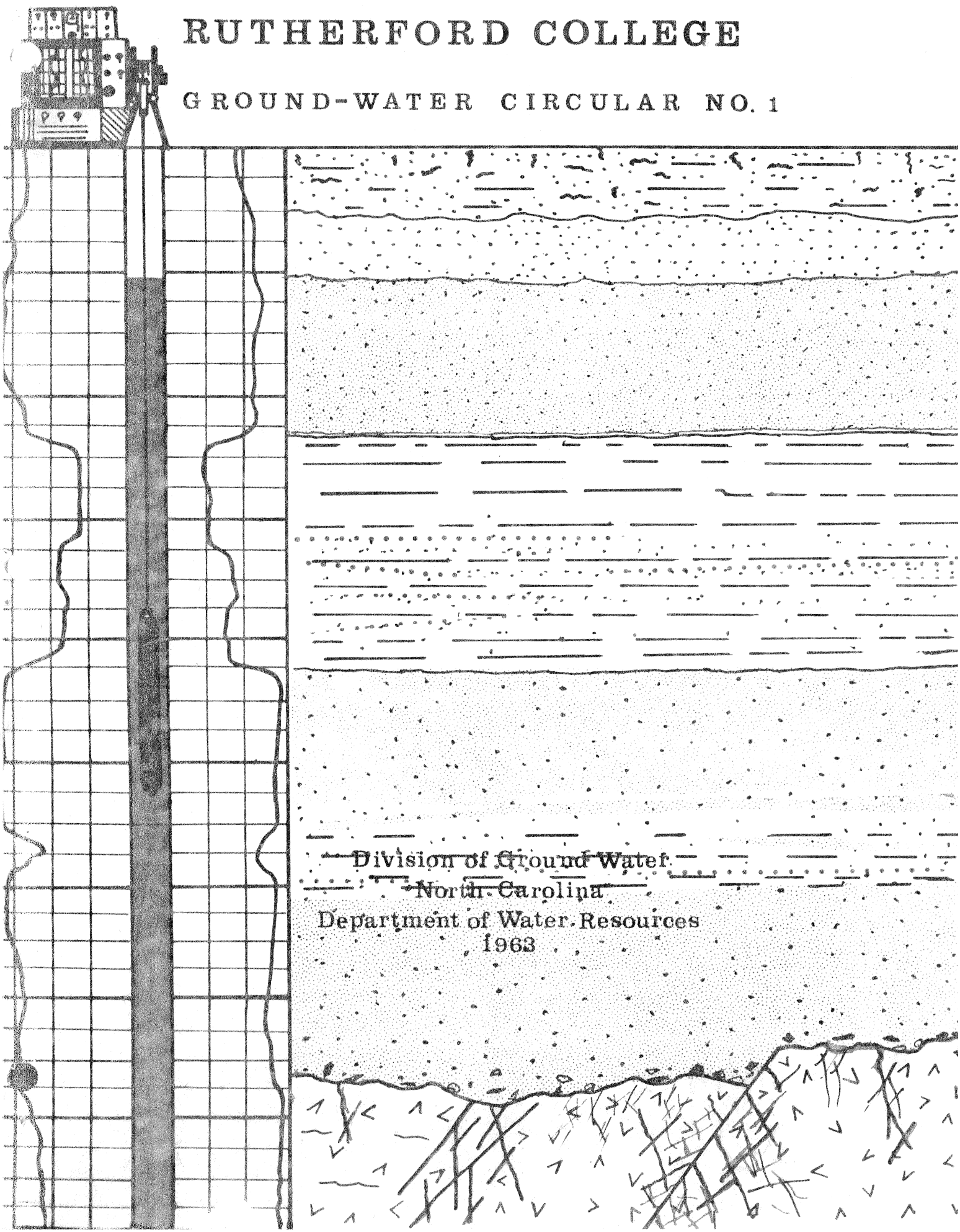
GROUND-WATER CONDITIONS AT RUTHERFORD COLLEGE

GROUND-WATER CIRCULAR NO. 1



Division of Ground Water
North Carolina
Department of Water Resources
1963

NORTH CAROLINA

BOARD OF WATER RESOURCES

J. R. TOWNSEND, Chairman - DURHAM

DAN K. MOORE, Chairman Pro Tempore - CANTON

GLENN M. TUCKER, Secretary- CAROLINA BEACH

P. D. DAVIS - DURHAM

WAYNE MABRY - ALBEMARLE

C. H. PRUDEN, JR. - WINDSOR

S. VERNON STEVENS, JR. - BROADWAY

* * * * * * * * * *

CONTENTS

ILLUSTRATIONS

TABLES

GROUND-WATER CONDITIONS AT RUTHERFORD COLLEGE, NORTH CAROLINA

by WILLIAM E. BRIGHT

INTRODUCTION

The Rutherford College Water Committee, realizing that the future of Rutherford College depends largely on an adequate water supply and that it is a basic necessity for attracting industry, requested the Division of Ground Water provide them with information on the availability and quality of ground-water in the area as a possible source of supply. Based on this request, a brief, generalized investigation of the geology and ground-water resources of the Rutherford College area (fig. 1) was made during the spring of 1963 by the Author.

The purpose of this investigation was to appraise the ground-water resources of the Rutherford College area, with special reference to the possibility of obtaining an adequate water supply from wells for municipal, industrial and other purposes.

This report is designed to summarize the results of the investigation relative to quality, quantity, availability, and development of a ground-water supply. Further, the results of this survey have made it possible to offer recommendation that may be helpful in the development of future ground-water supplies.

GENERAL HYDROLOGIC SETTING

The area described in this report lies within the Piedmont Province and, in general, the topography is characterized largely by low rounded hills, with moderate to gentle slopes and draws that are deep and broad. The total relief is about 240 feet, with elevations ranging from about 1,240 feet above sea level at Rutherford College to about 1,000 feet above sea level along the Catawba River. The area is located in the Catawba River Basin and is drained by Island, Micol and Hoyle Creeks which flow northward and empty into the Catawba River.

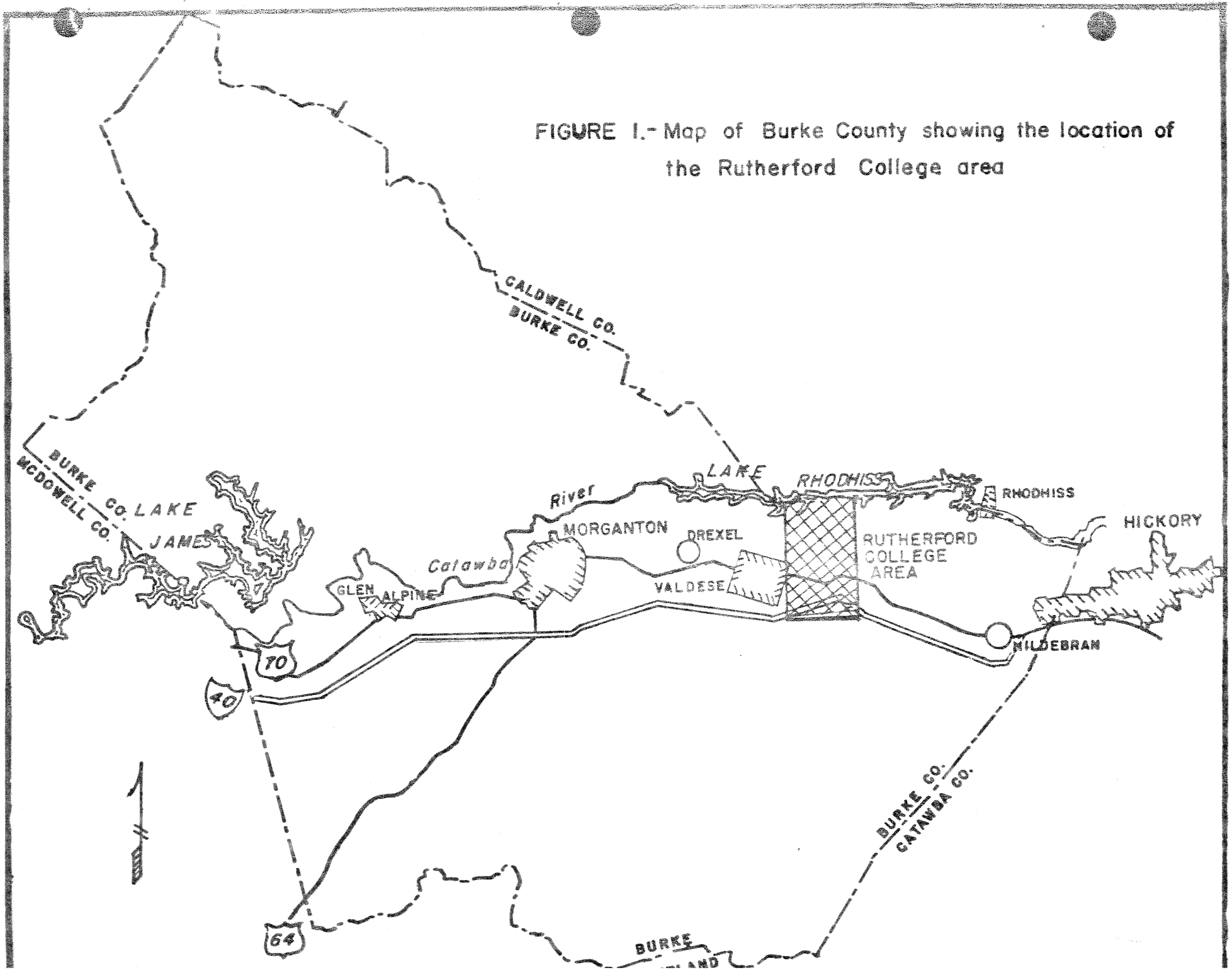


FIGURE 1.- Map of Burke County showing the location of the Rutherford College area

The average yearly precipitation at three U. S. Weather Bureau stations in the area, Hickory, Lenoir and Morganton is about 48 inches. Table I shows the general monthly distribution of precipitation at the three stations.

The average mean annual temperature for these three stations is about 59° F. December with an average mean temperature of 41.8° F is the coldest month and July with an average mean of 77.5° F is the warmest month.

Table I - Mean Monthly and Annual Precipitation in inches

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Aver. Annual
Hickory	4.22	3.75	4.86	3.35	3.58	3.64	5.00	5.83	3.27	3.25	3.14	4.12	48.01
Lenoir	4.01	3.79	4.77	3.67	3.79	4.40	4.86	5.93	3.24	3.46	2.91	3.76	48.59
Morganton	4.40	3.69	4.99	3.49	3.51	3.57	5.42	5.73	3.95	3.42	3.07	4.19	49.43

As in most of the Piedmont Region of the State, the geology of the Rutherford College area is complex, and many types of crystalline rocks are present--both metamorphic and igneous. However, the rocks may be generally divided into a mica schist unit and a hornblende gneiss unit, as shown in figure 2. The mica schist unit consists predominantly of a foliated mica schist interlayered with bands of gneiss and other rock types. The hornblende gneiss unit is predominantly hornblende gneiss interlayered with bands of schist and other types of rocks. Information from wells drilled in the area indicate that the subsurface extent of the hornblende gneiss is greater than the outcrop area.

These formations have been fractured to a considerable degree by various geologic processes, which, in addition to their general foliated and schistose structure, has resulted in the formation of a layer of residual soil and weathered rock a few feet to several tens of feet thick over most of the area.

GROUND-WATER OCCURRENCE AND AVAILABILITY

In the Rutherford College area, ground-water occurs both in the zone of soil and weathered rock and in the weathered bedrock. In the zone of soil and weathered rock, the ground-water reservoir consists of the space between the individual mineral grains and rock fragments. This reservoir

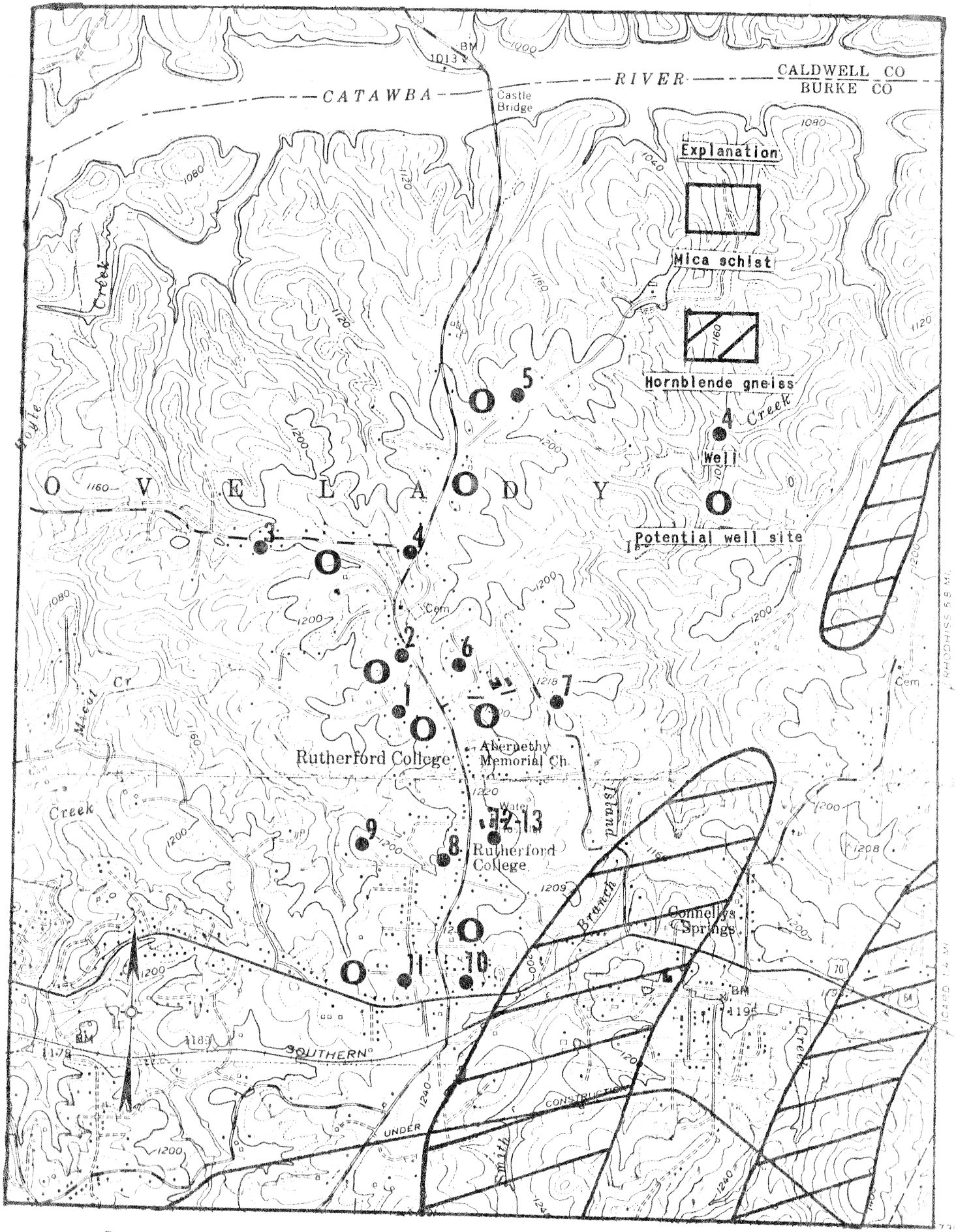


Figure 2.
Map showing geology, well locations and potential drilling sites in the Rutherford College area.

is not generally of sufficient thickness and is not permeable enough to yield large quantities of water to individual wells, but may be adequate as a source of domestic supplies. Many dug, bored and drilled wells yield water from this reservoir, which also serves to recharge the underlying bedrock reservoir.

In the crystalline bedrock, consisting principally of gneiss and schist, water occurs in the structural openings such as joints, faults, planes of schistosity and similar fractures. Thus, the amount of water available from the reservoir generally depends on the number, size and interconnection of the fractures. The rock fractures generally decrease with depth, so that most of the water in the bedrock reservoir occurs in a zone that extends only a few hundred feet beneath the land surface.

Available well records indicate that at least moderate quantities of water can be obtained almost everywhere. Most of the wells in the vicinity are for domestic purposes and many tap only the reservoir in the weathered rock zone. These wells generally yield adequate supplies except during times of extreme drought when the water table declines to depths at or below the depth of the shallow wells. Most domestic wells constructed during recent years have been drilled into the bedrock reservoir, and good yields have been obtained although sites were selected for convenience with little emphasis placed on selecting sites most favorable for large yields. It was not possible to measure maximum yields of domestic wells, however the range is reflected in Table II.

The only large supply of water required at the present time in the area is that for the Valdese General Hospital, where an adequate quantity is obtained from two wells, Nos. 12 and 13 in Table II. If pumped at near maximum capacity, these wells would be adequate for current municipal needs including present hospital requirements.

TABLE II - Record of Wells - Rutherford College

Well No.	Owner	Topography	Depth Feet	Casing Diam. (in.)	Yield gpm	Static Water Level (ft)	Remarks
1	George Turner	Hill	145	6	-	-	Good Supply
2	Ensa Bright	Hill	142	6	5	32	
3	Jim Whisnant	Hill	-	6	15	-	
4	Charlie McDaniel	Hill	60	36	-	27	Dug Well

TABLE II (Continued)

Well No.	Owner	Topography	Depth Feet	Casing Diam. (in.)	Yield gpm	Static Water Level (ft)	Remarks
5	Howard Barlowe	Hill	176	6	30	-	
6	James Rabbit	Hill	90	6	-	-	Good Yield
7	W.F. Hallyburton	Hill	107	6	30	22	
8	V.O. Bravard	Hill	71	6	25	-	
9	S.G. Griffin	Hill	150	6	50?	25	Excel. Yield
10	Everett Cockrell	Hill	176	6	-	-	Good Yield
11	William Turnmire	Hill	171	6	-	-	
12	Valdese Gen. Hosp.	Draw	400	8	171	35	Very Good Well
13	Valdese Gen. Hosp.	Draw	405	6	55	27	Good Well

SELECTION OF WELL SITES

The topography in perhaps many places in the Piedmont Province is controlled by the geologic structure, thus, interpretation of structure by topographic features can be an aid in selecting favorable water well sites. For example, draws or valleys generally indicate areas where fracturing and jointing are greatest and where wells yields are usually highest. The layer of residual soil and weathered rock is generally thicker in draws and valleys and serves as a reservoir to supply water to the fractured bedrock. Also, the direction of movement of ground water is normally towards the draws and valleys and away from hills.

In the Rutherford College area, the rocks appear to be jointed and fratured and many well developed draws, capable of producing moderate yields, are present. Several draws selected as a part of this investigation that would serve as potential drilling sites are shown in Figure 2.

GROUND-WATER QUALITY

Analyses of water samples collected from wells at Rutherford College are shown in Table III. These samples indicate that the ground water in the area is generally low in total dissolved mineral content and suitable for most purposes without treatment.

Most of the samples analyzed showed an iron content ranging from 0.05 parts per million to 0.5 parts per million. A few of the samples contained

relatively high concentrations of iron, however. The relatively high iron content of water from these wells may reflect local differences in the mineral constituents of the reservoir rock. For example, hornblende gneiss, a rock containing some iron may be the source of waters with a relatively high iron content.

The ground water, in general, is soft and slightly acid on the ph scale. These partial analyses indicate that water supplies of good quality can be obtained from wells that are developed in the most favorable sites.

TABLE III - Analysis of Ground Water From Rutherford College

Well No.	1	2	3	4	5	6
Iron (Fe)	0.05	0.25	0.20	0.10	0.45	0.20
Hardness ($CaCO_3$)	34	50	34	50	10	10
Specific Conductance	60	90	70	115	50	50
Chlorides	20	10	10	20	10	15
ph	6.9	7.1	5.9	6.8	5.6	6.3

TABLE III - (Continued)

Well No.	7	8	9	10	11	12
Iron (Fe)	4.0	0.2	1.5	2.6	3.1	0.05
Hardness ($CaCO_3$)	34	10	34	10	34	49
Specific Conductance	75	50	105	75	90	130
Chlorides	20	15	15	20	20	
ph	6.4	6.6	7.1	6.5	6.7	7.1

Expressed in Parts Per Million (ppm)

WATER REQUIREMENTS

Rutherford College has a population of about 1,000 people which obtain their water supply from individual wells. Based on estimated daily water requirements of about 75 gallons per capita, ground water withdrawal for municipal supply would amount to about 75,000 gallons per day. The water requirements at the Valdese General Hospital is estimated to be about 50,000 gallons per day, thus the total requirement

for both municipal and hospital consumption is about 125,000 gallons per day. Several existing wells as shown in Table II, if utilized properly, would supply more than enough water to satisfy current demands.

The relatively large number of potential well sites indicate that considerable quantities of water could be obtained for expansion of the municipal system or for individual industrial supplies. Individual wells in the Piedmont do not generally yield large quantities of water and ground water would not generally be adequate for industries using large quantities of water. However, ground-water supplies for a considerable number of industries using small to moderate (25,000 - 100,000) quantities could probably be developed without difficulty if wells are drilled at the most favorable sites.

Expansion of the municipal system could be accomplished by adding wells as needed for additional supplies for domestic, industrial and other purposes. However, it may be more practical and desirable to develop individual supplies in some cases rather than supply industrial water through the municipal system.

SUMMARY AND CONCLUSION

A brief investigation of ground-water conditions at Rutherford College indicates that a water supply of satisfactory quantity and quality to meet the requirements of the community can be obtained from wells. Current requirements for domestic and hospital use, estimated at about 125,000 gallons a day can be obtained from existing wells if planned and managed properly.

The area contains many favorable sites for potential wells that will probably yield at least moderate and perhaps relatively large quantities of water for expansion of a municipal system or development of individual industrial supplies. As in most of the Piedmont and Mountain Regions, large yields from individual wells should not be expected. However, adequate quantities of water for a considerable number of industries requiring 25,000 to 100,000 gallons a day can probably be obtained without difficulty. As a part of the investigation, several of the more favorable drilling sites were selected. The specific quantity of water available at these sites can be determined only by drilling test wells.

REFERENCES

LeGrand, H. E., 1954, Geology and Ground Water in the Statesville Area, North Carolina: North Carolina Department Conservation and Development Bulletin 68.

Geologic Map of North Carolina, 1958: North Carolina Department Conservation and Development.

Base Map reproduced from the Drexel and Valdese, North Carolina 7.5 Minute Quadrangles, 1947: U. S. Geologic Survey.