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Site Name (Subject):	SPRUANCE SOUTHERN, INC.
Site ID (Document ID):	NCD003214574
Document Name (DocType):	Preliminary Assessment/Site Inspection (PA/SI)
Report Segment:	
Description:	FIT Screening Site Investigation
Date of Document:	2/11/1991
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Access Level:	PUBLIC
Division:	WASTE MANAGEMENT
Section:	SUPERFUND
Program (Document Group):	SERB (SERB)
Document Category:	FACILITY

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

FEB 11 1991

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MAR 19 1991
SUPERFUND SECTION

FIT

4WD-WPB

Mrs. Pat DeRosa, Head
CERCLA Branch
Superfund Section
Waste Management Division
North Carolina Department of Environment,
Health and Natural Resources
P.O. Box 27687
Raleigh, North Carolina 27611-7687

Dear Ms. DeRosa:

Enclosed for your files is the Phase I, Screening Site Inspection report prepared by the Region IV Field Investigation Team, NUS Corporation for Spruance Southern, Inc (NCD003214574). The EPA recommends that no further remedial action be planned at this site under Superfund at this time. However, if new information becomes available, this decision may be revisited as appropriate.

If you have any question regarding this site, please contact me at (404) 347-5065.

Sincerely yours,

Deborah A. Vaughn-Wright

Deborah A. Vaughn-Wright
Project Manager

Enclosure

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NUS CORPORATION
1927 LAKESIDE PARKWAY
SUITE 614
TUCKER, GEORGIA 30084
404-938-7710

CERCLA

C-586-1-1-43

2-28-91
NFRAP
D. Vaughn-Wright

January 31, 1991

Mr. A.R. Hanke
Waste Programs Branch
Waste Management Division
Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30365

SISB/SAS
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EPA - REGION IV
ATLANTA, GA

Subject: Screening Site Inspection, Phase I
Spruance Southern, Incorporated
Winston-Salem, Davidson County, North Carolina
EPA ID No. NCD003214574
TDD No. F4-9001-136
Revision 0

Dear Mr. Hanke:

FIT 4 was tasked to conduct a Screening Site Inspection, Phase I, of Spruance Southern, Incorporated in Winston-Salem, Davidson County, North Carolina. Phase I included a comprehensive review of EPA and state file material, a drive-by facility reconnaissance, and a target survey to determine the population potentially affected.

Spruance Southern, Incorporated, is a 3.5 acre facility located on U.S. Highway 52, 1.7 miles north of the town of Midway in Winston-Salem, Davidson County, North Carolina (Refs. 1, 2). Spruance Southern began operations in 1953 as a manufacturer of coatings such as paints, furniture sealers, and lacquers for the furniture industry. Paint production at the facility was discontinued in 1979 (Refs. 1, 3). Prior to 1953, Salem Paint Company occupied the property for about 20 years (Ref. 1).

The facility is located on the outskirts of Winston-Salem and covers approximately 3 acres of sparsely wooded land. A drum storage area is located on the north side of the building along with a 300-gallon storage vat. On the east side of the property are seven storage tanks situated above ground. There are approximately 50 drums on the ground that appear to be in satisfactory condition. No identification of their contents is known (Ref. 4). The front side of Spruance faces west where there is a parking area that extends to the south side. Spruance is located in a suburban area and is surrounded by residences, with the nearest residence located about 100 feet south (Refs. 2, 4).

Spruance Southern uses the following raw materials in its operations: various pigments, oils, resins, and solvents, including xylene, toluene, and methanol (Ref. 5). Spent nonhalogenated solvents are the hazardous wastes generated which are collected in drums and in an aboveground storage tank (Refs. 1, 6). The spent solvents are first placed in a 300-gallon tank and then transferred to 55-gallon drums which are stacked on asphalt (Refs.1, 3). The drums have been transported to a recycling facility in Jamestown, North Carolina, since 1982 (Refs. 1, 3, 5, 7).

In 1985, a storage vat overflowed causing potential soil and groundwater contamination. A check valve was installed to prevent reoccurrence (Ref. 8). Spruance generated 60,000 pounds of waste solvents in 1988; at the end of the year, more than 16,000 pounds of waste were being stored on site (Ref. 9).

In November 1980, Spruance Southern filed a RCRA Part A application for a hazardous waste storage permit. In the application the facility estimated an annual quantity of approximately 28 tons of waste generated per year (Ref.10). On June 30, 1982, the company requested deletion as a storer, advising that waste solvents were hauled and recycled before the 90-day storage limit (Ref. 7). On July 7, 1982, the request was granted by the North Carolina Division of Health Services (Ref. 11). In March 1984, the company was advised by the state of North Carolina that a RCRA Part B would not be required (Ref. 12). A RCRA inspection in October 1984, revealed rusty containers on site were in violation of regulatory standards. By November 1984, the facility corrected the deficiency and was in compliance (Ref. 1). A compliance inspection in October 1989, determined that Spruance Southern was in violation of several regulations. Since Spruance had not transported hazardous wastes since 1986, its transporter status was cancelled in 1989 (Ref. 6). The facility is currently classified as a generator (Ref. 13).

Davidson County, North Carolina, is located in the Piedmont Physiographic Province and groundwater region of north central North Carolina. This region is characterized by thick regolith over fractured igneous and metamorphic rock (Refs. 14, 15, plate 28; 13, pp. 251, 252). The climate is mild and temperate with an annual net precipitation of 10 inches (Ref.16, pp. 1, 13, 43, 63). One-year, 24-hour rainfall is approximately 3.3 inches (Ref. 17, p. 93). The topography of the area consists of rounded hills and northeast-trending ridges cut by dendritic drainage. Topographic relief near the facility ranges from 690 to 900 feet above mean sea level (Ref. 2).

In Davidson County, the bedrock consists of granites, diorites, gabbros, schists, and both felsic and mafic gneisses (Ref. 18, Figure 2). The source of groundwater in the area is the unconfined fractured soil and crystalline rock aquifer system. Water is contained in the pore spaces of weathered rock and soil and in the joints and fractures of the bedrock. Local water levels in the aquifer are varied (Ref. 14, p. 252). The regolith represents the layer of lowest hydraulic conductivity with values in the 1.0×10^{-7} to 1.0×10^{-5} cm/sec range (Ref. 19, p. 29). Depth to the water table beneath the facility is 30 feet below land surface (bls) (Ref. 20, p. 30). The direction of groundwater flow is toward areas of lower elevation, such as lakes and streams (Ref. 21, p.10). Beneath the facility, this direction is to the northeast (Ref. 2).

Well depths in Davidson County range from less than 100 feet bls to several hundred feet bls. Yields generally range from 2 to 50 gallons per minute (gpm), but some wells can yield more than 100 gpm. Most domestic wells are shallow with low yields (Ref. 21, pp. 62, 64). There are many springs in Davidson County; most yield less than 10 gpm and mostly occur at the heads of steep valleys and in an area where the regolith is relatively thin (Ref. 21, p.12).

A majority of residents within a 4-mile radius of the facility receive their water from the Davidson Water System (Refs. 2, 22). The potable water source for Davidson County is surface water. Davidson Water, Inc. has an intake located 7.2 miles northwest of Spruance Southern, on the Yadkin River

(Refs. 2, 23, 24). The intake is not along the surface water pathway (Ref. 2). The system serves approximately 29,000 connections (Ref. 23). Parts of the Davidson system, which produces an average of 6.5 million gallons per day, extend into portions of Forsyth, Guilford, and Randolph counties (Refs. 23, 25). In addition, approximately 10 residences between 3 and 4 miles of the facility receive water from the Winston-Salem Water System which has an intake in Salem Lake and the Yadkin River (Refs. 2, 26). The intakes are greater than 4 miles from Spruance and are not located along the facility's surface water drainage pathway. The Winston-Salem system serves 72,655 connections (Ref. 26). Those residents not supplied by surface water sources are served by private wells. A topographic house count indicates there are approximately 55 houses using wells within 3 miles of the facility and 60 houses between 3 and 4 miles from the facility (Ref. 2). These well depths range from 25 to 75 feet bls (Refs. 22, 27). The nearest private well is located approximately 4,800 feet southeast of the facility (Refs. 2, 4).

Surface water drainage at Spruance Southern would flow approximately 600 feet northeast to an unnamed intermittent stream that flows approximately 2,600 feet northeast to an unnamed creek. This creek flows approximately 1 mile east, joins Little Brushy Fork Creek and flows approximately 2.4 miles south to Brushy Fork Creek. Brushy Fork Creek flows south approximately 2.5 miles into Tom-A-Lex Lake. Tom-A-Lex Lake extends 3 miles south to Abbotts Creek which flows south for the remainder of the 15-mile migration pathway (Ref. 2). Three intakes are located along the surface water migration pathway (Ref. 2). Two of the intakes are owned by the city of Lexington, and the other is owned by the city of Thomasville (Refs. 24, 28, 29, 30). The intakes owned by Lexington are 9 and 10.7 miles from Spruance Southern, and are situated in Tom-A-Lex Lake and Abbotts Creek, respectively (Refs. 2, 31). The intake on Tom-A-Lex Lake has 9,435 connections, but the intake on Abbotts Creek apparently has never been used (Refs. 28, 29). Also, the Thomasville intake is located in Tom-A-Lex Lake (Ref. 2). There are 8,200 connections to the system, and the intake is 9.2 miles along the surface water migration pathway (Refs. 2, 30, 32). Based on the facility's location and elevation, it is not considered to be in a flood plain (Ref. 2).

An offsite reconnaissance in March 1990, showed that Spruance Southern is currently active. A fence surrounded the facility's hazardous areas preventing access (Ref. 4). An observation of the immediate area did not show any signs of stressed vegetation. No schools or day-care centers were identified in the immediate area; however, a junior and a senior high school are located almost 3 miles southwest of Spruance (Refs. 2, 4).

Although there are some critical habitats in the state of North Carolina, none are located within Davidson County (Ref. 33). The heart-leaf plantain (Plantago cordata), is a state-designated endangered plant species found in Davidson County (Ref. 34). There are no sensitive environments within a 4-mile radius or along the surface water pathway of Spruance Southern (Ref. 35). Water in the area is used for fishing and recreation (Ref. 22).

Based on the lack of significant targets associated with Spruance Southern, FIT 4 recommends no further action be planned for Spruance Southern. If you have any questions concerning this assessment, please contact me at NUS Corporation.

Very truly yours,

A.D. Douglas
Project Manager

Approved:

Greg Schank

ADD/jec

cc: Deborah Vaughn-Wright

REFERENCES

1. Stan Atwood, Toxicologist, Solid and Hazardous Waste Management Branch, Environmental Health Section, North Carolina Department of Human Resources, letter to Denise Bland, EPA North Carolina CERCLA Project Officer, Air and Hazardous Material Division. Subject: Final Preliminary Assessment Report, Spruance Southern, Inc., November 27, 1985.

2. U.S. Geological Survey, 7.5 minute series Topographic Quadrangle Maps of North Carolina: Winston-Salem 1961 (Photorevised 1971), Welcome 1969 (PR 1987), Winston-Salem East 1950 (PR 1987), Midway 1969 (PR 1987), scale 1:24,000.

3. Potential Hazardous Waste Site Preliminary Assessment (EPA Form 2070-12) and attachments for Milan Yard Landfill. Filed by Stan Atwood and Pat DeRosa, North Carolina, Solid and Hazardous Waste Management Branch, November 20, 1985.

4. NUS Corporation Field Logbook No. F4-2138 for Spruance Southern, Inc., TDD No. F4-9001-136. Documentation of facility reconnaissance, March 28, 1990.

5. Stan Atwood, memo to file Spruance Southern, Inc., November 14, 1985. Subject: Conversation with Rick Forrest, Production Supervisor, Spruance Southern, Inc., concerning waste management practices and waste production.

6. North Carolina Department of Human Resources, Solid and Hazardous Waste Management Branch, Inspection and Evaluation Report for Spruance Southern, Inc., October 17, 1989.

7. Spruance Southern, Inc., letter to O.W. Strickland, Head, Solid and Hazardous Waste Management Branch, Division of Health Services. Subject: Application for change in classification under RCRA, June 6, 1982.

8. Stan Atwood, Spruance Southern, Inc., November 14, 1985. Subject: Conversation with Stephen Phibbs, Former Inspector of Spruance Southern, Inc., concerning personal knowledge of operations at Spruance Southern Inc.

9. North Carolina 1988 Hazardous Waste Generator Only Annual (Part A) Report, Spruance Southern, Inc., March 1, 1989.

10. General Information, North Carolina Consolidated Permits Program, Spruance Southern, Inc., Filed by Earnest L. Broome, Vice President, Spruance Southern, Inc., November 13, 1980.

11. O.W. Strickland, Head, Solid and Hazardous Management Branch, Division of Health Services, letter to Ermon Rush, Spruance Southern, Inc. Subject: Granted change in classification under RCRA, July 7, 1982.

12. O.W. Strickland, Head, Solid and Hazardous Management Branch, Division of Health Services, letter to Ermon Rush, Spruance Southern, Inc. Subject: Permit denial and termination of interim status.

13. Hazardous Waste Data Management System (HWDMS) printout for Spruance Southern, Inc., EPA ID NCD003214574, August 10, 1989.

14. Linda Aller et al., DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings, EPA-600/2-87-035 (Ada, Oklahoma: EPA, April 1987).

15. Oscar E. Meinzer, The Occurrence of Groundwater in the United States, U.S. Geological Survey, Water-Supply Paper No. 489 (Washington, D.C.: GPO, 1923).

16. U.S. Department of Commerce, Climatic Atlas of the United States (Washington, D.C.: GPO, June 1968) Reprint: 1983, National Oceanic and Atmospheric Administration.

17. U.S. Department of Commerce, Rainfall Frequency Atlas of the United States, Techical Paper No. 40 (Washington, D.C.: GPO, 1961).

18. Jasper L. Stuckey and Stephen G. Conrad, Explanatory Test for Geologic Map of North Carolina, North Carolina Department of Conservation and Development Bulletin Number 71 (Raleigh, North Carolina, 1958).

19. R. Allan Freeze and John A. Cherry, Groundwater (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1979), p. 29.

20. Charles C. Daniel III, Statistical Analysis Relating Well Yield to Construction Practices and Siting of Wells in the Piedmont and Blue Ridge Provinces of North Carolina, U.S. Geological Survey Water Resources Investigations Report 86-4132 (Raleigh, North Carolina, 1987).

21. Harry E. LeGrand, Geology and Groundwater in the Statesville Area, North Carolina, U.S. Geological Survey Bulletin No. 68 (1959).

22. NUS Corporation Field Logbook No. F4-2113 for Lexington Municipal Landfill, TDD No. F4-9001-112. Documentation of facility reconnaissance, March 20, 1990.

23 Division of Health Services, Environment Health Section, Water Supply Branch, Public Water Supply Data Sheet, Surface Water Only, North Carolina Inventory Document (PWSI. 410), Davidson Water, Inc., June 1990.

24. North Carolina Surface Water Intakes, July 11, 1990.

25. Mary Pangan, Clerk, Davidson Water Company, telephone conversation with Mike Profit, NUS Corporation, May 3, 1988. Subject: Water source.

26. Division of Health Services, Environmental Health Section, Water Supply Branch, Public Water Supply Data Sheet, Surface Water Only, North Carolina Inventory Document (PWSI. 410), Winston-Salem, June 1990.

27. Water Use Survey, NUS Corporation, B.E. Eller, Resident, March 28, 1990.

28. Division of Health Services, Environment Health Section, Water Supply Branch, Public Water Supply Data Sheet, Surface Water Only, North Carolina Inventory Document (PWSI. 410), Town of Lexington, July 10, 1990.

29. Roger Spott, Superintendent, Lexington Water System, telephone conversation with A.D. Douglas, NUS Corporation, October 12, 1990. Subject: Abbotts Creek intake.

30. Division of Health Services, Environmental Health Section, Water Supply Branch, Public Water Supply Data Sheet, Surface Water Only, North Carolina Inventory Document (PWSI. 410), City of Thomasville, July 10, 1990.

31. U.S. Geological Survey, 7.5 minute series Topographic Quadrangle Maps of North Carolina: Lexington 1950 (Photorevised 1987), scale 1:24,000.

32. NUS Corporation Field Logbook No. F4-1451 for Classic Furniture Corporation, TDD No. F4-8905-72. Documentation of facility reconnaissance, June 8, 1989.

33. U.S. Fish and Wildlife Service, Endangered and Threatened Species of the Southeastern United States (Atlanta, Georgia, 1988).

34. North Carolina Natural Heritage Program Element List for Davidson County, June 30, 1989.

35. North Carolina Natural Heritage Program Natural Areas Database for Davidson County, July 5, 1989, pp. 113-125.

Site Inspection Report

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NCD	6032 14574

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) — ☒ POTENTIAL — ☐ ALLEGED
04 NARRATIVE DESCRIPTION

unknown

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: _____) — ☐ POTENTIAL — ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

unknown

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) — ☒ POTENTIAL — ☐ ALLEGED
04 NARRATIVE DESCRIPTION

unknown

01 ☒ M. UNSTABLE CONTAINMENT OF WASTES (Spills, Runoff, Standing liquids, Leaking drums) — 02 ☐ OBSERVED (DATE: 1985) — ☐ POTENTIAL — ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

An on-site storage vat overflowed causing potential soil and ground-water contamination.

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) — ☐ POTENTIAL — ☐ ALLEGED
04 NARRATIVE DESCRIPTION

unknown

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) — ☐ POTENTIAL — ☐ ALLEGED
04 NARRATIVE DESCRIPTION

n/a

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: _____) — ☐ POTENTIAL — ☐ ALLEGED
04 NARRATIVE DESCRIPTION

n/a

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

n/a

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

SSI Phase I conducted by Margaret Graves, written by A.D. Douglas both of NUS Corp. Dec. 12, 1990.

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NCD	003214574

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 A. GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: _____
02 ☐ OBSERVED (DATE: 1985)
04 NARRATIVE DESCRIPTION
☒ POTENTIAL ☐ ALLEGED

01 B. SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: _____
02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION
☐ POTENTIAL ☐ ALLEGED

NA

01 C. CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED: _____
02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION
☐ POTENTIAL ☐ ALLEGED

NA

01 D. FIRE/EXPLOSIVE CONDITIONS
03 POPULATION POTENTIALLY AFFECTED: _____
02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION
☐ POTENTIAL ☐ ALLEGED

NA

01 E. DIRECT CONTACT
03 POPULATION POTENTIALLY AFFECTED: _____
02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION
☐ POTENTIAL ☐ ALLEGED

unknown

01 F. CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED: _____ (Acres)
02 ☐ OBSERVED (DATE: 1985)
04 NARRATIVE DESCRIPTION
☒ POTENTIAL ☐ ALLEGED

01 G. DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: _____
02 ☐ OBSERVED (DATE: 1985)
04 NARRATIVE DESCRIPTION
☒ POTENTIAL ☐ ALLEGED

01 H. WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED: _____
02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION
☐ POTENTIAL ☐ ALLEGED

NA

01 I. POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED: _____
02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION
☐ POTENTIAL ☐ ALLEGED

NA

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NCD	C03214574

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
A NPDES				
B UIC				
C AIR				
D RCRA				Generator
E RCRA INTERIM STATUS				
F SPCC PLAN				
G STATE (Specify)				
H LOCAL (Specify)				
I OTHER (Specify)				
J NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
A. SURFACE IMPOUNDMENT		
B. PILES		
C. DRUMS, ABOVE GROUND		
D. TANK, ABOVE GROUND		
X E. TANK, BELOW GROUND	Unknown	
F. LANDFILL		
G. LANDFARM		
H. OPEN DUMP		
I. OTHER (Specify)		

04 TREATMENT (Check all that apply)
- A. INCENERATION
- B. UNDERGROUND INJECTION
- C. CHEMICAL/PHYSICAL
- D. BIOLOGICAL
- E. WASTE OIL PROCESSING
- F. SOLVENT RECOVERY
- G. OTHER RECYCLING/RECOVERY
- H. OTHER (Specify)

05 OTHER
- X A. BUILDINGS ON SITE

06 AREA OF SITE: Approx 3 Acres

07 COMMENTS

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

A. ADEQUATE, SECURE | X B. MODERATE | C. INADEQUATE, POOR | D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

300-gallon tank
55-gallon drums

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: YES X NO

02 COMMENTS

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports.)

SSI Phase I conducted by Margaret Graves, written by A.D. Douglas NUS Corp Dec. 12, 1990.

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NCD	063214574

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)	SURFACE	WELL	02 STATUS: ENDANGERED	AFFECTED	MONITORED	03 DISTANCE TO SITE
COMMUNITY	A. X	B. X	A. ☐	B. ☐	C. X	A. 7.2 (mi)
NON-COMMUNITY	C. ☐	D. X	D. ☐	E. ☐	F. ☐	B. ____ (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☐ A. ONLY SOURCE FOR DRINKING X B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available) ☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available) ☐ D. NOT USED, UNUSEABLE

02 POPULATION SERVED BY GROUND WATER 115 03 DISTANCE TO NEAREST DRINKING WATER WELL ____ (mi)

04 DEPTH TO GROUNDWATER	05 DIRECTION OF GROUNDWATER FLOW	06 DEPTH TO AQUIFER OF CONCERN	07 POTENTIAL YIELD OF AQUIFER	08 SOLE SOURCE AQUIFER
4800 (ft)	Into the east	30 (ft)	100 (gpd)	X YES ☐ NO

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)

There are approximately 55 private well within 3 miles of the facility and approximately 60 more between 3 to 4 miles from the facility. Their depths range from 25 to 75 feet. The nearest private well is 4800 feet SE.

10 RECHARGE AREA		11 DISCHARGE AREA	
☐ YES ☐ NO	COMMENTS: unknown	☐ YES ☐ NO	COMMENTS: unknown

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

X A. RESERVOIR, RECREATION DRINKING WATER SOURCE ☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES ☐ C. COMMERCIAL, INDUSTRIAL ☐ D. NOT CURRENTLY USED

02 AFFECTED POTENTIALLY AFFECTED BODIES OF WATER

NAME:	AFFECTED	DISTANCE TO SITE
Yadkin River	☐	7.2 NW (mi)
Salem Lake	☐	>4 (mi)
	☐	____ (mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. 1710 (NO. OF PERSONS)	B. 1216 (NO. OF PERSONS)	C. 1900 (NO. OF PERSONS)

02 DISTANCE TO NEAREST POPULATION 200 (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE 12. approx. 04 DISTANCE TO NEAREST OFF-SITE BUILDING 1500 ft. (mi)

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site (e.g., rural, village, densely populated urban area))

The area is densely populated with residences. Commercial businesses 1500 ft Northwest of the facility.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NCD	003214574

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

☐ A. 10^{-2} – 10^{-3} cm/sec ☒ B. 10^{-4} – 10^{-6} cm/sec ☐ C. 10^{-4} – 10^{-3} cm/sec ☐ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)

☐ A. IMPERMEABLE (Less than 10^{-7} cm/sec) ☒ B. RELATIVELY IMPERMEABLE (10^{-4} – 10^{-6} cm/sec) ☐ C. RELATIVELY PERMEABLE (10^{-2} – 10^{-4} cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH
30 (ft)	Unknown (ft)	Unknown

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
10 (in)	3.3 (in)	0.1 %	NE	1.3 %

09 FLOOD POTENTIAL

SITE IS IN _____ YEAR FLOODPLAIN

10 ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)

ESTUARINE: A. > 4 (mi)

OTHER: B. _____ (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species)

> 4 (mi)

ENDANGERED SPECIES: Heart-Leaf Plantain.

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS; NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AGRICULTURAL LANDS: AG LAND
A. 1500 ft (mi)	B. 200 ft (mi)	C. _____ (mi)	D. _____ (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

The site is located in a densely populated residential area, along with commercial businesses within 2000 feet.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

SSI Phase I conducted by Margaret Graves, written by A.D. Douglas NUS Corp. Dec. 12, 1990.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NCD	003214574

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER	unknown		
SURFACE WATER	"		
WASTE	"		
AIR	"		
RUNOFF	"		
SPILL	"		
SOIL	"		
VEGETATION	"		
OTHER	"		

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS
unknown	
"	
"	
"	
"	

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☒ GROUND ☐ AERIAL

02 IN CUSTODY OF NUS Corp. Tucker, GA (404) 938-7710
Name of organization or individual

03 MAPS ☒ YES ☐ NO

04 LOCATION OF MAPS

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

Off-site reconnaissance field logbook.

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

SSI Phase I conducted by Margaret Graves, written by A. D. Douglas NUS Corp. Dec. 12, 1990.

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NCD	0032 14574

II. CURRENT OWNER(S)

01 NAME	02 D+B NUMBER
Sprouance Southern, Inc.	(919)764-0940

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
P.O. Box 3254	

05 CITY	06 STATE	07 ZIP CODE
Winston Salem	NC	27102

PARENT COMPANY (If applicable)

08 NAME	09 D+B NUMBER

10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE

12 CITY	13 STATE	14 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 NAME	09 D+B NUMBER

10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE

12 CITY	13 STATE	14 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 NAME	09 D+B NUMBER

10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE

12 CITY	13 STATE	14 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 NAME	09 D+B NUMBER

10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE

12 CITY	13 STATE	14 ZIP CODE

III. PREVIOUS OWNER(S) (List most recent first)

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

IV. REALTY OWNER(S) (If applicable, list most recent first)

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NCD	003214574

II. CURRENT OPERATOR (Provide if different from owner)			OPERATOR'S PARENT COMPANY (If applicable)		
01 NAME Spreicance Southern, Inc.		02 D+B NUMBER	10 NAME -		11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)		13 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER				

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)			PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)		
01 NAME		02 D+B NUMBER	10 NAME		11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)		13 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD				
01 NAME		02 D+B NUMBER	10 NAME		11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)		13 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD				
01 NAME		02 D+B NUMBER	10 NAME		11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)		13 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD				

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

SSI Phase I conducted by Margaret Graves written by A.D. Douglas NUS Corp. Dec. 12, 1990.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NCD	003214574

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER
Sprucance Southern, Inc.	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

III. OFF-SITE GENERATOR(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
NA			

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
Seaboard Chemicals			

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
Jamestown	NC				

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

SSI Phase I conducted by Margaret Graves written by A.D. Douglas NUS Corp Dec. 12, 1990.

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NCD	60 32 14 574

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
NA

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ D. SPILLED MATERIAL REMOVED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ E. CONTAMINATED SOIL REMOVED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ F. WASTE REPACKAGED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ G. WASTE DISPOSED ELSEWHERE — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ H. ON SITE BURIAL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ I. IN SITU CHEMICAL TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ J. IN SITU BIOLOGICAL TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ K. IN SITU PHYSICAL TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ L. ENCAPSULATION — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ M. EMERGENCY WASTE TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ N. CUTOFF WALLS — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ O. EMERGENCY DIKING SURFACE WATER DIVERSION — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ P. CUTOFF TRENCHES/SUMP — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ Q. SUBSURFACE CUTOFF WALL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NCD	003214574

II PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R. BARRIER WALLS CONSTRUCTED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
NA

01 ☐ S. CAPPING COVERING — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
NA

01 ☐ T. BULK TANKAGE REPAIRED — 02 DATE 1985 — 03 AGENCY Sprinance
04 DESCRIPTION
Check Valve installed

01 ☐ U. GROUT CURTAIN CONSTRUCTED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
NA

01 ☐ V. BOTTOM SEALED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ W. GAS CONTROL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ X. FIRE CONTROL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ Y. LEACHATE TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ Z. AREA EVACUATED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ 1. ACCESS TO SITE RESTRICTED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ 2. POPULATION RELOCATED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
"

01 ☐ 3. OTHER REMEDIAL ACTIVITIES — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
NA

III. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

SSI Phase I conducted by Margaret Graves written by A. D. Douglas NUS Corp. Dec 12, 1990.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NCD	063214574

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY ENFORCEMENT ACTION X YES NO

02 DESCRIPTION OF FEDERAL STATE LOCAL REGULATORY ENFORCEMENT ACTION

In October 1984 rusty containers founded at the facility were in violation of regulatory standards. Spruance corrected the violations by November 1984. In October 1989 more violations were discovered at the facility. The facility later ~~were~~ ~~later~~ cleared those violations.

III. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis reports)

SSI Phase I Conducted by Margaret Graves written by A. D. Douglas NUS Corp. Dec. 12, 1990.

EPA FORM 2070-13 (7-81)

APPENDIX

I. FEEDSTOCKS

CAS Number	Chemical Name
1. 7664-41-7	Ammonia
2. 7440-36-0	Antimony
3. 1309-64-4	Antimony Trioxide
4. 7440-38-2	Arsenic
5. 1327-53-3	Arsenic Trioxide
6. 21109-95-5	Barium Sulfide
7. 7726-95-6	Bromine
8. 106-99-0	Butadiene
9. 7440-43-9	Cadmium
10. 7782-50-5	Chlorine
11. 12737-27-8	Chromite
12. 7440-47-3	Chromium
13. 7440-48-4	Cobalt
14. 1317-38-0	Cupric Oxide
15. 7758-98-7	Cupric Sulfate
16. 1317-39-1	Cuprous Oxide
17. 74-85-1	Ethylene
18. 7647-01-0	Hydrochloric Acid
19. 7664-39-3	Hydrogen Fluoride
20. 1335-25-7	Lead Oxide
21. 7439-97-6	Mercury
22. 74-82-8	Methane
23. 91-20-3	Napthalene
24. 7440-02-0	Nickel
25. 7697-37-2	Nitric Acid
26. 7723-14-0	Phosphorus
27. 7778-50-9	Potassium Dichromate
28. 1310-58-3	Potassium Hydroxide
29. 115-07-1	Propylene
30. 10588-01-9	Sodium Dichromate
31. 1310-73-2	Sodium Hydroxide
32. 7646-78-8	Stannic Chloride
33. 7772-99-8	Stannous Chloride
34. 7664-93-9	Sulfuric Acid
35. 108-88-3	Toluene
36. 1330-20-7	Xylene
37. 7646-85-7	Zinc Chloride
38. 7733-02-0	Zinc Sulfate

II. HAZARDOUS SUBSTANCES

CAS Number	Chemical Name
1. 75-07-0	Acetaldehyde
2. 64-19-7	Acetic Acid
3. 108-24-7	Acetic Anhydride
4. 75-86-5	Acetone Cyanohydrin
5. 506-96-7	Acetyl Bromide
6. 75-36-5	Acetyl Chloride
7. 107-02-8	Acrolein
8. 107-13-1	Acrylonitrile
9. 124-04-9	Adipic Acid
10. 309-00-2	Aldrin
11. 10043-01-3	Aluminum Sulfate
12. 107-18-6	Allyl Alcohol
13. 107-05-1	Allyl Chloride
14. 7664-41-7	Ammonia
15. 631-61-8	Ammonium Acetate
16. 1863-63-4	Ammonium Benzoate
17. 1066-33-7	Ammonium Bicarbonate
18. 7789-09-5	Ammonium Bichromate
19. 1341-49-7	Ammonium Bifluoride
20. 10192-30-0	Ammonium Bisulfite
21. 1111-78-0	Ammonium Carbamate
22. 12125-02-9	Ammonium Chloride
23. 7788-98-9	Ammonium Chromate
24. 3012-65-5	Ammonium Citrate, Dibasic
25. 13826-83-0	Ammonium Fluoborate
26. 12125-01-8	Ammonium Fluoride
27. 1336-21-6	Ammonium Hydroxide
28. 6009-70-7	Ammonium Oxalate
29. 16919-19-0	Ammonium Silicofluoride
30. 7773-06-0	Ammonium Sulfamate
31. 12135-76-1	Ammonium Sulfide
32. 10196-04-0	Ammonium Sulfite
33. 14307-43-8	Ammonium Tartrate
34. 1762-95-4	Ammonium Thiocyanate
35. 7783-18-8	Ammonium Thiosulfate
36. 628-63-7	Amyl Acetate
37. 62-53-3	Aniline
38. 7647-18-9	Antimony Pentachloride
39. 7789-61-9	Antimony Tribromide
40. 10025-91-9	Antimony Trichloride
41. 7783-56-4	Antimony Trifluoride
42. 1309-64-4	Antimony Trioxide
43. 1303-32-8	Arsenic Disulfide
44. 1303-28-2	Arsenic Pentoxide
45. 7784-34-1	Arsenic Trichloride
46. 1327-53-3	Arsenic Trioxide
47. 1303-33-9	Arsenic Trisulfide
48. 542-62-1	Barium Cyanide
49. 71-43-2	Benzene
50. 65-85-0	Benzoic Acid
51. 100-47-0	Benzonitrile
52. 98-88-4	Benzoyl Chloride
53. 100-44-7	Benzyl Chloride
54. 7440-41-7	Beryllium
55. 7787-47-5	Beryllium Chloride
56. 7787-49-7	Beryllium Fluoride
57. 13597-99-4	Beryllium Nitrate
58. 123-86-4	Butyl Acetate
59. 84-74-2	n-Butyl Phthalate
60. 109-73-9	Butylamine
61. 107-92-6	Butyric Acid
62. 543-90-8	Cadimium Acetate
63. 7789-42-6	Cadmium Bromide
64. 10108-64-2	Cadmium Chloride
65. 7778-44-1	Calcium Arsenate
66. 52740-16-6	Calcium Arsenite
67. 75-20-7	Calcium Carbide
68. 13765-19-0	Calcium Chromate
69. 592-01-8	Calcium Cyanide
70. 26264-06-2	Calcium Dodecylbenzene Sulfonate
71. 7778-54-3	Calcium Hypochlorite
72. 133-06-2	Captan
73. 63-25-2	Carbaryl
74. 1563-66-2	Carbofuran
75. 75-15-0	Carbon Disulfide
76. 56-23-5	Carbon Tetrachloride
77. 57-74-9	Chlordane
78. 7782-50-5	Chlorine
79. 108-90-7	Chlorobenzene
80. 67-66-3	Chloroform
81. 7790-94-5	Chlorosulfonic Acid
82. 2921-88-2	Chlorpyrifos
83. 1066-30-4	Chromic Acetate
84. 7738-94-5	Chromic Acid
85. 10101-53-8	Chromic Sulfate
86. 10049-05-5	Chromous Chloride
87. 544-18-3	Cobaltous Formate
88. 14017-41-5	Cobaltous Sulfamate
89. 56-72-4	Coumaphos
90. 1319-77-3	Cresol
91. 4170-30-3	Crotonaldehyde
92. 142-71-2	Cupric Acetate
93. 12002-03-8	Cupric Acetoarsenite
94. 7447-39-4	Cupric Chloride
95. 3251-23-8	Cupric Nitrate
96. 5893-66-3	Cupric Oxalate
97. 7758-98-7	Cupric Sulfate
98. 10380-29-7	Cupric Sulfate Ammoniated
99. 815-82-7	Cupric Tartrate
100. 506-77-4	Cyanogen Chloride
101. 110-82-7	Cyclohexane
102. 94-75-7	2,4-D Acid
103. 94-11-1	2,4-D Esters
104. 50-29-3	DDT
105. 333-41-5	Diazinon
106. 1918-00-9	Dicamba
107. 1194-65-6	Dichlobenil
108. 117-80-6	Dichlone
109. 25321-22-6	Dichlorobenzene (all isomers)
110. 266-38-19-7	Dichloropropane (all isomers)
111. 26952-23-8	Dichloropropene (all isomers)
112. 8003-19-8	Dichloropropene-Dichloropropane Mixture
113. 75-99-0	2-2-Dichloropropionic Acid
114. 62-73-7	Dichlorvos
115. 60-57-1	Dieldrin
116. 109-89-7	Diethylamine
117. 124-40-3	Dimethylamine
118. 25154-54-5	Dinitrobenzene (all isomers)
119. 51-28-5	Dinitrophenol
120. 25321-14-6	Dinitrotoluene (all isomers)
121. 85-00-7	Diquat
122. 298-04-4	Disulfoton
123. 330-54-1	Diuron
124. 27176-87-0	Dodecylbenzenesulfonic Acid
125. 115-29-7	Endosulfan (all isomers)
126. 72-20-8	Endrin and Metabolites
127. 106-89-8	Epichlorohydrin
128. 563-12-2	Ethion
129. 100-41-4	Ethyl Benzene
130. 107-15-3	Ethylenediamine
131. 106-93-4	Ethylene Dibromide
132. 107-06-2	Ethylene Dichloride
133. 60-00-4	EDTA
134. 1185-57-5	Ferric Ammonium Citrate
135. 2944-67-4	Ferric Ammonium Oxalate
136. 7705-08-0	Ferric Chloride

II. HAZARDOUS SUBSTANCES

CAS Number	Chemical Name
137. 7783-50-8	Ferric Fluoride
138. 10421-48-4	Ferric Nitrate
139. 10028-22-5	Ferric Sulfate
140. 10045-89-3	Ferrous Ammonium Sulfate
141. 7758-94-3	Ferrous Chloride
142. 7720-78-7	Ferrous Sulfate
143. 206-44-0	Fluoranthene
144. 50-00-0	Formaldehyde
145. 64-18-6	Formic Acid
146. 110-17-8	Fumaric Acid
147. 98-01-1	Furfural
148. 86-50-0	Guthion
149. 76-44-8	Heptachlor
150. 118-74-1	Hexachlorobenzene
151. 87-68-3	Hexachlorobutadiene
152. 67-72-1	Hexachloroethane
153. 70-30-4	Hexachlorophene
154. 77-47-4	Hexachlorocyclopentadiene
155. 7647-01-0	Hydrochloric Acid (Hydrogen Chloride)
156. 7664-39-3	Hydrofluoric Acid (Hydrogen Fluoride)
157. 74-90-8	Hydrogen Cyanide
158. 7783-06-4	Hydrogen Sulfide
159. 78-79-5	Isoprene
160. 42504-46-1	Isopropanolamine Dodecylbenzenesulfonate
161. 115-32-2	Kelthane
162. 143-50-0	Kepone
163. 301-04-2	Lead Acetate
164. 3687-31-8	Lead Arsenate
165. 7758-95-4	Lead Chloride
166. 13814-96-5	Lead Fluoborate
167. 7783-46-2	Lead Fluoride
168. 10101-63-0	Lead Iodide
169. 18256-98-9	Lead Nitrate
170. 7428-48-0	Lead Stearate
171. 15739-80-7	Lead Sulfate
172. 1314-87-0	Lead Sulfide
173. 592-87-0	Lead Thiocyanate
174. 58-89-9	Lindane
175. 14307-35-8	Lithium Chromate
176. 121-75-5	Malthion
177. 110-16-7	Maleic Acid
178. 108-31-6	Maleic Anhydride
179. 2032-65-7	Mercaptodimethur
180. 592-04-1	Mercuric Cyanide
181. 10045-94-0	Mercuric Nitrate
182. 7783-35-9	Mercuric Sulfate
183. 592-85-8	Mercuric Thiocyanate
184. 10415-75-5	Mercurous Nitrate
185. 72-43-5	Methoxychlor
186. 74-93-1	Methyl Mercaptan
187. 80-62-6	Methyl Methacrylate
188. 298-00-0	Methyl Parathion
189. 7786-34-7	Mevinphos
190. 315-18-4	Mexacarbate
191. 75-04-7	Monoethylamine
192. 74-89-5	Monomethylamine
193. 300-76-5	Naled
194. 91-20-3	Naphthalene
195. 1338-24-5	Naphthenic Acid
196. 7440-02-0	Nickel
197. 15699-18-0	Nickel Ammonium Sulfate
198. 37211-05-5	Nickel Chloride
199. 12054-48-7	Nickel Hydroxide
200. 14216-75-2	Nickel Nitrate
201. 7786-81-4	Nickel Sulfate
202. 7697-37-2	Nitric Acid
203. 98-95-3	Nitrobenzene
204. 10102-44-0	Nitrogen Dioxide
205. 25154-55-6	Nitrophenol (all isomers)
206. 1321-12-6	Nitrotoluene
207. 30525-89-4	Paraformaldehyde
208. 56-38-2	Parathion
209. 608-93-5	Pentachlorobenzene
210. 87-86-5	Pentachlorophenol
211. 85-01-8	Phenanthrene
212. 108-95-2	Phenol
213. 75-44-5	Phosgene
214. 7664-38-2	Phosphoric Acid
215. 7723-14-0	Phosphorus
216. 10025-87-3	Phosphorus Oxychloride
217. 1314-80-3	Phosphorus Pentasulfide
218. 7719-12-2	Phosphorus Trichloride
219. 7784-41-0	Potassium Arsenate
220. 10124-50-2	Potassium Arsenite
221. 7778-50-9	Potassium Bichromate
222. 7789-00-6	Potassium Chromate
223. 7722-64-7	Potassium Permanganate
224. 2312-35-8	Propargite
225. 79-09-4	Propionic Acid
226. 123-62-6	Propionic Anhydride
227. 1336-36-3	Polychlorinated Biphenyls
228. 151-50-8	Potassium Cyanide
229. 1310-58-3	Potassium Hydroxide
230. 75-56-9	Propylene Oxide
231. 121-29-9	Pyrethrins
232. 91-22-5	Quinoline
233. 108-46-3	Resorcinol
234. 7446-08-4	Selenium Oxide
235. 7761-88-8	Silver Nitrate
236. 7631-89-2	Sodium Arsenate
237. 7784-46-5	Sodium Arsenite
238. 10588-01-9	Sodium Bichromate
239. 1333-83-1	Sodium Bifluoride
240. 7631-90-5	Sodium Bisulfite
241. 7775-11-3	Sodium Chromate
242. 143-33-9	Sodium Cyanide
243. 25155-30-0	Sodium Dodecylbenzene Sulfonate
244. 7681-49-4	Sodium Fluoride
245. 16721-80-5	Sodium Hydrosulfide
246. 1310-73-2	Sodium Hydroxide
247. 7681-52-9	Sodium Hypochlorite
248. 124-41-4	Sodium Methylate
249. 7632-00-0	Sodium Nitrate
250. 7558-79-4	Sodium Phosphate, Dibasic
251. 7601-54-9	Sodium Phosphate, Tribasic
252. 10102-18-8	Sodium Selenite
253. 7789-06-2	Strontium Chromate
254. 57-24-9	Strychnine and Salts
255. 100-420-5	Styrene
256. 12771-08-3	Sulfur Monochloride
257. 7664-93-9	Sulfuric Acid
258. 93-76-5	2,4,5-T Acid
259. 2008-46-0	2,4,5-T Amines
260. 93-79-8	2,4,5-T Esters
261. 13560-99-1	2,4,5-T Salts
262. 93-72-1	2,4,5-TP Acid
263. 32534-95-5	2,4,5-TP Acid Esters
264. 72-54-8	TDE
265. 95-94-3	Tetrachlorobenzene
266. 127-18-4	Tetrachloroethane
267. 78-00-2	Tetraethyl Lead
268. 107-49-3	Tetraethyl Pyrophosphate
269. 7446-18-6	Thallium (I) Sulfate
270. 108-88-3	Toluene
271. 8001-35-2	Toxaphene
272. 12002-48-1	Trichlorobenzene (all isomers)
273. 52-68-6	Trichlorfon
274. 25323-89-1	Trichloroethane (all isomers)
275. 79-01-6	Trichloroethylene
276. 25167-82-2	Trichlorophenol (all isomers)
277. 27323-41-7	Triethanolamine Dodecylbenzenesulfonate
278. 121-44-8	Triethylamine
279. 75-50-3	Trimethylamine
280. 541-09-3	Uranyl Acetate
281. 10102-06-4	Uranyl Nitrate
282. 1314-62-1	Vanadium Pentoxide
283. 27774-13-6	Vanadyl Sulfate
284. 108-05-4	Vinyl Acetate
285. 75-35-4	Vinylidene Chloride
286. 1300-71-6	Xylenol
287. 557-34-6	Zinc Acetate
288. 52628-25-8	Zinc Ammonium Chloride
289. 1332-07-6	Zinc Borate
290. 7699-45-8	Zinc Bromide
291. 3486-35-9	Zinc Carbonate
292. 7646-85-7	Zinc Chloride
293. 557-21-1	Zinc Cyanide
294. 7783-49-3	Zinc Fluoride
295. 557-41-5	Zinc Formate
296. 7779-86-4	Zinc Hydrosulfite
297. 7779-88-6	Zinc Nitrate
298. 127-82-2	Zinc Phenolsulfonate
299. 1314-84-7	Zinc Phosphide
300. 16871-71-9	Zinc Silicofluoride
301. 7733-02-0	Zinc Sulfate
302. 13746-89-9	Zirconium Nitrate
303. 16923-95-8	Zirconium Potassium Fluoride
304. 14644-61-2	Zirconium Sulfate
305. 10026-11-6	Zirconium Tetrachloride

Reference 1

North Carolina Department of Human Resources
Division of Health Services
P.O. Box 2091 • Raleigh, North Carolina 27602-2091

James G. Martin, Governor
Phillip J. Kirk, Jr., Secretary

Ronald H. Levine, M.D., M.P.H.
State Health Director

27 November 1985

Ms. Denise Bland
EPA NC CERCLA Project Officer
Air and Hazardous Material Division
345 Courtland Street, N.E.
Atlanta, GA 30365

SUBJECT: Preliminary Assessment Report
Spruance Southern, Inc. NC D003214574
Highway 52-S
Winston Salem, NC 27102

Dear Ms. Bland:

Enclosed please find the Preliminary Assessment report for the subject site. This priority is based on review of available data.

Spruance Southern, Inc., is about a 3.5 acre site located off old U.S. 52-S (NC 8) near Midway in Davidson County. It began operation in 1953 as a manufacturer of industrial coatings (paints, furniture sealers, and lacquers). Prior to 1953, Salem Paint Co. operated on the site for about 20 years. Spruance Southern presently produces furniture sealers and lacquers. They ceased all paint production in 1979.

Hazardous wastes are spent non-halogenated solvents. Annual waste production was 28 tons in 1980. The spent solvents are first held in a 300 gallon tank and then transferred to 55 gallon drums. Drums are stacked on asphalt and removed within 90 days to Seaboard Chemical for recycling of solvents. In addition, the company has 9 storage tanks for solvent feedstocks. Two of these are underground.

No major spills or leaks were reported. A RCRA inspection on October 9, 1984 cited severe rusting of containers but the company was in compliance on November 16, 1984.

There are no nearby surface waters, but there is a private well within 100 ft. of the plant. Because of the possibility that solvents may have leaked or spilled on the site in the past, soil and well sampling is recommended. Based on the available information, a low priority is recommended for inspection at this site.

On 26 November 1985, this Preliminary Assessment was reviewed by CERCLA Unit personnel and by the following representatives from the North Carolina Department of Natural Resources and Community Development, Division of Environmental Management: Doug Dixon, Groundwater Section; Glen Ross, Air Quality Section; and Howard Bryant, Water Quality Section.

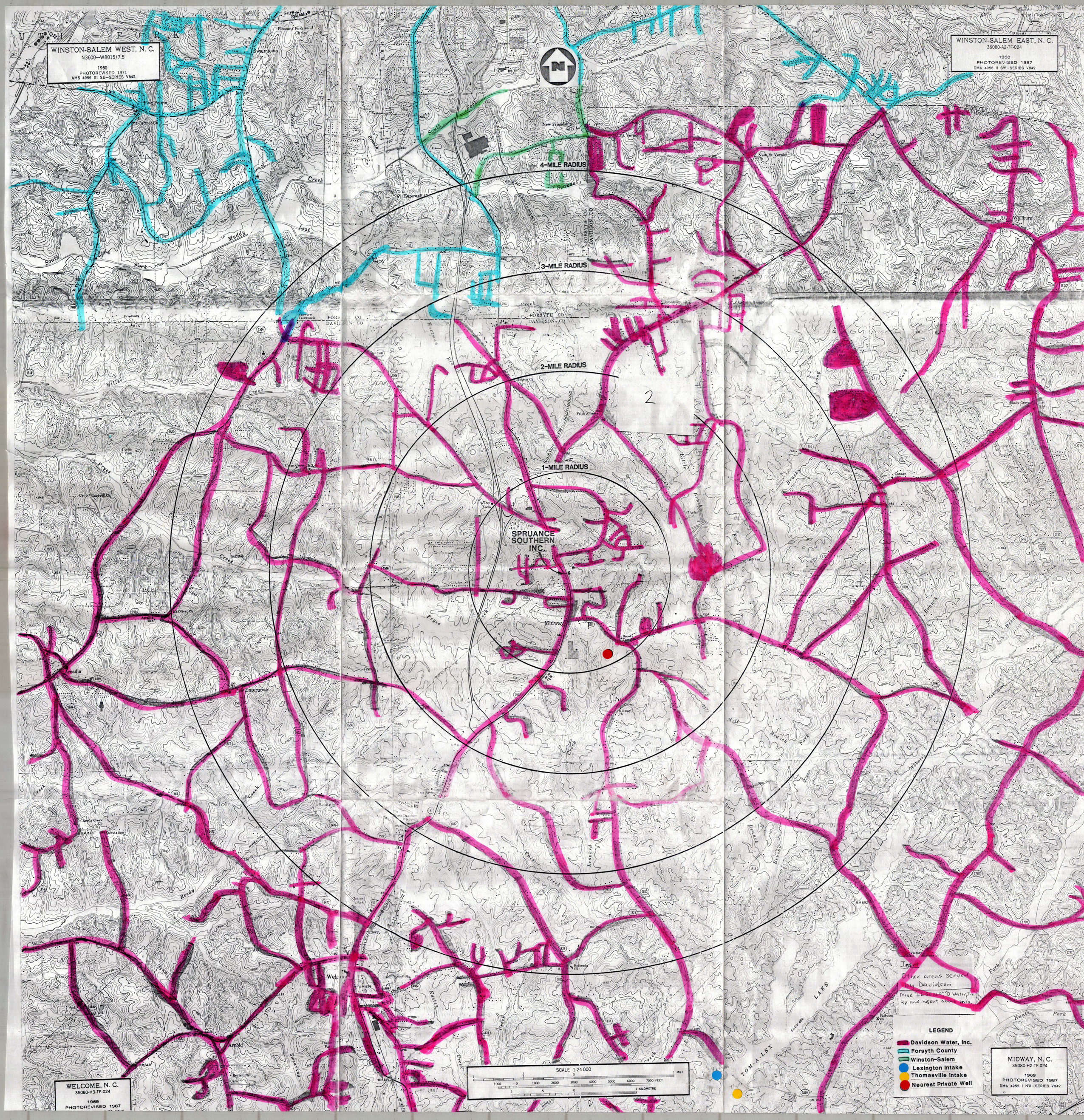
If you have any questions, please call me at (919) 733-2178.

Sincerely,

Stan Atwood

Stan Atwood, Toxicologist
Solid and Hazardous Waste Management Branch
Environmental Health Section

SA/tb/0221b


WINSTON-SALEM WEST, N. C.
N3600—W8015/7.5
1950
PHOTOREVISED 1971
AMS 4956 III SE-SERIES V842
WINSTON-SALEM EAST, N. C.
36080-A2-TF-024
1950
PHOTOREVISED 1987
DMA 4956 II SW-SERIES V842
4-MILE RADIUS
3-MILE RADIUS
2-MILE RADIUS
1-MILE RADIUS
SPRUANCE SOUTHERN INC.
2
Midway
Arcadia
Enterprise
Arnold
Welcome
Lexington
Thomasville
TOM-A-LEX LAKE
FORSYTH CO
DAVIDSON CO
Other areas scrutiny by Davidson
move LEGEND & Water Tk. up and insert above info.
LEGEND
Davidson Water, Inc.
Forsyth County
Winston-Salem
Lexington Intake
Thomasville Intake
Nearest Private Well
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETRE
WELCOME, N. C.
35080-H3-TF-024
1969
PHOTOREVISED 1987
MIDWAY, N. C.
35080-H2-TF-024
1969
PHOTOREVISED 1987
DMA 4955 I NW-SERIES V842

Reference 3

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D003214574

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Spruance Southern, Inc.	Old U.S. 52-S (NC 8)

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Winston Salem	NC	27102	Davidson	29	6

09 COORDINATES LATITUDE	LONGITUDE
35 57 35 .N	80 13 08 .W

10 DIRECTIONS TO SITE (Starting from nearest public road)

Take 52 South from Winston Salem to Hickory Tree Road Exit. (~ 1½ to 2 mi. South of Davidson Co. line). Turn left on Hickory Tree Road (SR 1508) to dead end at old 52 (NC 8), turn right and go about 3/4 mile. Plant is brick building on left across railroad tracks.

III. RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)
Spruance Southern, Inc.	P.O. Box 3054

03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER
Winston Salem	NC	27102	(919) 764-0940

07 OPERATOR (If known and different from owner)	08 STREET (Business, mailing, residential)

09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER
			( )

13 TYPE OF OWNERSHIP (Check one)

☒ A. PRIVATE ☐ B. FEDERAL: _____ (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL

☐ F. OTHER: _____ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)

☐ A. RCRA 3001 DATE RECEIVED: 08 / 18 / 80 (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: / / (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION

☐ YES DATE / / (MONTH DAY YEAR)
☒ NO

BY (Check all that apply)

☐ A. EPA ☐ B. EPA CONTRACTOR ☐ C. STATE ☐ D. OTHER CONTRACTOR
☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: _____ (Specify)

CONTRACTOR NAME(S): _____

02 SITE STATUS (Check one)

☐ A. ACTIVE ☒ B. INACTIVE ☐ C. UNKNOWN

03 YEARS OF OPERATION

1953 (BEGINNING YEAR) ---- (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED

Spruance Southern manufactures lacquers and sealers for the furniture industry. Salem Paint Co. operated on the site from the 1930's until 1953. Wastes generated include dirty solvents from cleaning operations and from off-spec products. Solvents include toluene, methanol, and xylene. Wastes are collected in a 300 gallon tank and dispensed

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

into 55 gallon drums, which are stored less than 90 days. The drums are stacked on asphalt They transport the waste to Seaboard Chem. for recycling of solvents. They produce about 600 gallons of waste/mo. No spills were reported, although there is the potential for both soil and groundwater contamination. There are two underground and 7 above ground tanks for feedstock solvents. One well was reported to be within 100 ft. of the property.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)

☐ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☒ C. LOW (Inspect on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NUMBER
Rick Forrest, Prod. Supervisor	Spruance Southern, Inc.	(919) 764-0940

04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
Stan Atwood/Pat DeRosa	NC DHR/DHS	SHW Mgmt. Br.	919 733-2178	11 / 20 / 85 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D003214574

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. GROUNDWATER CONTAMINATION — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Underground solvent tanks.

01 [ ] B. SURFACE WATER CONTAMINATION — 02 [ ] OBSERVED (DATE: _____) — [ ] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

01 [ ] C. CONTAMINATION OF AIR — 02 [ ] OBSERVED (DATE: _____) — [ ] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

01 [X] D. FIRE/EXPLOSIVE CONDITIONS — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Wastes are flammable.

01 [ ] E. DIRECT CONTACT — 02 [ ] OBSERVED (DATE: _____) — [ ] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

01 [X] F. CONTAMINATION OF SOIL — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
03 AREA POTENTIALLY AFFECTED: 1-2 (Acres) — 04 NARRATIVE DESCRIPTION

01 [X] G. DRINKING WATER CONTAMINATION — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

At least one well reported to be within 100 ft. of site.

01 [ ] H. WORKER EXPOSURE/INJURY — 02 [ ] OBSERVED (DATE: _____) — [ ] POTENTIAL — [ ] ALLEGED
03 WORKERS POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

01 [ ] I. POPULATION EXPOSURE/INJURY — 02 [ ] OBSERVED (DATE: _____) — [ ] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D003214574

II. HAZARDOUS CONDITIONS AND INCIDENTS *(Continued)*

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION *(Include name(s) of species)*

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES *(Spills/runoff/standing liquids/leaking drums)* — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

V. SOURCES OF INFORMATION *(Cite specific references, e. g., state files, sample analysis, reports)*

As previously cited.

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D003214574

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ☐ A. SOLID
- ☐ B. POWDER, FINES
- ☐ C. SLUDGE
- ☐ D. OTHER _____ (Specify)
- ☐ E. SLURRY
- ☒ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS _____
CUBIC YARDS _____
NO OF DRUMS _____

03 WASTE CHARACTERISTICS (Check all that apply)

- ☒ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ☐ D. PERSISTENT
- ☐ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☒ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☐ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS	600	G	Estimated per month.
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

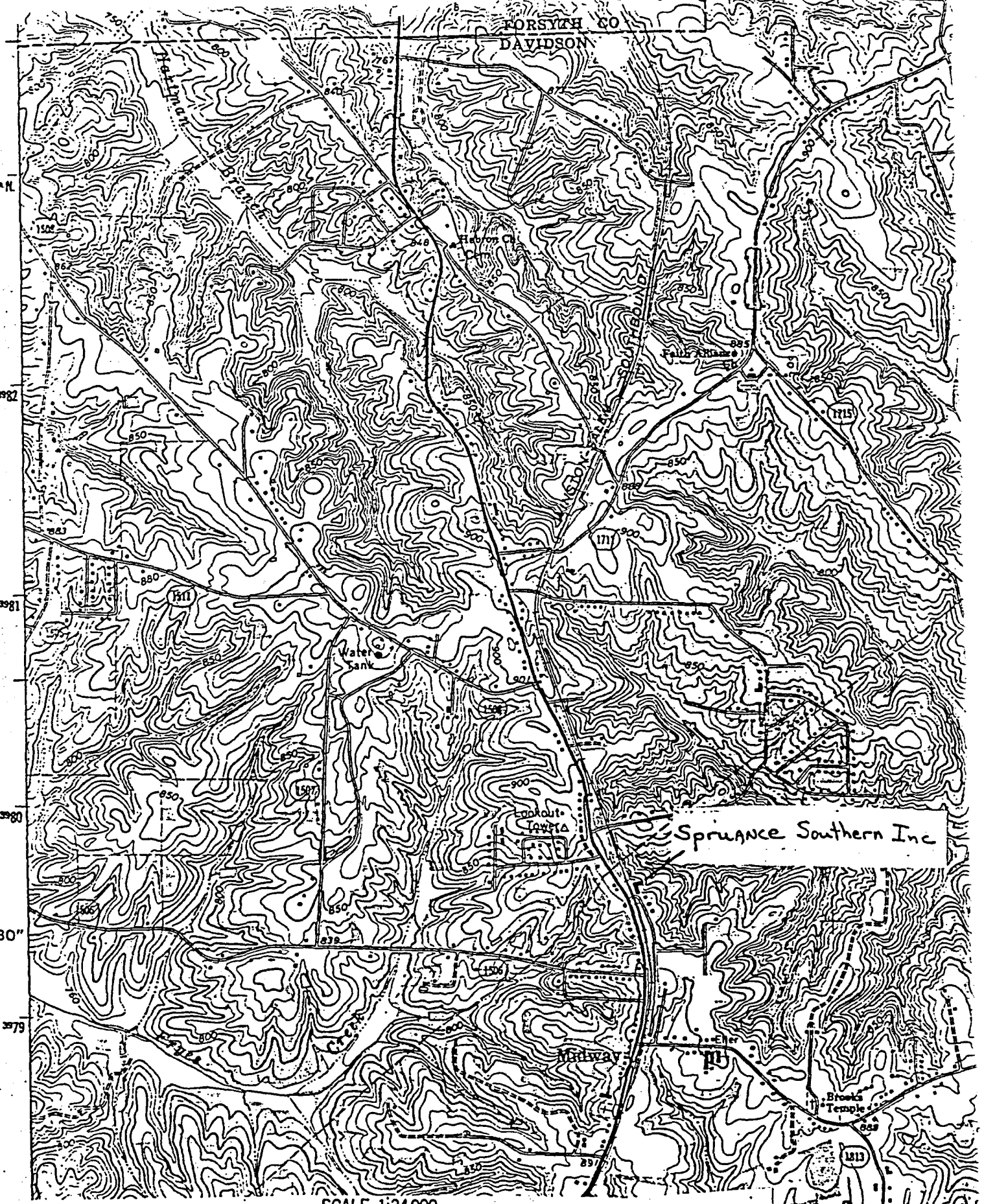
01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
SOL	Methanol	67561	Tanks		
SOL	Toluene	108883	Tanks		
SOL	Xylene	1330207	Tanks		
SOL	Naptha				
SOL	Mineral Spirits				

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	Nitrocellulose		FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1. Permanent files, NC Solid and Hazardous Waste Mgmt. Branch, Raleigh, NC.
2. Rick Forrest, Production Supervisor, Spruance Southern, Inc., personal communication, 11-14-85.
3. Stephen Phibbs, Waste Management Specialist, NC SHW Mgmt. Branch, Winston Salem, NC, personal communication, 11-14-85.



SCALE 1:24000 OLD 52

1 ½ 0 1 MILE

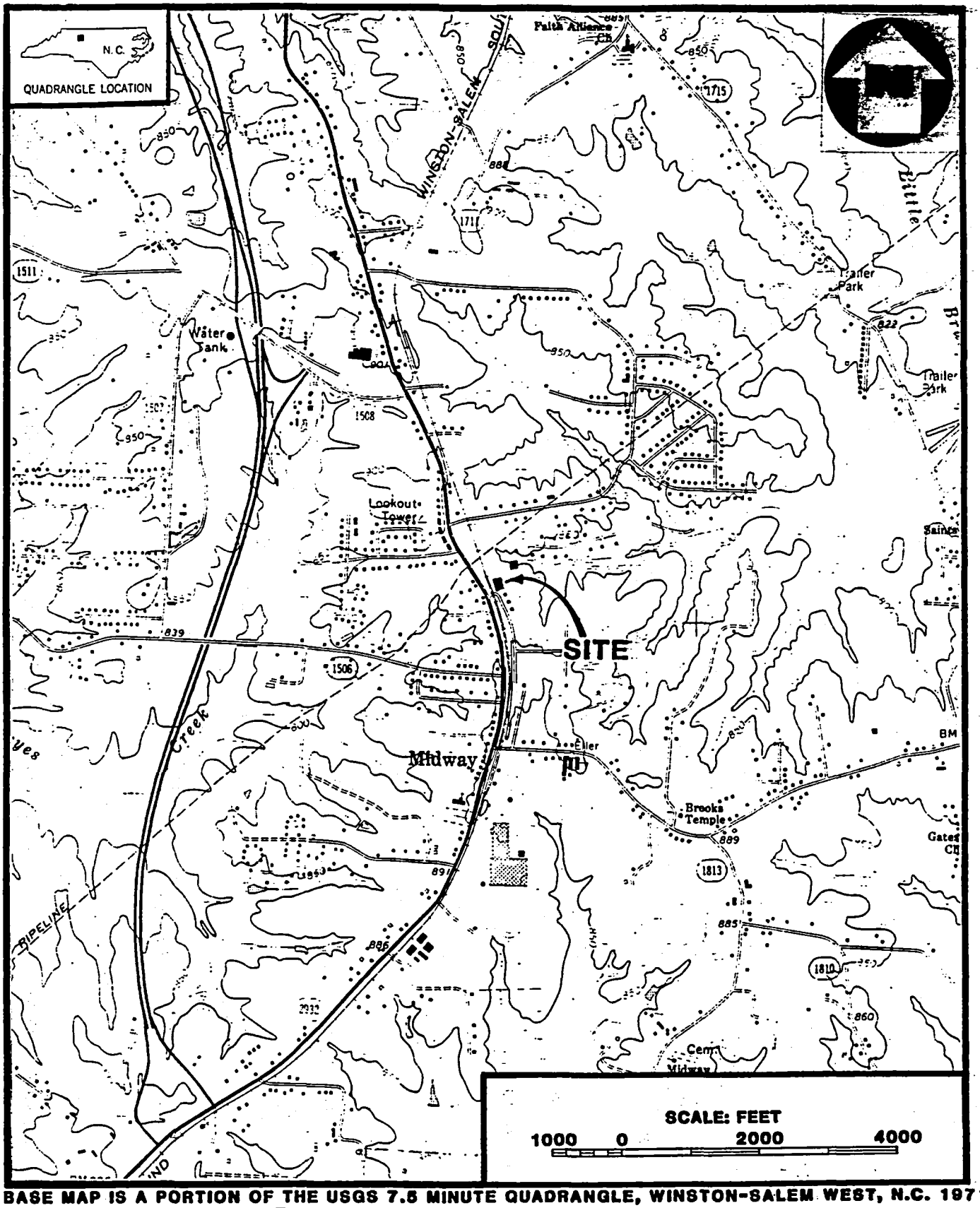
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

MIDWAY, N. C.
N3552.5—W8007.5/7.5

1969

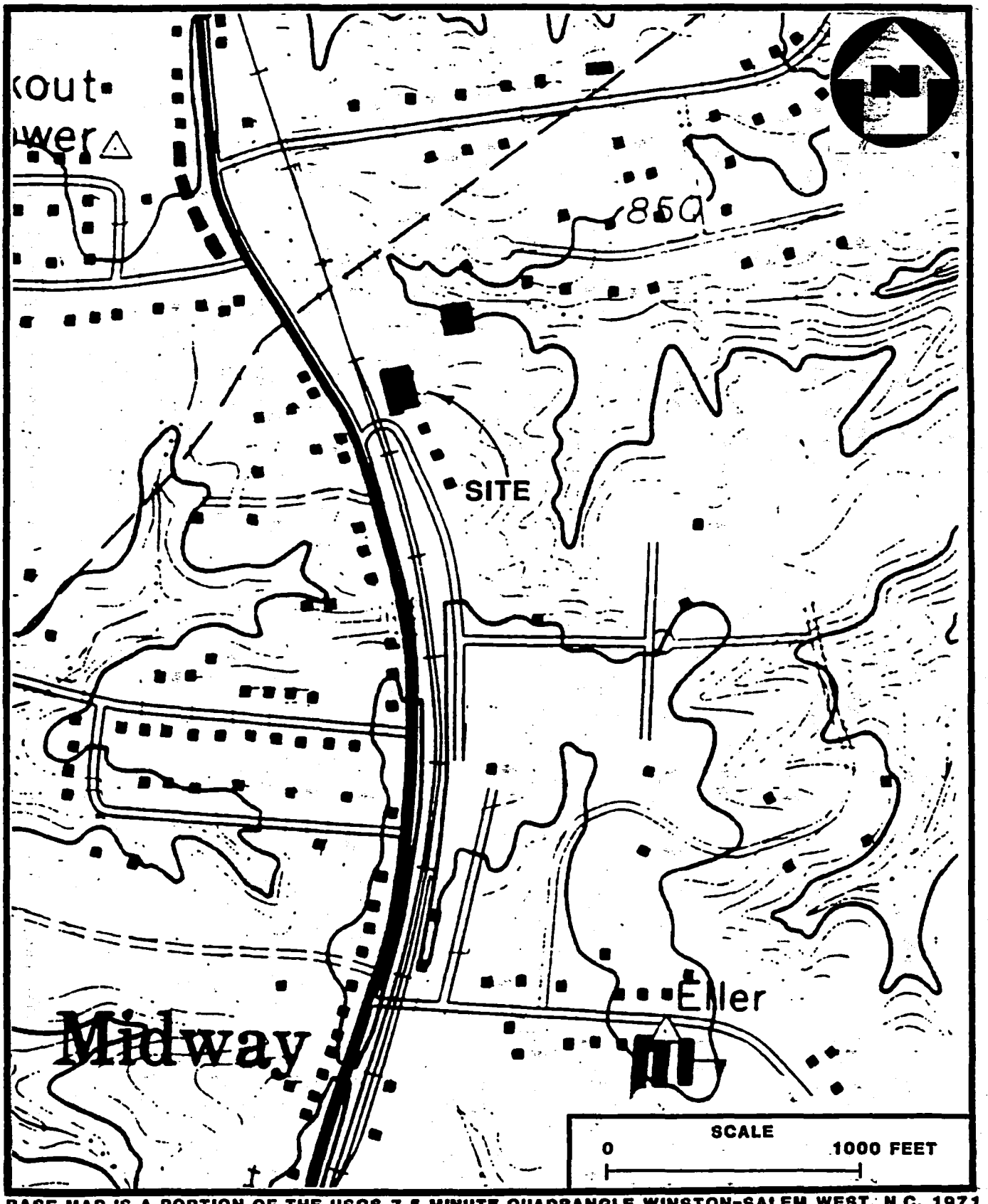


BASE MAP IS A PORTION OF THE USGS 7.5 MINUTE QUADRANGLE, WINSTON-SALEM WEST, N.C. 1971.

SITE LOCATION MAP
SPRUANCE SOUTHERN INC.
MIDWAY, NORTH CAROLINA

FIGURE 1

NUS CORPORATION



BASE MAP IS A PORTION OF THE USGS 7.5 MINUTE QUADRANGLE WINSTON-SALEM WEST, N.C. 1971.

SITE LAYOUT MAP
SPRUANCE SOUTHERN INC.
MIDWAY, NORTH CAROLINA

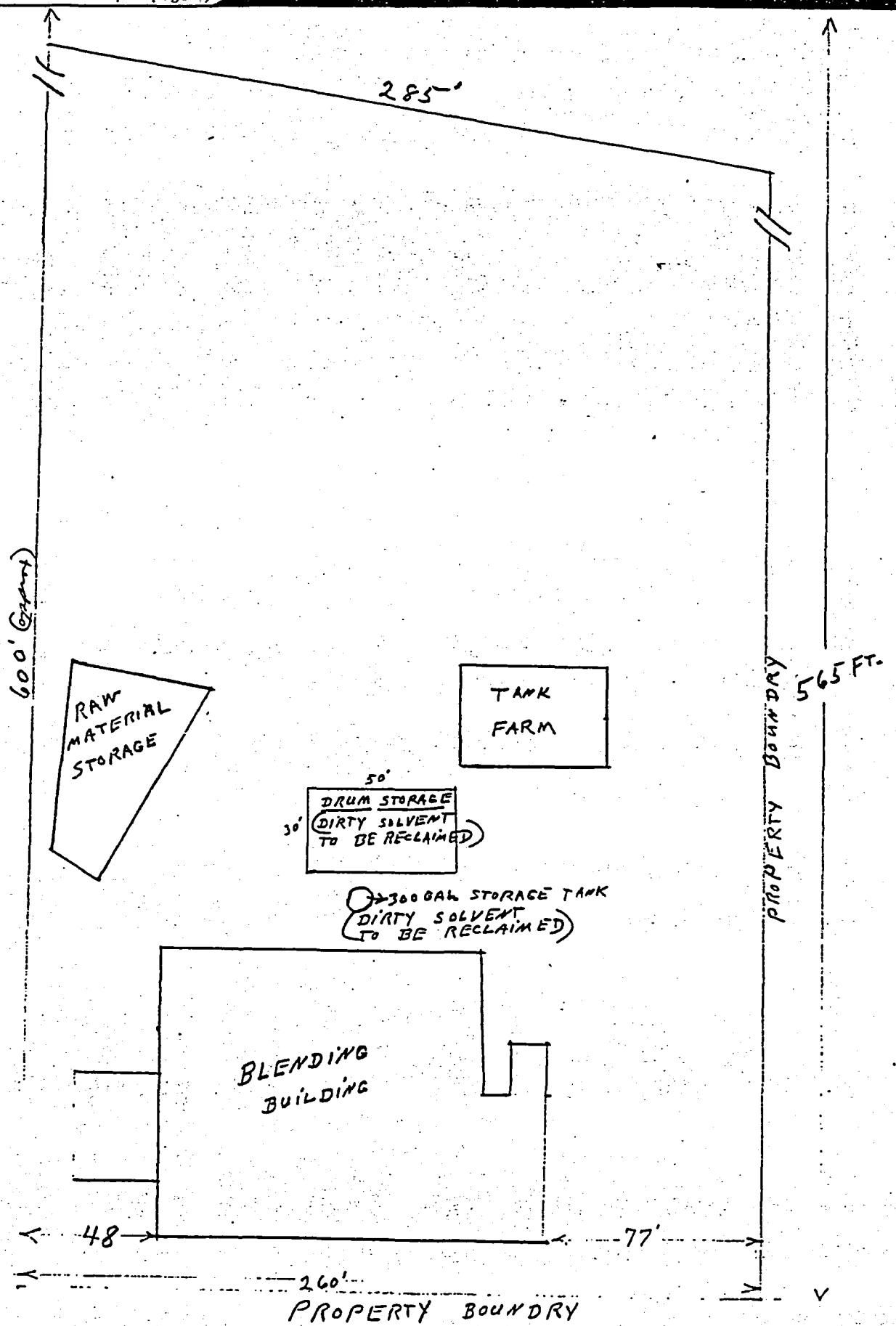
FIGURE 2

NUS CORPORATION

ued from page 4.

Form Approved OMB No. 158-S80004

FACILITY DRAWING (see page 4)



1MM = 20 FT.

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D003214574

II. HAZARDOUS CONDITIONS AND INCIDENTS *(Continued)*

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION *(Include name(s) of species)*

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES *(Spills/runoff/standing liquids/leaking drums)* — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

V. SOURCES OF INFORMATION *(Cite specific references, e. g., state files, sample analysis, reports)*

As previously cited.

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D003214574

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ☐ A. SOLID
- ☐ B. POWDER, FINES
- ☐ C. SLUDGE
- ☐ D. OTHER _____ (Specify)
- ☐ E. SLURRY
- ☒ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS _____
CUBIC YARDS _____
NO OF DRUMS _____

03 WASTE CHARACTERISTICS (Check all that apply)

- ☒ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ☐ D. PERSISTENT
- ☐ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☒ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☐ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS	600	G	Estimated per month.
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

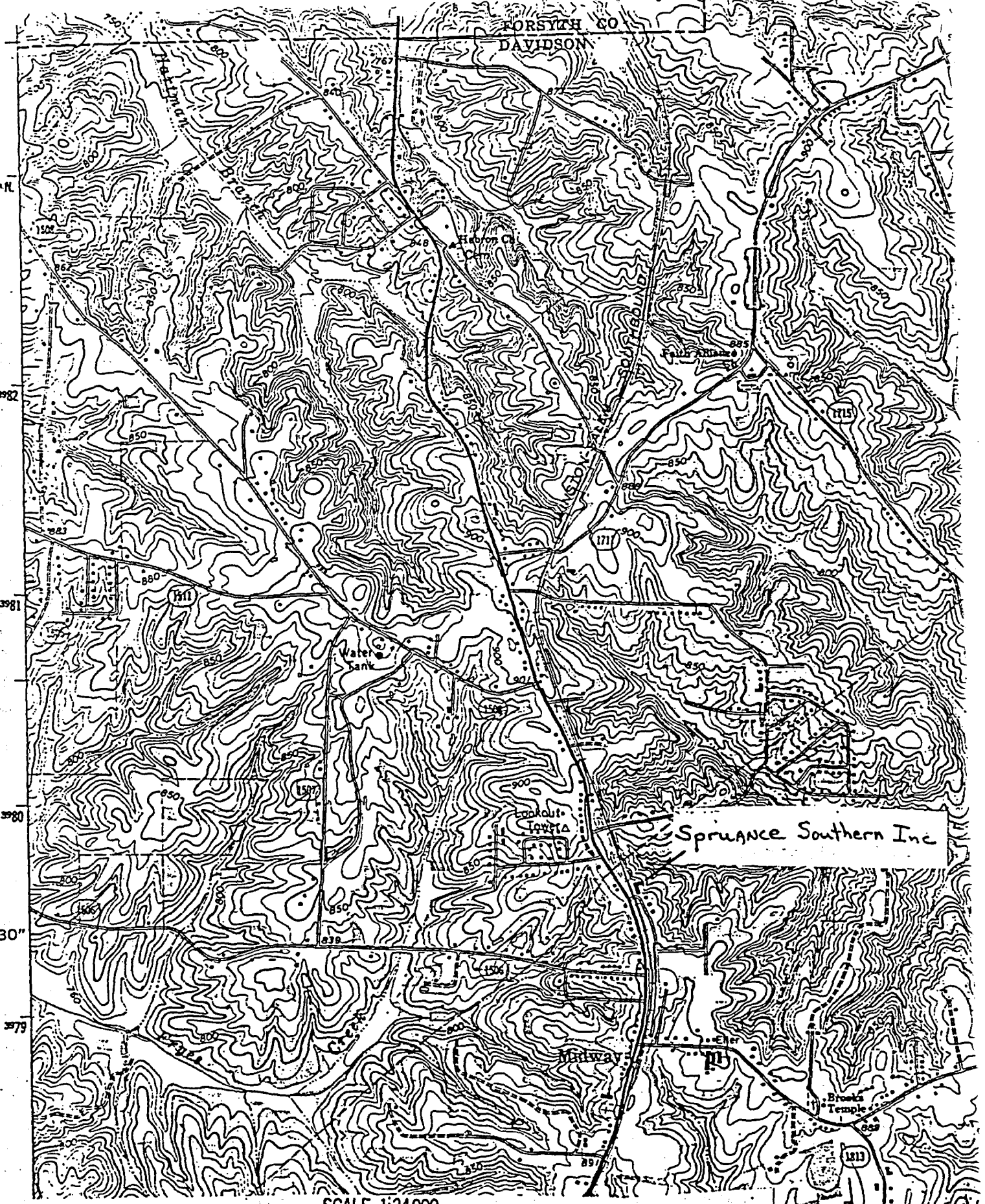
01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
SOL	Methanol	67561	Tanks		
SOL	Toluene	108883	Tanks		
SOL	Xylene	1330207	Tanks		
SOL	Naptha				
SOL	Mineral Spirits				

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	Nitrocellulose		FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1. Permanent files, NC Solid and Hazardous Waste Mgmt. Branch, Raleigh, NC.
2. Rick Forrest, Production Supervisor, Spruance Southern, Inc., personal communication, 11-14-85.
3. Stephen Phibbs, Waste Management Specialist, NC SHW Mgmt. Branch, Winston Salem, NC, personal communication, 11-14-85.



SCALE 1:24000 OLD 52

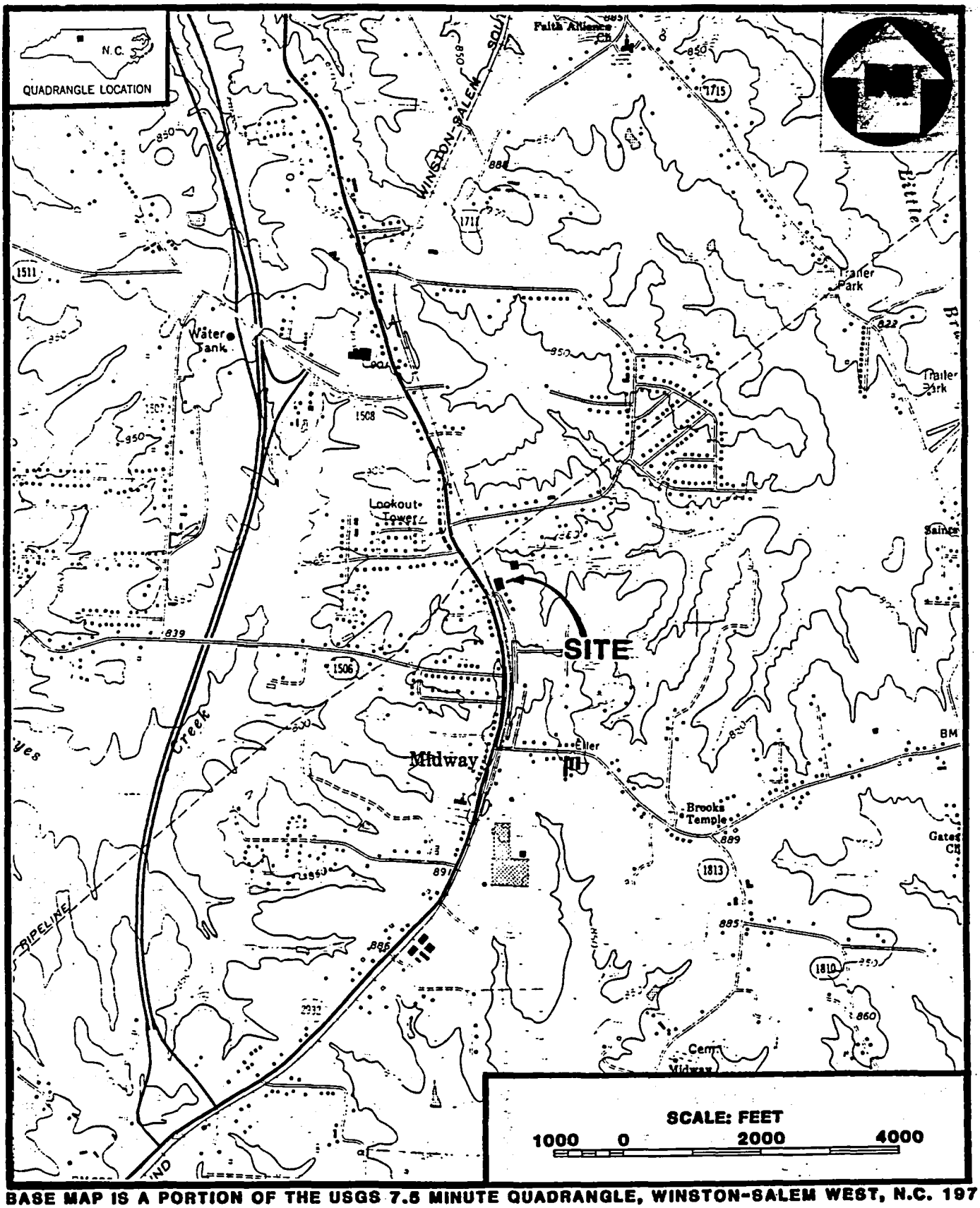
1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

MIDWAY, N. C.
N3552.5—W8007.5/7.5
1969

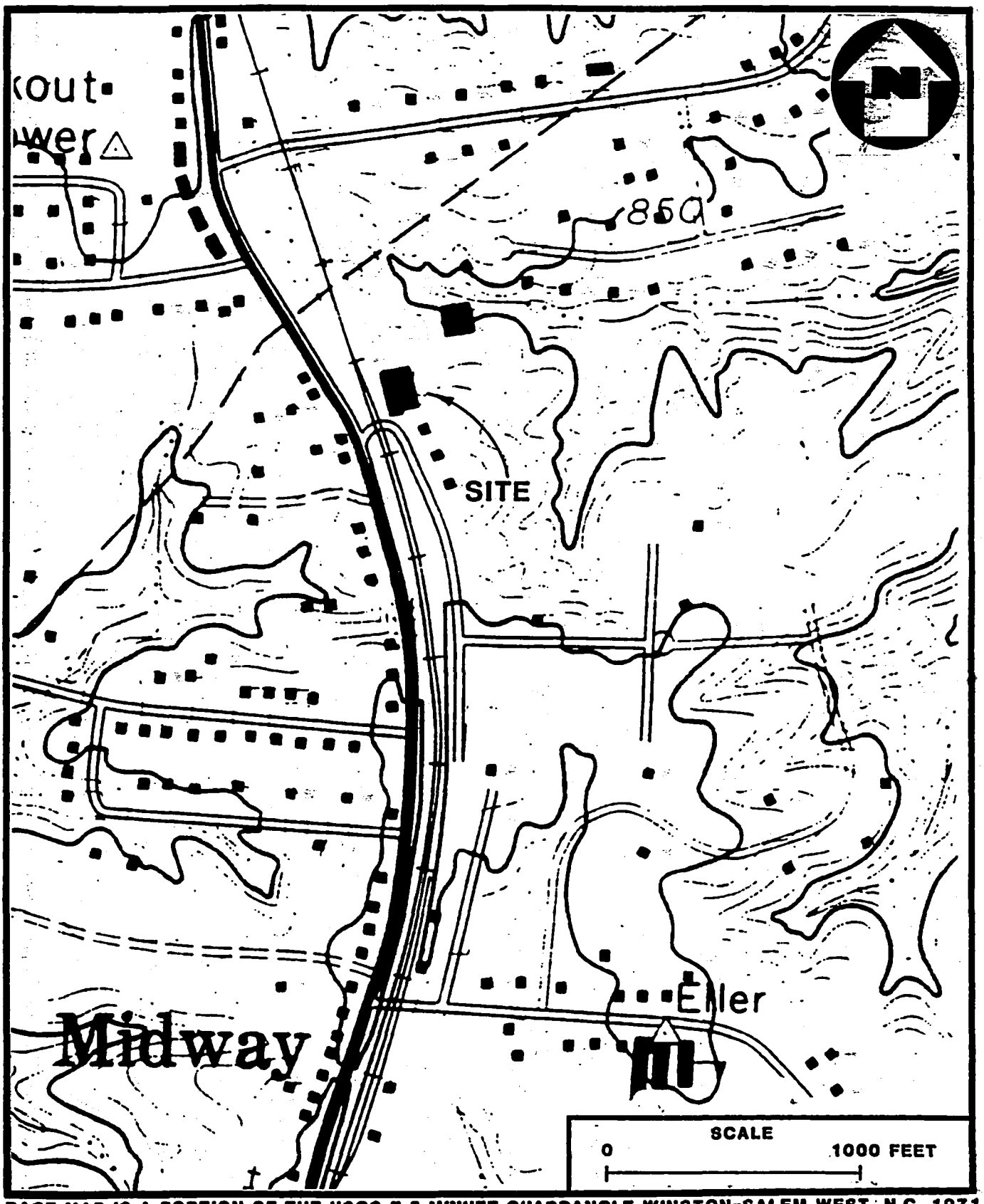


BASE MAP IS A PORTION OF THE USGS 7.5 MINUTE QUADRANGLE, WINSTON-SALEM WEST, N.C. 1971.

SITE LOCATION MAP
SPRUANCE SOUTHERN INC.
MIDWAY, NORTH CAROLINA

FIGURE 1

NUS CORPORATION



BASE MAP IS A PORTION OF THE USGS 7.5 MINUTE QUADRANGLE WINSTON-SALEM WEST, N.C. 1971.

SITE LAYOUT MAP
SPRUANCE SOUTHERN INC.
MIDWAY, NORTH CAROLINA

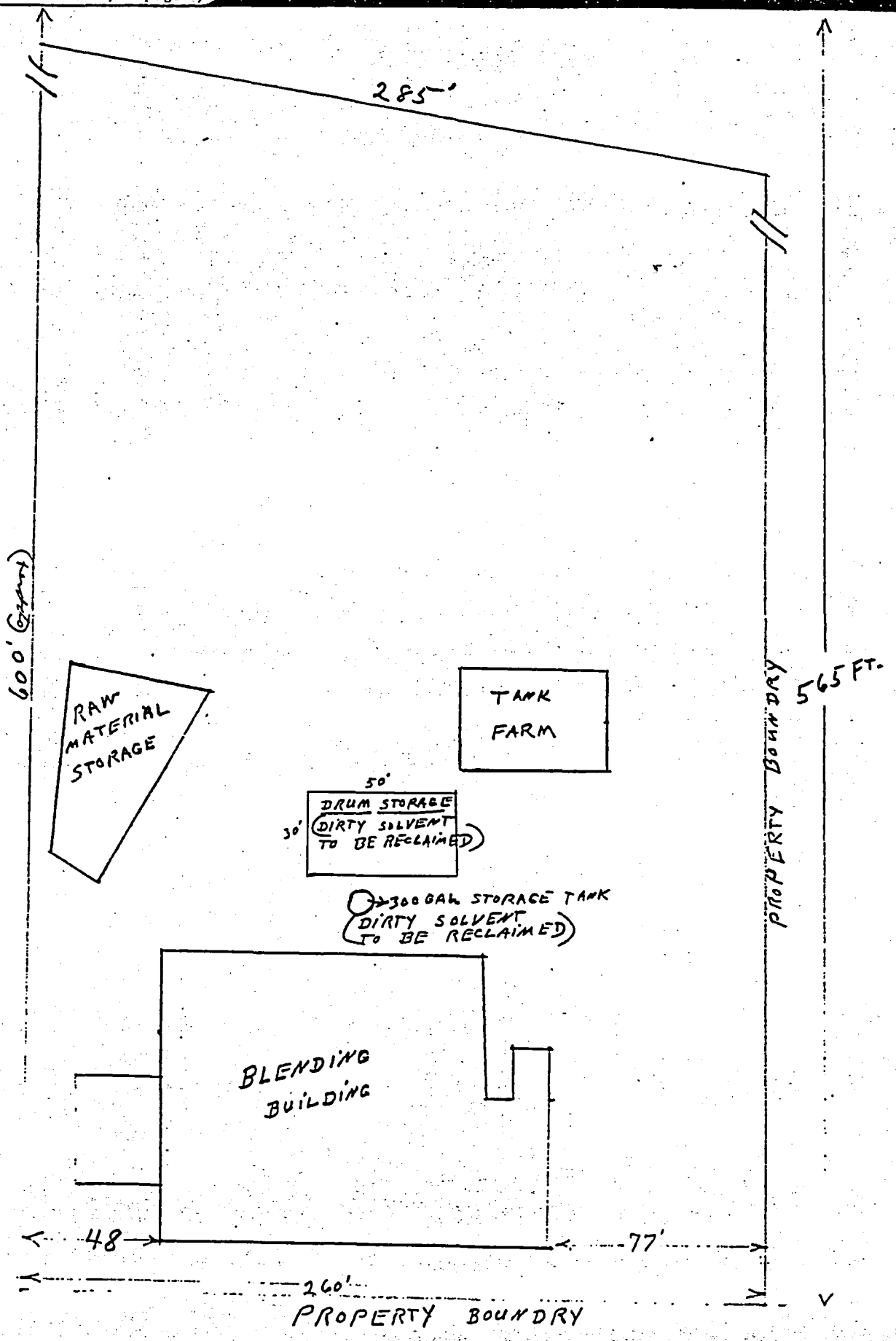
FIGURE 2

NUS CORPORATION

ued from page 4.

Form Approved OMB No. 158-S80004

FACILITY DRAWING (see page 4)



1 MM = 20 FT.

Reference
4

a product of

J. L. DARLING CORPORATION
TACOMA, WASHINGTON 98421 U.S.A.

"Rite in the Rain."
WEATHERPROOF

LEVEL

NOTEBOOK NO. 311

FA-2138
SPRUANCE SOUTHERN CO.
TDD # F4-9001-136
BRICS # NCUI I$
WINSTON-SALEM, FORSYTH, NC
MARGARET D. GRAVES-PM

LOGBOOK REQUIREMENTS
REVISED - NOVEMBER 29, 1988

NOTE: ALL LANGUAGE SHOULD BE FACTUAL AND OBJECTIVE

1. Record on front cover of the Logbook: TDD No., Site Name, Site Location, Project Manager.
2. All entries are made using ink. Draw a single line through errors, initial and date corrections.
3. Statement of Work Plan, Study Plan, and Safety Plan discussion and distribution to field team with team members' signatures.
4. Record weather conditions and general site information.
5. Sign and date each page. Project Manager is to review and sign off on each logbook daily.
6. Document all calibration and pre-operational checks of equipment. Provide serial numbers of equipment used onsite.
7. Provide reference to Sampling Field Sheets for detailed sampling information.
8. Describe sampling locations in detail and document all changes from project planning documents.
9. Provide a site sketch with sample locations and photo locations.
10. Maintain photo log by completing the stamped information at the end of the logbook.
11. If no site representative is on hand to accept the receipt for samples, an entry to that effect must be placed in the logbook.
12. Record I.D. numbers of COC and receipt for sample forms used. Also record numbers of destroyed documents.
13. Complete SMO information in the space provided.

3-27-90 WE THE UNDERSIGNED HAVE READ AND UNDER-STOOD THE WORKPLAN

MARGARET GRAVES, PM
Margaret D. Graves
TERRY TANNER
Terry Tanner
STEPHANY FINE

ALL ENTRIES, SHALL BE MADE BY ME, MARGARET GRAVES UNLESS OTHER WISE INDICATED.
MARGARET GRAVES
Margaret Graves PM

2

8:23
3/28/90 We arrived at Spruance early. Weather is partly cloudy and ~ 57°F.

Facility is located in a rural area on the outskirts of Midway, NC in Davidson County. The facility is active.

The front part of the building is paved and the sides and front are used as parking area with gravel. The facility is 3 acres.

The front of the building is facing southwest with railroad tracks running parralel to the building.

Although the front of the building of the building is not fenced the back of the building is fenced, therefore not easily

M. Nunez 3-28-90

accessible to non-employees. According to file material, there is a drum storage area on site.

In view of where we are are seven storage vats on top of the ground that hold according to file material 10,000 gallons. These are located to East of the building.

To the north end of the building are a drum storage area with old and new drums placed haphazardly and seemingly not in good condition.

To the North of the facility approximately 50ft. from the facility down gradient

M. Nunez 3-28-90 3

4

is the Midway Racquet + Tennis Swim Club. Contamination from the facility would definitely flow in this direction.

Also downgradient from the facility is a pipeline extending underground and then over the ground. This pipe-line may be extending from the facility but I couldn't tell because of its location. But it is in a gully type area.

I didn't see any indication of drainage even though I from some type of wet weather ditch was present.

There were overhead power lines as well as underground cables present. Railroad tracks were also a few

M. Hawes 3-20-90

feet from the site. This would make it slightly difficult to do geophysics because of the close proximity of the interferences.

I did notice one smoke stack leading from the top of the building. This would be a concern for onsite air emissions.

There was a water hydrant approximately 10 ft. from the facility indicating County/City water. But due to the rural area we decided to ride around and look for any houses or private wells.

Approximately 1/2 mile east we found the first

M. Hawes 3-28-90

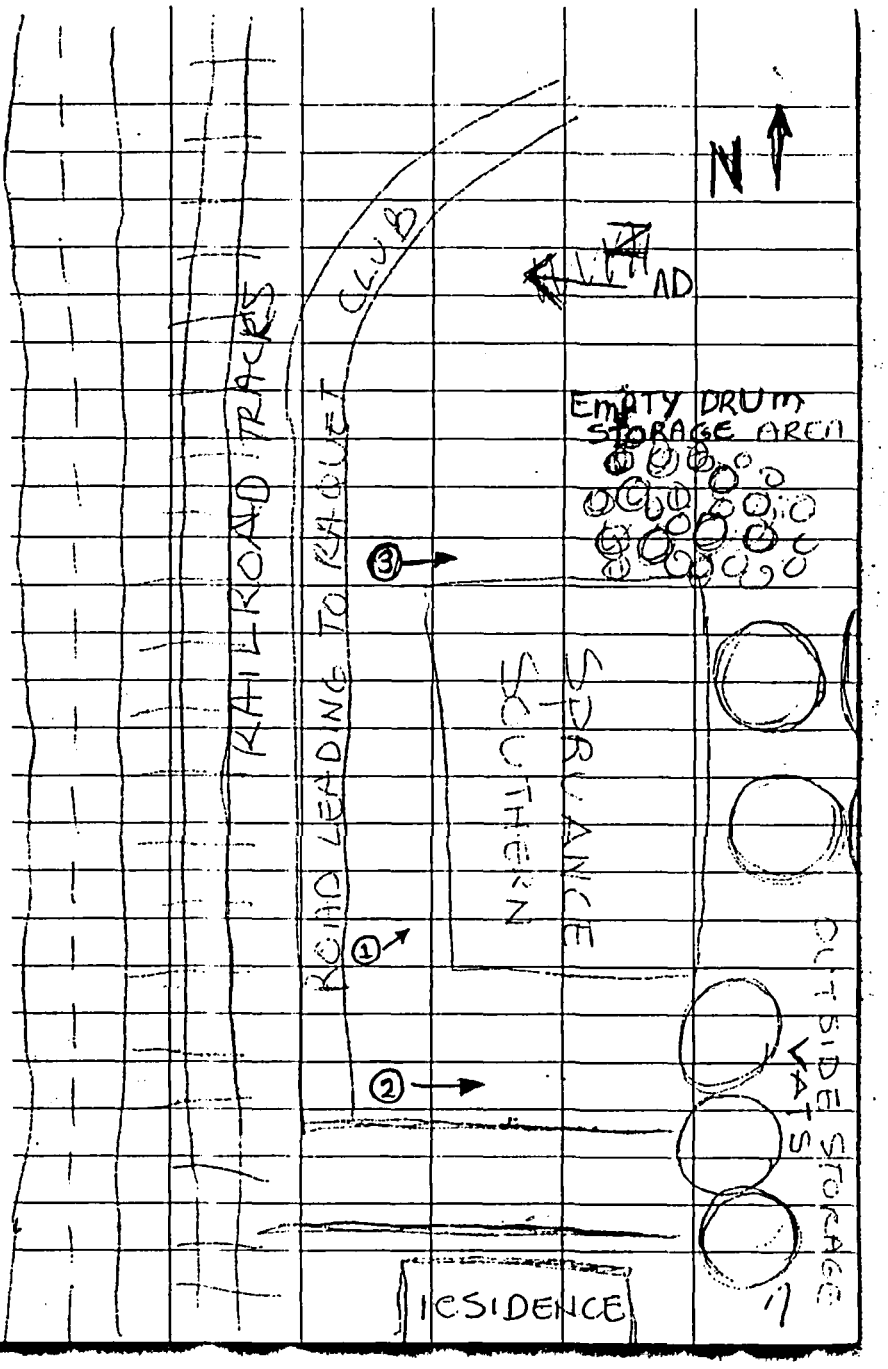
6

Resident on private well water. He was located at RT 9 Box 300. He told me that the County water lines extended to the plant Company (Sprinane)

Located by the drum storage area on the northside of the property he walked seeing a large tank. This tank must have been the 300-gallon storage tank mentioned in the file material.

No stress vegetation was seen at the site. Also, no schools, playgrounds, daycares, are noted in the area.

M. Harvey 3-28-90



40

Case No.

Low Concentration yes/no

Airbill No.

Lab

Media
Soil
Water

Airbill No.

Lab

Media
Soil
Water

Date 3-27-90 By Whom Margaret Graves

Time 8:30 Diagram No. 1

Location Western side of Sprinance Southern, Inc.

Description Front side of facility

Date 3-27-90 By Whom Margaret Graves

Time 8:50 Diagram No. 2

Location Southern side of Sprinance Southern, Inc. Storage vats, southside of property

Date 3-27-90 By Margaret Graves

Time 9:05 Diagram No. 3

Location North side of property

Description Drums located on north side of property approximately 50 drums.

41

Reference

5

DATE: 14 November 1985

TO: File

FROM: Stan Atwood sa

SUBJECT: Spruance Southern, Inc. NC D003214574

I spoke with Rick Forrest [(919) 764-0940], Production Supervisor for Spruance Southern today. We talked about the waste management practices of his company and the types of wastes produced at his plant.

Presently they produce lacquers and sealers for the furniture industry; although, they also made paints prior to 1980. The site has been used for similar purposes for at least 50 years.

Raw materials include various pigments, oils, resins, and solvents, including xylene, toluene, and methanol. Waste solvents are stored in a 300 gallon tank before being transferred to 55 gallon drums. Mr. Forrest said he generally did not accumulate over 20 drums at a time. They transport the dirty solvents to Seaboard Chemical in Jamestown, NC for recycling. No major spills or leaks were reported.

They also have a 80,000 gallon storage capacity for clean solvents. Seven 10,000 gallon tanks are above ground and two tanks are underground.

There are no wells on the property that he knew of, although there is a well within 100 ft. of the property.

SA/tb/0221b

Reference 6

NORTH CAROLINA DEPARTMENT OF HUMAN RESOURCES
SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH
P.O. BOX 2091 RALEIGH, NORTH CAROLINA 27602-2091
306 N.WILMINGTON STREET

RECEIVED OCT 17 1989 HAZARDOUS WASTE BRANCH

90-033

DOCKET #

INSPECTION AND EVALUATION REPORT

EPA ID: # NCD003214574 FACILITY NAME: SPRUANCE SOUTHERN INC.

ADDRESS: HWY 52 SOUTH, RT 9, BOX 305 D CITY: WINSTON SALEM NC 27102

NEW: ✓ UPDATE: ____ DATE OF INITIAL EVALUATION: 10 11 89 STAFF ID: 21

RESPONSIBLE AGENCY: S S = STATE R = EPA X = OVERSEE O = OTHER

TYPE OF EVALUATION COVERED BY THIS REPORT: ENTER ONE: 1

1= COMPLIANCE EVAL. INSP.(CEI)
2= SAMPLING INSPECTION
3= RECORD REVIEW
4= COMP.GWM EVAL.(CME)
5= COMPLIANCE SCHED. (FOLLOW UP)
6= CITIZEN COMPLAINT
7= PART B CALL-IN
8= WITHDRAWAL CAMD.
9= CLOSED FACILITY
10= GENERAL
11= CASE DEVELOPMENT
12= O & M INSPECTION
00= INFORMAL MEETING

DATE OF EVALUATION COVERED BY THIS REPORT: 10 11 89

CLASS OF VIOLATION

VIOLATIONS/RELEASES

CLASS	GWM/RLSB	C/CP	FIR	FP.B	CHEM.SUM	INSPEST.	OT	LAND BAN
I						0	X	0
II						0		0

ACCEPTABLE CODES

X S Z O R^ B^	X S Z O	X S Z O I^ B^	X S Z O	X S Z O C B	X S Z O	X S Z O	X S Z O

KEY
X = VIOLATIONS O = NO VIOLATION Z = PENDING
B = VIOL. & SPECIALTY; S = SAME VIOL./SPEC.

SPECIALTIES
I = HO Insurance only; C = CA SCHED. VIOL.
R = 3008(h)-like release; ^ = CLASS I only

ENTERED DEC 7 1989

ENFORCEMENT ACTIONS: (AREA OF VIOL./RLSB.-GW, CP, IR, FD, CS, HA, OT, LD, or AA)

CLASS	AREA OF VIOL.	TYPE CODE	DATE ACTION TAKEN	COMPLIANCE DATES SCHED.	ACTUAL	PENALTY ASSES.	COLL.	RESP AG.
I	OT	05						

CODES FOR TYPES OF ENFORCEMENT ACTIONS:
03 = WARNING LETTER/NOV
04 = ADMIN. COMPLAINT
05 = FINAL ADMIN. ORDER
10 = INFORMAL
11 = FILED CIVIL ACTION
12 = FILED CRIMINAL ACTION
13 = CIVIL REFERRAL TO AG
90 = HEARING

COMMENTS: UNANNOUNCED INSPECTION - VIOLATIONS NOTED

RCRA INSPECTION REPORT

1) **Facility Information**

SPRUANCE SOUTHERN INC.
RT 9, BOX 305 D
WINSTON SALEM, NORTH CAROLINA 27102

NCD 003214574

2) **Facility Contact**

MR. MICHAEL PLYLER (919) 764-0940
FACILITY MANAGER

3) **Survey Participants**

MR. MICHAEL PLYLER, SPRUANCE SOUTHERN INC.
MR. SCOTT READLING, NCDEHNR

4) **Date of Inspection**

OCTOBER 11, 1989

5) **Applicable Regulations**

40 CFR PARTS 262, 263 AND 265

6) **Scope of Survey**

NO CHANGE

7) **Facility Description**

SPRUANCE SOUTHERN INCORPORATED MANUFACTURES INDUSTRIAL CHEMICALS, COATINGS FROM VARIOUS RAW MATERIALS. ALL HAZARDOUS WASTE GENERATED IS CURRENT COLLECTED IN DRUMS AND AN ABOVE GROUND STORAGE TANK RECENTLY INSTALL (APRIL/MAY 1989). HAZARDOUS WASTE IS DISPOSED OF BY OLDDVER CORPORATION NCD 000773655.

8) **Site Deficiencies**

262.34(a)(1) REFERENCED 265.171 EVIDENCE OF LEAKING CONTAINERS/STRUCTURAL DEF
265.173(a) CONTAINERS NOT KEPT CLOSED (SEVEN CONTAINERS)
265.174 WEEKLY INSPECTIONS NOT ADEQUATE FOR CONTAINERS
265.192(a) NEW TANK ASSESSMENT
265.193(b)(1) SECONDARY CONTAINMENT NEEDED ADQUATELY CONSTRUCTED
265.194(b)(2) OVERFILL PREVENTION CONTROLS NOT IN PLACE

9) **Compliance Schedule/Recommendations**

TO BE ESTABLISHED BY THE RALEIGH OFFICE

...IONS CONTINUED

262.34 (a)(2) ACCUMULATION DATES NOT CLEARLY MARKED ON CONTAINERS
A TOTAL OF (15) FIFTEEN CONTAINERS NOTED ON INSPECTION

262.34 (a)(3) "HAZARDOUS WASTE" NOT CLEARLY MARKED (3) THREE CONTAINERS

262.34 (a)(4) REFERENCED

265.16(c) ANNUAL TRAINING UPDATE EXCEEDED

265.16 (d)(3) DISCRIPTION OF TRAINING NEEDED

265.31 FACILITY NOT MAINTAINED TO MINIMIZE RELEASES

265.35 AISLE SPACE MAINTAINED AT FACILITY AND WASTE STORAGE AREA

265.37(a)(1) ARRANGEMENT WITH LOCAL AGENCIES

265.37 (a)(3) ARRANGEMENTS WITH STATE EMERGENCY RESPONSE TEAMS CONTRACTORS

265.37 (a)(4) HOSPITAL

265.52 (c) ARRANGEMENTS AGREED TO LISTED IN CONTINGENCY PLAN

265.52 (e) LOCATIONS OF EMERGENCY EQUIPMENT

265.53 (b) PLAN SUBMITTED TO LOCAL AGENCIES

262.34(b) EXCEEDED 90 DAY STORAGE ON AT LEAST SEVEN (7) CONTAINERS
DATES IDENTIFIED

5-18-89	6-28-89
6-1-89	6-28-89
6-1-89	7-6-89
6-21-89	

A TOTAL OF ESTIMATED 75 DRUMS RETURNED TO SPRUANCE TO BE EITHER DISPOSED OF OR REWORKED — MOST AT THIS POINT ARE PROBABLY TO BE EMPTIED INTO WASTE TANK.

A TOTAL OF NINE (9) DRUMS OF VARIOUS VAT SAMPLES / LAB SAMPLES WERE ALSO STORED — ALL SAMPLES INDIVIDUALLY CONTAINERIZED IN SIZE RANGING FROM 150 mL TO 1 GALLON.

GENERATOR INSPECTION FORM - PART 262

Name of Site	EPA I.D.	County
SPRUANCE SOUTHERN INC.	NCD003214574	DAVIDSON
Location	Inspection Date	Signature of Inspector(s)
HWY 52 SOUTH, WINSTON SALEM	OCTOBER 11, 1989	[illegible]
Compliance Date 27102		Signature of Facility Contact
C = COMPLIANCE		[illegible]

An inspection of your facility has been made this date and you are notified of the violations, if any, marked below with a cross (X).

SUBPART A - GENERAL

1. Hazardous Waste Determination (262.11)
   - C Subpart D waste (b)
   - C Subpart C waste (c)(1)(2)

2. EPA Identification Numbers
   - C EPA generator number (a)
   - C EPA transporter/facility (c)

SUBPART B - THE MANIFEST

3. General Requirements (262.20)
   - C proper manifest (a)
   - C permitted facility (b)

4. Required Information (262.21)
   - C document number (a)(1)
   - C generator identification (a)(2)
   - C transporter identification (a)(3)
   - C facility identification (a)(4)
   - C D.O.T. description (a)(5)
   - C total quantity (a)(6)
   - C certification (b)

5. Number of Copies (262.22)
   - C minimum number

6. Use of the Manifest (262.23)
   - C generator handwritten signature (a)(1)
   - C transporter signature/date (a)(2)
   - C retain copy (a)(3)
   - C copies to transporter (b)

SUBPART C - PRE-TRANSPORT REQUIREMENTS

7. Packaging (262.30)
   - C D.O.T. compliance

8. Labeling (262.31)
   - C D.O.T. compliance

9. Marking (262.32)
   - C D.O.T. compliance (a)
   - C "HAZARDOUS WASTE" label (b)

10. Placarding (262.33)
    - C D.O.T. compliance

11. Accumulation Time (262.34)
    - X Subpart I; J (a)(1)
    - X accumulation date (a)(2)
    - X "Hazardous Waste" (a)(3)
    - X Subpart C; D (a)(4)*
    - X personnel training (a)(4)*

*Cite specific violations of 40 CFR 265 under remarks

SUBPART D - RECORDKEEPING AND REPORTING

12. Recordkeeping (262.40)
    - C manifest retention (a)
    - C annual/exception report (b)
    - C test/waste analysis (c)

Annual Reporting (262.41)
C submitted (a)(1-6)
C submitted (b)

14. Exception Reporting (262.42)
C transporter contact (a)
C exception report (b)(1)(2)

REMARKS: VIOLATIONS

262.34(a)(1) SUBPART I; J REFERENCED

265.171 EVIDENCE OF LEAKING CONTAINERS / STRUCTURAL DEFECTS

265.173 (a) CONTAINER MUST BE KEPT CLOSED AT ALL TIMES (7) CONTAINERS

265.174 WEEKLY INSPECTIONS NOT ADEQUATE DRUMS / TANKS

265.192 (a) NEW TANK ASSESSMENT (ALL PARTS)

265.193(b)(1) SECONDARY CONTAINMENT SECTION

265.194 (b)(2) OVERFILL PREVENTION CONTROLS (HIGH LEVEL ALARMS, LEVEL SENSING DEVICES)

262.34(a)(2) ACCUMULATION DATES CLEARLY MARKED ON CONTAINERS (15)

262.34(a)(3) "HAZARDOUS WASTE" " " " (3)

262.34(a)(4) SUBPART C; D AND PERSONNEL TRAINING 265.16

265.16(c) ANNUAL REVIEW TRAINING

265.16(d)(3) DISCRIPTION OF TRAINING (OUTLINE)

265.35 AISLE SPACE MAINTAINED

265.37 (a)(1) ARRANGEMENT WITH LOCAL AGENCIES

265.37 (a)(3) " " STATE EMERGENCY RESPONSE TEAMS CONTRACTOR

265.37 (a)(4) " " HOSPITALS

265.52(e) LOCATIONS OF EMERGENCY EQUIPMENT

265.53 (b) PLAN SUBMITTED TO AGENCIES

265.52(c) ARRANGEMENTS AGREED TO BY LOCAL AGENCIES

262.34(b) EXCEEDED NINTY DAY STORAGE OF WASTE (7) CONTAINERS

CONTAINER/TANK INSPECTION FORM - PART 265

SPRUANCE SOUTHERN INC.	NCD 003214574	OCTOBER 11, 1989
Name of Site	EPA I.D.	Inspection Date

SUBPART I - USE AND MANAGEMENT OF CONTAINERS

1. Condition Of Containers (265.171)
   - C leakage
   - X past leakage (evidence)
   - C severe rusting
   - X structural defect

2. Compatibility Of Waste With Containers (265.172)
   - C visual evidence of noncompliance (leakage, corrosion)

3. Management of Containers (265.173)
   - X closed (a)
   - C improper handling or storage (b)

4. Inspections (265.174)
   - X weekly (minimum)

5. Special Requirements For Ignitable or Reactive Waste (265.176)
   - C 15m (50 ft)

6. Special Requirements For Incompatible Waste (265.177)
   - C mixing (a)
   - C unwashed container (b)
   - C separation (c)

SUBPART J - TANKS

1. General Operating Requirements (265.192)
   - C compatibility (a)(b)
   - C uncovered tank precautions (c)
   - X overflow prevention (d)

2. Waste Analysis and Trial Tests (265.193)*
   *Section not applicable to a generator only
   - C waste analysis/trial test

3. Inspections (265.194)
   - C discharge control equipment (a)(1)
   - X monitoring equipment (a)(2)
   - X waste level (a)(3)
   - C construction material (a)(4)
   - C surrounding area (a)(5)
   - C assessment schedule/procedures (b)

4. Closure (265.197)
   - C plan on-site

5. Special Requirements For Ignitable Or Reactive Waste (265.198)
   - C properly stored (a)(1)(2)(3)
   - C buffer requirements (b)

6. Special Requirements For Incompatible Wastes (265.199)
   - C properly stored (a)
   - C tank washed (b)

REMARKS: VIOLATIONS

DHS Form 3010 (Rev. 9-83)
SOLID & HAZARDOUS WASTE

TRANSPORTER INSPECTION FORM - PART 263

Name of Site	EPA I.D.	County
SPRUANCE SOUTHERN INC.	NCD 003214574	DAVIDSON
Location	**Inspection Date**	**Signature of Inspector(s)**
HWY 52 SOUTH, WINSTON SALEM	OCTOBER 11, 1989	
Compliance		**Signature of Facility Contact**
27102		
C= COMPLIANCE		X

An inspection of your facility has been made this date and you are notified of the violations, if any, marked below with a cross (X).

SUBPART A - GENERAL

1. EPA Identification Number (263.11)
   C yes (a)(b)

2. Transfer Facility Requirements (263.12)
   C 10 days limit

SUBPART B - MANIFEST SYSTEM/RECORDKEEPING

3. The Manifest System (263.20)
   C generator signature (a)
   C transporter signature/date/copy (b)
   C accompanying manifest (c)
   C delivery compliance (d)(1)(2)(3)
   N/A bulk shipment-water (e)(1)(2)(3)(4)(5)
   N/A rail shipment (f)(1)(2)(3)(4)
   N/A foreign shipment (g)(1)(2)(3)

4. Compliance With The Manifest (263.21)
   C designated facility delivery (a)(1)
   C alternate facility delivery (a)(2)
   C designated transporter delivery (a)(3)
   N/A designated foreign facility (a)(4)
   C generator contact (b)

5. Recordkeeping (263.22)
   C signed copies (a)
   N/A bulk shipment-water (b)
   N/A rail shipment (c)(i)(ii)
   N/A foreign shipment (d)
   C extended retention (e)

SUBPART C - HAZARDOUS WASTE DISCHARGES

6. Immediate Action (263.30)
   C immediate action (a)
   C notification (c)(1)(2)
   C water transporter notification (d)

7. Discharge Clean-Up (263.31)
   C remedial action

REMARKS: NO VIOLATIONS

NO HAZARDOUS WASTE TRANSPORTED

SINE 10/20/86

CANCELLING TRANSPORTER

DHS Form 3010 (Rev. 9-83)
SOLID & HAZARDOUS WASTE

Department of Human Resources
Division of Heal Services
Solid & Hazardous Waste Management Branch

JUL 2 1982
SOLID & HAZARDOUS WASTE MANAGEMENT BRANCH

Reference

7

APPLICATION FOR CHANGE IN CLASSIFICATION UNDER RCRA

Date: 6-30-82

Company Name: SPRUANCE SOUTHERN, INC.

Company Address: P.O. Box 3054 ~~Winston Salem, NC~~ 27102

EPA ID No: NCD003214574

Mr. O. W. Strickland, Head
Solid & Hazardous Waste Management Branch
Division of Health Services
P. O. Box 2091
Raleigh, N. C. 27602

Dear Mr. Strickland:

Our company requests the following change in its classification under RCRA (check all that apply):

Add As	Delete As	
☐	☐	generator
☐	☐	transporter
☐	☐	treater
☐	☑	storer
☐	☐	disposer
☐	☐	small generator

Our reason for this request is:

WILL BE TAKING TO SEABOARD CHEMICAL WITHIN 90 DAY LIMIT.

NOTE: Give any pertinent information. This may be a change in your process, a new calculation of the volume of your waste, new analyses of your waste, etc. Be specific. Please note that this is not a petition for delisting a listed waste, which requires totally different handling.

If your request takes you out of the regulated system, but you wish to retain your EPA ID No., please state why.

(over)

Reference
8

DATE: 14 November 1985

TO: File

FROM: Stan Atwood sa

SUBJECT: Spruance Southern, Inc. NC D003214574

I spoke by telephone with Stephen Phibbs [(919) 761-2390] about his knowledge of the operations of Spruance Southern. He has inspected this facility on several occasions.

Stephen said that Spruance Southern is a formulator of lacquers and enamels. Dirty solvents are first placed in a large vat behind the building. The spent solvents are then delivered to 55 gallon drums and are transported to Seaboard Chemical in Jamestown, NC for recycling. He also said that spills from overflow from the storage vat occurred before a check valve was installed 3 to 4 months ago.

SA/tb/0221b

Reference 9

17

N. C. DEPARTMENT OF HUMAN RESOURCES
DIVISION OF HEALTH SERVICES

RECEIVED MAR 1 0 1989 HAZARDOUS WASTE

N. C. 1988 HAZARDOUS WASTE GENERATOR ONLY ANNUAL (PART A) REPORT *

Four Digit Standard Industrial Classification (SIC) No. For Operations In Your Company That Generated The Waste 2851

I. Installation EPA ID Number: NCD003214574

II. Name of Installation: Sherwin Southern, Inc

III. Location of Installation: Rt 9 Box 305-D
(Street or Route Number)

Winston-Salem Davidson NC 27107
(City or Town) (County) (State) (Zip Code)

IV. Installation Contact: Mike Plyler (919) 764-0940
(Name) (Area Code) (Phone Number)

V. Waste Identification:

	A. EPA Waste No.	B. Description of Waste/ Chemical Name	1. Remedial Action Waste	C. Quantity Generated (LBS)	D. Handling Method/Quantity/Location Waste Shipped to: 1. Handling Method Code	2. Quantity Shipped to TSD or Recovery Facility (LBS)	3. TSD Facility EPA ID No./ Recovery Facility Name	E. In Storage December 31, 1988: 1. Storage Method Code	2. Quantity (LBS)
1	F005	Waste Spent Solvent	0	59,713	T05	41,228	SCD036275626	S01	16,093
2		Flammable Liq. NOS			T03	2,027	ALD981020854	S01	
3		from tank washing							
4									
5									
6									
7									
8									
9									
10									
11									
12									

if more space is needed check ____ and complete attachment 1

VI. List EPA ID Numbers for each Transporter used during reporting year: SCD036275626
ALD981020854

VII. CERTIFICATION: I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Mike Plyler (Signature) Mike Plyler (Print or Type Name) 3/1/89 (Date Signed)

*Read instructions before completing form

DHS 3036 (Revised 1-89) Do. No. 0351A
Hazardous Waste Branch

Please print or type in the unshaded areas only (fill-in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER: F N C D 0 0 3 2 1 4 5 7 6

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

U.D.E. K.X.3

RECEIVED

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If ... Reference 10 ... the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.

SPECIFIC QUESTIONS	MARK "X" YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	MARK "X" YES	NO
A. Is this facility a publicly-owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)		X		B. Does or will this facility (either existing or proposed) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)		X
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)		X		D. Is this a proposed facility (other than those described in A or B above) which will result in a discharge to waters of the U.S.? (FORM 2D)		X
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)	X		X	F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X		H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X		J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X

III. NAME OF FACILITY

1 SKIP SPRUANCE SOUTHERN INC

IV. FACILITY CONTACT

A. NAME & TITLE (last, first, & title)	B. PHONE (area code & no.)
2 BROOME EARNEST VICE-PRESIDENT	919 764 0940

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 PO BOX 3054

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 WINSTON-SALEM	NC	27102

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 ROUTE 52 SOUTH

B. COUNTY NAME

DAVIDSON

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE (if known)
	NC	27102	

CONTINUED FROM THE FRONT

VII. SIC CODES (4-digit, in order of priority)

A. FIRST	B. SECOND
7 2 8 5 1 (specify) PAINT MANUFACTURER	C 7 (specify)
C. THIRD	**D. FOURTH**
7 (specify)	C 7 (specify)

VIII. OPERATOR INFORMATION

A. NAME: SPRUANCE SOUTHERN INC.

B. Is the name listed in Item VIII-A also the owner? [X] YES [ ]

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)
F = FEDERAL; S = STATE; P = PRIVATE; M = PUBLIC (other than federal or state); O = OTHER (specify)
P (specify)

D. PHONE (area code & no.): C A 919 764 0940

E. STREET OR P.O. BOX: P O BOX 3054

F. CITY OR TOWN: WINSTON-SALEM

G. STATE: N C

H. ZIP CODE: 27102

IX. INDIAN LAND

Is the facility located on Indian lands? [ ] YES [X] NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)
T N	C T g P
B. UIC (Underground Injection of Fluids)	**E. OTHER (specify)**
T U	C T g (specify)
C. RCRA (Hazardous Wastes)	**E. OTHER (specify)**
T R	C T g (specify)

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

MANUFACTURER OF INDUSTRIAL COATINGS INCLUDING PAINT, LACQUER, ENAMELS AND STAINS.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
Ernest L. Broome, Vice President	Earnest Lindley Broome	November 13, 19

COMMENTS FOR OFFICIAL USE ONLY

print or type in the unshaded areas only
(fill-in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-S8000

FORM 3 RCRA — EPA — U.S. ENVIRONMENTAL PROTECTION AGENCY
HAZARDOUS WASTE PERMIT APPLICATION
Consolidated Permits Program
(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER: F NCD003214 5

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your f... revised application. If this is your first application and you already know your facility's EPA I.D. Number; or if this is a revised application, enter your EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

[ ] 2. NEW FACILITY *(Complete item ...)*

C: 8 — YR. 53 MO. 03 DAY 01 — FOR EXISTING FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*.

YR. __ MO. __ DAY __ — FOR NEW FA... PROVIDE TH... (yr., mo., & da...) TION BEGAN... EXPECTED T...

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[ ] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES — CODES AND DESIGN CAPACITIES

A. PROCESS CODE — Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are prov... entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes be... describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY — For each code entered in column A enter the capacity of the process.
1. AMOUNT — Enter the amount.
2. UNIT OF MEASURE — For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the un... measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY	PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:			**Treatment:**		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS	TANK	T01	GALLONS PER DAY OR LITERS PER DAY
TANK	S02	GALLONS OR LITERS	SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS	INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS			
Disposal:					
INJECTION WELL	D79	GALLONS OR LITERS	OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER			
LAND APPLICATION	D81	ACRES OR HECTARES			
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY			
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS			

RECEIVED ... REGION IV

UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G	LITERS PER DAY	V	ACRE-FEET	
LITERS	L	TONS PER HOUR	D	HECTARE-METER	
CUBIC YARDS	Y	METRIC TONS PER HOUR	W	ACRES	
CUBIC METERS	C	GALLONS PER HOUR	E	HECTARES	
GALLONS PER DAY	U	LITERS PER HOUR	H		

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons ... other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C — DUP — T/A — C 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT	2. UNIT OF MEASURE (enter code)	OFFICIAL USE ONLY
X-1	S02	600	G		5				
X-2	T03	20	E		6				
1	S01	7000	G		7				
2					8				
3					9				
4					10				

ontinued from the front.

III. PROCESSES *(continued)*

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "T04")*. FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

. DESCRIPTION OF HAZARDOUS WASTES

EPA HAZARDOUS WASTE NUMBER — Enter the four—digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If yo handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four—digit number*(s)* from 40 CFR, Subpart C that describes the characteri tics and/or the toxic contaminants of those hazardous wastes.

ESTIMATED ANNUAL QUANTITY — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annua basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non—listed waste*(s)* that will be handlec which possess that characteristic or contaminant.

UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriat codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking intc account the appropriate density or specific gravity of the waste.

PROCESSES

1. PROCESS CODES:
   For listed hazardous waste: *For each listed hazardous waste entered in column A, select the code(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
   For non—listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate all the processes that will be used to store, treat, and/or dispose of all the non—listed hazardous wastes that possess that characteristic or toxic contaminant.
   Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code*(s)*.
2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER — Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV *(shown in line numbers X-1, X-2, X-3, and X-4 below)* — A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non—listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
X-1	K054	900	P	T03 D80	
X-2	D002	400	P	T03 D80	
X-3	D001	100	P	T03 D80	

ued from page 2.

E: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)		FOR OFFICIAL USE ONLY	
N C D 0 0 3 2 1 4 5 7 4	1	W DUP	2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				2. PROCESS DESCRIPTION (If a code is not entered in D(1))
1	K 0 7 8	28	T	S 0 1				
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
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22								
23								
24								
25								
26								

Continued from the front.

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*

F N C D 0 0 3 2 1 4 5 7 4 T/A C 6

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail)*.

VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground—level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail)*.

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*
35 57 10 N	80 12 32 W

VIII. FACILITY OWNER

[X] A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & no.)*

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
Earnest L. Broome	Earnest L. Broome	November 13, 1980

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED

DIVISION OF HEALTH SERVICES
P.O. Box 2091
Raleigh, N.C. 27602-2091

Reference 11

Ronald H. Levine, M.D., M.P.H.
STATE HEALTH DIRECTOR

Date: July 7, 1982

Mr. Ermon Rush
Spruance Southern, Inc.
P.O. Box 3054
Winston-Salem, NC 27102

Re: Facility ID No. NCD003214574

Dear Mr. Rush:

Based on information supplied by you we have processed and accepted at the State level your request for the facility identified with the above ID number to receive the indicated change in classification under RCRA:

Add As	Delete As	
☐	☐	generator
☐	☐	transporter
☐	☐	treater
☐	☒	storer
☐	☐	disposer
☐	☐	small generator

We are advising EPA of the change in your status. Please notify us if there is any further change in your operations which would again affect your status. Your EPA ID NO. is ☐ is not ☒ being cancelled.

Cordially,

O. W. Strickland, Head
Solid & Hazardous Waste Management Branch
Environmental Health Section

OWS

cc: John Herrmann
EPA Region IV
Emil Breckling

DHS Form 3048 3/82
Solid & Haz. Waste Mgt. Branch

Reference 12

Ronald H. Levine, M.D., M.P.H.
STATE HEALTH DIRECTOR

DIVISION OF HEALTH SERVICES
P.O. Box 2091
Raleigh, N.C. 27602-2091

March 13, 1984

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Ermon Rush
Spruance Southern Co.
P.O. Box 3054
Winston-Salem, N.C. 27102

Re: NCD003214574

Dear Mr. Rush:

On December 12, 1983, in response to a formal call for part B of a permit application, an officer of your company advised this Branch that a part B application would not be filed. Following this, on January 29, 1984 and February 1, 1984, the Solid and Hazardous Waste Management Waste Management Branch of the Department of Human Resources published a legal notice in the Raleigh papers, announcing its intention to deny a permit and terminate interim status for a number of plants, including yours.

You are now advised that this plant has been denied a permit as a hazardous waste treatment, storage, or disposal facility and its interim status has been formally terminated. As of March 30, 1984, the operators of it may not treat or dispose of hazardous waste, nor store it for more than 90 days from the of accumulation.

If you have any questions about this matter, please call or write to Mr. Keith Lawson at this office.

Very sincerely,

O. W. Strickland, Head
Solid and Hazardous Waste Management Branch
Environmental Health Section

OWS/KL: tl

NCD042391039	SPRINGFIELD INC SPRINGFIELD COOK RALPH MGR WTR & WSTW	HIGHWAY 79 LAUREL HILL		28351	GENERAL DELIVERY LAUREL HILL	NC	28351	X		803	547-2901
NCD003214574	SPRUANCE SOUTHERN INC BEVLEA, MIKE	HIGHWAY 52 SOUTH WINSTON-SALEM		27102	ROUTE 9 BOX 305-D WINSTON-SALEM	NC	27107	X		919	764-0940
NCD003951078	SQUARE D COMPANY PHILLIPS, DAVID A.	123 BINGHAM ROAD ASHEVILLE		28806	PO BOX 5107 ASHEVILLE	NC	28803	X		704	252-0300
NCD067203752	SQUARE D COMPANY BUCHANAN, BILL	HIGHWAY 64 KNIGHTDALE		27545	PO BOX 27446 RALEIGH	NC	27611	X	X	919	266-3671
NCD101773000	SQUARE D COMPANY HYATT, PAMELA A.	1809 AIRPORT ROAD MONROE		28110	PO BOX 5002 MONROE	NC	28110	X		704	283-7411
NCD991278730	SQUIBB E R & SONS VARLEY, DAVE	FLOWERS ROAD KENLY		27542	1000 SQUIBB DRIVE KENLY	NC	27542	X		919	284-5131
NCD004073362	ST JOE CONTAIN R COMPANY TAYLOR LEWIS ENG COORDINA	1201 WESTINGHOUSE BLVD CHARLOTTE		28217	PO BOX 7248 CHARLOTTE	NC	28217	X		904	227-1171
NCD981744840	STACK POLE COMPONENTS COMPANY O'QUINN, MARK	2504 NORTH BLVD RALEIGH		27604	2504 NORTH BLVD RALEIGH	NC	27604	E		919	821-5296
NCD982082406	STACLEAN DIFFUSER COMPANY JOHNSON, JUDY	2200 OLD WILKESBORO ROAD SALISBURY		28144	PO DRAWER 1147 SALISBURY	NC	28145	X		704	636-8697
NCD982118408	STADIUM CLEANERS POLLARD, SCOTT	205 EAST 10TH STREET GREENSVILLE		27834	205 EAST 10TH STREE GREENSVILLE	NC	27834	E		919	758-2701
NCD041047936	STAMEY CHRYSLER-PLYMOUTH DODGE BECK, KENNETH	SUGAR HILL ROAD & I 40 WE MARION		28752	PO BOX 249 MARION	NC	28752	X		704	652-2858
NCD084167444	STANADYNE INC DIESEL SYSTEMS G BENSON ROBERT FACILITY EN	405 WHITE STREET JACKSONVILLE		[redacted]	PO BOX 5084 JACKSONVILLE	NC	28540	X		919	353-3666
NCD091567065	STANADYNE INC DIES L SYSTEMS G VANNI RANDOLPH MGR FAC EN	CLARKS NECK RD ROUTE 3 WASHINGTON		27889	PO BOX 1105 WASHINGTON	NC	27889	X		919	975-2553
NCD982162950	STANDARD COMMERCIAL TOBACCO CO CORBETT, R.S.	2201 MILLER ROAD WILSON		27893	PO BOX 450 WILSON	NC	27894	E		919	291-5307
NCD981932031	STANDARD FLEXIBLE PACKAGING CO PHILLIPS, JOHN	HIGHWAY 73 WEST MOUNT GILEAD		27306	PO BOX 1007 MOUNT GILEAD	NC	27306	X		919	439-6137
NCD054284518	STANDARD PACKAGING & PRINTING JONES, CRAIG	HIGHWAY 73 WEST MT. GILEAD		27306	PO BOX 706 MT. GILEAD	NC	27306	X		919	439-6137
NCD109146430	STANDARD PRODUCTS GOLDSBORO MOTAMEDI, MIKE	308 FEDELON TRAIL GOLDSBORO		27530	308 FEDELON TRAIL GOLDSBORO	NC	27530	X		919	735-5394

Reference 13

FACILITY ID	FACILITY NAME	FACILITY ADDRESS	MAILING ADDRESS	TELEPHONE

Reference
14

EPA-600/2-8
April

DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings

by

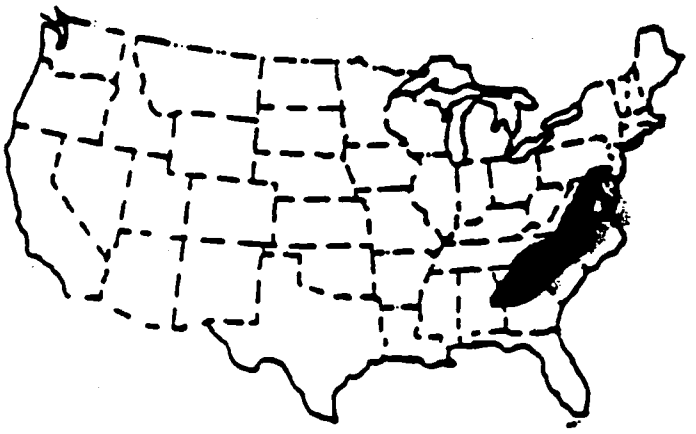
Linda Aller
Truman Bennett
Jay H. Lehr
Rebecca J. Petty
and
Glen Hackett
National Water Well Association
Dublin, Ohio 43017

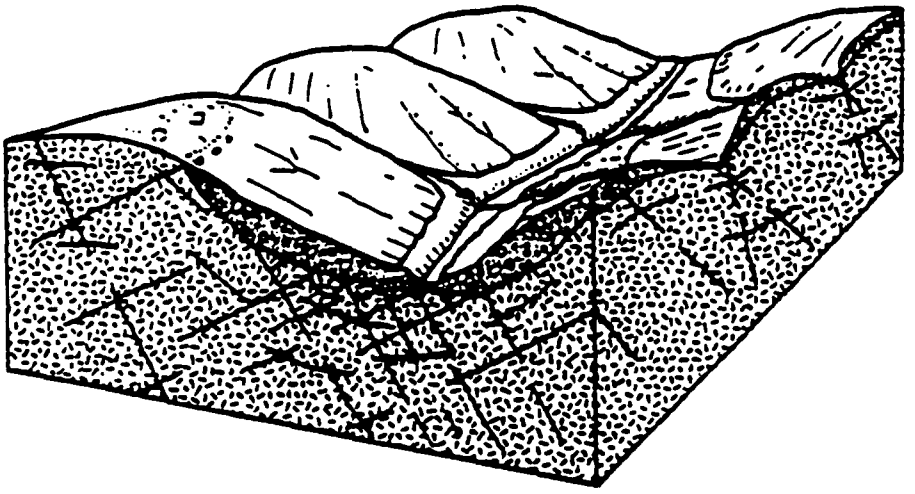
Cooperative Agreement CX-810715-01

Project Officer
Jerry Thornhill
Applications and Assistance Branch
Robert S. Kerr Environmental Research Laboratory
Ada, Oklahoma 74820

ROBERT S. KERR ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
ADA, OKLAHOMA 74820

8. PIEDMONT BLUE RIDGE GROUND-WATER REGION





8A	Mountain Slopes
8B	Alluvial Mountain Valleys
8C	Mountain Flanks
8D	Regolith
8E	River Alluvium
8F	Mountain Crests
8G	Swamp/Marsh

8. PIEDMONT BLUE RIDGE REGION

(Thick regolith over fractured crystalline and metamorphosed sedimentary rocks)

The Piedmont and Blue Ridge region is an area of about 247,000 km2 extending from Alabama on the south to Pennsylvania on the north. The Piedm part of the region consists of low, rounded hills and long, rolling, northeast-southwest trending ridges whose summits range from about a hundred meters above sea level along its eastern boundary with the Coastal Plain to to 600 m along its boundary with the Blue Ridge area to the west. The Blue Ridge is mountainous and includes the highest peaks east of the Mississippi. The mountains, some of which reach altitudes of more than 2,000 m, have smooth-rounded outlines and are bordered by well-graded streams flowing in relatively narrow valleys.

The Piedmont and Blue Ridge region is underlain by bedrock of Precambria and Paleozoic age consisting of igneous and metamorphosed igneous and sedimentary rocks. These include granite, gneiss, schist, quartzite, slate, marble, and phyllite. The land surface in the Piedmont and Blue Ridge is underlain by clay-rich, unconsolidated material derived from in situ weatheri of the underlying bedrock. This material, which averages about 10 to 20 m in thickness and may be as much as 100 m thick on some ridges, is referred to as saprolite. In many valleys, especially those of larger streams, flood plains are underlain by thin, moderately well-sorted alluvium deposited by the streams. When the distinction between saprolite and alluvium is not importan the term regolith is used to refer to the layer of unconsolidated deposits.

The regolith contains water in pore spaces between rock particles. The bedrock, on the other hand, does not have any significant intergranular porosity. It contains water, instead, in sheetlike openings formed along fractures (that is, breaks in the otherwise "solid" rock). The hydraulic conductivities of the regolith and the bedrock are similar and range from abo 0.001 to 1 m day^{-1}. The major difference in their water-bearing characteristics is their porosities, that of regolith being about 20 to 30 percent and that of the bedrock about 0.01 to 2 percent. Small supplies of water adequate for domestic needs can be obtained from the regolith through large-diameter bored or dug wells. However, most wells, especially those whe moderate supplies of water are needed, are relatively small in diameter and a cased through the regolith and finished with open holes in the bedrock. Although, as noted, the hydraulic conductivity of the bedrock is similar to that of the regolith, bedrock wells generally have much larger yields than regolith wells because, being deeper, they have a much larger availble drawdown.

The Occurrence of Ground Water in the United States

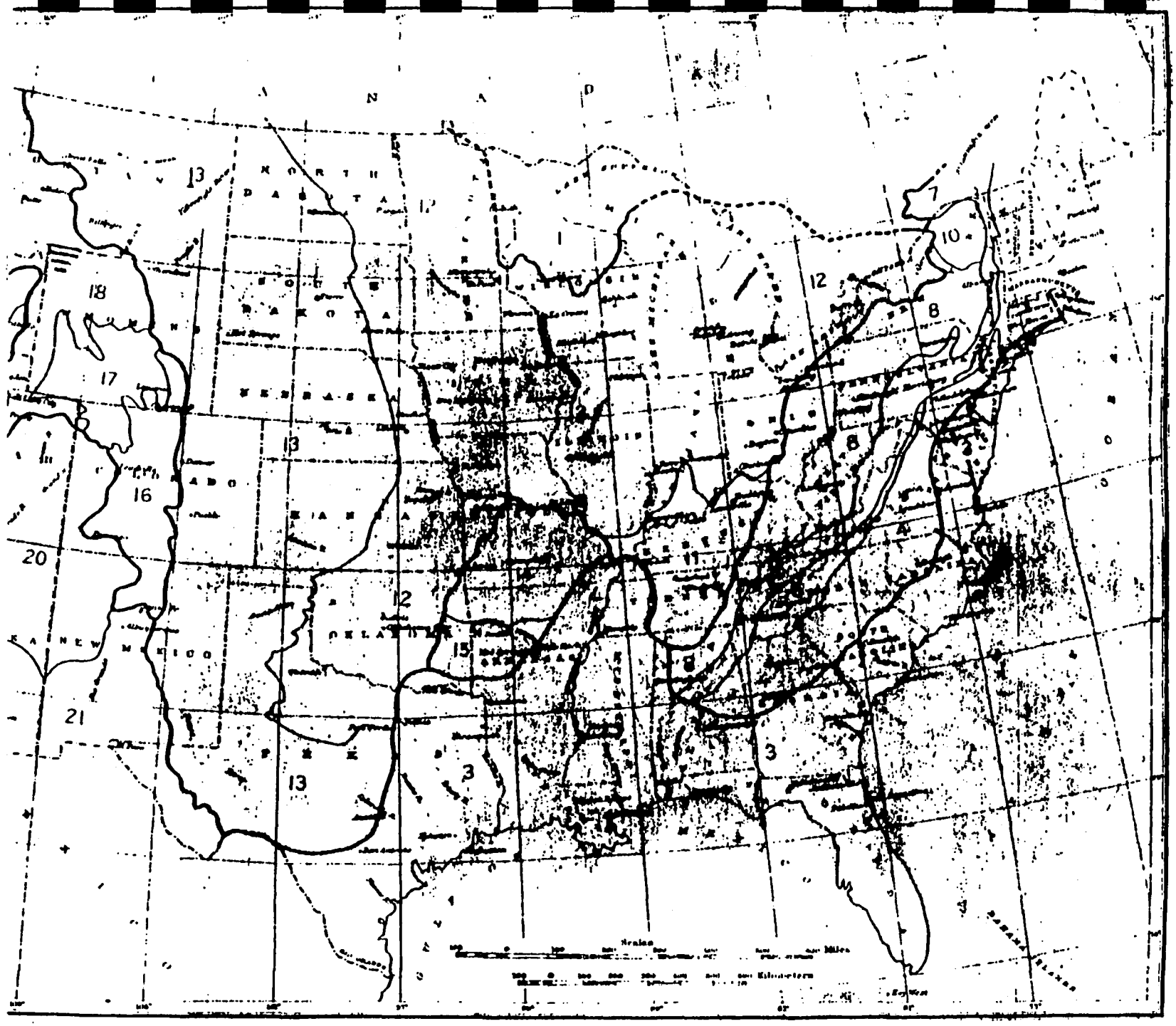
With a Discussion of Principles

By OSCAR EDWARD MEINZER

GEOLOGICAL WATER-SUPPLY PAPER 489

Reference 15

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1923



PHYSIOGRAPHIC DIVISIONS

MAJOR DIVISION	PROVINCE
Laurentian Upland	1. Superior Upland
Atlantic Plain	2. Continental Shelf (submerged)
	3. Atlantic Coastal Plain
Appalachian Highlands	4. Piedmont province
	5. Blue Ridge province
	6. Appalachian Valley province
	7. St. Lawrence Valley
	8. Appalachian Plateau
	9. New England province
	10. Adirondack province
Interior Plains	11. Interior Low Plateau
	12. Central Lowland
	13. Great Plains
Interior Highlands	14. Ozark Plateaus
	15. Ouachita province
Rocky Mountain region	16. Southern Rocky Mountains
	17. Wyoming Basin
	18. Northern Rocky Mountains
Intermontane Plateaus	19. Columbia Plateau
	20. Colorado Plateau
	21. Basin and Range province
Pacific Mountain region	22. Sierra Nevada and Cascade Mountains
	23. Pacific Border province
	24. Lower California province

ED STATES SHOWING MAJOR PHYSIOGRAPHIC DIVISIONS AND PHYSIOGRAPHIC PROVINCES

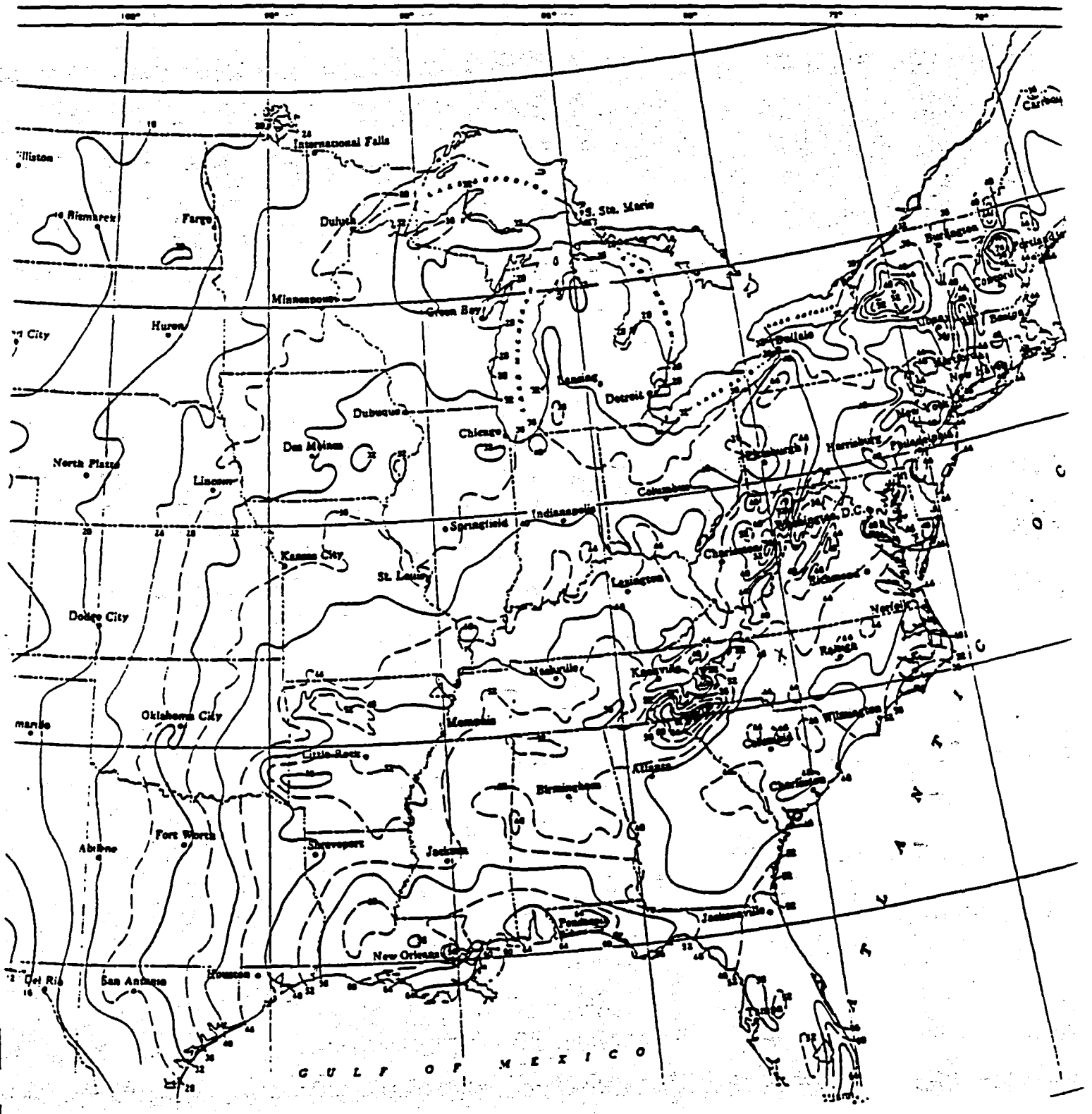
d on map prepared by a committee of the Association of American Geographers, N. M. Fenneman, chairman

Reference
16

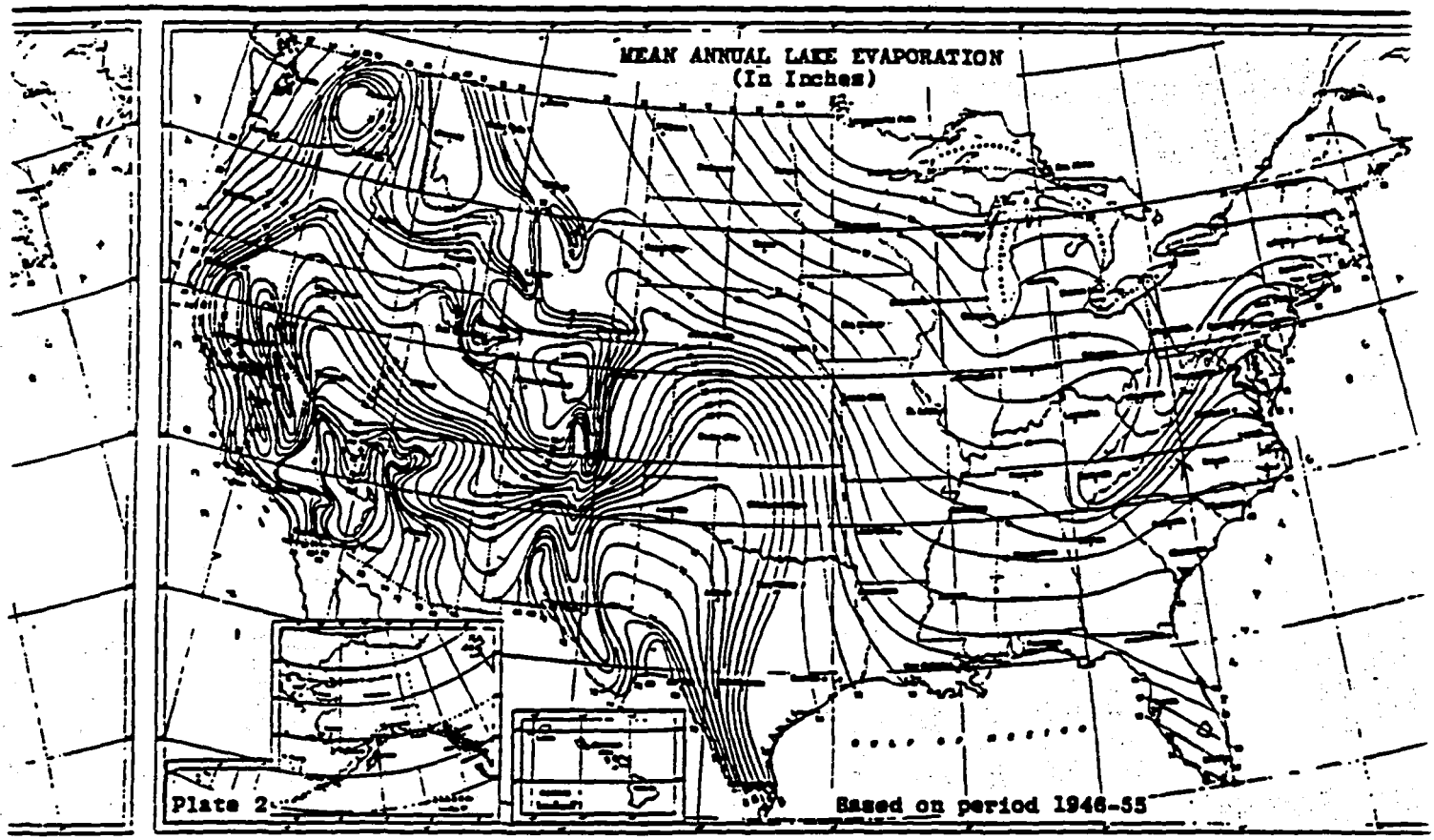
CLIMATIC ATLAS OF THE UNITED STATES

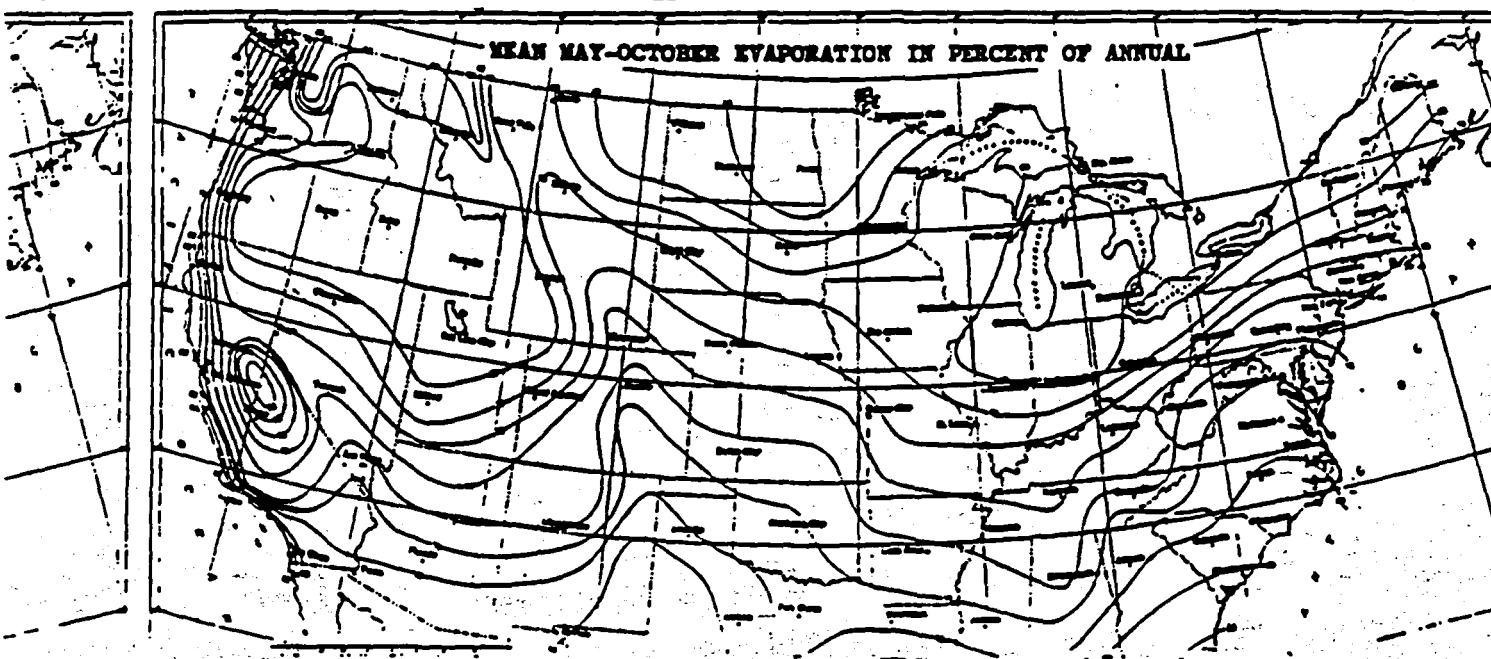
ronmental Science Services Administration . Environme

.L ANNUAL TOTAL PRECIPITATION (Inches)



N AND LAKE EVAPORATION





DEPARTMENT OF COMMERCE
[illegible] B. Hodges, Secretary

WEATHER BUREAU
F. W. Reichelderfer, Chief

Reference 17

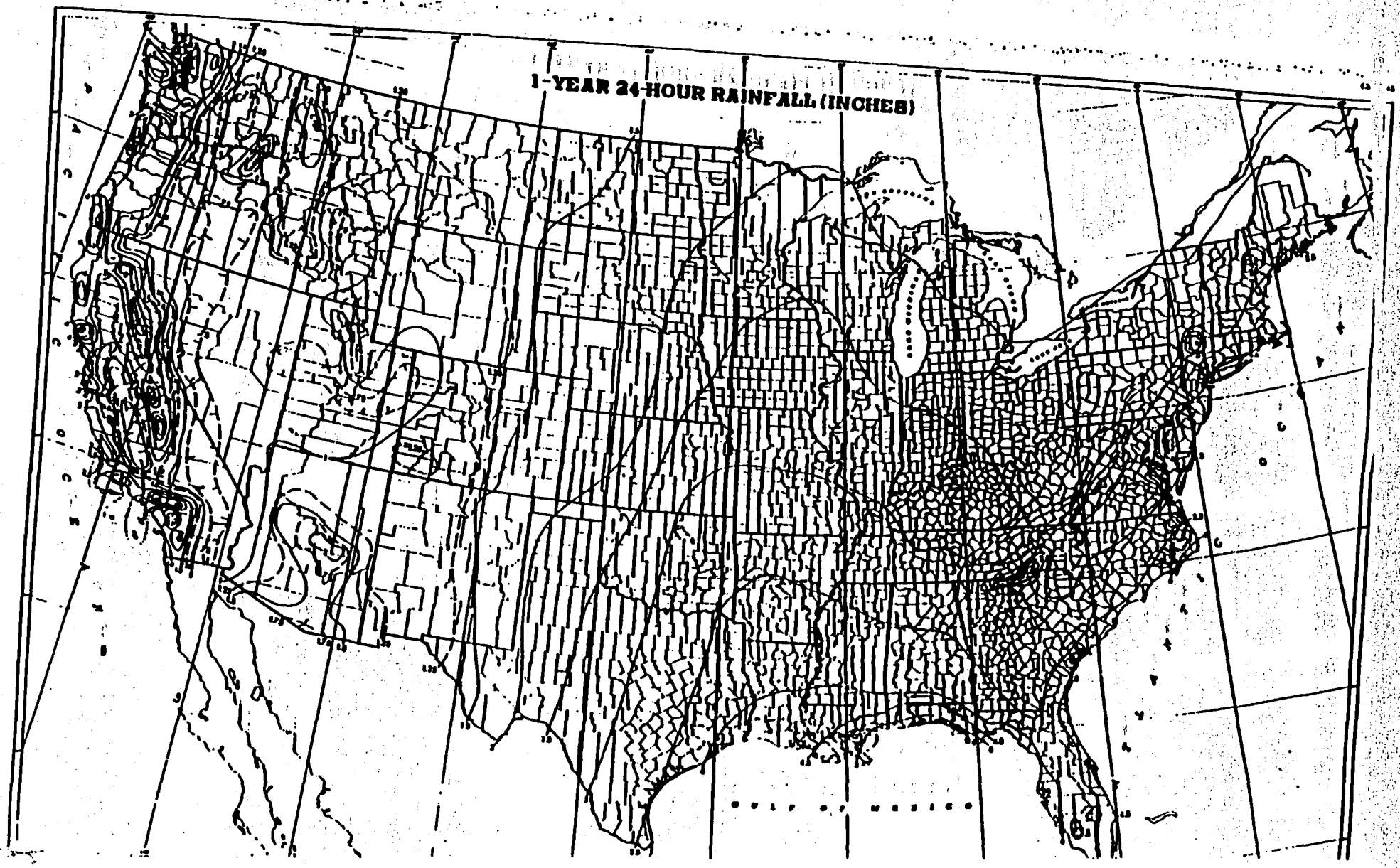
TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

Prepared by
DAVID M. HERSHFIELD
Cooperative Studies Section, Hydrologic Services Division
for
Engineering Division, Soil Conservation Service
U.S. Department of Agriculture

PROPERTY OF EPA
FIT IV


1-YEAR 24-HOUR RAINFALL (INCHES)

Reference
18

EXPLANATORY TEXT
FOR
GEOLOGIC MAP OF NORTH CAROLINA

with considerable subsurface data, obtained from deep-well records, is presented below.

DESCRIPTION OF ROCK UNITS

INTRODUCTION

In the explanation listed on the map and discussed below, a three-fold grouping of rock units has been used. First, the rock units have been grouped as sedimentary rocks, metasedimentary and metavolcanic rocks, and igneous and metamorphic rocks. Igneous and metamorphic rocks have been grouped together because some of the units used have characteristics of both igneous and metamorphic rocks. Second, an attempt has been made to group the rock units in the explanation according to their geographic distribution in the State. Third, as far as possible the sequence in the explanation represents the stratigraphic position of the rock units in the earth's crust. This is thought to be correct for the sedimentary rocks; however, in the case of metasedimentary rocks, metavolcanic rocks, and igneous and metamorphic rocks, the sequence in the explanation may not represent the true stratigraphic position. For example, the rock units used in the metavolcanic rocks of the Carolina Slate Belt are interbedded and, as a result, are not distinctly different in age. The exact ages of most of the granites listed as Paleozoic(?) and Paleozoic are not known, and as a result some may be the exact stratigraphic equivalents of others. The same holds true for the granite gneisses, as Eckelman and Kulp (1956) classed the Cranberry granite gneiss and the Henderson granite gneiss as stratigraphically equivalent. Finally, the exact ages of the gneisses and schists are not known, and it is quite probable that the units used contain materials differing greatly in ages.

IGNEOUS AND METAMORPHIC ROCKS

The gneisses, schists, and granite gneisses, listed as Precambrian(?), present a major problem in age classification. Many of these units in the Blue Ridge area, according to King (personal communication), are unconformable below Lower Cambrian and Upper Precambrian units and should be classed as Precambrian without the query. However, the difficulty comes in going southeast from the Blue Ridge area where similar units have no certain stratigraphic relations to the Cambrian or Upper Precambrian. The result is that Precambrian(?) looks incongruous in the Blue Ridge area where these rocks are in contact with Upper Precambrian and Lower Cambrian, but is well justified in the southeast. No simple solution could be found for the problem, and it has been left for map users to draw their own conclusions.

GNEISSES AND SCHISTS

PRECAMBRIAN(?)

The three units—Mica gneiss, Mica schist, and Hornblende gneiss—used in this grouping represent essentially Carolina gneiss and Roan gneiss in the areas mapped by Keith and similar materials outside these areas. The formation names Carolina gneiss and Roan gneiss are no longer accepted by the U. S. Geological Survey and are not used on the present map. The three units as presently constituted are too complex in composition to be given formation names, and it was thought best to use the rock-unit names, Mica gneiss, Mica schist, and Hornblende gneiss.

Mica Gneiss (mgn)

The Mica gneiss unit, as mapped, occurs over a wider area and probably underlies more square miles of the State than any other formation on the map. It is especially abundant in the Blue Ridge region and the western part of the Piedmont Plateau where it covers large areas. It is less abundant in the central part of the Piedmont Plateau but is common along the eastern part of that area. In the Blue Ridge and upper Piedmont areas, the Mica gneiss unit consists largely of Carolina gneiss as mapped by Keith (1903, 1904, 1905, 1907a, 1907b, 19007c, and 1931). In other parts of the State the Mica gneiss unit is in all respects comparable to that in the areas mapped by Keith.

The Mica gneiss unit consists of an immense series of mica gneiss, mica schist, and fine granitoid layers in which mica gneiss predominates. Most of these are light to dark gray in color, weathering to dull gray, greenish gray, or yellow. Varying amounts of garnet gneiss, garnet schist, kyanite gneiss, granite gneiss, hornblende gneiss, and crystalline limestone or marble are present in the unit at many localities. There are also included in the Mica gneiss unit younger bodies of

granite, diorite, and dikes and lenses of pegmatite too small or not well enough known to show on the map. Mica gneiss, which is the chief component of the Mica gneiss unit, is composed chiefly of quartz and feldspar with varying amounts of mica, both biotite and muscovite, with biotite predominating in many localities. Much of the Mica gneiss unit is doubtless metamorphosed sedimentary material, while some of it resembles granite gneiss and may well represent granite that has been strongly metamorphosed. Rock of this type has been quarried extensively around Asheville, Buncombe County; Hickory, Catawba County; Henderson, Vance County; and Raleigh, Wake County. This material was used in the construction of the present State Capitol in Raleigh, which was erected between 1830 and 1835.

Bands and lenses of mica schist, usually fine-grained and composed of quartz, muscovite, a little biotite, and very little feldspar are common in the Mica gneiss unit. Closely associated with the mica schist bands and lenses are extensive bands and zones of garnet gneiss, garnet schist, and kyanite gneiss. The garnet and kyanite gneisses and schists are too widespread to describe in detail here. Some of the better known garnet areas are near Marshall, Madison County; on Sugar Loaf Mountain near Willetts, the Savannah mine on the headwaters of Betty Creek, and the Presley mine near Speedwell in the upper Tuckaseegee valley, all in Jackson County; and on Shooting Creek, Clay County. An important belt of kyanite gneiss, six to eight miles wide, extends along the line of the Black and Great Craggy Mountains from Swannanoa, Buncombe County, to Bakersville, Mitchell County. The kyanite crystals vary in length from a fraction of an inch to three or four inches but average less than an inch. On weathered surfaces, they often stand out in relief, giving the rock a porphyritic appearance. Small garnets are often associated with the kyanite gneiss.

At many places throughout the Mica gneiss unit there are thin, interbedded layers of hornblende gneiss and schist, too small to show on the map. These are in all respects similar to the Hornblende gneiss unit described below.

Bodies of crystalline limestone or marble are present at many localities in the Mica gneiss unit. The more important of these occur near Marshall, Madison County; south of Bakersville, Mitchell County; eight miles northwest of Winston-Salem, Forsyth County; and near Germanton, Stokes County.

Included in the Mica gneiss unit at many places are dikes and lenses of pegmatite which are distinctly younger than the enclosing rock. These vary in thickness from a few inches to as much as 200 feet (Olson, 1946, p. 7) and are equally variable in length. Most of the kaolin and feldspar produced in North Carolina prior to 1945 came from pegmatite bodies. Throughout the history of mica mining in the State pegmatites have been, and still are, the chief source of sheet mica. A wide variety of commercially less important minerals are present in the dikes, and Olson (1944, p. 26) stated, "At least 44 different minerals have been reported from the Spruce Pine pegmatites." Spodumene-bearing pegmatites, which are the chief source of lithium in the United States, are abundant in the Mica gneiss unit south of Lincolnton in the Kings Mountain district.

The Mica gneiss is deeply weathered in most places and is covered with a thick layer of residual clay. As a result, fresh outcrops and ledges of solid rock are seldom seen except along streams, on steep slopes, and in the more mountainous areas. The residual clay contains fragments and layers of schist, quartz, mica, and gneiss. The cover of soil on the thick mantle of residual clay and weathered rock is usually light and thin.

Mica Schist (msh)

The Mica schist unit occurs most abundantly along the western border of the Piedmont Plateau, just east of the Blue Ridge Mountains, and extends intermittently completely across the State. In the vicinity of Kings Mountain and around Gastonia there are fairly large areas of mica schist, and smaller areas are widespread throughout the Piedmont Plateau. The main occurrences of this unit along the western border of the Piedmont Plateau, the area around Gastonia, and the areas throughout the lower Piedmont are essentially mica schist of the Carolina gneiss as mapped on the various folios of the U. S. Geological Survey.

North of the Yadkin River, the Mica schist unit consists principally of a thinly foliated muscovite-sericite schist. This unit also includes bands and zones of muscovite-biotite schist and some areas of mica gneiss, partly altered to mica schist. Injections of granite, too small to show on the map, are also common east of the Blue Ridge, and small amounts of hornblende gneiss and schist are present at many places in the unit. At many places, the Mica schist contains varying amounts of gar-

net, sillimanite, kyanite, magnetite, ilmenite, and pyrite.

South of the Yadkin River, the Mica schist unit consists basically of biotite schist. Three varieties of biotite schist are common, namely, biotite schist, biotite-muscovite schist, and sillimanite-biotite schist. All gradations exist among the three varieties. The sillimanite schist is in all places more contorted and sheared than the other varieties. A number of accessory minerals, including garnet, graphite, chlorite, and pyrite are present in the Mica schist unit. Pegmatites and narrow quartz veins occur throughout the mica schist. The pegmatites in general average less than a foot in thickness and rarely exceed four feet in length. Locally, they make up as much as one-half of the sillimanite-biotite schist. Overstreet and Griffitts (1955, pp. 551-556) gave an excellent description of the Mica schist unit and related rock units and discussed their mineral content in some detail.

Bands and zones of hornblende gneiss and hornblende schist, most of which are too small to show on the map, are common throughout the Mica schist unit. These hornblende rocks are generally of simple mineral composition and locally may contain varying amounts of garnet. Many bodies of foliated to massive granite, too small to show on the map, are present in the unit.

The Mica schist around Gastonia and in the other areas of the Piedmont Plateau to the east and northeast is essentially a fine-grained rock composed chiefly of quartz, muscovite and sericite mica. At places, the rock is a quartz-biotite schist, while at others it becomes a quartz-sericite, chlorite schist. The Mica schist evidently resulted from the metamorphism of sedimentary rocks that varied greatly in character from place to place. Weathering has been extensive, and outcrops of fresh rock are seldom seen except along streams and on steep slopes. The thick layer of residuum consists of clay mixed with fragments and layers of schist, quartz, and mica. The clay varies from yellow to dark red in color depending on the amount of biotite in the schist. The soil cover is usually light and thin.

Hornblende Gneiss (hgn)

The Hornblende gneiss unit is most abundant in the mountain region west of the Blue Ridge and north and northeast of Asheville. Several small areas occur west of the Blue Ridge in Clay and Macon Counties. In and parallel to the east side of the Blue Ridge small areas occur almost completely across the State. In the central part of the upper Piedmont, in the general vicinity of Hickory and Statesville, there are some relatively large areas. Smaller areas occur along the eastern edge of the Piedmont Plateau, particularly in Wake County.

The Hornblende gneiss unit consists essentially of Roan gneiss as mapped and defined by Keith (1903). The type locality of the Roan gneiss is Roan Mountain, which lies along the North Carolina-Tennessee line and extends southward into Mitchell County, North Carolina. Keith (1903) stated, "The Roan gneiss appears to cut the Carolina gneiss, but the contacts are so much metamorphosed that the fact cannot be proved." He considered the Roan gneiss as chiefly diorite and smaller amounts of gabbro, which had been intruded into older rocks and metamorphosed to hornblende gneiss and hornblende schist.

In recent years considerable attention has been given to Roan gneiss, as mapped and defined by Keith, and much of it is no longer considered to be of igneous origin. Kesler (1944, 1955) pointed out that bodies of hornblende gneiss in the Kings Mountain district (See Kings Mountain group below, p. 31) are metamorphosed, calcareous sediments. Parker (1952, p. 8) described the relation of the hornblende gneiss to the mica gneiss in the Spruce Pine district and concluded that certain thin, interbedded hornblende gneisses and actinolite-tremolite rocks may have been impure dolomitic limestones. He added: "The mafic mineralogic composition, however, coupled with the conformable relations to mica gneiss, has led most workers to believe that the ordinary hornblende rocks are metamorphosed mafic volcanic extrusives, and perhaps, in part at least, are conformable intrusive sills," and concluded, "Perhaps some of the hornblendic rocks are sedimentary in origin and some are igneous."

Brobst (unpublished) concluded that the Roan-type rocks (hornblende gneiss) are of sedimentary origin and stated, "The hornblende rocks, therefore, may represent the metamorphosed equivalent of impure carbonate layers in the sedimentary sequence." Overstreet and Griffitts (1955, p. 553) considered the hornblende gneiss between Kings Mountain and Marion, North Carolina, to be in part of igneous and in part of sedimentary origin.

The Hornblende gneiss unit consists essentially of hornblende gneiss and hornblende schist layers that vary from a fraction of an inch to many feet in thickness. The thin layers of hornblende gneiss and hornblende schist are interbedded with thin layers of mica gneiss and mica schist to the extent that portions of the Hornblende gneiss unit contains considerable mica gneiss and mica schist, and in the same way portions of the Mica gneiss unit and portions of the Mica schist unit contain considerable amounts of hornblende gneiss and hornblende schist.

The hornblendic rocks of the Hornblende gneiss unit include distinctly banded gneisses consisting of alternating layers of hornblende and feldspar, schistose rocks consisting almost entirely of coarse to fine hornblende needles, and nearly massive amphibolites that lack distinct foliation. The gneisses and schists are black to dark green and grade into one another by feldspar content. Quartz, feldspar, and hornblende are the chief minerals present, but varying amounts of biotite and chlorite are present at places.

Garnet is less abundant than in the Mica gneiss and Mica schist but at places becomes an important constituent of the Hornblende gneiss. Pegmatite dikes, some of which have furnished considerable amounts of feldspar and mica, are present at many places in the unit. Numerous bodies of soapstone and talcose schist are associated with the Hornblende gneiss unit especially in the Spruce Pine district. These bodies, which vary from five to 25 feet in thickness and consist of talc, soapstone, actinolite, biotite, chlorite, and vermiculite, appear to have been formed locally by secondary hydrothermal alteration of the hornblende gneiss.

In the more mountainous areas, the Hornblende gneiss often crops out as ledges and bold ridges, but at lower elevations it usually occupies broad, flat areas or lower ground. It weathers readily and is usually covered with a thick layer of residual clay mixed with rock fragments. This clay has a strong, dark-red color and is covered with a rich, fertile soil.

GRANITE GNEISSES

PRECAMBRIAN(?)

Along the western edge of the Piedmont Plateau and throughout much of the Blue Ridge Mountains area, according to Keith (see reference above), the older gneisses and schists have been intruded by a number of rocks which he classed as granites and granite gneisses (all highly metamorphosed) and named in various areas Cranberry granite, Henderson granite, Max Patch granite, and Beech granite. One unit, the Blowing Rock gneiss, he did not definitely class as a granite, even though he considered it intrusive into the older gneisses and the Cranberry granite.

Little has been published on these rocks since the work of Keith, but a number of workers in the area have made observations that caused them to doubt the validity of classing these units as either intrusive in origin or true granites in composition. This is true especially of the Cranberry and Henderson granites. Brobst (unpublished) listed and described the Cranberry granite as Cranberry gneiss. He discussed specifically some layers, typical of the Cranberry gneiss, which are interbedded with other metamorphic rocks along the northwest and east borders of the Bakersville-Plumtree area, Avery County, close to the contact of the large body of Cranberry gneiss that surrounds that part of the Spruce Pine district on three sides (Kulp and Brobst, 1956). Eckelman and Kulp (1956) considered the Cranberry and Henderson granites to be metasedimentary in origin and stratigraphically equivalent.

During the preparation of the present map it was not possible to restudy these units in detail. As a result, in the areas covered by published folios these units are shown as nearly as possible as originally mapped. Outside the areas covered by published folios, it is doubtful if the units correspond in all details to those in the areas covered by published maps. In view of the diversity of materials in the units and the intense metamorphism which has altered them, it was decided, after discussing the problem with a number of workers who have made observations in the field, to add the word gneiss to each unit originally classed as granite. As a result, each of these units originally classed as granite becomes a granite gneiss on the present map.

Unnamed Granite Gneiss (gru)

In Jackson, Haywood, and Swain Counties, west and north of Sylva, are areas of Unnamed granite gneiss. J. B. Hadley, on a map of the Great Smoky Mountains area furnished for use in the preparation of the present map, designated these rocks as granite gneiss without formation or unit names or

age designations. Hadley et al. (1955, p. 402) classed these rocks as Max Patch and Cranberry as mapped by Keith (1904) and described them as medium to very coarse genissic granites, generally gray but locally pink in color and containing minor amounts of leucogranite, amphibolite, pegmatite, and much blue quartz.

Cameron (1951, p. 10) described one of these areas near Bryson City in some detail. He classed the rocks of the area as granitic gneisses and described them as predominantly fine- to coarse-grained leucocratic and mesocratic gneisses, varying in composition from granitic to granodioritic with well developed foliation and lineation. He stated that the granite gneisses are cut by dikes of fine-grained granite and by dikes of medium-gray granite porphyry.

Granite Gneiss Complex (gnc)

Beginning a few miles northeast of Morganton and extending in a southwest direction across Burke, McDowell, Rutherford, and Polk Counties is an area underlain with rocks classed as Granite gneiss complex on the present map. About half of this area, in Burke and McDowell Counties, extending to latitude 35° 30′ N. and longitude 82° W. in Rutherford County, was mapped by Keith on the Morganton quadrangle, which was not published. He made field surveys in the Morganton quadrangle in the years 1896, 1899, 1900, 1901, and 1907 and was aided by D. B. Sterrett during the last year. Traverse sheets available in the U. S. Geological Survey files show complete coverage of the quadrangle. Based on these surveys, Philip B. King edited a geologic map of the Morganton quadrangle, which appears to be a generalization by Keith of a more detailed map not at present available.

The central part of the Morganton quadrangle, as edited by King, is underlain with a rock unit 5 to 15 miles wide which is classed as "Cranberry, Henderson (and other?) granites (Archean) (includes small areas of Roan gneiss)." Small areas of the same unit are shown in the southeast corner of the Morganton 30′ quadrangle and in the Shelby 15′ quadrangle. Rocks of this unit in Cleveland, Lincoln and Burke Counties were named Toluca quartz monzonite and classed as Ordovician in age by Griffitts and Overstreet (1952).

The main area of Granite gneiss complex extends southwest from the Morganton quadrangle across Rutherford County and well into Polk County. LeGrand and Mundorff (1952) mapped this unit in Rutherford County as mica schist and granite with schist predominant, and hornblende gneiss and granite interlain, and in Polk County as granite gneiss interlain with hornblende gneiss, and hornblende gneiss and granite interlain.

Attempts were made to harmonize the mapping done by LeGrand and Mundorff in Rutherford and Polk Counties with that done by Keith in the Morganton quadrangle. Attempts were also made to determine if the granitic material in the Granite gneiss complex as shown on the present map could be correlated with the granitic rocks in the southeast corner of the Morganton quadrangle and the northeast corner of the Shelby quadrangle, which Griffitts and Overstreet designated as Toluca quartz monzonite of Ordovician age.

The problem was not fully recognized until compilation of the map was well underway, and time was not available to work out all the details. Two field parties, working independently, spent several days in the area and decided that the materials mapped by LeGrand and Mundorff in Polk and Rutherford Counties and by Keith in the Morganton quadrangle are essentially the same. It was decided that in the time available no correlation could be made between the granites in the area and the Toluca quartz monzonite to the east and southeast.

The rock unit shown on the present map as Granite gneiss complex contains mica gneiss, mica schist, and hornblende gneiss similar to that in the gneisses and schists described above. In addition it contains granite gneiss similar to Henderson granite gneiss, and Cranberry granite gneiss and also younger granite.

Henderson Granite Gneiss (hgg)

The Henderson granite gneiss unit on the present map is essentially Henderson granite as originally named and described by Keith (1905) and further described (1907b). The Henderson granite as mapped by Keith is not shown in contact with Cranberry granite at any place on his maps. On the present map the main area of Henderson granite gneiss begins near Marion, McDowell County, and continues southwest to the South Carolina line. West of Marion, a narrow band continues northeast along the west side of the Shady dolomite and Erwin formation to the limits of the Mount Mitchell quadrangle. Recently, Eckelman and Kulp (1956) extended this band north-

east to near Linville Falls, McDowell County, where it makes contact with what they considered the southern extension of Cranberry granite as mapped by Keith in the Cranberry folio. They considered the Cranberry granite and the Henderson granite to be metasedimentary in origin and stratigraphically equivalent.

Keith (1905, p. 4) stated that the Henderson granite extended eastward into the Morganton quadrangle. A large area in the Morganton quadrangle (discussed above under Granite gneiss complex) was mapped as Cranberry, Henderson (and other?) granites No age relations are shown between Cranberry and Henderson granites on the Morganton quadrangle, but in the legend on the Mount Mitchell folio, Keith placed Henderson granite above Cranberry granite. The exact origin and age of the Henderson granite is unknown.

The Henderson granite gneiss, whatever its origin and age, is composed essentially of rocks with a pronounced gneissoid structure. Mineralogically, the rock consists of orthoclase, plagioclase, quartz, muscovite, and biotite, named in the order of their abundance. Biotite varies a great deal in amount but is usually subordinate. The gneiss is usually gray in color but becomes lighter on weathering. Porphyritic crystals of feldspar are a prominent feature of the gneiss, and at many places it is a typical augen gneiss. The porphyritic varieties are not limited to any particular areas or positions in the gneiss but are generally irregularly distributed through it. Porphyritic varieties of the gneiss grade into even-grained varieties, and the two varieties may be seen in a single exposure. Even-grained varieties of the gneiss are subordinate in amount to the porphyritic varieties.

The rocks of this unit have been greatly changed by metamorphism. In areas where the finer grained beds did not contain porphyritic crystals of feldspar, the rock has been metamorphosed into gneisses and schists similar to those of the Mica gneiss and Mica schist units. Areas of mica gneiss, mica schist, and hornblende gneiss, too small to show on the map, are included at many places in the Henderson granite gneiss.

Weathering of the Henderson granite gneiss varies greatly, and as a result the rock produces a varying landscape with strong cliffs and ridges in places and broad, flat areas in others. The Henderson granite gneiss has not been much used, but it offers an important source of dimension and crushed stone.

Cranberry Granite Gneiss (cgn)

The Cranberry granite gneiss unit on the present map consists essentially of Cranberry granite as originally named and described by Keith (1903), and further described (1904, 1905, and 1907c). The name Cranberry granite was first given to well developed exposures at Cranberry, Mitchell County, now Avery County. The relations of the Cranberry granite gneiss to the Henderson granite gneiss have been discussed above under Henderson granite gneiss.

Keith (references listed above) considered the Cranberry granite as igneous in origin, Archean in age, and intrusive into older formations. He described it as granite of varying texture and color, and schists and granitoid gneisses derived from granite. Included were small or local beds of schistose basalt, diorite, hornblende gneiss, and pegmatite.

As pointed out above, a number of workers in the area have made observations that caused them to doubt the validity of classifying the Cranberry granite as either intrusive in origin or a true granite in composition. Brobst (unpublished) described the unit as Cranberry gneiss, consisting of white to gray gneisses, composed chiefly of microcline, sodic plagioclase, and quartz, and stated that in some layers biotite, muscovite, and rarely hornblende may be present in amounts in excess of ten percent. He described the texture as cataclastic, with rounded and fractured porphyroblasts of microcline or plagioclase from three millimeters to one centimeter across the longest dimension.

The Cranberry granite gneiss unit occurs as strips and patches in the Mountain region along the northwest border of the State. These begin about the latitude of Asheville in Haywood and Madison Counties and continue northeast to the Virginia line. The strips and patches which make up the unit have an elongation which conforms in general with the northeast-southwest trend of the mountains.

The Cranberry granite gneiss, whatever its origin, is essentially a gneiss, which grades at places into schist. Logs of cores from 12 drill holes, varying in length from 400 to 1250 feet, which were drilled at the Cranberry iron mine in the type locality of the Cranberry granite in 1943-1944, were examined during the preparation of

this report. These logs, which were prepared by competent geologists, show the rock to be a typical gneiss. In addition to gneiss, narrow bands of hornblende gneiss, chlorite schist, and pegmatite were occasionally shown near the iron-ore veins. Some of the gneiss in the area is coarse-grained, but much of it is medium-grained and uniform in texture. In color, it varies from light to dark gray.

In general, the Cranberry granite gneiss is a medium-grained, even-textured rock that varies from light to dark gray in color. It is composed of quartz, orthoclase, plagioclase, muscovite, biotite, and occasionally hornblende. In some areas the rock is more or less porphyritic, and in some places it has a marked red appearance due to the presence of red feldspar. The gneiss contains many small areas of mica gneiss, mica schist, hornblende gneiss, schistose basalt, diorite, metadiabase, metarhyolite, and pegmatite.

The Cranberry granite gneiss has been used to a limited extent for chimneys, foundations, and bridge piers, but no major quarrying operations have developed. The rock withstands weathering quite well in natural exposures. It takes a good polish and should make an attractive building stone. Quarry sites for crushed stone are available at many places.

Perhaps the most important mineral deposits associated with the Cranberry granite gneiss are the magnetic iron ores near Cranberry, Avery County. The magnetite deposits, while surrounded by the Cranberry granite gneiss, did not originate with the gneiss. According to Bayley (1923) the iron ore was brought up by pegmatites and deposited in the gneiss. These iron-ore bodies have been of interest for more than a hundred years. Systematic mining was carried on intermittently between 1880 and 1928, and some 2,250,000 tons of crude ore, which produced some 1,500,000 tons of shipping ore containing 42 to 46 per cent iron, were mined.

Blowing Rock Gneiss (brgn)

The main area of Blowing Rock gneiss is a wedge-shaped body beginning a few miles north of Blowing Rock, Watauga County, extending southward almost completely across Caldwell County and coming to a point at its southern end. A small area is shown near Creston, Ashe County. Keith (1903) named the unit Blowing Rock gneiss because it is well developed near the town of Blowing Rock. He classed it as an igneous rock, intrusive into Cranberry granite and older formations and described it as chiefly dark, coarse, porphyritic gneiss.

The unit consists of two varieties, one containing large porphyritic crystals of orthoclase feldspar embedded in a groundmass of quartz, feldspar, biotite, and muscovite, and the other consisting of the same minerals in grains of uniform size. The porphyritic crystals vary in length from three inches down to one-quarter of an inch and are frequently twinned. Many layers of fine-grained, black and gray schist are present in the unit. Biotite is so abundant that both varieties of the rock have a rather dark-gray color. The unit as a whole has been so much altered by folding and metamorphism that while some of it is gneissoid, much of it is distinctly schistose.

The rocks weather slowly, and outcrops are abundant, as in the Blue Ridge near Blowing Rock and south of Boone. Complete weathering produces a reddish-yellow clay, which is usually covered with light, well drained, fertile soil.

The Blowing Rock gneiss has been used locally to a limited extent, but its importance as a building stone has not been realized. The formation contains material suitable for ornamental and building uses that can be obtained in great abundance.

Max Patch Granite Gneiss (mpgn)

Max Patch granite gneiss consists entirely of Max Patch granite as mapped by Keith (1904 and 1905). It was named for Max Patch Mountain in Madison County, North Carolina, which may be considered the type locality. In North Carolina the unit is limited to Haywood and Madison Counties, with small extensions in Cocke and Unicoi Counties, Tennessee. Keith classed the unit as almost wholly coarse grained, in places porphyritic and in places of uniform grain. It is composed of orthoclase, plagioclase, quartz, biotite, and a little muscovite. At many places crystals of orthoclase feldspar more than an inch long are present. The porphyritic variety is dull white to light gray in color, while the even-grained variety is darker in color due to the biotite present. Another variety of considerable extent is a coarse red granite which gets its color from the red feldspar present. The red feldspars are often partially altered to epidote, giving the rock an attractive color. In places the feldspar has been

so far replaced by epidote that this mineral composes one-third to one-half of the bulk of the rock.

The unit has been so completely metamorphosed that most of it has a gneissic to schistose structure, and little, if any, true granite remains unaltered. The porphyritic variety of the unit has been altered to augen gneiss, while the even-grained variety has been altered to gneiss or schist.

Weathering reduces the surface of the unit slowly, and as a result it commonly occupies higher elevations and steep slopes. Complete decay results in a reddish or brownish clay of no great depth. Where soils accumulate on gentle slopes, they are rich and fertile.

Mineral deposits are scarce in the Max Patch granite gneiss. A few small pegmatites near Lemon Gap, Madison County, contain small amounts of radioactive minerals. Some of the red feldspars, partly altered to epidote, make beautiful polished specimens, but the rocks of the unit have not become important as building materials.

Beech Granite Gneiss (bgn)

Beech granite gneiss consists of Beech granite as mapped by Keith (1903, 1905, and 1907c) and named for Beech Mountain, Avery County, where it is best developed. The largest area lies in and around Beech Mountain in Avery County, and extends westward into Carter County, Tennessee. Three other small areas are shown on the map, one around Blowing Rock in Watauga and Caldwell Counties, another west of Roan Mountain, Mitchell County, and extending into Carter County, Tennessee, and a third in the western part of Yancey County, extending into Unicoi County, Tennessee.

The unit consists of three varieties of granite gneiss. One is a coarse-grained, usually porphyritic rock, another is medium to fine grained, while the third is a coarse, red variety. In the porhyritic variety, crystals of orthoclase feldspar as much as two inches in length are often present. The chief minerals present in the unit are orthoclase and plagioclase feldspar, quartz, biotite, and a little muscovite. The porphyritic variety is dull white to light gray in color, the medium- to fine-grained variety is darker in color due to the presence of biotite mica, while the red variety gets its color from many pink or red feldspar crystals present.

The unit has been greatly changed by metamorphism. The mineral composition is essentially that of a granite, but the rocks composing the unit have a decided gneissic structure often becoming schistose with an increase of mica. The rocks of this unit are not too readily attacked by weathering and usually underlie higher ground. On complete weathering they produce a thin, brownish clay containing much sand. On gentle slopes where soils develop, they are strong and fertile.

Mineral deposits are not known to occur in the Beech granite gneiss. The unit contains rock varieties that should make excellent building and crushed stone, but due mainly to location, they have not been developed.

GRANITES AND MAFIC IGNEOUS ROCKS

Rocks of definite igneous origin that have undergone varying amounts of metamorphism and possess textures ranging from massive to gneissic are classed as Paleozoic(?), Paleozoic, and Triassic(?) on the present map. The units classed as Paleozoic(?) could probably be classed as Paleozoic without the query, as most of them, except the dunites, have been considered for years as late Carboniferous in age and were shown on the 1932 Geologic Map of the United States as Carboniferous(?). However, little has been done to prove or disprove this classification since 1932, and it was thought best to show them on the present map as Paleozoic(?).

PALEOZOIC(?)

There are five rock units in this group, four of which consist of granite, syenite, and diorite-gabbro. The fifth is classed as dunite and consists essentially of peridotite and pyroxenite, partly altered to talc, soapstone, and serpentine. The positions of these units in the column is arbitrary.

Dunite (du)

Dunite bodies are most abundant in the Blue Ridge Mountains where more than 250 outcrops occur in a northeast-southwest trending belt approximately 175 miles long. A few small bodies occur in the western half of the Piedmont Plateau, but the most important bodies outside the Blue Ridge Mountains are found in the northern part of Wake County. Only a few of the larger bodies in the Blue Ridge Mountains and those in Wake County are shown on the map. In the mountains

the bodies vary greatly in size. The smallest, near Otto, contains 1500 square feet, while the largest, near Swannanoa in Buncombe County, is four miles long with a maximum width of nearly one mile. One of the most interesting is a ring dike near Webster, Jackson County, with a major axis six miles long and a minor axis about four miles long. In Wake County the deposits vary in length from a few hundred feet to nearly two miles.

The age of the dunites is not definitely established. Keith (folios listed above) classed the dunites as Archean in age. He considered them intrusive into and closely related to the Roan gneiss but older than Cranberry and other granites which he classed as Archean in age. Pratt and Lewis (1905, p. 159) suggested that they may have been formed during the Taconic revolution at the end of the Ordovician period. Parker (1952), Brobst (unpublished) and King (1955) classed the dunites as Paleozoic in age.

The dunites consist chiefly of peridotite and pyroxenite, in part altered to talc, soapstone, and serpentine. Some deposits consist almost entirely of olivine, and some contain small amounts of pyroxene minerals, but most of them have been altered extensively by metamorphism and hydration. Many of the deposits in their present state consist of talc, soapstone, serpentine, asbestos, chlorite, vermiculite, and varying amounts of carbonate. Unlike most metamorphosed rocks they show only minor schistosity. Amphibole minerals, such as tremolite and actinolite, often form bunches and radiating clusters in soapstone.

The dunites in general weather slowly and often stand out as hills and ledges with much barren rock exposed at the surface. Final decay leaves a stiff yellow clay of little depth, and soils derived from this clay are of no value. Many of the deposits, particularly in the Blue Ridge Mountains, are covered sparsely with a stunted vegetation.

The dunites contain a wide variety of minerals that have been of interest at different times for many years. Many of the deposits contain varying amounts of chromite; and, while the production has been limited, much prospecting has been carried out for this mineral. At a few places, especially near Webster and Democrat, nickel silicate veins are conspicuous in the dunite, and considerable prospecting was carried out for nickel at Webster more than fifty years ago. The dunites contain varying amounts of corundum. Between 1871 and 1905, North Carolina was an important producer of corundum, most of which came from dunites. Talc and soapstone, associated with the dunites, have been of interest for many years, and small amounts have been produced. The most important period of activity was during World War II, when considerable amounts of ground talc and crayons were produced around Marshall, Madison County. In recent years, considerable interest has developed in the olivine associated with the dunites. Hunter (1941) described some twenty-five deposits in the Blue Ridge Mountains that contain 230 million tons of high-grade olivine and more than one billion tons of partly altered olivine. Varying amounts of vermiculite are associated with some of the dunites, and vermiculite production, which began in North Carolina in 1933, has continued intermittently since that time.

Granite (gr)

The rocks included in this unit are abundant along the western edge of the Coastal Plain and throughout the Piedmont Plateau. They were divided into three belts by Watson and Laney (1906), as follows: (1) Eastern Piedmont and Western Coastal Plain Belt; (2) Central Piedmont Belt (Carolina Igneous Belt); and (3) Western Piedmont Belt.

The rocks of the three belts are essentially granite according to the commonly accepted meaning of the term. They consist in general of quartz, orthoclase, plagioclase, biotite, a little muscovite, and varying amounts of accessory minerals, such as chlorite, epidote, titanite, zircon, and magnetite. On the basis of accessory minerals, varieties such as biotite granite and biotite-hornblende granite may be recognized. Councill (1954), on the basis of microscopic studies of the feldspars present, pointed out that in addition to granite, granodiorite is present, and quartz monzonite is common. He stated: "Many of the so-called granites of North Carolina approach more closely the mineral composition of granodiorite and/or quartz monzonite than normal granite."

Each of the three belts listed above contains distinctive granites that seem to justify a brief description.

The western boundary of the Eastern Piedmont and Western Coastal Plain Belt is formed by sedimentary rocks of Triassic age. In general the granites of this belt are massive, even-granular rocks, that show little effects of metamorphism. Jointing is common but not excessive at any place.

The textures present are chiefly medium to coarse grained. Porphyritic texture, though not abundant, is present at many localities, while fine-grained texture is seldom found. Two basic colors, one a light to medium gray and the other light to medium pink, sometimes approaching red, predominate. Outcrops, while not abundant, are common throughout the belt. Along stream valleys, outcrops form elongated masses and ledges; while in rolling topography, large boulders are often found. Away from streams in relatively flat topography, flat to dome-shaped masses often occur. Where it has not been removed by erosion, the granites are covered with a residuum varying from a few inches to as much as 25 to 40 feet thick. This residuum varies in color from buff, yellow, and red to reddish-brown, depending on the weathering of the underlying granite.

The granites of the Central Piedmont Belt (Carolina Igneous Belt) occupy a region several miles wide in the central part of the Piedmont Plateau. In this belt bodies of granite, varying greatly in shape and size, have intruded older rocks. On the basis of work by Mundorff (1948) and LeGrand and Mundorff (1952), the granites of this belt can be divided into three distinct geographic areas.

In one area, the granite, which Mundorff (1948) mapped as Sheared granite, crops out as an irregular and interrupted zone across northern Randolph County, southeastern Guilford County, most of Alamance County, the southeastern corner of Caswell County, and into central Person County. The granite is most commonly a coarse-grained rock of light-pink color, composed chiefly of orthoclase, plagioclase, quartz, and biotite. At a few places, it is light gray and medium grained, with plagioclase as the chief feldspar. The granite is badly crushed and broken with the development of a schistose or gneissic structure.

Basic dikes that vary from green to brown in color occur nearly everywhere in the granite in great numbers. Rarely does an outcrop of 200 to 300 feet of granite fail to expose one or more dikes, and at many places 10 to 12 dikes cut a granite body of that size. The dikes are more numerous and closely spaced along the margins of the granite. In some marginal exposures dike material is more abundant than granite. The dikes are fine grained, schistose in structure, and composed chiefly of chlorite, biotite, plagioclase, and augite. The granites of this area were intruded into basic volcanic rocks, largely of andesitic origin. Councill (1954, p. 56) described these granites as containing inclusions of basic volcanic rocks, probably of andesitic composition. It is probable that the dikes described above are in part dikes and in part inclusions from the basic volcanic rocks into which the granite was intruded.

In the second area, the granite, which Mundorff (1948) mapped as Porphyritic granite, crops out as irregularly shaped masses and elongated bodies in the southeastern corner of Rockingham County, across northwestern Guilford County, and in the southeastern half of Forsyth County. The granite in this area is coarse grained to porphyritic in texture and usually medium gray in color. Porphyritic crystals of orthoclase feldspar up to eight inches in length have been observed in this granite. The groundmass consists of feldspar, quartz, and biotite. At many places dikes and fingers of granite can be seen cutting the surrounding gneiss and schists parallel to the regional strike. The granites have intruded these rocks much more complexly than could be shown on the map. Except for gneissic structure around the margins of the bodies, which was probably inherited from the gneisses and schists into which the granite was intruded, no effects of shearing or metamorphism are present.

In the third area, the granite, which LeGrand and Mundorff (1952) and LeGrand (1954) mapped as Granite and Granite-diorite complex, begins about the Forsyth-Davidson county line, lies west of the Gold Hill fault, and continues southwest to the South Carolina line. Mundorff and LeGrand mapped the rocks of this area as Granite: Granite and diorite, granite predominant: and Diorite and granite, diorite predominant. On the present map, the first two of these have been combined in one unit, Granite. The diorite and granite, diorite predominant unit has been included in the Diorite-gabbro unit, which is discussed as a separate unit. In using this subdivision, the boundaries between the Granite unit and the Diorite-gabbro unit are necessarily somewhat indefinite. In this area granite occurs in some places as distinct bodies and in other places interlayered with diorite. Large bodies composed essentially of granite, occur in northern Davidson and eastern Davie Counties, in Rowan County, and in southern Iredell and Catawba Counties. Large areas of granite-diorite complex, in which granite predominates and which are shown as granite, occur in Davidson, Davie, Rowan, Cabarrus, Mecklenburg, and eastern Gaston and Lincoln Counties. In the

granite-diorite complex, the relations of the granite and diorite are uncertain. At many places, relations suggest that granite has intruded diorite, while at others it appears that diorite has intruded granite. In western Gaston and Lincoln Counties, granite has been intruded into gneisses and schists, forming a complex. Where granite predominates, this complex has been mapped as Granite. As a result, considerable gneiss and schist are included in the granites in Gaston and Lincoln Counties.

The granites of this area vary from fine grained, through medium grained to porphyritic in texture, with medium-grained and porphyritic texture predominating. Porphyritic granites are common along the western part of the area in Gaston, Iredell, Rowan, and Davie Counties and northwest of Concord, Cabarrus County. The other granites of the area vary from medium to fine-grained in texture, with medium-grained texture predominating. Outcrops are common and vary from large boulders to flat-surface areas. Colors vary from almost white through various shades of gray and pink to almost red. Minerals present consist of orthoclase, plagioclase, quartz, biotite, muscovite, and various accessory minerals. Where granite is associated with diorite, hornblende often occurs in the granite. Jointing is widespread but not excessive at any place in these rocks. The larger bodies, composed essentially of granite, show little metamorphism, but where granite has been intruded into gneisses and schists and in the granite diorite complexities, gneissic structure is often found. The rocks of this area react readily to the forces of weathering, and as a result the residuum varies in thickness from a few inches to many feet. The residuum covering the granites varies from buff through yellow to reddish-brown in color, while that covering the granite-diorite complex is much darker in color.

The granites of the Western Piedmont Belt consist of numerous bodies of varying size and shape lying between the Central Piedmont Belt and the Blue Ridge, exclusive of the Mount Airy granite in northern Surry County. The granite in northern Stokes and eastern Surry Counties are largely porphyritic. The others are medium to fine grained, with medium-grained rocks predominating. Most of these rocks may be classed as biotite granite, since biotite is common in all the outcrops. They are composed of orthoclase, plagioclase, quartz, biotite, a little muscovite, and minor accessory minerals. They vary from massive granite, showing no metamorphism, as in Stone Mountain, Wilkes County, to gneissic and schistose rock, where granites have been intruded into gneisses and schists. Outcrops are in the form of boulders and flat-surface exposures. Stone Mountain in northern Wilkes County, is a barren, granite monadnock, 500 to 600 feet high and measuring three to four miles in circumference at the base. The residuum in the various areas is similar in composition and color and equally as thick as that found in other granite regions of the State.

The rocks of the Granite unit as a whole have intruded a wide variety of older rocks. As a result, many small bodies and lenses of these older rocks, chiefly in the form of gneisses, schists, and metamorphosed volcanics, are included in the Granite unit. The rocks of this unit contain quartz veins, pegmatite dikes, and dikes of granite, quartz porphry, aplite, diorite, gabbro, and diabase, which vary in amounts and sizes from place to place.

Mineral deposits as such are not abundant in the Granite unit, but the granites of the unit are the basis of an important quarrying industry. Quarries too numerous to discuss here, but which have been described by Councill (1954), are widespread throughout the unit and furnish a large production of dimension and crushed granite.

Syenite (sy)

The only discrete body of syenite in the State is a ring dike, approximately 22 miles in circumference, located in the west-central part of Cabarrus County, LeGrand and Mundorff (1952). The outcrop of this syenite body varies in width from a few hundred feet at its southern limits to more than a mile along its western border, where it is crossed by Rocky River. The Syenite is more resistant to erosion than the surrounding rocks and stands out strongly in relief. The area of outcrop is generally marked by large boulders and pedistal rocks. The rock is an augite-syenite, composed largely of bluish-gray feldspar and augite. It is uniformly of coarse texture and massive in structure showing no effects of metamorphism. The absence of a fine-grained matrix permits the syenite to disintegrate into a residual granular material that makes excellent road metal.

Mount Airy Granite (mag)

The name, Mount Airy Granite, is introduced by the writers for a body of granite approximately eight miles long and four miles wide, which is

located around Mount Airy in northeastern Surry County. Much of the granite in this area is deeply weathered and covered with a thick layer of residumm. The most important outcrop is located one mile north of Mount Airy, where a body of fresh granite more than five thousand feet long occupies the crest of a prominent hill. The rock is a very light gray, nearly white, biotite granite of medium texture, composed of orthoclase, plagioclase, quartz, biotite, and minor amounts of apatite, zircon, muscovite, chlorite, and epidote. On the basis of the feldspar content, it is best classed as a quartz monzonite. The rock contains no injurious minerals and is free of joints and the effects of metamorphism. Quarrying was started at Mount Airy in 1890 and has continued uninterrupted since that time. Over the years, the quality and attractiveness of the rock has made Mount Airy granite a popular building stone. The absence of joints and lack of metamorphism have made possible the production of dimension stone of almost any desired size. The rock is used extensively for the construction of mausoleums, bridges, statues, and as architectural stone and curbing. Large amounts of crushed stone are produced also.

Diorite-Gabbro (digb)

Rock of the Diorite-gabbro unit are confined largely to the Central Piedmont Plateau, where they are associated with granites of the Central Piedmont Belt (the Carolina Igneous Belt), discussed above. They are most abundant west of the Gold Hill fault and south of Forsyth and Yadkin Counties, but a few small bodies are found in southeastern Guilford County, southern Caswell and Person Counties, and in the northeastern corners of Person and Granville Counties. The rocks of this unit range locally from diorite to gabbro but, as a whole, are intermediate between true diorite and gabbro. Some rocks consisting of diorite and granite, diorite predominating, are included in the unit. Areas of relatively true diorite and gabbro have been designated on the map, but most of the rock is shown as Diorite-gabbro. Bodies of almost normal diorite occur in southeastern Guilford, southern Caswell, and Person Counties. Bodies of nearly normal gabbro are found in northeastern Granville and Person Counties, inside the syenite ring dike in Cabarrus County, and from a short distance north of Barber south to Bear Poplar in Rowan County. The Diorite-gabbro is a coarse-textured rock that is distinctly massive and not closely jointed. It is composed chiefly of hornblende or pyroxene, plagioclase, and varying amounts of quartz and accessory minerals. In some places it is exposed as rounded boulders or flat outcrops that are not much weathered, but in most places it is deeply weathered, and covered with a thick layer of soil that is deep red or brown and relatively fertile. At several places, both on interstream areas and along valleys, shallow depressions resembling sinks in limestone are present. These appear to be the result of weathering and solution of the Diorite-gabbro.

PALEOZOIC

The four units in this group have been studied and described by Olson (1944), Griffitts and Overstreet (1952), Parker (1952), and Overstreet and Griffitts (1955) and classed as Paleozoic. These workers did not agree completely as to the position the units occupy in the Paleozoic, but they were in agreement in classing them as Paleozoic in age. Two of these, Toluca quartz monzonite and Cherryville quartz monzonite, consist in part of Whiteside granite as mapped by Keith and Sterrett (1931).

Toluca Quartz Monzonite (tqm)

Toluca quartz monzonite consists of numerous bodies of varying shape and size, occupying a belt extending across central and western Cleveland County, western Lincoln County, and into southern Burke County. It was named by Griffitts and Overstreet (1952) for the town of Toluca in the western edge of Lincoln County. Individual bodies vary from a few inches to several thousand feet thick and from a few feet to ten miles long. In general, these are parallel to the foliation of the mica gneiss into which they were intruded but occasionally cross it. Outcrops are not abundant as the rock is deeply weathered and underlies broad areas of light-gray soil. Toluca quartz monzonite is typically a medium gray, moderately gneissic rock. Usually, the smaller bodies are more strongly foliated than the larger, which, while gneissic throughout, are more strongly foliated near the margins. Chief minerals are oligoclase, microcline, orthoclase, quartz, and biotite. Minor amounts of garnet and muscovite and small amounts of apatite, zircon, ilmenite, and monazite are present. The rock is characterized by a wide variation in texture and composition. The texture

is everywhere gneissic, but the size, shape, and arrangement of the grains vary widely.

Monazite-bearing pegmatites genetically associated with the quartz monzonite inject it and occur parallel to the foliation of the surrounding gneiss. These dikes vary from a few inches to several feet in thickness and often attain lengths of several hundred feet. Overstreet and Griffitts (1955, p. 556) classed the Toluca quartz monzonite as early Ordovician in age.

Cherryville Quartz Monzonite (cqm)

Cherryville quartz monzonite occupies a broad belt across eastern Cleveland, western Gaston, and central Lincoln Counties. The unit was named by Griffitts and Overstreet (1952) for Cherryville, Gaston County. Outcrops are not abundant as the rock underlies thick layers of light-gray soil. South of Cherryville, the belt is parallel to the structure of the older rocks, but north of Cherryville, it bends eastward and crosses the structures of the older rocks. The Cherryville quartz monzonite contains many inclusions of country rock. It is essentially a gray, even-grained, massive to slightly gneissic rock, consisting chiefly of two varieties, one containing muscovite and biotite and the other containing muscovite but no biotite. It is, in general, a medium-grained rock, composed of oligoclase, microcline, quartz, muscovite, and biotite, with minor amounts of zircon, ilmenite, and apatite. Overstreet and Griffitts (1955, p. 556) classed the Cherryville quartz monzonite as probably Devonian in age.

Two major varieties of pegmatite dikes, spodumene-bearing and mica-bearing, are related to the Cherryville quartz monzonite. Spodumene-bearing pegmatites are restricted to the tin-spodumene belt that lies along the east side of the Cherryville quartz monzonite bodies. These dikes are most commonly in gneiss, but some extend into the quartz monzonite bodies. These dikes vary from zoned and nongneissic, north of Kings Mountain, to gneissic and nonzoned, south of Kings Mountain. Mica-bearing pegmatites that are well zoned occur in the northern part of the Lincolnton and Shelby quadrangles. These form dikes that cross the foliation of the enclosing gneiss and also the Toluca quarts monzonite.

Whiteside Granite (wg)

The Whiteside granite unit on the present map is essentially Whiteside granite as originally named and described by Keith (1907b). It was named for the cliffs of Whiteside Mountain, Jackson County, where it is well developed. On the present map, it is shown as several areas of varying sizes and shapes, along the southern boundary of the State in Henderson, Transylvania, and Macon Counties. The granite is a light-gray, even-grained, massive rock, composed of orthoclase, plagioclase, quartz, muscovite, biotite, and minor amounts of magnetite, ilmenite, and garnet. Biotite varies in amount and is often absent. The granite was injected into older rocks, parallel to their foliation, and often contains inclusions of gneiss and schist. Two varieties were described by Keith. One is fine to medium grained and massive, the other contains a decided flow banding. Outcrops vary with topography, and much of the granite is covered with thick layers of light red to yellowish soil mixed with sand.

Alaskite (al)

The Alaskite unit consists essentially of a coarse-grained pegmatitic granite that crops out near Spruce Pine, Mitchell County, as a number of bodies varying greatly in size and shape. The rock, which has been of interest to miners in the Spruce Pine district for several years, was designated by Hunter (1940) as alaskite. It consists essentially of oligoclase, quartz, microcline, and muscovite, listed in the order of abundance. Dark-colored minerals are almost absent, but small amounts of biotite and garnet occur at places near inclusions or contacts with country rock and are apparently products of contamination. The rock is not true alaskite, but the name is so well established in the Spruce Pine district that it is used here. The alaskite masses are granitoid in texture and uniform in grain size and mineral content. Much of the rock is sufficiently coarse-grained to be called pegmatite, but its uniformity and wide extent make the name Alaskite appropriate. The alaskite bodies contain many inclusions of gneiss and schist near their margins, but internally they are relatively free of such. Alaskite bodies containing inclusions of gneiss and schist often grade into gneiss and schist, containing numerous bands and lenses of alaskite. Most inclusions, as well as alaskite bands and lenses, are parallel to one another and to the foliation of the country rock.

Pegmatites occur in all parts of the alaskite, but the average size and number is greater near the margins of the alaskite bodies. The pegmatites

in alaskite and in the surrounding gneisses and schists are important sources of mica, feldspar, kaolin, and other minerals, for the production of which the Spruce Pine district is widely recognized. Sheet mica is obtained almost exclusively from pegmatites. For many years, feldspar and kaolin were produced from fresh and weathered pegmatites. As the demands for these minerals increased, attention was directed to alaskite, and it is now the chief source of feldspar, kaolin, and flake, or scrap, mica. Large bodies of unaltered alaskite serve as a source of feldspar by flotation. In many places, the alaskite is deeply weathered, often to depths approximating a hundred feet. Many of these weathered deposits are rich in kaolin and contains considerable flake mica. Most of the kaolin and a large part of the flake mica produced in the State are being obtained from weathered alaskite. Economically, Alaskite is one of the most important rock units shown on the present map.

TRIASSIC(?)

Two units, Bakersville gabbro and Diabase dikes, are shown as Triassic(?) on the present map. Diabase dikes have been considered of possible Triassic age for many years and probably should be classed as Triassic without the query; however, there is some question as to the exact age of the Bakersville gabbro. Keith (1903) first named this unit and described it in the text as Juratrias(?) but showed it in the legend on the geologic map as Juratrias without the query. The unit has received considerable attention in recent years, but its exact age is still in doubt. Kulp and Brobst (unpublished) showed Bakersville gabbro on an unpublished geologic map of the Spruce Pine district as Devonian. Brobst (1955, pp. 584-585) described the unit briefly and pointed out that it is considered younger than the alaskite and pegmatites. As to age, he stated, "The Bakersville might have been emplaced between the late Ordovician or early Silurian and the Triassic." The Committee on Geologic Names of the U. S. Geological Survey recommends Triassic(?) for the Bakersville gabbro, and it is so shown on the present map.

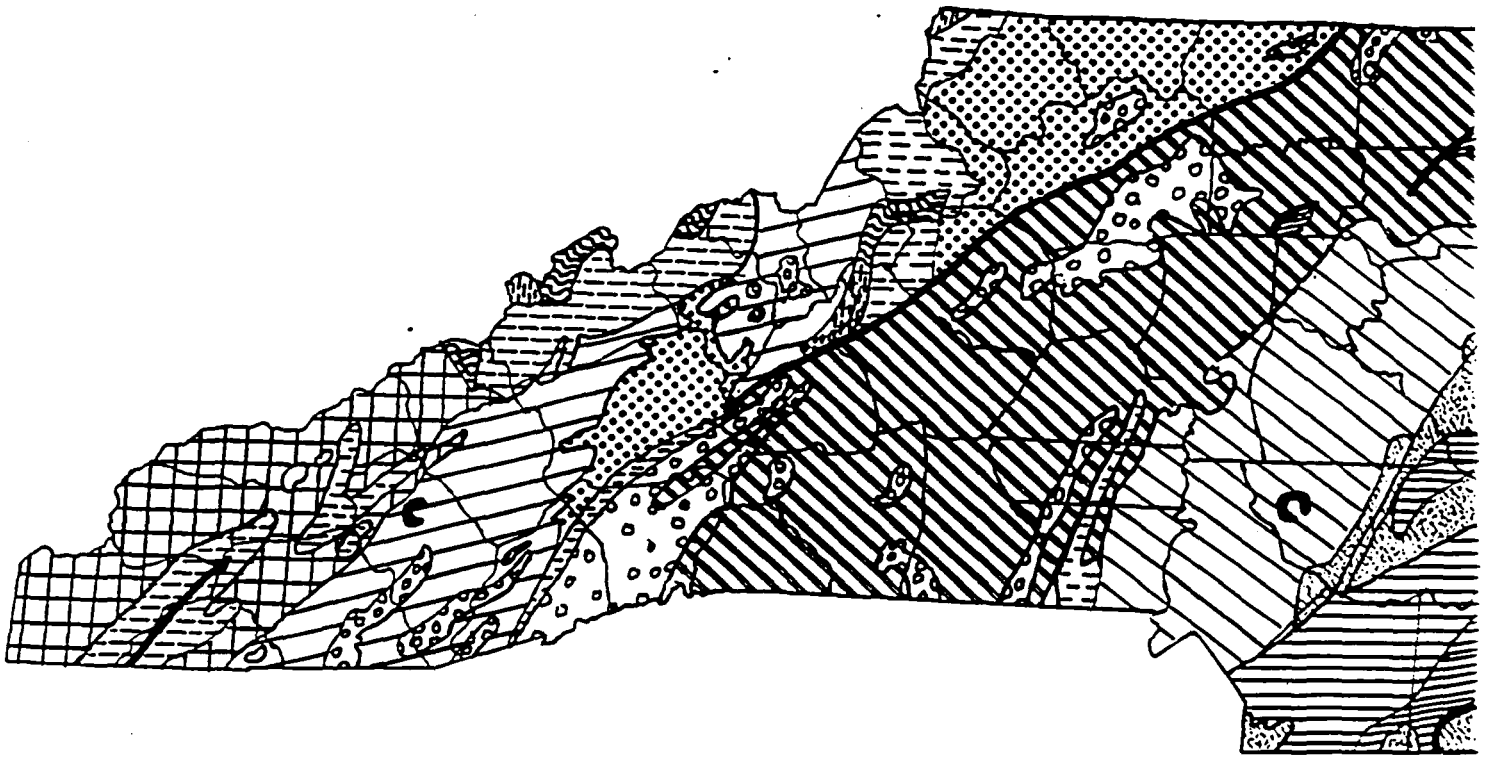
Bakersville Gabbro (Rg)

Bakersville gabbro outcrops are shown on the map near Bakersville, Mitchell County, and south and west of Elk Park and Cranberry, Avery County. The major outcrop near Bakersville is roughly triangular in shape, with a maximum length of five miles and a maximum width near the base of the triangle of about three miles. The outcrop near Elk Park and Cranberry is about two miles long and one mile wide. A number of outcrops too small to be shown on the map are found in the general area. Keith (1903) named the unit for Bakersville, Mitchell County, and described it briefly. It is a dense, hard, unmetamorphosed rock, nearly black when fresh but becoming reddish brown on weathering. It is composed chiefly of plagioclase, hornblende, and pyroxene in crystals of medium size, with small amounts of magnetite, epidote, and garnet as accessory minerals. The texture is usually massive and granular but occasionally becomes aplitic. Outcrops consist of spheroidal masses and boulders mixed in a dark-brown clay.

Diabase Dikes (Rd)

Diabase dikes of probable Triassic are widely distributed throughout the Piedmont and Mountain regions of North Carolina. They are most abundant in and adjacent to sedimentary rocks of Triassic age along the eastern and central Piedmont region, but become less common in the western Piedmont and are found sparingly in the Blue Ridge region. They also occur frequently along the western edge of the Coastal Plain where pre-Triassic rocks are not covered by younger sediments. Because of the wide distribution and limited area of outcrop, Diabase dikes are shown in only two localities on the map. One of these is the Deep River basin in Chatham, Lee, and Moore Counties, and the other is an unusually long dike northeast of Morganton, Burke County. In the Deep River basin, according to Reinemund (1955), who gave an excellent description of the diabase intrusives in that basin, dikes, sills, and sill-like masses occupy about four percent of the Triassic rocks. Diabase dikes in the Deep River basin vary in width from less than an inch to 320 feet and in length from a few feet to nearly seven miles. Most dikes in the area are between 20 and 75 feet wide and are fairly constant in width for several thousand feet of length. Sills and sill-like intrusives of diabase are abundant in the Deep River basin Triassic sediments and range in thickness up to 400 feet. In the Morganton area, an unusual diabase dike extends in a northwest-southeast direction with minor interruptions for nearly twenty miles.

Fig. 2



GENERALIZED GEOLOGICAL MAP
OF
NORTH CAROLINA

DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPME
DIVISION OF LAND RESOURCES
N. C. GEOLOGICAL SURVEY SECTION

CENOZOIC

Quaternary
Surficial sands and clays

Miocene (Yorktown formation)
Massive marine clay and interbedded shell beds and marls

Eocene (Castle Hayne formation)
White sandy shell limestone to dense silicified gray limestone

MESOZOIC

Cretaceous (Pee Dee formation)
Gray to green sands, impure limestones, marine clays, and interbedded sands

Cretaceous (Black Creek formation)
Black to gray, interbedded sands, clays, and marls

Cretaceous (Tuscaloosa formation)
Tan, red, and gray sands, and interbedded clays

Triassic
Red brown, purple, and gray sandstone, siltstone, shale, conglomerate, and some coal

PRECAMBRIAN TO PALEOZOIC

Granitic intrusive rocks
Includes intrusives and intrusive complexes of granite, granodiorite, quartz monzonite, diorite, gabbro, and a syenite ring dike that ranges in age from lower to middle Paleozoic

Metavolcanic epiclastic rocks
Includes laminated argillites, graywackes, graywacke conglomerates, arkoses, and novaculites

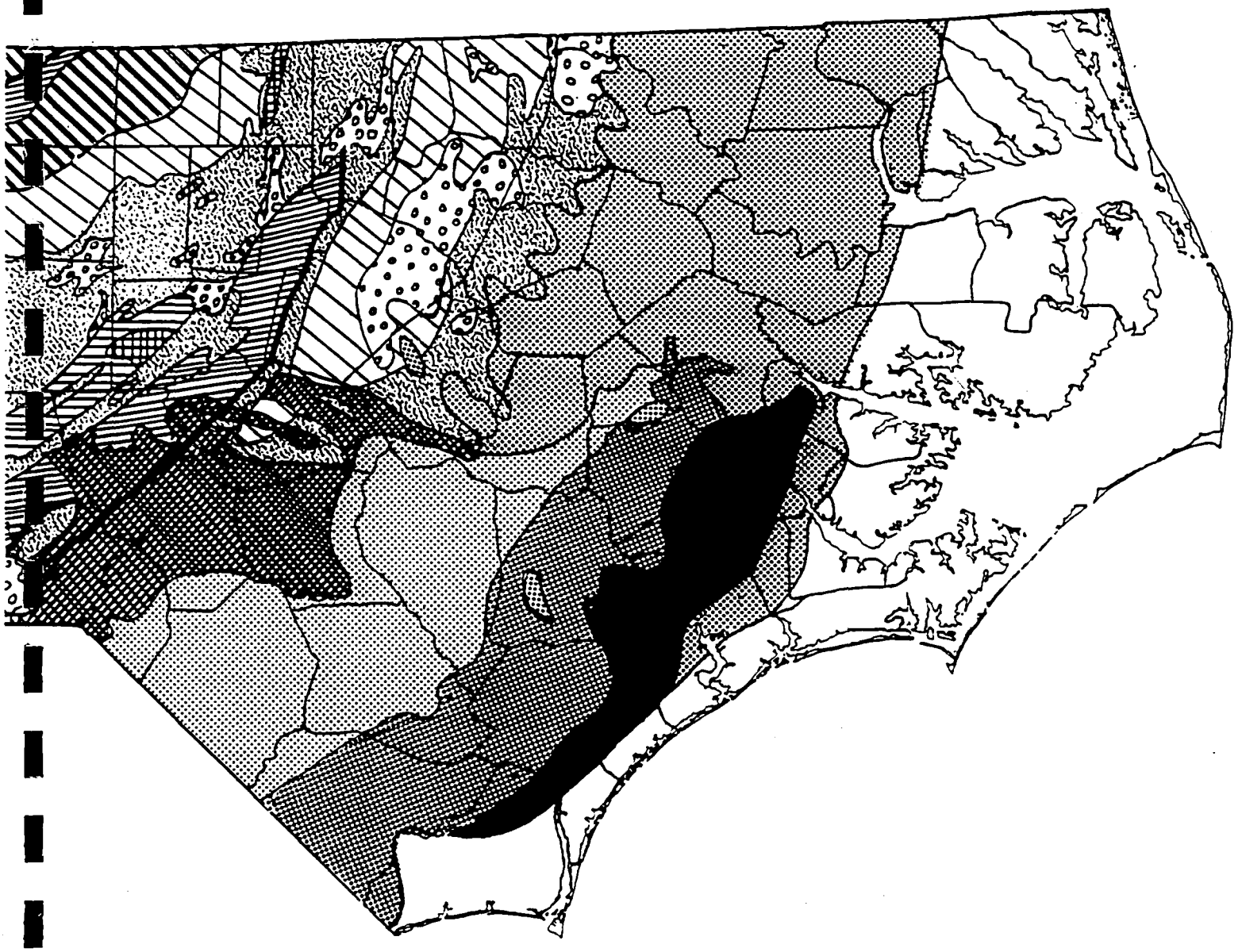
Felsic metavolcanic rock
Felsic pyroclastic tuffs, lithic tuffs, crystal tuffs, and rhyolite flow rocks

Mafic metavolcanic rock
Includes andesitic to basaltic pyroclastic tuffs, lithic tuffs, crystal tuffs, and andesite and basalt flow rocks

Plutonic and metamorphic rock
Includes plutonic granites, diorites, and gabbros that are interfingered with felsic, mafic gneisses, and schists

Metasedimentary rocks
Quartzite, schist, and marble probably of Paleozoic age

Ultramafic rocks
Peridotite and pyroxenite in part altered to talc, soapstone, and serpentine



Lower Cambrian
(Chilhowee, Shady, and Rome formations) Quartzite, shale, and dolomite, including Mount Rogers group in Ashe County

Gneiss and schist
Mixed mica gneisses and schists with lesser amounts of hornblende gneiss, also contains granitic rocks, pegmatite dikes, and isolated bodies of ultramafic rocks

PRECAMBRIAN

Great Smoky group
Metagraywacke, metaconglomerate, metaarkose, slate, and schist

Snowbird group and related rocks
Metasiltstone, metasandstone, and metavolcanic rocks

Younger Precambrian
Metasedimentary and metavolcanic rocks

Older Precambrian
Metasedimentary and metavolcanic rocks

Basement complex
Precambrian granite gneiss and granite

GEOLOGICAL SURVEY N.C. 1823

SCALE

0 10 20 30 40 50 miles

1980

Reference 19

R. Allan Freeze

Department of Geological Sciences
University of British Columbia
Vancouver, British Columbia

John A. Cherry

Department of Earth Sciences
University of Waterloo
Waterloo, Ontario

GROUNDWATER

Prentice-Hall, Inc.
Englewood Cliffs, New Jersey 07632

Table 2.2 Range of Values of Hydraulic Conductivity and Permeability

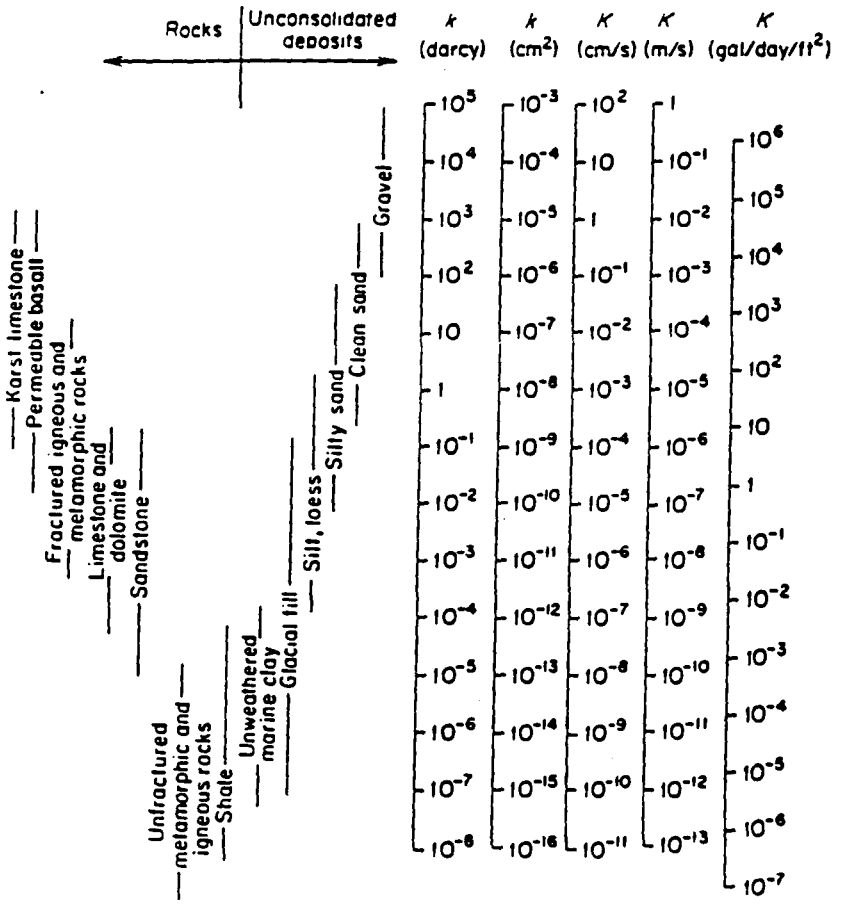


Table 2.3 Conversion Factors for Permeability and Hydraulic Conductivity Units

	Permeability, k*			Hydraulic conductivity, K		
	cm^2	ft^2	darcy	m/s	ft/s	U.S. gal/day/ft^2
cm^2	1	1.08×10^{-3}	1.01×10^{8}	9.80×10^{2}	3.22×10^{3}	1.85×10^{9}
ft^2	9.29×10^{2}	1	9.42×10^{10}	9.11×10^{5}	2.99×10^{6}	1.71×10^{12}
darcy	9.87×10^{-9}	1.06×10^{-11}	1	9.66×10^{-6}	3.17×10^{-5}	1.82×10^{1}
m/s	1.02×10^{-3}	1.10×10^{-6}	1.04×10^{5}	1	3.28	2.12×10^{6}
ft/s	3.11×10^{-4}	3.35×10^{-7}	3.15×10^{4}	3.05×10^{-1}	1	6.46×10^{5}
U.S. gal/day/ft^2	5.42×10^{-10}	5.83×10^{-13}	5.49×10^{-2}	4.72×10^{-7}	1.55×10^{-6}	1

*To obtain k in ft^2, multiply k in cm^2 by 1.08×10^{-3}.

Reference 20

STATISTICAL ANALYSIS RELATING WELL YIELD TO CONSTRUCTION PRACTICES AND SITING OF WELLS IN THE PIEDMONT AND BLUE RIDGE PROVINCES OF NORTH CAROLINA

By Charles C. Daniel III

U.S. GEOLOGICAL SURVEY

Water Resources Investigations Report 86-4132

Prepared in cooperation with the

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES
AND COMMUNITY DEVELOPMENT

Raleigh, North Carolina

1987

Table 5.--Summary statistics defining depth to water, casing depth, and saturated thickness of regolith according to topographic group in the Blue Ridge and Piedmont physiographic provinces [Statistics for wells penetrating bedrock beneath the western edge of the Coastal Plain sediments are given for comparison.]

Well characteristic	Blue Ridge					Piedmont					Coastal Plain [1]	
	Draws and valleys	Slopes and flats	Hills and ridges	All wells	Number of wells	Draws and valleys	Slopes and flats	Hills and ridges	All wells	Number of wells	All wells	Number of wells
Average water level (feet below land surface)	23.4	37.5	62.9	37.1	507	22.1	29.3	36.8	31.3	2,326	18.8	145
Median water level (feet below land surface)	18	35	50	30	507	20	25	32	27	2,326	15	145
Average casing (feet)	50.1	57.7	66.6	56.8	698	52.7	53.2	50.0	52.0	2,685	71.7	293
Median casing (feet)	43	55	60	53.5	698	45	46	41	44	2,685	63	293
Average saturated thickness of regolith (feet)	32.2	27.6	20.8	28.0	422	33.6	24.6	20.4	24.0	1,749	47.7	112
Median saturated thickness of regolith (feet)	28	20	10	20	422	28	15	9	13	1,749	44.5	112

[1] Topography of bedrock surface cannot be determined. Influence of topography on well yield in Coastal Plain is unknown.

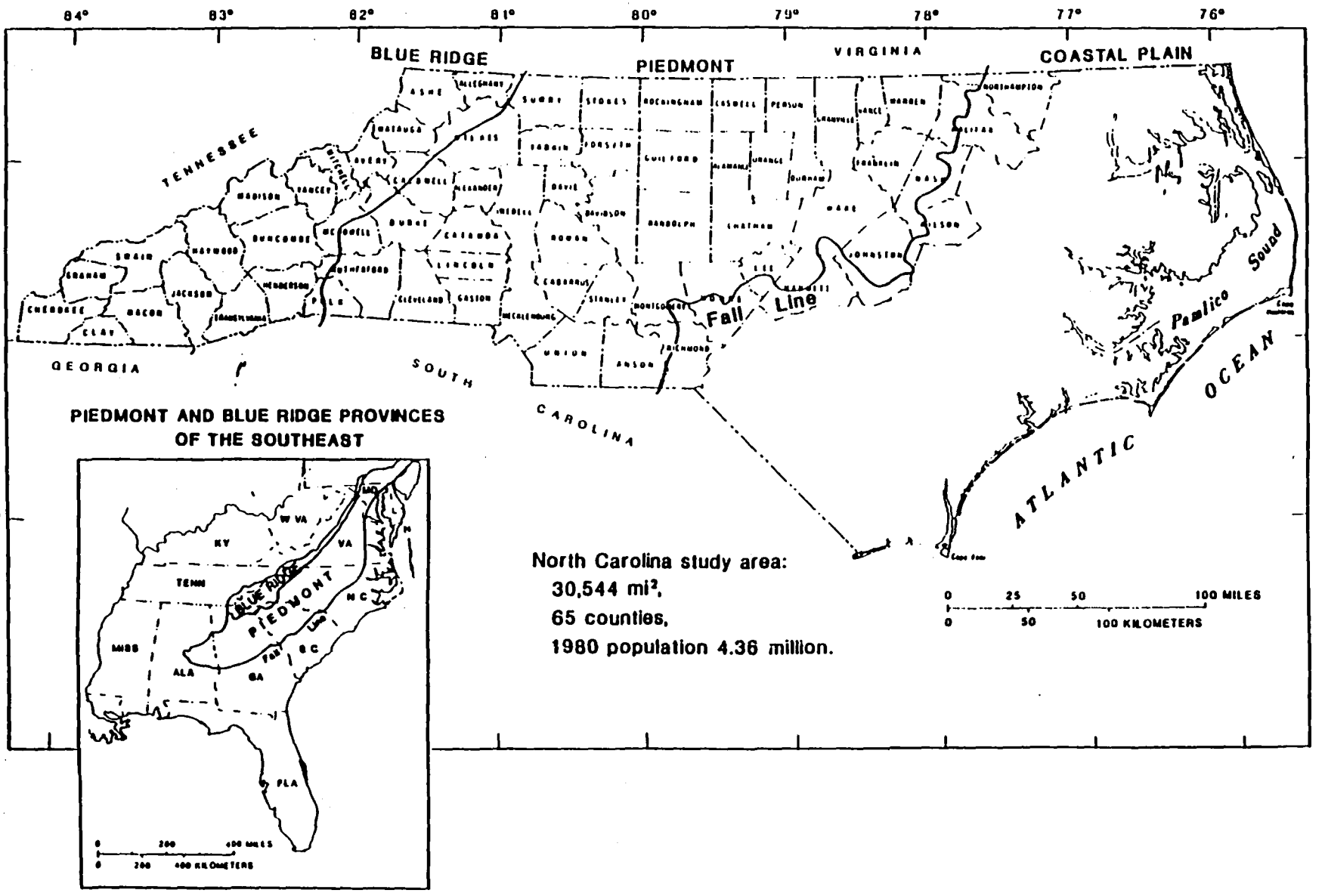


Figure 1.--Area of investigation showing counties and physiographic provinces.

Reference
21

NORTH CAROLINA
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
BEN E. DOUGLAS, *Director*

DAVIDSON

DIVISION OF MINERAL RESOURCES
JASPER L. STUCKEY, *State Geologist*

BULLETIN NUMBER 68

GEOLOGY AND GROUND WATER IN THE Statesville Area, North Carolina

By

HARRY E. LEGRAND
Geologist, U. S. Geological Survey

PREPARED COOPERATIVELY BY THE GEOLOGICAL SURVEY
UNITED STATES DEPARTMENT OF THE INTERIOR

1954

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LETTER OF TRANSMITTAL

Raleigh, North Carolina
February 15, 1954

To His Excellency, HONORABLE WILLIAM B. UMSTEAD
Governor of North Carolina

SIR:

I have the honor to submit herewith manuscript for publication as Bulletin No. 68, "Geology and Ground Water in the Statesville Area, North Carolina," by Harry E. LeGrand.

This report is another in the series being prepared on ground water in the State by the North Carolina Department of Conservation and Development in cooperation with the United States Geological Survey. In most parts of North Carolina, ground water is becoming increasingly important as a source of supply for industries, municipalities, and schools. It is believed that this report will be of value to those interested in ground water in the Statesville area.

Respectfully submitted,

BEN E. DOUGLAS,
Director

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GEOLOGY AND GROUND WATER IN THE STATESVILLE AREA, NORTH CAROLINA

By HARRY E. LEGRAND

ABSTRACT

The Statesville area is slightly west of the center of North Carolina and consists of Alexander, Catawba, Davidson, Davie, Iredell, and Rowan Counties. It includes 2,556 square miles and in 1950 had a population of 285,725. The people are engaged in both agriculture and manufacturing. In addition to the farmers, many industrial workers live in the rural areas; an outstanding feature is the great rural population and its relatively high standard of living.

The area lies in the Piedmont province. Topographically, it consists mostly of low, rounded hills and gentle slopes, although a few scattered mountains rise above the upland level. The numerous streams flow in valleys as much as 100 feet below the level of the upland. The major streams have moderately high gradients to the southeast.

Except for a small area of sedimentary rocks of Triassic age in Davie County, the area is underlain by igneous and metamorphic rocks consisting largely of schist, gneiss, granite, diorite, and a series of volcanic rocks. The volcanic rocks occur only in the southeastern parts of Davidson and Rowan Counties. Mica schists and mica and hornblende gneisses are the chief country rocks; they have been intimately intruded by granite in most of the area. Local changes in types of rocks are common, and large homogeneous masses of a single type of rock are rare. Crustal movements have tilted the rocks, many of which crop out in relatively thin bands. The most common trend of the outcrop belt is northeastward. Hiding the bedrock in most places is a thick layer of residual soil and weathered rock which supports much vegetation.

More than 35,000 individual wells furnish the domestic water supply for about two-thirds of the population. Drilled wells get water from fractures in the bedrock whereas the shallower dug and bored wells get water from the weathered material above bedrock.

Wells drilled in the basic rocks, such as hornblende gneiss, gabbro, and diorite, have a slightly higher average yield than wells in other rock units. The average yield of municipal and industrial wells in hornblende gneiss is about 60 gallons a minute; in all the rocks it is about 41 gallons a minute.

The amount of water yielded by wells is related to topographic location. The average yield of wells on hills is about half that of wells in other topographic locations and several times less than that of wells in draws. More than 80 percent of all existing wells are drilled on upland areas where conditions are unfavorable for large supplies of water. Thus the average yield of wells listed in this report is less than it would be if the wells were distributed evenly over all types of topography.

The amount of water that any specified well will yield is decided largely by chance and cannot be predetermined. However, if we consider a large number of wells, chance does not decide the yields. If we may use past wells as an index, the probabilities of future municipal and industrial wells are as follows: at least 60 percent will yield more than 18 gallons a minute, at least 40 percent will yield more than 33 gallons a minute, and at least 20 percent will yield more than 54 gallons a minute.

The amount of water contained in the rocks decreases with depth. The depth at which water is found cannot be predicted and is seldom known for existing wells. By analyzing the yields of wells of different depths, it is evident that the yield per foot of well generally decreases with depth. The chance of appreciably increasing the yield of a well by drilling deeper than 250 or 300 feet may be so slight that a new well might be more economical.

The withdrawal of water from wells is only a fraction of that available for recharging the underground reservoir. Recharge, coming from about 47 inches of rainfall annually, occurs in the interstream areas and discharge occurs chiefly in adjacent lowlands. The annual recharge and discharge are in natural balance, resulting in no perennial trend in the fluctuation of the water table. Its relatively quick circulation prevents the water from collecting much mineral matter in solution; with the exception of a high iron content in some places, the water is almost everywhere of good chemical quality.

Several tables were prepared to show the relation of yield to type of rock, to topographic location, a to depth of wells. The report contains a brief discussion of the ground-water resources of each county, wi tables of well data and chemical analyses. A geologic map of each county is also included.

INTRODUCTION

This report deals with the ground-water resources of a part of the west-central Piedmont of North Car lina. The area includes Alexander, Catawba, Davidson, Davie, Iredell, and Rowan Counties (fig. 1), whi represent an industrial and heavily populated rural section of the State. Although the numerous strean provide adequate water supplies to the large towns and industries, two-thirds of the population of t Statesville area, or more than 180,000 people, use wells as the source of domestic water supply. There a more than 35,000 individual wells, the great majority of which are installed with electric pumps. The pro lems arising in attempting to develop ground-water supplies are of three types relating chiefly to quanti rather than quality of water: (1) those in which the wells are so shallow that the water level is lowere below the bottoms of the wells during droughts or during periods of heavy withdrawal, (2) those in whic wells do not penetrate water-bearing material and, (3) those due to the inability of water to mo through the water-bearing material fast enough to satisfy the demands of individual wells. The present r port discusses these problems and offers suggestions as to possible solutions. Moreover, the report show that pumping from the underground reservoir is nowhere excessive, that there is no persistent lowering the water table, and that the underground reservoir offers a perennially dependable source of water supply.

The investigations on which the report is based were made through a cooperative agreement betwee the North Carolina Department of Conservation and Development and the Geological Survey, United State Department of the Interior. The program is under the direction of J. L. Stuckey, State Geologist of Nort Carolina, and A. N. Sayre, Chief, Ground Water Branch, U. S. Geological Survey.

The field work in the Statesville area was done chiefly in the summer and autumn of 1950 and 195 although some of the well data were collected in 1948 by M. J. Mundorff. It consisted of obtaining data o 821 wells and a number of springs, collecting samples of water, noting the geologic and topographic locatio of wells, and making a reconnaissance geologic map of the area. Information about the wells was obtaine from the well owners and drillers. Much of the information was given from memory, and some of it, there fore, may not be wholly accurate.

The writer wishes to express appreciation for the work of M. J. Mundorff, in charge of the cooperativ ground-water program in North Carolina between 1941 and 1948. Mr. Mundorff's intensive studies of th ground-water resources of some adjoining parts of the Piedmont, where simlar underground condition exist, largely furnished the pattern for this report. Marjorie M. Streicher and James T. Bales of the Geological Survey compiled many of the data used in this report. The chemical analyses were made by the U. S Geological Survey, under the direction of F. H. Pauszek, District Chemist, Raleigh, N. C.

The writer wishes to acknowledge the courteous and generous assistance of the well owners and well drillers who have furnished information for this report. Among the drilling companies who have contributed information are: R. E. Faw and Son, Hickory Well Supply Co., Carolina Well Drilling Co., Catawba Well and Pump Co., Kannapolis Well Drilling Co., A. L. Matlock, H. C. Huffman, W. R. Morrison, McCoy Huffman, J. W. Morrison, and T. A. Harris.

GEOGRAPHY

PHYSICAL FEATURES

The Statesville area lies within the Piedmont province, bordering the mountain province on the west. Most of the upland, or interstream, areas represent a peneplain that has been maturely dissected by streams. Consequently, the topography is characterized largely by low, rounded hills and gentle slopes. Streams have lowered the valleys through which they flow until they are generally more than 100 feet below the upland areas. The peneplain slopes southeastward, its elevation being about 1,200 feet in Alexander County and about 700 feet in Davidson County.

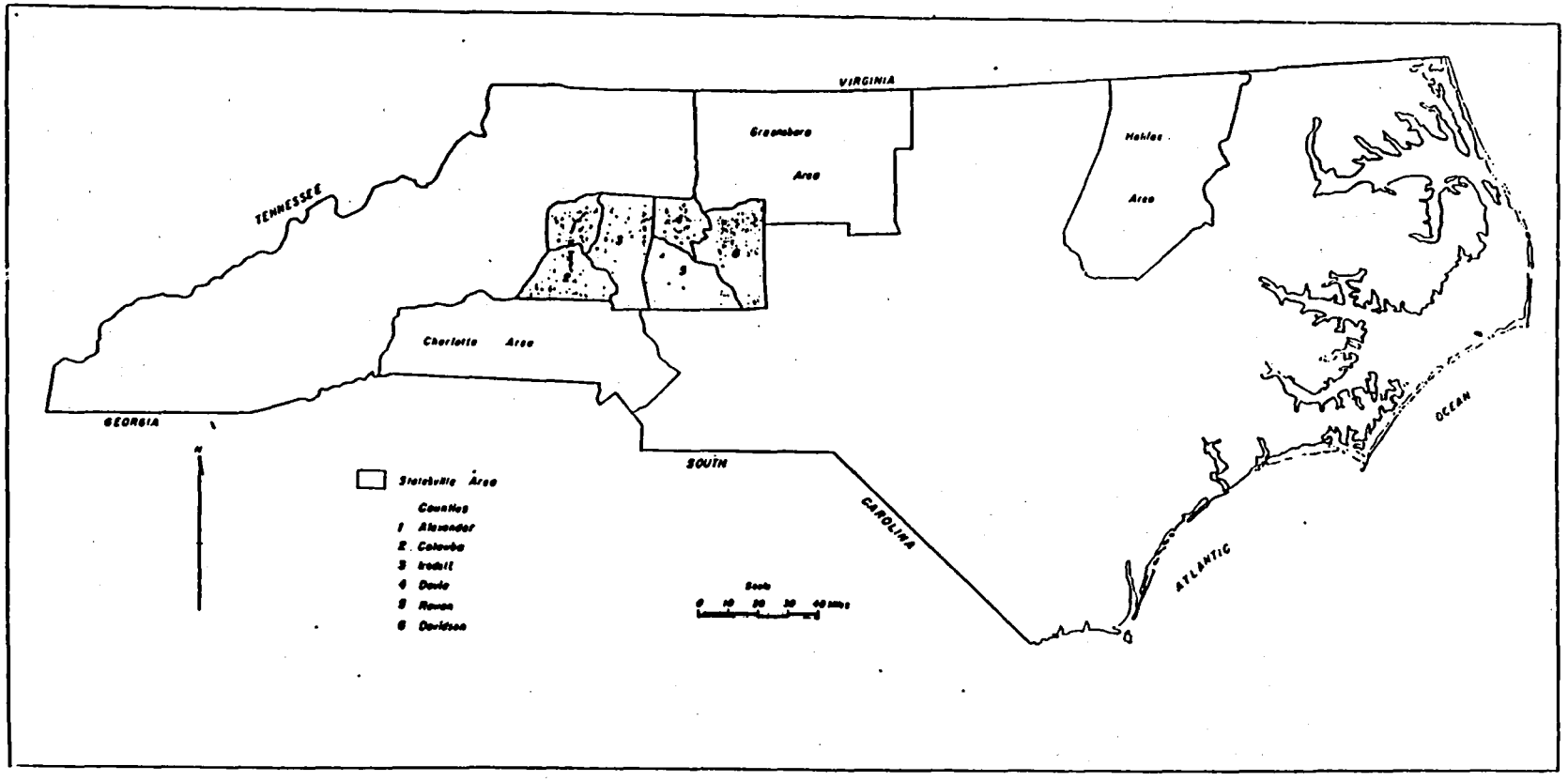

FIGURE 1.—*Map of North Carolina showing where major systematic ground-water investigations have been made.*

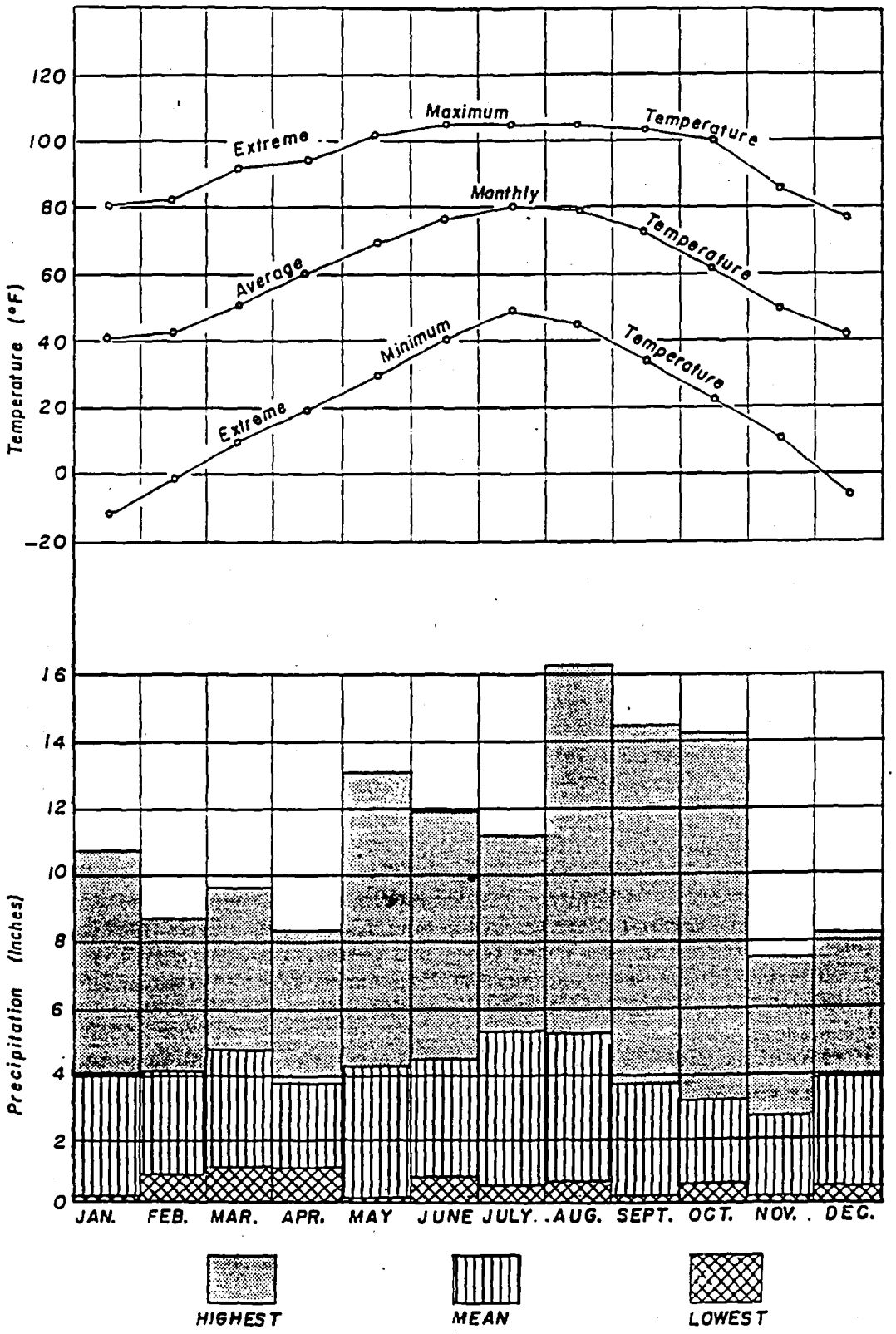

FIGURE 2.—*Climatic summary for Salisbury, Rowan County, based on records (1876-1945) of the Salisbur station of the U. S. Weather Bureau.*

Here and there prominent peaks, or monadnocks, rise several hundred feet above the peneplain. Mos of these monadnocks are composed of rocks more resistant to erosion than those of the surrounding pene plain. Quartzite, sillimanite schist, and poorly fractured, massive granites and diorites are the commor rocks forming the monadnocks, whereas the closely interlayered gneisses and schists and the smaller intru sive masses of granite and diorite are the common rocks underlying the peneplain. A heavy layer of soil an its veneer of vegetation cap the bedrock in most places.

The area is drained by two major streams, each having a general southeastward course. Davidson, Ro wan, and Davie Counties and the eastern parts of Iredell and Alexander Counties lie in the Yadkin Rive basin. The remainder of the area lies in the Catawba River basin. A close network of tributary streams whose courses are quite diverse, characterize the drainage. Parts of the courses of many of the stream are determined by the geologic structure of the area.

CLIMATE

Yearly precipitation is distributed almost evenly in the Statesville area. The average yearly precipita tion at the six U. S. Weather Bureau stations in the area is about 47 inches. Figure 2 shows the genera monthly distribution of precipitation at the station at Salisbury, Rowan County.

The average annual temperature ranges from about 58.5°F in Alexander County to about 60.5°F i Rowan County. Average, maximum, and minimum monthly temperatures at the Salisbury station are show in figure 2.

GEOLOGY

The Statesville area is underlain by a complex series of igneous and metamorphic rocks. (A glossar designed to clarify some of the geologic and hydrologic terms used in this report, is found on page 67.) Severa weeks were spent during the course of this investigation making a geologic map of the area. Considerin the large size of the area and the short time spent in mapping, it is apparent that the geology is necessari greatly generalized and that the map can be considered only a reconnaissance map. Each rock unit shown o the map is not necessarily restricted to a single type of rock because the space occupied by the outcrop of particular type of rock may be too small to show on a small-scale map. Also, many rocks are gradation between types.

The gradation between the rocks is of two types. The first can be seen in one outcrop where a progre sive change from one petrologic type to another occurs within a distance of a few inches or a few feet. T other type, of greater magnitude, may represent a zone of many feet or a few miles where two rocks are inte layered and a progressive change in the dominant rock can be observed generally. In the latter case granit everywhere represents one of the types, and precise local contacts may be observed. Generally the rocks a so intimately interlayered that only the dominant rock can be shown except on very large-scale maps. On t small-scale maps in this report only a small proportion of geologic boundaries are shown. Best use of thes maps can be made by assuming that the geologic contacts are approximate or arbitrary. The classificati of rocks in the Statesville area used in this report is based on lithology and physical appearance.

The geologic history of the area is not well known. Very old sedimentary and igneous rocks were fol ed and faulted and were metamorphosed by pressure and heat into schists of various types. Tuffs and oth volcanic materials covered some of the area and were altered to some degree. After these events igneo rocks, particularly granite, were intruded into the pre-existing rocks. The emplacement of granite was pr ceded by or accompanied by a general metamorphism of the crystalline schists. The high temperatures an directed pressures related to this metamorphism allowed granitic material to penetrate the schists in mately. The granite occurs as large, nearly homogeneous bodies, as veins and sheets, and as granitiz country rock. The intrusion of granite into the older rocks occurred in the area west of the volcanic rock which crop out in eastern Davidson and Rowan Counties.

It is generally thought that the last great earth movements and much of the granite emplacement occu red near the close of Paleozoic time. The youngest rocks of the area are sedimentary rocks in a relativel small downfaulted block in Davie County; these rocks and the diabase dikes which cut them are believed

be of Triassic age. Having been elevated during several geologic periods, all the rocks have been subjec to weathering and erosion, and much rock material has been stripped from above the present surface. rocks, therefore, have been beveled by erosion and the present surface is generally formed by east-trend schistose rocks tipped on edge. A heavy layer of soil mantle the bedrock in most places, showing that rate of erosion generally lags behind the rate of weathering.

AREAL DISTRIBUTION AND CHARACTER OF THE ROCKS

The rocks of the Statesville area represent, for the most part, a northeast extension of the same ty found in the Charlotte area to the southwest and described in the Charlotte report (LeGrand and Mundo 1952). The following descriptions of the rock types have been largely adapted from that report.

Mica schist.—Thinly laminated rocks containing a large amount of mica and showing a strong schist structure are abundant in the area and are interlayered with many other types of rocks. The schist is common rock in western Davie County and in Iredell, Catawba, and Alexander Counties, where it occurs general northeast-trending belts. Much of the original structure of the schist was destroyed by metamorp ism before and at the time of the emplacement of the granite, but much of it is thought to have been shale.

Schist-granite complex.—Several types of mixed rocks result from the injection of granite into the m schist. The schistose planes guided the intruded granitic material along these planes so that the schist a granite generally show a roughly parallel alinement. In some places the granitic material intruded the schi assimilated it, and altered it into a sort of composite gneiss. Although this type of gneiss represents a pa of the injection phenomena it is mapped as gneiss and not as a part of the schist-granite complex. The mo conspicuous occurrence of the schist and granite is as alternating and separate bands ranging from a fra tion of an inch to many hundreds of feet in width. For convenience in mapping and description of the roc the resulting products are classified according to the amount of granite present. The subdivision of the cor plex is similar to that used by Read (1931, p. 91) in describing the Loch Choire injection complex of Scotlan

The following subdivisions of the schist-granite complex can be conveniently distinguished:

1. Mica schist containing little or no granitic material.
2. Injection area; mica schist dominant.
3. Injection area; granite dominant.
4. Granite, more or less homogeneous.

To some extent the schist is dominant in the injected areas near areas of homogeneous schist, and granit is dominant in injected areas near areas of homogeneous granite, but this gradation between the dominar rocks is not everywhere apparent. Perhaps the reason for this is that the emplacement of granite took plac over large areas of the Appalachian Piedmont, and rather large masses of homogeneous granite are so com mon that it is not generally possible to relate one of these masses to a particular injection area. Under suc a classification most of the contacts mapped are gradational and therefore should not be regarded as distinc boundaries between rock types.

Granite.—The granite of the injection complex and that forming the large homogeneous masses are re garded as of the same age (Kesler, 1944, p. 759) although the available evidence is not conclusive. The granites vary considerably in texture and physical appearance owing, in part, to the type of country roc penetrated, the degree of assimilation by the granite, and conditions of cooling of the granitic solutions. Ar exposure of granite that is typical in lithology but is less weathered than the average is shown in figure 3.

The normal constituents of the granites are quartz and several varieties of feldspar, mostly rich in potash and soda. In some places either muscovite or biotite forms an important accessory mineral. Near some areas of diorite and gabbro, hornblende is a common mineral in the granite but large areas of hornblende granite are not common. Some of the granite in Davidson, Rowan, and Davie Counties forms an intricate complex with diorite and is discussed in a later section. Much of the rock mapped and discussed as gneiss represents a product of a country rock pervaded and permeated by granite. Thus in a broad sense, it is likely that granite, in all its types of emplacement, underlies more than half the Statesville area.

The emplacement of much of the granite is believed to have occurred during late Paleozoic time when the country rocks were generally metamorphosed. During this metamorphism high temperatures and pre-

vailing earth stresses influenced the invasion of the more volatile portion of magma by allowing it to be injected as veins and sheets into the country rock at great distances from the residual magma. Metamorphism resulting from the injection processes produced zones in the country rock rich in kyanite, sillimanite, and garnet. However, not in all places is it possible to distinguish between the effects of injection metamorphism and regional metamorphism of an earlier date.

FIGURE 3.—*Jointed and partially weathered granite near Woodleaf, Rowan County. Although typical of many massive granites, the rock is not as completely decomposed as most other rocks.*

Hornblende gneiss and schist.—Hornblende gneiss and schist (hereinafter called hornblende gneiss) occur over a wide area west of Davidson and Rowan Counties. Large bodies of this rock are not common, the usual occurrence being as beds a few inches or a few feet wide interlayered with other rock. The gneiss is similar to the Roan gneiss named by Keith and Sterrett (1931, p. 3) and mapped by them in the vicinity of Kings Mountain, Cleveland County. It is commonly composed of large quantities of hornblende and varying amounts of feldspar and quartz. However, other types of basic rocks occurring in subordinate amounts are included with the hornblende gneiss. In contrast to the granites and mica schists with which it is associated, the hornblende gneiss is dark in color where fresh and unaltered, and deep red or brown where weathered.

The age of the hornblende gneiss is not certain but its relation with other rocks indicates that it is older than all the other rocks of the area, with the possible exception of the mica schist and composite gneiss (see below) with which it is interlayered. Where the schistosity is strong the hornblende gneiss is interlayered with granite in northeast-trending belts, but the less schistose parts of the gneiss are cut transversely by dikes of granite. From field appearances it does not seem likely that the hornblende gneiss was modified much by injection metamorphism. At any rate, the rock now identifiable as hornblende gneiss is completely separate from the granite that intrudes it. Although the hornblende gneiss is a common rock it is generally subordinate to other types.

Composite gneiss.—Rocks of this unit include gneisses and schists, chiefly of granitic character, in which biotite is generally a conspicuous dark mineral. In many places it represents the gneissic portion of the type of rock mapped by Keith and Sterrett (1931, p. 3) as the Carolina gneiss. Part of Keith and Sterrett's description is applicable:

> "A portion of the Carolina gneiss is composed of banded granular layers of feldspar, quartz, and either muscovite or biotite or both, with accessory minerals. The texture is commonly much coarser and the foliation less pronounced than those of the mica schists. Some of this gneiss has developed from homogeneous rocks and therefore has a rather uniform texture and banding. Other parts of it have been derived from rocks of variable composition that produce a strong banding with variations in texture."

Some of the gneiss may represent granite that has been foliated as a result of earth movements; parts of the gneiss are products of injection phenomena in which granitic material has permeated a host probably of sedimentary origin, forming a composite rock.

The composite gneiss covers large areas in Iredell and Catawba Counties. In many places it is in c with the schist-granite complex, and the separation of these two classes is difficult and arbitrary. The posite gneiss contains numerous lenses of granite and hornblende gneiss. The areas where hornblende is prominently interlayered with the composite gneiss are shown on the geologic maps in a special patt

Gabbro-diorite.—Rocks ranging locally from gabbro to diorite but which, as a whole, are interme between true gabbro and diorite are common in some parts of the Statesville area. The most prominent c rence lies in a belt several miles wide extending northeastward from southern Iredell County through we Rowan County to the north-central part of Davie County. Similar rocks occur as small isolated mass other parts of the area. The rock is typically exposed in the area around Cleveland, Rowan County.

The gabbro-diorite is distinctly massive and not closely jointed. As is characteristic of other homogen igneous rocks of the area, the gabbro-diorite is commonly exposed as rounded boulders or smooth outc projecting above the general surface of the ground. These exposures are not greatly weathered, alth the mineral components are susceptible to weathering. The rock appears to be composed chiefly of hornbl or pyroxene and feldspar and varying amounts of quartz and accessory minerals. The color is generally c ranging from nearly black to green. Surficial alterations or parts of the rock to epidote accounts for of the green color. The texture is generally coarse.

FIGURE 4.—*Partially weathered granite (light) and diorite (dark) in road cut along U. S. Route 29, about miles west of Thomasville, Davidson County.*

Diorite-granite complex.—Rocks of this complex cover a large area in Davidson, Davie, and Rowan Cou ties. They are believed to have a wide distribution outside the Statesville area, although very little geologic study has been made of the rocks of this complex.

An intermediate to basic component, chiefly diorite, and an acid component, chiefly granite, form thi complex. The intermediate to basic component varies in composition, being a gabbro in some places and diorite in others, but for convenience it is called diorite in this report. The acid component is granite in a places.

So closely spaced are the individual rock bodies within the complex that not even the larger homogeneous bodies can be shown on the accompanying maps. It was decided to split the complex proper into two units, one in which the diorite predominates and the other in which the granite predominates. In using this subdivision the boundaries between these units are necessarily arbitrary and somewhat indefinite.

The most conspicuous occurrence of the granite is as discrete bodies, apparently veining and penetrating the diorite in random fashion (fig. 4). Each type of rock is clearly separated from the other, and neither is modified appreciably.

The diorite is a dark-blue or gray medium-textured rock composed predominantly of hornblende and feldspar and varying amounts of quartz, biotite, pyroxene, and other accessory minerals. Epidote is common as an alteration product, apparently after the calcic feldspars. The rock granulates readily near the surface of the ground and the soil may be composed in part of disintegrated hornblende crystals typical of the Mecklenburg soil types. Dense light-green dikes of aplite commonly penetrate the diorite.

The granite forming the complex with the diorite is light in color, being composed almost entirely of feldspar and quartz. Biotite, muscovite,, and other accessory minerals common in most granites are not conspicuous. Like the diorite with which it is associated, the granite disintegrates readily near the surface, breaking down into pea-size aggregates of quartz and feldspar.

Some of the diorite is strongly schistose and much of the granite is sheared. The wide range in degree of metamorphism of the diorite suggests that basic rocks of different ages are included in this complex. It must be admitted that the relation of the diorite to the granite, as well as the relation of both to other rocks of the area, is somewhat obscure.

Slates and related volcanic rocks.—In the eastern part of Davidson and Rowan Counties a series of slates are interbedded with volcanic rocks. These rocks form the western edge of a northeast-trending belt which extends across the State and which is generally known as the Carolina Slate belt. The ore deposits they contain, chiefly gold, have led to detailed study of parts of the belt. A part of the belt lying in the east corner of Rowan County is described by Laney (1910) and a part lying in southern Davidson County is described by Pogue (1910).

A common rock of this unit is slate, which appears to represent sediments derived from volcanic rocks. The slates, blue and dense where fresh, show distinct bedding planes near the Rowan-Stanly County line. To the west, near its contact with igneous rocks, the slate is quite schistose and steeply dipping. The slates and the volcanic rocks which they enclose strike northeastward.

The volcanic rocks, chiefly tuffs of rhyolite and andesite, are interbedded with the slates and grade into them. The fine-grained tuff is dense and resembles chert; it grades into the slate and also into coarser tuffs which show fragments of coarse feldspar and quartz.

The rocks of the Slate belt represent, in time, a period of intermittent volcanic activity. During the active intervals lavas of rhyolite and andesite were thrown out. The commingling of volcanic ash and other ejecta with some land waste led to the formation of tuffs. During the quieter intervals the beds of finer material were deposited. Some of the beds, especially the finer tuffs and the rocks later converted to slate, are believed to have been deposited in water.

Included with the rocks of the Slate belt are greenstone schists, which are green in color and slightly to highly schistose, and are basic rocks of igneous origin. The typical greenstone is fine grained, and in the more massive facies phenocrysts of dark-green hornblende and greenish-yellow epidotized feldspar are distinguishable (Laney, 1910, p. 43). The greenstone in many places represents andesitic tuff. Granite is intermixed with the greenstone, forming a complex similar to that of the granite and diorite to the west. In fact, it is difficult to distinguish between the diorite-granite complex and the greenstone-granite complex.

Detailed studies of local areas in the Slate belt by Laney (1910), Pogue (1910), and Stuckey (1928) and regional studies by King (1949) indicate that the age of the rocks is conjectural, although they are known to be of Paleozoic age or older.

Granodiorite.—Bordering the southern part of the gabbro-diorite in western Rowan County is a rock that is tentatively classed as granodiorite. It appears to be intermediate in composition between the granite

that borders it on the south and west and the gabbro-diorite that bodders it on the north. Its contacts both the granite and the gabbro-diorite are indefinite and gradational.

Quartzite.—The only conspicuous outcrop of quartzite in the Statesville area is in eastern Cat: County. The quartzite forms a prominent northeast-trending ridge, the highest part of which is Ande Mountain. The quartzite occurs as steeply dipping beds ranging in thickness from a few feet to se hundred feet, although the belt in which it is interbedded with schists is less than a mile wide. The b(only about 5 miles long in Catawba County but it extends southwestward into Lincoln County.

Limestone and dolomite.—Crystalline limestone and dolomite occur in a small belt approximately pa: with the quartzite in Catawba County. In contrast with the quartzite, the rock weathers readily, and cc quently outcrops are scarce. The areal extent of these rocks in Catawba County is not definitely known probably is less than a square mile in the aggregate. The rocks are interbedded with schist. They are d and are not known to contain solution channels.

Triassic rocks (Newark group).—Rocks including shale, sandstone, and conglomerate, cut by dia dikes, occur in a downfaulted block in northwestern Davie County. These rocks, unlike other rocks of area in appearance, composition, and degree of metamorphism, as similar to and undoubtedly equiv: to rocks in two other belts in North Carolina which are known to be of Triassic age. These rocks in D County were described in 1932 (Brown, pp. 525-528).

GROUND WATER

OCCURRENCE AND MOVEMENT

The portion of the outer crust of the earth that contains ground water may be regarded as an un ground reservoir. The underground reservoir in the Statesville area consists of two contrasting types, the clayey and sandy soil and weathered material which underlies the surface to depths generally ran; from several feet to several tens of feet and (2) the underlying bedrock. In the soil and weathered r water occurs between the individual mineral grains, but in the underlying bedrock it occurs only in f tures. These fractures generally are not evenly distributed, so that they may be an inch or two or sev feet apart. Many are interconnected sufficiently to allow ground water to circulate through them. In m places fracture openings are only a fraction of an inch wide, although there is a great variation in siz openings. The size and number of fractures appear to decrease with depth. As a result, most ground w: occurs at a depth of less than 150 feet—much of it in the upper 30 feet of bedrock. Therefore, the lo limit of the reservoir is a thick, indefinite zone; the top, however, is a definite though fluctuating sur: known as the water table.

Ground water moves slowly through the soil and fractures in the rock, always under the influence gravity. After percolating downward en masse through the soil and mantle rock, ground water is restric in circulation to fractures in the bedrock. The water does not generally move to great depths but instea shunted almost laterally by "tight" or impermeable rocks to discharge points near the level of the peren: streams. Thus, in the Statesville area the movement of ground water from the recharge, or interstre: areas to the discharge, or stream, areas follows, in general, a short, sinuous path, the water flowing loc: through interconnecting fractures.

THE WATER TABLE

The water table, or upper surface of the underground reservoir, continuously changes its position, flecting changes in underground storage. There is a constant discharge of ground water by seepage i: streams and by evaporation and transpiration by vegetation, generally along the streams. The dischar causes a gradual lowering of the water table except during and immediately after periods of significant p cipitation, when recharge to the underground reservoir exceeds the discharge from it; as a result of th periods of precipitation the water table rises. Figue 5 shows the trends of water-level fluctuations in a w at Mocksville, Davie County. The water level in this well is controlled only by natural conditions, and

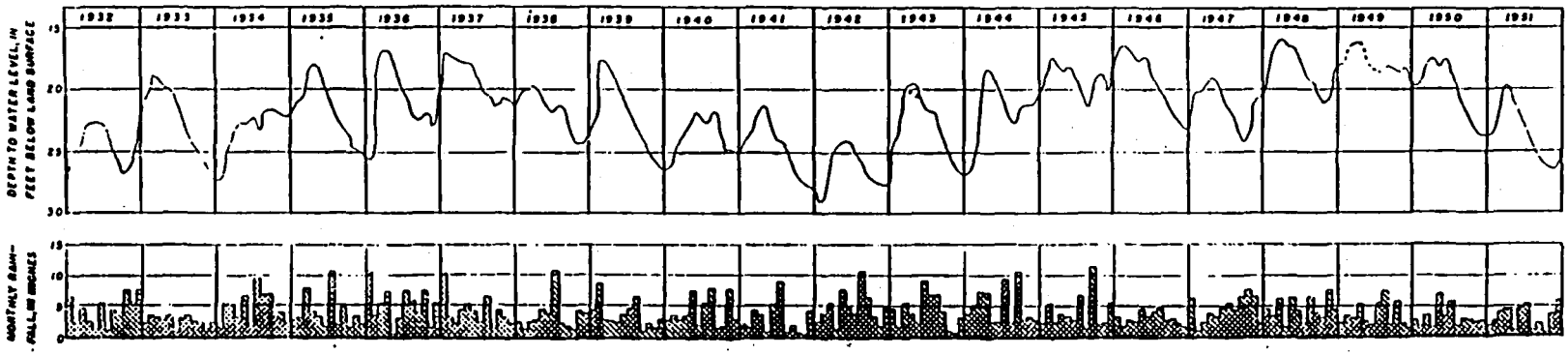

FIGURE 5.—*Chart showing fluctuation of the water level in a dug well at Mocksville, Davie County. The well, owned by L. S. Kurfees, is 32 feet deep.*

fluctuations are typical of those in the crystalline rocks of North Carolina. In the Statesville area the cline of the water table covers a longer aggregate period during a year and is more gradual than the rise the water table. With a year of normal rainfall the recharge to the underground reservoir is approxima ly equal to the discharge from it, so that the water table at the end of the year is at about the same level as the beginning of the year.

The withdrawal by pumping of wells is not great in the Statesville area, and the lowering of the wa table around individual wells does not affect the regional water table. There appears to be no evidence support the general belief that the water table has been declining during recent years. Both the logi deductions from an understanding of the principles of ground-water occurrence and movement and the act measurements of water levels during the past 20 years refute this belief and show, instead, that the wa table in unpumped or lightly pumped areas has no trend except that associated with climate.

In the Statesville area there is a noticeable change in the water table with the seasons. It generally gins to decline in April or May, owing to the increasing amount of evaporation and transpiration by plan which not only consume ground water but reduce the amount of precipitation that can reach the water tab Although interrupted by minor rises due to exceptionally heavy rainfall, this decline generally contin through summer and autumn, in spite of the abundant rainfall of July and August. By November or Dece ber, when much of the vegetation is dormant and evaporation is low, the precipitation again becomes effect in producing recharge and the water table begins to rise until it reaches another high stage about April May of the next year.

Aside from the above considerations of climate the depth to the water table in the Statesville area pends chiefly on topography and on the transmitting characteristics of fractures in the rocks. In valle the water table generally is at or near the ground surface, whereas on hills the water table may be 70 fe or more below the surface. Beneath those hills where fractures are large and abundant enough to d charge water rapidly into the adjacent valleys the water table will be lower than where the rocks conta few fractures.

The water table lies in the residuum or mantle rock in most places, especially beneath the broad upla areas where the residuum is thick. Although there is a great variation in the depth to the water table a in the thickness of the residuum, the water table generally lies several feet above the base of the residuu During droughts, when it may be several feet lower than during wet seasons, the water table is in the be rock in some places.

SPRINGS

Leakage from the underground reservoir in the form of springs is extremely common in the Statesvil area. The slopes are steep enough in many places to be transected by the water table, allowing water leak from the underground reservoir. In some places the leakage of water is so small and so scattered th evaporation and transpiration use it all, leaving none for runoff in streams; in other places the leakage concentrated enough to form a small spring. Almost all springs yield less than 10 gallons a minute a most yield 1 to 3 gallons a minute. Most of the springs show little fluctuation in yield, although some spring emerging from the upper slopes of hills show a decline in yield during dry seasons.

A major factor controlling the yield of springs is the residual soil that covers the bedrock almost every where. If the soil zone is extremely thin or absent at the junction of the water table and surface slope, th flow of water from the fractures or from the upper surface of the bedrock will be concentrated sufficientl for a spring to form. However, a moderately thin layer of soil allows water coming from the fractures t spread through it to be quickly lost by evaporation. Most springs occur in the heads of steep valleys wher emerging ground water will have a good chance of being concentrated. Springs would be larger and mor abundant if it were not for the fact that the soil tends to creep down the slopes toward the valleys and thu tends to cover the openings through which water might otherwise issue.

Their low yield and unfavorable locations in valleys prevent springs from being extensively used, al though they are a source of water for some rural dwellings. The available analyses indicate that spring water contains much less mineral matter in solution than does well water, chiefly because spring waters generally circulate more rapidly and at shallower depths through the rocks. The water of spring D, Davidson

County, contains 99 parts per million of dissolved solids, more than that from any other spring whose water was analyzed, although it flows from gabbro, one of the most soluble rocks in the area. Typical well water from the same type of rock contains 100 to 400 parts per million of dissolved solids.

QUALITY OF GROUND WATER

Ground water is almost everywhere of good chemical quality in the Statesville area. The water percolates through highly siliceous rocks, which are relatively insoluble in pure water, but which in the presence of water containing carbon dioxide are somewhat soluble. Although a large amount of water passes through the rocks, the water is in contact with the rocks a relatively short time. Consequently, the water is generally low in dissolved mineral matter.

Water from granite and granite gneiss normally contains no undesirable quantities of dissolved solids. Although mica schist contains water low in mineral matter, in some places it contains iron in objectionable amounts. Water from diorite and hornblende gneiss contains almost three times as much mineral matter in solution as does water from granite, although rarely are the ingredients concentrated in undesirable quantities.

From the standpoint of chemical character of the rocks and of the water derived from them, the rocks of the Statesville area, like those of the Charlotte area to the south (LeGrand and Mundorff, 1952, p. 14), may conveniently be divided into two groups. The first includes granite, granite gneiss, mica schist, slate, and rhyolite flows and tuffs—rocks approximating granite in composition. The second group includes diorite, gabbro, hornblende gneiss, and andesite flows and tuffs—rocks approximating diorite in composition. Table 1 shows a classification of ground water in the area based on these two groups of rocks.

The chemical quality of ground water in each county is discussed in each county section. Analyses of water from wells and springs, prepared by the U. S. Geological Survey, follow the table of well data for each county.

TABLE 1.—SUMMARY OF CHEMICAL ANALYSES OF WELL WATER IN THE STATESVILLE AREA, N. C.
Parts per million

	Granite[1]				Diorite[2]				Granite and diorite[3]			
			Range				Range				Range	
	Median	Mean	Low	High	Median	Mean	Low	High	Median	Mean	Low	High
Silica (SiO_2)	27	27.5	10	39	32	33.8	21	50	30	29.9	24	38
Total iron (Fe)	.11	.28	.02	1.70	.21	.60	.06	5.70	.09	.21	.02	.70
Calcium (Ca)	8	9.3	2	37	.21	35	4	174	7	12	6	22
Magnesium (Mg)	2	2.9	1	8	5	6.3	1	22	3	3	2	5
Sodium and potassium (Na+K)	7	7.7	4	13	10	11.7	3	35	8	7.3	3	11
Carbonate (CO_3)	0	0	0	0	0	0	0	0	0	0	0	0
Bicarbonate (HCO_3)	43	45.6	12	132	86	87.6	33	229	50	61.3	40	93
Sulfate (SO_4)	2	5.7	1	34	10	38.6	1	391	4	6.5	2	13
Chloride (Cl)	2	4.5	1	18	3	16	1	204	1	1.4	1	2
Fluoride (F)	.1	.29	0	1.5	.1	.3	0	2.2	.1	.14	.1	.2
Dissolved solids	80	84.4	25	187	175	196.6	70	696	80	93.4	77	120
Total hardness as $CaCO_3$	27	34.5	8	124	94	113.1	17	449	28	42.4	22	71
pH	6.5	6.55	5.8	7.0	7.0	7.12	6.3	8.2	6.7	6.88	6.6	7.6

[1] Water from wells in granite and granite gneiss. Represents 14 samples.
[2] Water from wells in diorite, gabbro, and hornblende gneiss. Represents 25 samples.
[3] Water from wells that penetrated both granite and diorite, and both granite and hornblende gneiss. Represents 8 samples.

FLOOD-PLAIN DEPOSITS

Many streams in the Statesville area are bordered by flat lowland areas, or flood plains, which are underlain by deposits of sand and gravel. The deposits, not shown on the geologic maps, are generally not thick or extensive.

These deposits have not been utilized as a source of ground water. Mundorff (1950) made a pre nary survey of the flood-plain deposits of the streams in the Piedmont and mountain provinces of N Carolina to determine their significance as water-bearing deposits. He made shallow test borings at place in Catawba County, three places in Davidson County, and three places in Rowan County (1950, and reached the general conclusions (p. 20) that:

> "The flood-plain deposits along many of the streams in the Piedmont and mountain sections of North Carolina at many places appear to contain deposits of permeable sands and gravels of sufficient thickness and extent to furnish large quantities of water to lines of wells or to galleries parallel to the streams where their perennial flow is adequate. Recharge from the stream would be induced by pumping the wells or galleries and lowering the water table below stream level. At many places one to several million gallons of water a day could be obtained by this method, and at some places, particularly in the western part of the State, where the flood-plain deposits appear to be thicker, substantially larger supplies might possibly be obtained."

The present study confirms the conclusions that Mundorff reached. Until a real effort is made to velop water supplies from these deposits it can be said that the ground-water resources of the Statesville have not been fully explored.

YIELD OF WELLS

Data on 821 wells are tabulated and given with the county descriptions in this report. Tables prepared showing the average depth, average yield, and other pertinent data for all drilled wells 3 inche diameter or larger for which there were sufficient data.

Unless otherwise noted, the term "yield" as used in this report represents the quantity of water th well is known to be capable of yielding. Because the yield of a well increases almost directly with an crease in drawdown of the water level, it would be desirable to know the drawdown at which a certain was measured. Unfortunately, most of the records are incomplete, in that the drawdown for the repo yield is seldom known. Therefore, the yield recorded for a well may be the maximum or only a fractio the supply available.

It has long been known that the yields of individual wells show a great range in the area, even tho they are in the same type of rock and are similar in depth and topographic location. One well may be excellent producer, whereas another a short distance away may be a poor producer. Because the yiel generally the most important consideration, a large part of the study was devoted to a determination of factors controlling the yield of individual wells. Unfortunately, it is not possible to determine with degree of accuracy the yield of a well until water is pumped from it. However, the present study shows t if proper consideration is given to the factors affecting the yield it is generally possible to get an adequ water supply. Moreover, frequent curves have been drawn from the data (p. 20) from which it is poss to determine the chances of a well producing a given amount of water.

The entrance and movement of water into the ground are governed by certain geologic factors wh need consideration. These factors, which furnish the criteria for selecting favorable well sites, are thickn of residuum, structure, rock type, and topography.

THICKNESS OF RESIDUUM

The land surface in most of the Statesville area is underlain by a layer of soil and weathered mater called mantle rock or residuum. This residuum may be absent or a few feet thick in some places and m than 100 feet thick in other places. It averages about 35 feet thick. Although the contact between the re duum and underlying bedrock may be sharp, there is generally a gradational zone between them. The re duum is generally thick on broad, gently rolling uplands and thin on steep slopes.

The residuum is the result of chemical weathering of the underlying rock. A thick residuum may in cate that water could move with ease down through it and into some of the fractures in the under ing bedrock. Also, the thick layer of residuum, which generally is highly porous although not necessar very permeable, serves as a reservoir to feed water into the fractures. This reservoir in thick residu causes wells that penetrate the underlying bedrock to have a steady yield through the year, almost unaffect by droughts.

The depth to which a well is cased generally indicates the thickness of the residuum because most wells are cased to bedrock. A number of wells have been deepened by drilling in old dug or bored wells, themselves perhaps bottoming on bedrock, which procedure necessitated extending the casing several feet into the bedrock. Consequently, no definite relations could be established by plotting the depth of casings of the wells against the yields of the wells. Nevertheless, it is generally agreed that a well penetrating several tens of feet of residuum has a better chance of being successful than one penetrating only a few feet.

STRUCTURE

Almost all the rocks in the Statesville area have some structural planes along which are openings capable of transmitting water. Some of these structural planes may be due to faulting and folding (the latter resulting in so-called planes of schistosity). Others have developed along the borders of intrusive rocks and still others develop from other causes. All the openings made by the structural planes may, for the sake of convenience, be called joints.

Joints, generally trending northeastward and dipping steeply, are very prominent in the schists, slates, and gneisses. They generally are parallel and closely spaced, and consequently the openings may be small. Inasmuch as they form the major type of joints, the yield of wells penetrating them will depend largely on the size and number of openings, their continuity with sources of recharge, and the constancy of infiltration into them. Most of the intake area for such wells occurs where the penetrated schistose joints crop out or where they are in contact with the overlying residuum. If this intake area is on a steep hill where runoff is great and influent seepage is slight, the well may be a small producer. Therefore, it would be desirable to locate a well where the outcropping joints have access to the influent seepage (Herrick and LeGrand, 1949, p. 21), though in few cases is it possible to do this deliberately because the schistose rocks are generally covered by residuum.

Other types of joints cut the rocks at various angles, some of the joints having definite patterns of alinement. Wells drilled at places where the rock is closely jointed and sheared will generally yield more water than wells drilled in massive rocks. These joints must intersect each other and have contact with the residuum in order to transmit water continuously to a well. A type of jointing characteristic of massive rocks such as granite is called sheeting, or large-scale exfoliation. These joints are almost horizontal, being nearly parallel to the land surfaces but somewhat flatter. Their convexity on hills causes ground water to drain quickly toward the valleys (LeGrand, 1949, p. 110). Rocks that show pronounced sheeting yield considerably more water to wells in lowlands than on hills.

Veins and dikes commonly penetrating the rocks are nearly everywhere jointed or have joints along their contacts with the host rock. Stuckey (1929, p. 10) and Mundorff (1948, p. 26) have shown that quartz veins are very brittle and that water-bearing fractures in these veins are the source of supply for many successful wells. Even though rock outcrops may be scarce, there is generally evidence of the existence of a quartz vein in the form of white, resistant boulders of quartz on the surface.

EFFECT OF TOPOGRAPHIC LOCATION

In accordance with the method used by Mundorff (1948, p. 30), table 2 has been prepared to show the number of wells, average depth, and average yield of wells in five different types of topographic locations in the Statesville area. Figure 6 illustrates the five types. Although the classification appears to be a convenient one, the types grade into one another and it is not always easy to decide to which type a given well site should be assigned.

The most striking features of the table are the large number of wells drilled on hills and their relatively low yields. The average yield of a well on a hill is about half that of a well on a flat or slope and several times less than that of a well in a draw or valley. Wells in draws have the highest average yield, although only a small percentage of all wells are located in draws. It can be concluded from the table that most wells are located where there is the least chance of getting a large supply of water.

Explaining why wells drilled on hills yield less water than wells drilled in other locations Mundorff (1948, p. 31) says:

"There are several reasons why wells drilled on hills yield less water than wells drilled in other locations. In homogeneous rocks, hills are apt to be formed because the underlying rock is more resistant to erosion than it is in the surrounding area. In some places the greater resistance is due to a difference in rock which makes it harder but in most places the rock has more resistance to erosion because it is less jointed or fractured. Joints and fractures facilitate entrance of ground water which promotes chemical decay and permits mechanical erosion. Thus, depressions such as draws and valleys suggest that the rock underlying the depressions has more openings through which ground water can move than the rock underlying the hills. Flat areas usually are peneplane remnants and do not indicate anything about the resistance of the underlying rock. Theoretically wells in flat areas should have about the same yield as the average for wells in all topographic locations. Actually, the average yield is somewhat larger than the average for all topographic locations possibly because in the flat areas recharge to ground water is apt to be greater than elsewhere. However, the average yield for all locations is lowered by the large number of wells drilled on hills as compared to the number of wells drilled in draws and valleys.

In non-homogeneous rocks such as the bedded gneisses and schists and the Triassic sedimentary rocks, the topography in many places is often controlled by the relative ease of circulation of ground water, just as in homogeneous rocks. In the bedded rocks, however, circulation of water occurs along cleavage and bedding planes as well as along joints and fractures. Where bedding planes and cleavage planes dip steeply, most wells will end in the same kind of rock as that exposed within a few hundred feet of the well.

A second reason that wells on hills yield less water than wells in valleys and draws is that the direction of movement of the ground water is towards the valleys where it discharges into the streams; therefore, the natural movement of the ground water is away from the wells drilled on the hills and toward the wells drilled in the valleys.

Draws include minor depressions which may or may not contain small streams. The distinction between a draw and a valley is more or less arbitrary and depends upon the interpretation of the observer. As used here, small, relatively narrow depressions with angular or rounded sides and bottom are considered to be draws. Valleys are much larger and generally have a flood plain or bottomland and a perennial stream. It seems probable that the reason for the better record of wells in draws is because the draws more exactly mark the location of the structural weakness in the rocks. Valleys may have originated at their present location because of a zone of weakness but this zone of weakness may be relatively small in comparison with the present size of the valley. Therefore, most of the wells drilled in the valleys quite possibly are not drilled into the zone of weakness that originally determined the course of the stream. On the other hand, a well drilled in a relatively narrow draw will have a very good chance of striking the zone of weakness. It would seem, then, that the minor topographic features are more important in choosing a well site than the larger features."

TABLE 2.—AVERAGE YIELD OF DRILLED WELLS ACCORDING TO TOPOGRAPHIC LOCATION

Topographic location	Number of wells	Average depth (feet)	Yield (gallons a minute)		
			Average	Per foot of well	Per foot of well below water Table[1]
Hill	213	233	14	0.06	0.07
Flat	114	215	30	.14	.17
Slope	156	224	27	.12	.14
Draw	14	280	75	.27	.31
Valley	23	155	35	.23	.29
All wells	520	224	24	.11	.13

[1] Assuming the water table to be an average of 35 feet below the surface.

EFFECT OF TYPE OF ROCK

The type of rock penetrated by a well may have a considerable bearing on the amount of water yield. Except for the granular rocks of Triassic age, the rocks of the Statesville area are dense, and the interlocking of the mineral grains prevents circulation of water through the rock mass. Although the rocks may have similar primary characteristics, each type has responded differently to the structural forces and weathering to which it has been subjected since its formation. Consequently, the rock types are different in the readiness with which they yield water to wells penetrating them.

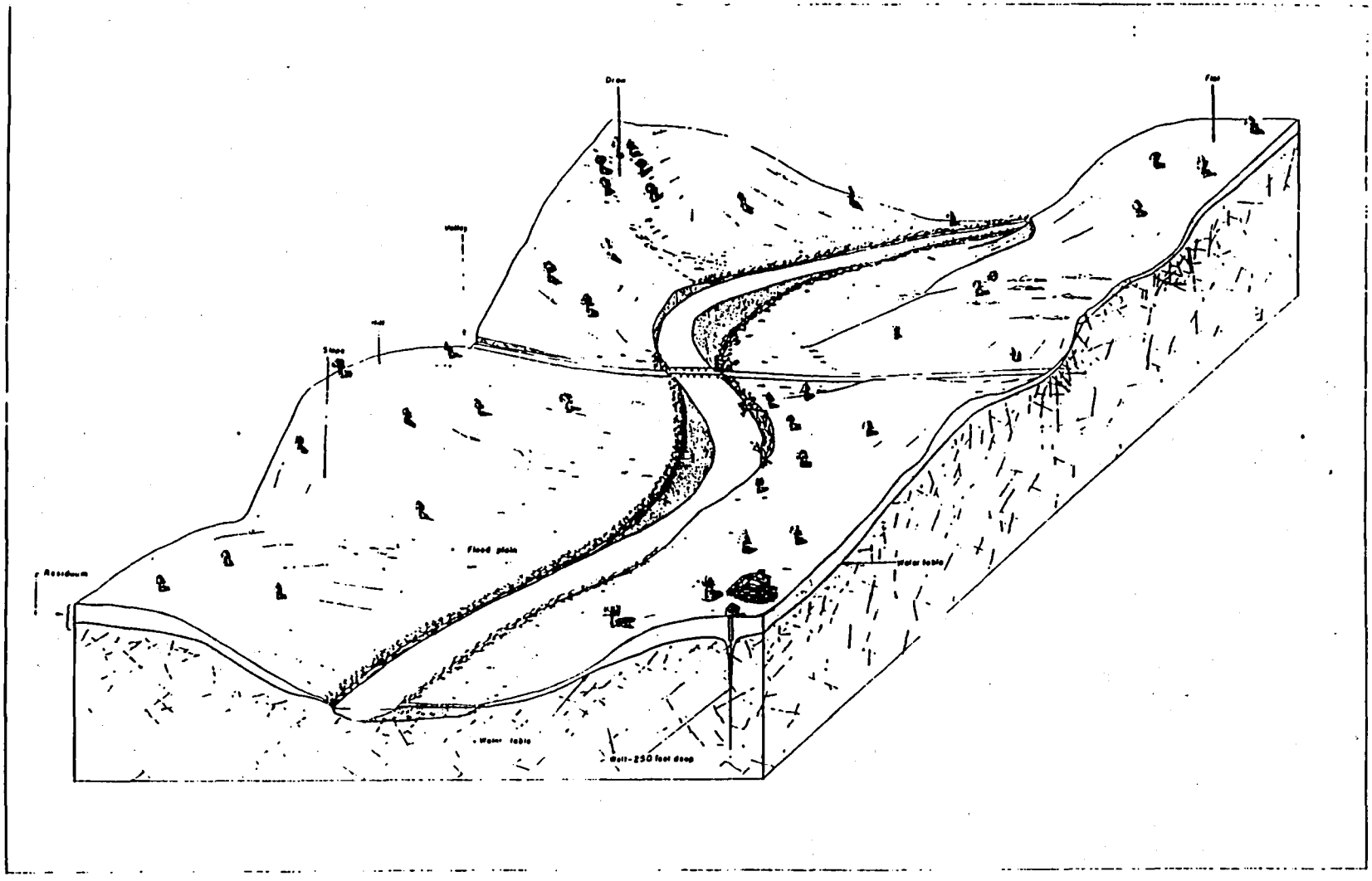

FIGURE 6.—*Diagrammatic sketch showing the types of topography discussed in this report, the decrease in joints with increasing depth in the bedrock, and some of the interrelations of the residuum, the water table, and the topography.*

The areas in which the different rock units occur are shown on individual county maps in the text. T reconnaissance nature of the mapping and the common variation of rock types within distances of tens feet or even fractions of a foot make the geologic maps less accurate than desired. The type of rock pe trated or thought to have been penetrated by a well is given with other data in the well tables. The d on 821 wells are tabulated and given with the county descriptions in this report. In order to compare water-yielding properties of wells in the different rock units, tables were prepared showing the average dep average yield, and other important data for all drilled wells 3 inches or more in diameter in each rock un

Table 3 shows the relative yields of wells in the principal crystalline rock units in the area. The wells have an average depth of 225 feet and an average yield of 24 gallons a minute. The lowest yield v zero and the highest yield was about 500 gallons a minute. Fifty percent of all wells yield at least 15 g lons a minute.

TABLE 3.—AVERAGE YIELD OF DRILLED WELLS ACCORDING TO ROCK TYPE

Rock type	Number of wells	Average depth (feet)	Yield (gallons a minute)		
			Average	Per foot of well	Per foot of well below water table[1]
Granite	73	254	17	0.07	0.08
Granite gneiss and schist-granite complex	175	205	23	.11	.14
Granite-diorite complex	21	258	35	.14	.16
Gabbro-diorite	54	302	30	.10	.11
Hornblende gneiss and schist	104	214	29	.13	.16
Mica schist	58	232	22	.10	.11
Slate and volcanics	33	133	15	.11	.15
All wells	520	225	24	.11	.13

[1] Assuming the water table to be an average of 35 feet below the surface.

TABLE 4.—AVERAGE YIELD OF MUNICIPAL AND INDUSTRIAL WELLS ACCORDING TO ROCK TYPE

Rock type	Number of wells	Average depth (feet)	Yield (gallons a minute)		
			Average	Per foot of well	Per foot of well below wate table[1]
Granite	14	506	27	0.05	0.06
Granite gneiss and mica schist-granite complex	37	320	32	.10	.11
Granite-diorite complex	10	328	52	.16	.18
Gabbro-diorite	29	413	38	.09	.10
Hornblende gneiss and schist	30	373	60	.16	.18
Mica schist	19	395	38	.10	.11
Slate and volcanics	4	260	31	.12	.14
All wells	143	377	41	.11	.12

[1] Assuming the water table to be an average of 35 feet below the surface.

The table shows that wells penetrating intermediate or basic rocks such as diorite, gabbro, and h blende gneiss yield more than wells penetrating acid rocks such as granite, granite gneiss, mica schist, the slates and related acid volcanic rocks. This difference is probably due to the greater solubility of basic rocks and consequently to the ability of circulating water to enlarge by solution the fractures in basic rocks. Owing to the scarcity of wells in the Triassic sedimentary rocks, the average expected yiel wells penetrating these deposits is not known. Mundorff (1948, p. 29) shows that the average yield of w in similar rocks of Triassic age is 17 gallons a minute.

Table 3 does not necessarily give a true picture of the water-yielding characteristics of each rock because it includes data on domestic wells, whose yields in most cases are below the potential yields and below the reported yields of municipal and industrial wells. Table 4, summarizing the data for municipal and industrial wells which represent attempts to obtain the largest possible yields, also indicates that the basic rocks yield more water than the acid rocks. It shows that hornblende gneiss is the highest-yielding rock in the area. The average yield of municipal and industrial wells is higher than that of domestic wells because they are deeper and because they are pumped at a higher rate, resulting in greater drawdown and a lower pumping level.

RELATION OF DEPTH OF WELL TO YIELD

The relation of the depth of a well to the amount of water the well will yield is given in table 5.

Table 5 indicates that the deep wells have higher average yields than shallow wells. This apparent relation may be misleading because the greater yield of deep wells is due, not so much to the greater depth, but to the fact that deep wells are generally for municipal and industrial purposes and consequently are pumped at greater rates and have greater drawdowns than shallow wells, most of which are drilled for domestic supplies and are stopped when it becomes apparent that an adequate supply has been obtained. Table 5 shows that wells less than 100 feet deep have a greater average yield per foot of well than wells in any other depth range. It also shows that the yield per foot of well for wells more than 250 feet deep is much less than that of wells of shallower depth.

The fact that most wells do not increase their yields appreciably with increasing depth is due to the decrease in number and size of fractures with depth.

If a satisfactory supply of water is not available at a certain depth, it is, of course, difficult to decide how much deeper to drill. As a matter of hindsight it appears that some wells abandoned at depths greater than 400 feet because of lack of water should have been abandoned at much shallower depths; on the other hand, many wells abandoned at depths of about 150 feet might have yielded good supplies if they had been drilled deeper. The depth at which an inadequate well should be abandoned is largely an economic problem of the well owner.

TABLE 5.—AVERAGE YIELD OF DRILLED WELLS ACCORDING TO DEPTH

Range in depth (feet)	Number of wells	Average depth (feet)	Yield (gallons a minute)		
			Average	Per foot of well	Per foot of well below water table[1]
0–100	100	80	18	0.22	0.49
101–150	139	126	19	.15	.21
151–200	91	175	19	.11	.14
201–250	52	222	20	.09	.11
251–300	28	281	28	.10	.11
Deeper than 300	110	509	42	.08	.09
All wells	520	225	24	.11	.13

[1] Assuming the water table to be an average of 35 feet below the surface.

Drilling to great depths in the rocks of the Statesville area is seldom justified; if adequate water is not obtained above depths of 250 or 300 feet, there is little chance of obtaining a large amount at greater depths. However, as Mundorff (1948, p. 32) points out, if the well yields 40 gallons a minute at 250 feet and a yield of 50 gallons a minute is desired, the chances are good that the additional water can be obtained by drilling 75 or 100 feet more.

PROBABILITIES OF SUCCESSFUL WELLS

How much water can a prospective well owner expect his well to yield? Unfortunately no positive answer can be given to such an important question because the conditions in the underground reservoir penetrated by one well are not the same as those in the reservoir penetrated by another. The most impor

tant factors that control the yield of wells have been discussed, and an understanding of them will solve most well problems.

Because there is a wide range in yields of individual wells, the yields were separated into conve size groups, and tables showing their frequency distribution were constructed. Curves were constr from these tables showing the percentage of wells for which the yields are equal to or more than any s fied amount.

The lower curve of figure 7 reveals the frequency of wells yielding at least a certain amount, this c including industrial, municipal, and domestic drilled wells. The data are not altogether accurate, the rep yields being too high in some cases and too low in other cases. Nevertheless, there appears to be a n complete compensation of the inaccuracies in the data, and consequently the curve is thought to be r

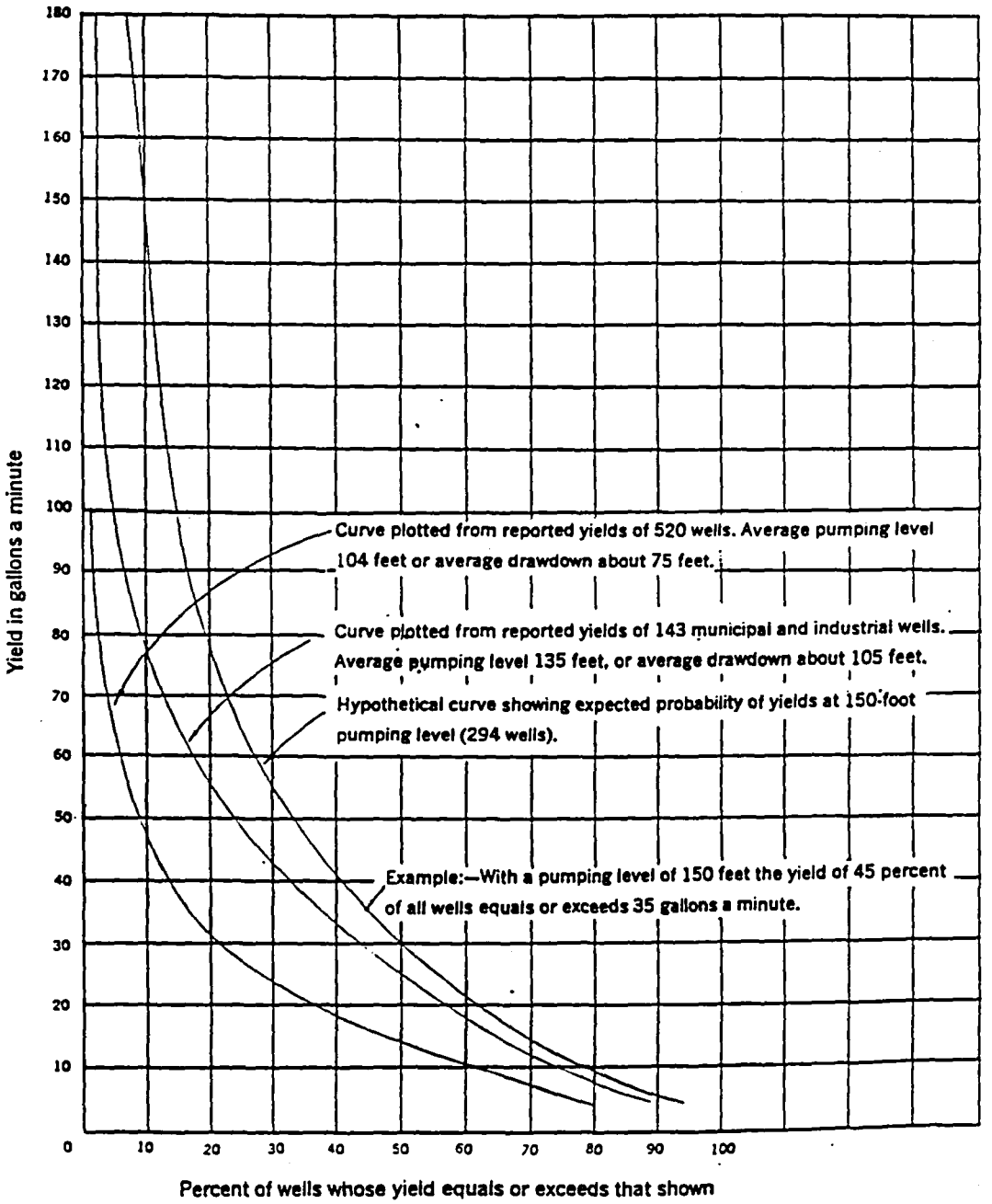

FIGURE 7.—*Probability Curves of Yields of Wells in the Statesville Area.*

sentative of actual conditions. The middle curve represents the frequency of yields of industrial and municipal wells. Wells plotted on this curve naturally have higher expected yields than those on the lower curve because they are pumped at greater rates.

The upper curve is a hypothetical curve which attempts to show the expected frequency of yields at a pumping level of 150 feet. The curve was derived in the following way: The specific capacity (yield per foot of drawdown) for each well on which data were available was determined, and the yield of each well was then calculated at a pumping level of 150 feet. The calculated yield was then reduced by 30 percent so as to be conservative. (Many tests were of short duration, with bailer instead of pump, and consequently the water level may still have been lowering at a given rate of withdrawal when the tests ended. The reported yields of these wells, therefore, may have been too great. The calculated yield may also have been too great because the specific capacity of a well under water-table conditions may be less with greater drawdowns. The correction of 20 percent is arbitrary but is considered reasonable.) After the corrected yields for the wells were calculated they were grouped in frequency-distribution tables and then plotted as the upper curve. Although this curve is not based on precise data, the fact that it is a "higher yielding" curve and similar to the municipal-and-industrial curve, which represents a pumping level of 135 feet, suggests that it is usable.

The wells used in plotting the lower curve were separated according to topographic locations and replotted as curves on figure 8. These curves show clearly the relative merits of topographic locations. For example, the percentage of wells yielding 30 gallons a minute or more on hills is 9, on slopes 31, on flats 46 and in valleys or draws 64.

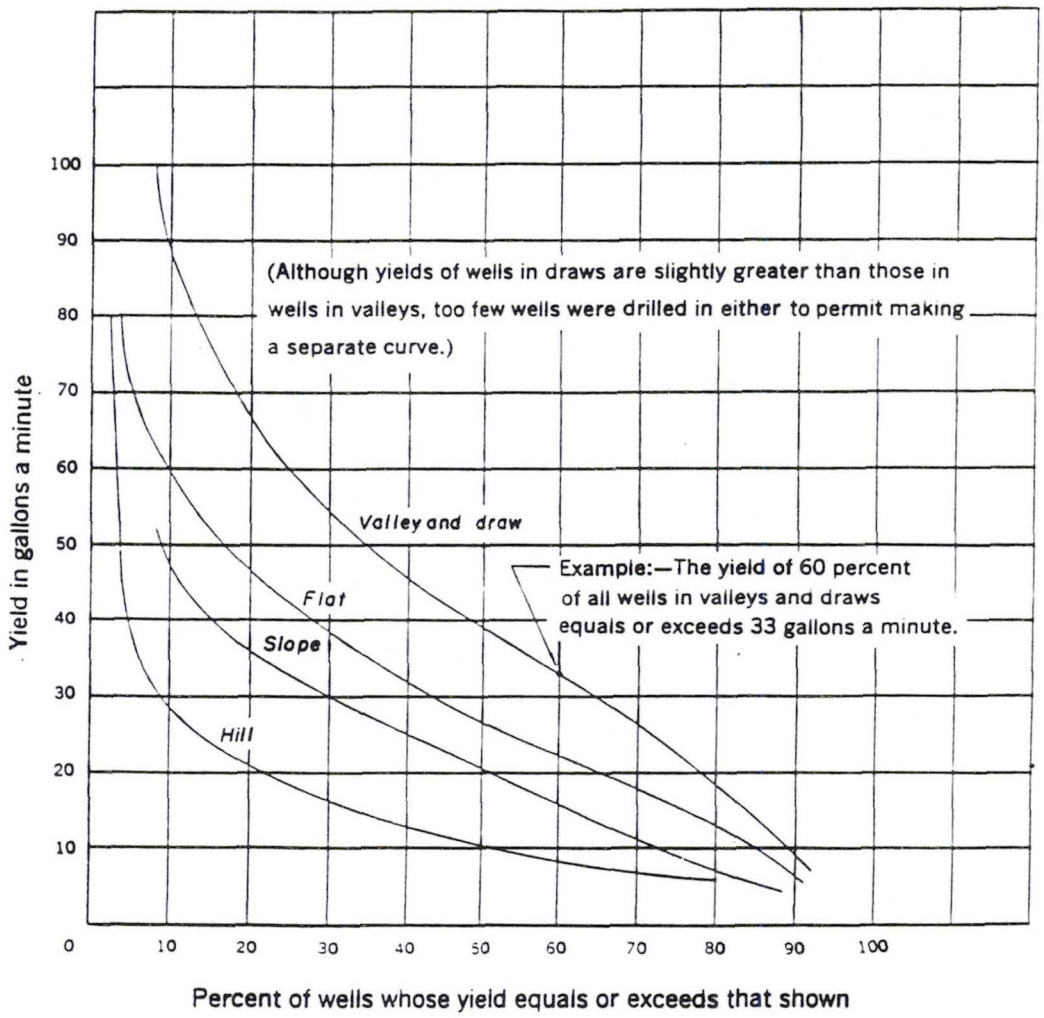

FIGURE 8.—*Probability curves of yields of wells in the Statesville area according to topographic location.*

The curves do not distinguish the merit of wells according to depth or to type of crystalline rock pe trated. Figures of yield taken from the curves might be too great for wells in bare granite and they mi be too low for wells penetrating hornblende gneiss under a heavy mantle of soil. Nevertheless, the cur are believed to be adaptable to most conditions in the crystalline rocks of the Statesville area.

The amount of water that a particular well may be expected to yield is decided largely by factors t cannot altogether be predetermined. Not knowing what the yield of his proposed well will be except t it probably will be between zero and 500 gallons a minute, the well owner is likely to have such a confu philosophy about underground water that he may discredit all factors except luck or chance. But when consider a large number of wells, chance no longer decides. Of the industrial and municipal wells, at le 60 percent will yield more than 18 gallons a minute, at least 40 percent will yield more than 33 gallon minute, and at least 20 percent will yield more than 54 gallons a minute. These probabilities are deri from the records of existing wells whose locations were selected for convenience. Their locations w mostly unfavorable for large supplies. Consequently, the probabilities of large yields would have been s greater if the wells had been more favorably located.

Table 6, below, shows the frequency pattern of municipal and industrial wells whose yields are wit certain ranges.

TABLE 6.—RANGE IN YIELD OF MUNICIPAL AND INDUSTRIAL WELLS IN THE STATESVILLE AREA.

Yield (gallons a minute)	0–5	6–10	11–20	21–40	41–80	More than 80
Percent of total wells	9	9	19	25	30	8

EFFECT OF PUMPING ON WATER LEVELS

Pumping a well lowers the water table in an area around the well to form a depression in the water su face, which is known as the cone of depression, and the amount the water surface is lowered is the dra down. The drawdown in a well increases as the rate of pumping is increased. As water is pumped out a well more water moves in to take its place. When the rate of pumping exceeds the rate of recharge, replenishment, the cone of depression becomes larger and deeper until sufficient recharge is intercepted balance the withdrawal.

The relatively low permeability of the weathered mantle rock and the inability of fractures in the be rock to transmit water readily cause the cones of depression of wells in the Statesville area to deepen co siderably while extending laterally only a short distance. This constriction of the cone of depression preven a well from yielding as large a supply of water as can be obtained from more productive aquifers in other par of the United States, but it allows wells to be spaced more closely without interference than would otherwi be the case. No exact rule can be given about the proper spacing of wells in the Statesville area, but it ca be stated that generally two wells less than 200 feet apart will interfere with each other substantially, wher as wells spaced 1,000 feet or more apart may not affect each other appreciably. Almost no data are ava able to indicate locally the lateral extent of a cone of depression.

During the early stages of pumping a well the drawdown is rapid, but with continued pumping at given rate the rate of drawdown progressively decreases until a state of near equilibrium is reached. Thi apparent state of equilibrium may be reached after a few hours or after several tens of hours of pumping.

In spite of the apparent equilibrium established in a well between discharge through pumping and re charge by water entering the cone of depression, a continuous lowering of water level has been noted in few wells that have been heavily pumped over a period of years. In these cases it is probable that th rate of pumping exceeds the local rate of recharge, causing the cone of depression to broaden and deepen a more water is drawn from storage. This overpumping can be overcome by reducing the pumping rate o by letting the well rest some of the time. Unfortunately, some people erroneously use the lowering of wate level in a particular well as evidence to point out that the entire underground reservoir is being depleted o water. Actually a lowering of the water level is necessary to cause water to flow toward the well and onl a persistent lowering gives evidence of local overdevelopment of the ground-water supply.

COUNTY DESCRIPTIONS

In the following pages the geography, geology, and ground-water conditions of the Statesville area are described briefly by counties, in order from west to east and north to south: Alexander, Catawba, Iredell, Davie, Rowan, and Davidson. With each county description are included two maps, one showing the geology and the other the location of wells inventoried for this report. At the end of each county description are tables of well data.

Because much of the information about the wells was given from memory by well drillers and well owners, there are some inaccuracies. Moreover, some explanations about the data are necessary in order that the reader's interpretations will be reliable. For example, the depths of casing listed indicate the depth to hard, dense rock; this is especially true in the case of industrial and municipal wells, but some domestic wells have casing penetrating as much as 10 to 15 feet of bedrock because they were drilled in older dug or bored wells which themselves extended to bedrock. The water-bearing materials listed are reasonably accurate, although many wells penetrated two or more types of rock. The water levels listed are the static, or nonpumping, levels reported by the well drillers and owners or measured by the writer. The information about the yield of wells, in gallons a minute, varies greatly in degree of accuracy. Many of the yields listed are based on bailer tests, some of which may be inaccurate because the tests were of short duration. In others the drawdown was small and the potential yield of the well is much greater than is shown. As the yield increases with an increase in drawdown, in only a few cases are the yields known for individual wells at two or more pumping levels; some listed, especially in Catawba County, represent bailer tests rather than true pumping tests.

After the table of well data is a table of analyses of water from wells and springs in the county. The numbers at the heads of the columns are the numbers of the wells from which the water samples came.

Population figures given are from the 1950 census.

ALEXANDER COUNTY

(Area: 255 square miles. Population: 14,554)

Geography.—Alexander County forms the northwestern corner of the Statesville area. The county is chiefly agricultural, the main crops being tobacco, corn, and cotton. Taylorsville, with a population of 1,310, is the only incorporated town; Hiddenite and Stony Point are other communities.

The topography is hilly, especially in the area west and north of Taylorsville where mountain peaks and ridges are common. Several peaks of the Brushy Mountains along the northern boundary of the county have elevations of more than 2,500 feet. The area south and east of Taylorsville is a southeastward-sloping peneplain dissected by a close network of streams. The headwaters of the larger streams are in the mountain sections in the north and west. The drainage in the general area northeast of Taylorsville is southeastward to the South Yadkin River. In the remainder of the county the drainage is largely southward toward the Catawba River. The streams are swift and commonly clear. Their courses are devious and apparently are not closely related to structural weaknesses in the underlying rocks.

Geology.—An immense series of schists underlie Alexander County. The schist in aggregate is mostly a quartz-mica rock, varying in fissility from place to place. In a broad sense it represents a host rock into which granite and various basic rocks have been intruded.

The geology of the county is complex and the map (fig. 9) is necessarily generalized. One reason for this is that the schist changes gradually from place to place in texture and composition and particularly in the amount of granite and basic material contained. Distinct local contacts between the types of rock are, of course, common, but they cannot be shown on a small-scale map.

Hornblende gneiss, occurring as beds a few inches or a few feet thick and roughly conformable with the schistosity of the host rock, is common in the eastern half of the county. In a few places, especially in some valleys, it forms larger masses.

DAVIDSON COUNTY

(Area: 547 square miles. Population: 62,244)

Geography.—Davidson County is the easternmost county discussed in this report. Lexington, the county seat, and Thomasville are the only large towns. Leading industries are agriculture and the manufacture of textiles and furniture. Dairying and the growing of wheat, oats, corn, and hay are the chief rural activities. Railroads and paved highways serve the populated areas of the county.

Davidson County is in the heart of the Piedmont Plateau. Its surface is formed by the uplifted and partly dissected peneplain that was developed on the underlying crystalline rocks. Most of the hills are smoothly rounded and covered by vegetation. Except where flood plains border the streams, the slopes are steep enough to cause the land to be well drained. A few shallow enclosed depressions, in which water rarely stands, occur on the broad interstream areas underlain by gabbro in the area around Linwood. The topography is most hilly along the valley of the Yadkin River near the west and south borders of the county.

The drainage within the county is mostly southward to the Yadkin River. The streams are small but numerous. The heads of the streams are springs that emerge from reentrants in the interstream areas. Although the springs are small, they are numerous enough to produce fair-sized creeks having perennial flows. Parts of many streams appear to follow structural weaknesses of the underlying rocks, particularly in the Slate belt in the southeastern part of the county. However, in general the causes for the particular courses of the streams are not obvious, and until detailed geologic work can be done the extent of adjustment of streams to rock structures probably will not be known.

Geology.—Although a great variety of rocks occur in Davidson County they may conveniently be divided into the following four major groups: granite, diorite, gabbro, and the volcanic rocks.

Granite underlies a large area in the northwestern part of the county. It is typically exposed in the area north, west, and southwest of Welcome. It is a light-colored rock containing large phenocrysts of feldspar and upon weathering, forms a gravelly and sandy soil. Outcrops of fresh granite are not common, but the soil zone is thin enough in many places to allow parts of the weathered rock to be exposed. The nearly horizontal type of jointing, called sheeting, is very common.

The boundaries of the granite with other rocks have not been precisely determined. In an area west of Lexington gabbro and diorite are in contact with the granite, but in most places only the approximate contact, as shown on the geologic map (p. 60), is represented by a zone in which there is an increase in the quantity of diorite bodies to the east. In fact, rocks of the granite and diorite complex occur in an extensive area east of the large granite area and seem to grade into both the porphyritic granite and the gabbro.

Gabbro occurs in two large areas and in several small areas. As classed in this report it is a basic rock which varies considerably from place to place in composition but which more nearly approximates gabbro than any other rock. It occurs typically in the area around Linwood. Its area is characterized by a thick mantle of red and brown soil on the uplands.

Rocks of the Carolina Slate belt occur in the southeastern part of Davidson County. A part of this belt, including the Cid mining district, was mapped by Pogue whose description follows (1910, p. 26):

> "Wide bands of a sedimentary, slate-like rock, composed of varying admixtures of volcanic ash and land waste, have the greatest areal extent. Intercalated with these occur strips and lenses of acid and basic volcanic rocks, represented by fine- and coarse-grained volcanic ejecta and old lava flows. The acid rocks include fine tuffs, coarse tuffs, and breccias, chiefly of a rhyolitic and dacitic character; together with flows of rhyolite and dacite. The basic series embraces fine tuffs, coarse tuffs, breccias, and flows of an andesitic and trachy-andesitic stamp. Gabbro and diabase dikes cut the other formations."

Like those of the remainder of the county the rocks of the Slate belt have been folded and faulted sufficiently to be tipped on edge and to have a prevailing northeast trend. In general the topography is hillier and the soil zone thinner than in the western part of the county.

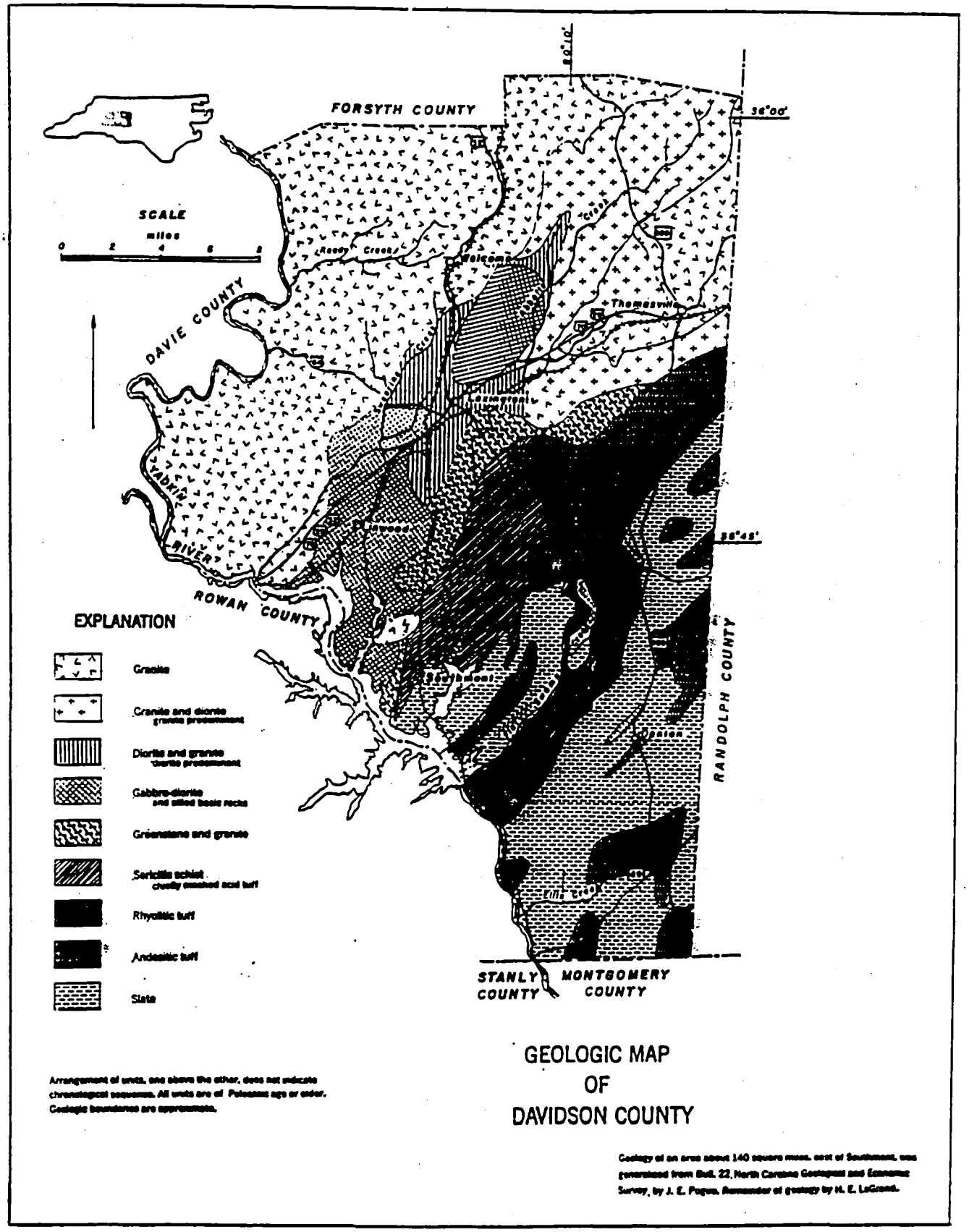

FIGURE 19.—*Geologic map of Davidson County.*

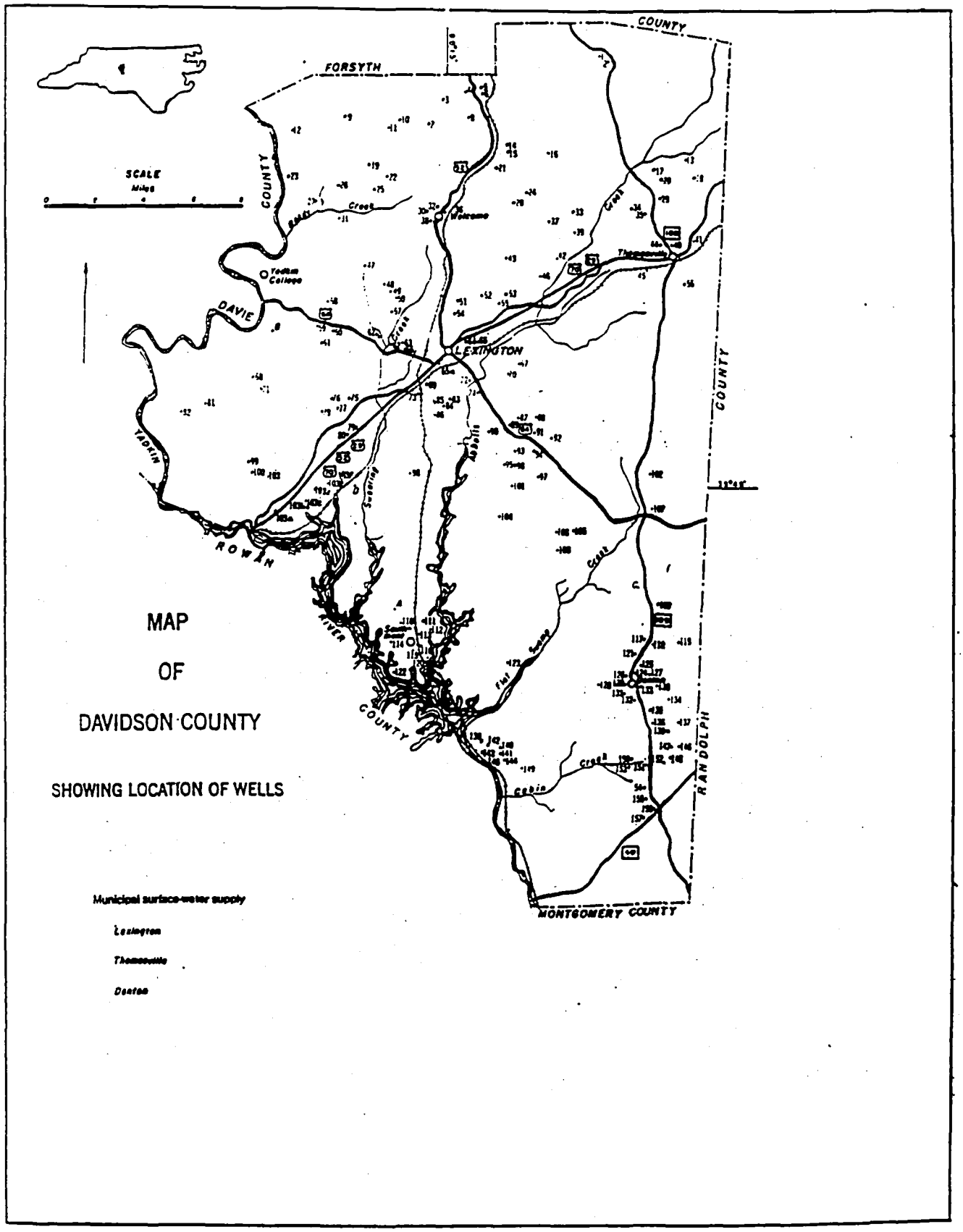

FIGURE 20.—*Map of Davidson County showing location of wells.*

The relation of the volcanic rocks to the intrusive rocks on the west is not clear. The intrusive rocks are composed of a network of granite and more basic rocks of a dioritic character. Some of the dioritic material adjacent to the volcanic belt represents mashed and altered andesitic tuff, whereas other parts appear to be intrusive diorite. It is probable that the development of the granite and diorite complex represents a late stage in the igneous activity that produced the volcanic rocks. Although numerous minor faults, and possibly major faults, occur in the belt, the present reconnaissance study did not produce evidence to show the existence of a major fault between the intrusive and extrusive belts. Unraveling the development of the volcanic rocks and the adjacent intrusive complex posed the most difficult problem with which the writer was faced in the Statesville area.

Ground water.—With the exception of the municipal water supplies of Lexington and Thomasville, which come from streams, most domestic and many industrial water supplies are from wells. A few domestic supplies are obtained from springs.

Many rural supplies are obtained from dug or bored wells 18 inches or larger in diameter. These wells, being relatively shallow, develop water from the clayey residual material above bedrock. They are generally satisfactory for domestic purposes if less than 2 gallons of water a minute is needed. They may fail during dry seasons if the water table declines near, or below, the bottoms of the wells.

In recent years there has been a large increase in the number of drilled wells in the rural parts of the county. Two-inch shot-drilled wells are especially common. Most of them are capable of furnishing 3 to 8 gallons a minute—adequate for general domestic use. The present investigation deals chiefly with 3 inch and larger drilled wells, which reveal ground-water conditions better than other types of wells.

The records of the yields of wells in the county indicate the water-yielding properties of the different kinds of rocks only in a general way. Many of the good wells penetrate gabbro or diorite. The gabbro and diorite trending slightly west of south through Lexington and Linwood probably are capable of larger yields than are the other rocks. Owing to the deep mantle of residuum on the hills, wells on hills in the gabbro and diorite should be more productive than wells on hills in other types of rocks. A large number of wells yielding less than 10 gallons a minute have been drilled in the granite in the northwest part of the county. Almost all these unsuccessful wells were drilled on hills, where the residuum is too thin to store much water and where the prominent openings in the granite are convex exfoliation joints which allow water to drain readily away from the hills to the valleys. Large feldspar crystals, which have been disengaged from the granite on the hills and washed into the lowlands, form permeable gravel beneath the flood plains along some of the streams. These gravel deposits constitute a potentially productive source of ground water—probably capable of furnishing more than 500 gallons a minute to individual wells in a number of places in the western part of the county. The slates and volcanic rocks of the southeastern part of the county are similar to other rocks in water-yielding properties. However, the slates and acid volcanic rocks in general are covered by only a thin layer of residuum, suggesting that they are poorer water-bearing rocks than the basic volcanic rocks and gabbro.

Analyses of six samples of water from wells and two samples from springs are given in a table following the well records. All the samples were from diorite or gabbro except well 19, from granite, and spring C, from acid tuff. Although only one sample of water was collected from granite in the county, the analysis of this water is typical of those from granite everywhere in the Statesville area. The water from diorite and gabbro contains about three times as much dissolved solids as does water in granite. The mineral content of the water from well 56 is probably as great as that from any other well water in the county. It is probable that water from well 103d, containing 172 parts per million of dissolved solids, is typical of that from diorite and gabbro.

Temperatures of well waters range from about 58° to about 63°F.

RECORDS OF WELLS IN DAVIDSON COUNTY—*Continued*

Well no.	Location	Owner	Date completed	Topography	Depth (ft.)	Diameter (in.)	Depth of casing (ft.)	Water-bearing material	Water level (ft.)	Yield (gpm)	Remarks
62	1 mile NW of Lexington	Fritts Packing Co.		do	138	6		Diorite-granite	30	30	
62a	2 miles NW of Lexington	do	1950	do	200	6		do	40	20	
63	1 mile NW of Lexington	H. G. Fritts		Hill	107	6		do	52	6	
64	1 mile NE of Lexington	Coble Dairy Products, Inc.		Slope	210	6		do		30	
65	1 mile N of Lexington	do		do	220	6		do		30	Yield has declined from 100 gallons a minute.
65a	Lexington	do		Flat	805	10	50	do		20	Water level is lowered to 150 feet after 10 hours pumping.
66	2 miles NW of Lexington	H. G. Fritts		Hill	168	6		do	50	2	
67	2 miles NE of Lexington	Holly Grove School		do	256	6		Granite		15	
68	4 miles W of Lexington	Tyro School		do	308	6		do	40	4	Pump set deep, pumps air.
69	Lexington	Winnonah Cotton Mills	1902	Slope	602	8		Diorite	25	31	Pumping level 250 feet.
70	3 miles E of Lexington	Davidson County Home		Hill	225	8		Granite	50+		Adequate supply.
71	3 miles W of Lexington	E. W. Rents	1944	Flat	215	4	25	do	30	10+	
72	Lexington	J. C. Burkhard		do	92	4	19	Diorite	28	5+	
73	do	Dacotah Cotton Mills		Slope	200	6		do			Abandoned. Formerly supplied entire mill.
74	1 mile SE of Lexington	Arlin Briggs		do	63	4	40	Slate	20	10+	
75	2 miles SW of Lexington	Coble Dairy Products, Inc.	1944	do	214	6		Diorite	27	10	Drawdown 50 feet.
76	do	do	1948	Hill	146	6	115	do	50	15	
77	do	do	1948	Flat	241	6	100	do	45	50	
78	3 miles SW of Lexington	do		do	212	6	175	do		50	Analysis.
79	2 miles SW of Lexington	O. A. Narsbee	1946	do	160	6	93	do	16	20	
80	do	Mrs. Hobart Yarborough	1946	Slope	210	8	60	do	25	15	Drawdown 25 feet.
81	4 miles W of Lexington	Churchland School		Hill	575	4		Granite	60	17	
82	5 miles W of Lexington	W. L. Grubb		Slope	225	6		do		5	
83	1 mile S of Lexington	Hugh Martin		do	65	6		Diorite		20	
84	do	R. L. Shoaf		do	135	6	119	do		10	
85	do	Richard Davis	1948	Draw	72			do	27	40	
86	do	Fred O. Sink, Jr.	1946	Slope	153	8	79	do	35	3	
87	3 miles SE of Lexington	John Beck		do	100			Slate	40	14	
88	2 miles SE of Lexington	Brice Young		Flat	78	4	32	Tuff	35	6	Drawdown 25 feet.
89	do	John Beck		Hill	630	6		Slate	40	5	Drawdown 75 feet.
90	do	Frank Burkhard		do	135	4	40	Tuff	60	3	
91	do	Henry Lime		do	120	3	20	do	45	1	
92	do	Denton Young		Slope	108	4	60	do	8	25+	Drawdown slight.
93	do	Calvin Kesler		do	135	4	30	do	30	2	Drawdown considerable.
94	do	Walter Surratt		do	100	3		Volcanic rock	30	5	
95	do	Mr. Hedrick		Hill	233	2½	28	Andesite tuff	65	0	
96	do	do		do	85	2½	28	do	25	1	
97	do	Chaney Beck		Valley	133	4	20	do	20	15	
98	do	Junior Order Orphanage		Slope	556	10		Gabbro-diorite	4	52	Water reported hard. Pumping level 190 feet.
99	5 miles NW of Southmont	Orell's Grocery		do	127	2½		Granite		4	
100	do	do		Valley	156	6		do		7	
101	2 miles SE of Lexington	Foy Swain		Hill	199	4	4	Andesite tuff	65	0	
102	4 miles N of Denton	M. L. Varner		Valley	78	6	71		8		
103	4 miles NW of Southmont	J. W. Wilson		Hill	212	4	90	Granite	37		
103a	do	A. W. Jacobs	1949	do	168	2½	42	do		6	Well dynamited.
103b	3 miles NW of Southmont	Clark Poultry Farm		Flat	309	6	100	Diorite	30	20	
103c	3 miles SW of Lexington	Charlie Graham		Slope	135	6	38	do	35	35	Drawdown slight.
103d	3 miles NW of Southmont	do		Hill	200	2		do	40		Analysis. Temperature 61°F. Large yield reported.
103e	do	Linwood Manufacturing Co.		Flat	300	6	35	do	15	25	
103f	3 miles SW of Lexington	do		do	200	6		do	15	40	
104	3 miles SE of Lexington	Robert Hedrick		Slope	94	4	50	Andesite tuff	40	25	Drawdown slight.
105	4 miles SE of Lexington	Homer Young	1948	Valley	52	6	17	Slate	+1	40	Natural flow 3 gallons a minute.
106	do	do		do	10	50		Massive slate	4	20	
107	3 miles N of Denton	Silver Valley School		do	254	6				100+	
108	4 miles NW of Denton	Hurt Hedrick		Slope	85	4	30	Slate and tuff	28	10	
109	2 miles NE of Denton	Dallas Ward		Valley	74		6				
110	1 mile NE of Southmont	C. D. Lookabill		Slope	152	4		Gabbro-diorite		5	
111	do	Harry Cunningham		do	65	6	20	Schist	16	15	
112	do	Ardell Lanier		do	50	6		do	15	10	
113	1 mile E of Southmont	Winston-Salem Southbound Railroad	1910	Flat	150	6		Gabbro-diorite	25	20	Water reported hard.

CHEMICAL ANALYSES OF GROUND WATER FROM DAVIDSON COUNTY
(Numbers at heads of columns correspond to well numbers in table of well data)

Parts per million

	19	53	56	73	103d	116
Silica (SiO_2)	39	32	21	50	42	24
Iron (Fe), total	.11	.29	1.9	.12	1.1	5.7
Iron (Fe), in solution	.04	.06	.05	.06	.09	.16
Calcium (Ca)	5.4	60	94	13	21	64
Magnesium (Mg)	1.5	15	22	6.1	10	12
Sodium and potassium (Na + K)	9.6	16	35	11	8	18
Carbonate (CO_3)	0	0	0	0	0	0
Bicarbonate (HCO_3)	43	229	106	90	91	215
Sulfate (SO_4)	1.3	13	24	2.2	5.8	9.3
Chloride (Cl)	1.6	23	204	3.5	3.2	44
Fluoride (F)	.2	.1	.1	.1	.0	.1
Nitrate (NO_3)	1.3	5.4	.4	.6	32	.1
Dissolved solids	81	284	477	132	172	278
Total hardness as $CaCO_3$	20	211	325	55	94	209
pH	6.8	6.85	6.95	6.85	6.7	7.0
Rock type	Granite	Diorite	Diorite	Diorite	Diorite	Diorite
Date of collection	Aug. 11, 1948	Aug. 12, 1948	June 9, 1948	June 9, 1948	Apr. 10, 1951	Feb. 21, 1950

	C	D
Silica (SiO_2)	18	33
Iron (Fe), total	1.3	.47
Iron (Fe), in solution	.04	.03
Calcium (Ca)	2.0	11
Magnesium (Mg)	1.3	4.9
Sodium and potassium (Na + K)	4.3	2.9
Carbonate (CO_3)	0	0
Bicarbonate (HCO_3)	16	36
Sulfate (SO_4)	3.0	3.0
Chloride (Cl)	2.8	9.8
Fluoride (F)	.1	.2
Nitrate (NO_3)	.2	8.4
Dissolved solids	40	99
Total hardness as $CaCO_3$	11	48
pH	5.7	6.6
Rock type		Gabbro
Date of collection	Mar. 23, 1950	Nov. 1, 1950

Analyzed by the Quality of Water Branch, U. S. Geological Survey.

GLOSSARY

(The definitions of the terms listed below are for the benefit of the layman and driller and are not necessarily as precise as those found in scientific textbooks.)

Acid rock—an igneous rock composed chiefly of light-colored minerals.

Alluvium—deposits of clay, sand, and gravel beneath the flood plains of streams.

Aplite—a dense light-colored, frequently greenish fine-grained acid rock, generally occurring as dikes penetrating granite, diorite, and greenstone.

Basic rock—an igneous rock composed chiefly of dark-colored minerals.

Composite gneiss—a banded rock formed by the intrusion of granite into, and along the parting planes of, a schist.

Cone of depression—depression produced in the water level around a pumped well.

Diorite—a medium- to dark-colored granitelike rock composed chiefly of hornblende and feldspar; generally produces a dark-red soil; called black granite by some drillers.

Draw—a broad ravine, or the headward part of a valley.

Drawdown—difference, in feet, between the static water level and the pumping water level of a well.

Flat—a small upland plain, or an area having no appreciable slope.

Flood plain—a flat area, underlain by alluvium, bordering parts of some streams.

Gabbro—a dark-colored crystalline rock composed chiefly of feldspar and pyroxene; generally produces a dark-red soil; called black granite by some drillers.

Gneiss—a banded crystalline rock showing alinement of some minerals. If the composition is that of granite, it is a granite gneiss.

Granite—a light-colored crystalline rock composed chiefly of quartz and feldspar; generally produces a light-colored soil; called by some drillers "white granite" and by others "sand rock."

Greenstone—a green rock of the diorite class.

Hill—an upland area rising above the surrounding land.

Injection complex—a group of rocks formed from the intrusion of granites into schists. Alternate bands of schist and granite result.

Residuum—weathered material, including the soil, down to fresh, unweathered rock.

Saprolite—soft, rotten rock; bottom part of residuum.

Schist—a foliated metamorphic rock showing strong alinement of beds; called slate by some drillers. Schists described in this report contain considerable light-colored mica.

Schistosity—the property of schists and some gneisses to flake in parallel planes.

Slate—a fine-grained, strongly foliated rock formed from clayey material or volcanic ash. It may be easily split along the planes of foliation (parting planes).

Slope—an inclined surface of the land—the most extensive topographic feature in the area studied. Most wells are located on upland slopes or lowland slopes.

Topography—the surface features of an area.

Tuff—a hardened volcanic rock composed largely of volcanic ash.

Valley—an elongated depression in the land through which a stream may flow.

Water table—upper surface of the zone of saturation.

Weathering—decomposition of rocks near the surface of the ground, forming soft, rotten rock, or saprolite.

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3

Reference
22

"Rite in the Rain"®

ALL-WEATHER

LEVEL

Notebook No. 311

F4-2113

Lexington Municipal
Landfill
TDD No. F4-9001-112
Project Manager:
Maureen Goodson

LOGBOOK REQUIREMENTS
REVISED - NOVEMBER 29, 1988

NOTE: ALL LANGUAGE SHOULD BE FACTUAL AND OBJECTIVE

1. Record on front cover of the Logbook: TDD No., Site Name, Site Location, Project Manager.
2. All entries are made using ink. Draw a single line through errors. Initial and date corrections.
3. Statement of Work Plan, Study Plan, and Safety Plan discussion and distribution to field team with team members' signatures.
4. Record weather conditions and general site information.
5. Sign and date each page. Project Manager is to review and sign off on each logbook daily.
6. Document all calibration and pre-operational checks of equipment. Provide serial numbers of equipment used onsite.
7. Provide reference to Sampling Field Sheets for detailed sampling information.
8. Describe sampling locations in detail and document all changes from project planning documents.
9. Provide a site sketch with sample locations and photo locations.
10. Maintain photo log by completing the stamped information at the end of the logbook.
11. If no site representative is on hand to accept the receipt for samples, an entry to that effect must be placed in the logbook.
12. Record I.D. numbers of COC and receipt for sample forms used. Also record numbers of destroyed documents.
13. Complete SMO information in the space provided.

We the undersigned understand the scope of work as stated in the work plan.

Maureen Gordon Maureen Gordon

Lisa Ward Lisa Ward

000002

Tuesday, March 20, 1990
Sunny, About 45°F

We arrived at the entrance of the Lexington Municipal Landfill at 1240.

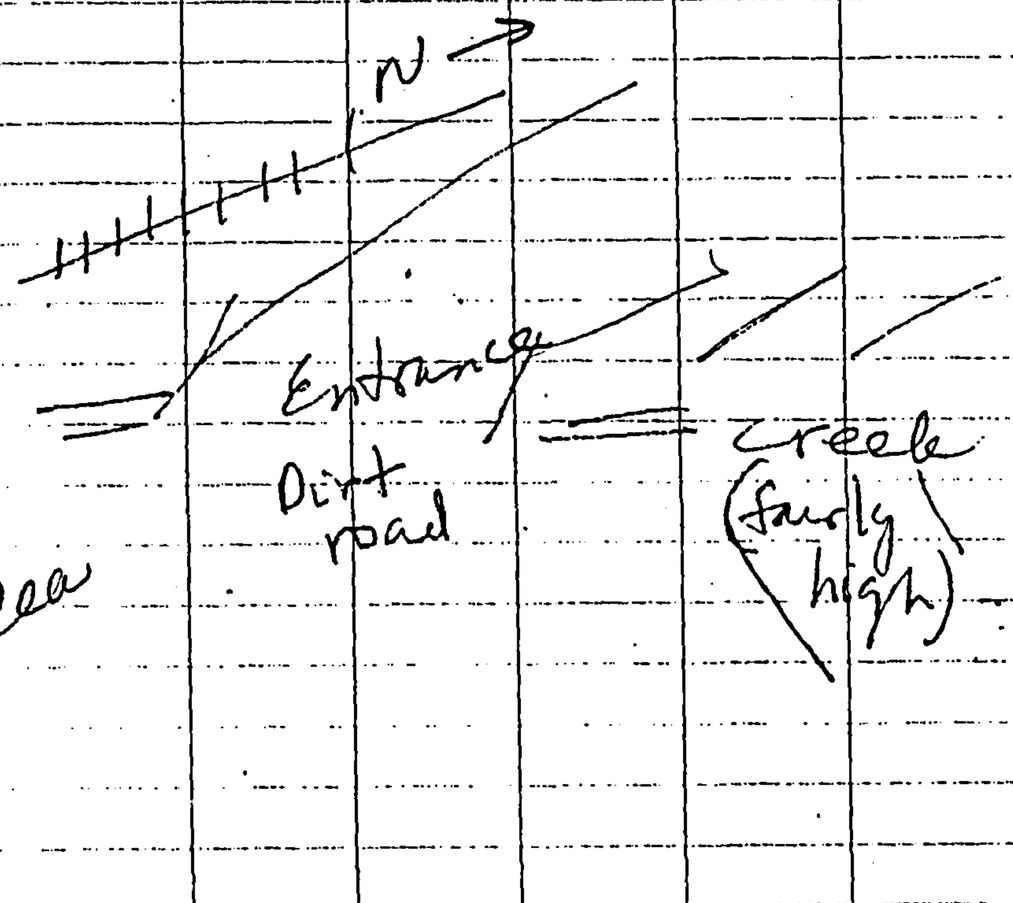
Take I-85 to 64 East. The first Left (SR 2726) the road to the landfill.
Radio tower on NE corner.

There is a creek running under the landfill's entrance and a RR track parallel to the road. The road is dirt.

South of the entrance Rea Construction Co. There is a stack with smoke. Lexington Asphalt Plant.

M. Good

3/20/90
Sign at gate
N.C. Permit #2903
Authorized personnel.



M. Good

000003

0:0004 3/20/90

The landfill is ~0.3 miles from entrance. There is a well on the east side of road before approaching the landfill, property NW.

There is drainage on either side of the road approaching the landfill.

The landfill itself is not well kept - no vegetation on top.

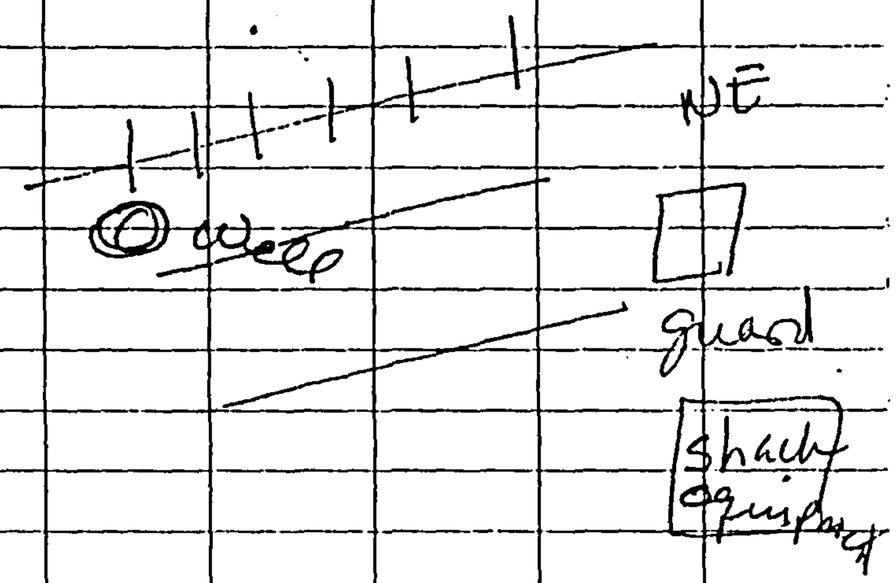
There is land moving machinary and a working guardhouse indicating that it is in use.

M. Sorder

3/20/90

Drainage is toward the SW.

There is no a fire hydrant on the landfill.



The landfill is flat then slopes to SW.

M. Sorder

0:0005

000006

3/20/90

The creek flows toward the landfill.

Trucks carrying building debris were passed on the road.

The immediate surrounding area is wooded.

Nearest resident 0.5 miles SW from site. South side of 64. H. Black Rd. There are hydrants along the road. Resident at #15 verified that area was on city water.

Small neighborhood. Rural area S of 64.

M. Gordo

3/20/90

Holly Grove small area SE - 1.25 mile. School.

W-64 before I-80 is a Ducanell Plant. Oldsmobile car dealership. Then commercial.

M. Gordo

000007

000008 3/20/90

We arrived at the Lexington Water Co 201 First Ave. at 1445.

Covers entire city. Surrounded by County Water.

Mr Dawson Stevens — Health Dept. Lexington.

Wells — northside. Don't have to connect to water systems.

Industries uses for cooling.

Intakes: Dahlstrom-alex By the Dam. Alternate and City Lake — not connected now. Will reconnect.

Charles Hamilton
Roger Spotts

M. Gordon

3/20/90

Davidson County has more miles of lines than most large cities. Water is all over county, but some people chose to use own private wells. Largest system in nation — mile of lines wise.

M. Gordon

000009

000010

3/20/90

Don Stevens -
We arrived at the Dept. of Human Resources 630. Environmental Health

Restaurant at corner has a private well

Duracell on 64 has had mercury problems. Identified private wells with Duracell

Jack Butler - Hazardous Waste Unit has records. Same number as David Lilly in Raleigh. RCRA.

M. Gordo

3/20/90

For private well info. Call 561-
(919) 7 2351, Dept. of Env Health, Winston-Sal
Mike Micky
Larry Lucas or Larry Kidd

Majority of the county is on municipal water. Some people still use private wells even though municipal water is available. Some wells are used for irrigation and animals. There are barely any new wells. Most wells are bored or dug ~~drilled~~ w/ the following depths:

Dug 25'-45' } majority
Bored 25'-75' }
Drilled 75'-125'

M. Gordo

000011

DIVISION OF HEALTH SERVICES - ENVIRONMENTAL HEALTH SECTION - WATER SUPPLY BRANCH
* * * PUBLIC WATER SUPPLY DATA SHEET * * *ONLY SURFACE SOURCE
NC INVENTORY DOCUMENT (PWSI.410) AS OF JUNE 90

DATE OF RUN 07/10/90

PWSI-ID W0410S
RE-CO-SEQ DATA LINE CODE

02-29-025

03 NAME OF PUBLIC WATER SYSTEM: DAVIDSON WATER INC
RESPONSIBLE PERSON ADDRESS: ROUTE 3 BOX 432

04 RESPONSIBLE PERSON CITY: LEXINGTON
STATE: NC
ZIP CODE: 27292
PHONE- AREA CODE/NUMBER: 704-787-5800

17 RESPONSIBLE PERSON NAME: RONALD EARNSWORTH JR SUPT W OP
LOCATION OF PUBLIC WATER SUPPLY: KOONTZ RD OFF HWY 64 WEST
UPDATE CODE: C

01 OWNERS NAME: DAVIDSON WATER INC
OWNERS STREET ADDRESS: PO BOX 308

02 OWNERS CITY: WELCOME
STATE: NC
ZIP CODE: 27374
OWNER TYPE: W

05 CITY OR COMMUNITY SERVED: LEXINGTON
COUNTY CODE: 029
IND RES: 000
SERVICE AREA CHARACTERISTICS: RES X; COT; REC; MOH; INS; SCH; MOT; RET; SST; CAG; PIC; LOG; MRR; SKI; BAT; VIS; HWY; AIR; OTHER

06 NO. CONSECUTIVE PURCHASING: 00
INTERSTATE CARRIERS: N
PWS TYPE: C
POPULATION SERVED: 000088102
NO. SERVICE CONNECTIONS: 0029000
NUMBER METERS: 0000000
CONSECUTIVE INDICATOR: 0

07 AVERAGE PRODUCTION GAL/DAY: 000650000
DESIGN GAL/DAY: 000600000
EMERGENCY GAL/DAY: 000000000
STORAGE CAPACITY/GALS.: 0000000000
MAXIMUM PRODUCTION GAL/DAY: 000000000

08 PWS BEGIN: 06/77
LAST SURVEY DATE: 07/20/68
BACTI AND TURBIDITY COMPLIANCE CYCLE: 01
ACTIVITY INDICATOR: A
DEACTIVATION DATE: 00/00/00
REASON:
ACTIVITY DATE: 072088

09

PUST CODE	REG BY	STATE REG	STATE DIS	BACTI FLAG	MONTHLY MONITOR	NUMBER SAMPLES	SEASON BEGIN	SEASON END	DAILY CHECKS	SAMPLE FREQ	MCL CK SAMPLE	CHLORINE P P M	TURBIDITY FLAG	TURBIDITY UNITS
NC	B	02		L	Y	000	00/00	00/00	1	000	2	00	L	1.4

16 - - - - - - - - - SOURCE - - - - - - - -

NO.	NAME	CODE	NUMBER WELLS	AVL	RIVER BASIN	LATITUDE DEG MIN SEC	LONGITUDE DEG MIN SEC	PWSI-ID OF SELLER	WATER TREATMENTS 6 7 8 9 0 1 2 3 4 5 6 7 8
01	YADKIN RI	S	00	P	0017	035 51 15	080 23 15	- -	Y B S A C Y G

Reference 23

Region County

REGION AND COUNTY CODES

02-01	Alamance	03-26	Cumberland	03-51	Johnston	02-76	Randolph
01-02	Alexander	04-27	Currituck	04-52	Jones	03-77	Richmond
01-03	Alleghany	04-28	Dare	03-53	Lee	03-78	Robeson
03-04	Anson	02-29	Davidson	04-54	Lenoir	02-79	Rockingham
01-05	Ashe	02-30	Davie	01-55	Lincoln	2 01-80	Rowan
01-06	Avery	04-31	Duplin	01-56	McDowell	01-81	Rutherford
04-07	Beaufort	03-32	Durham	01-57	Macon	03-82	Sampson
04-08	Bertie	04-33	Edgecombe	01-58	Madison	03-83	Scotland
03-09	Bladen	02-34	Forsyth	04-59	Martin	2 01-84	Stanly
04-10	Brunswick	02-35	Franklin	01-60	Mecklenburg	02-85	Stokes
01-11	Buncombe	01-36	Gaston	01-61	Mitchell	02-86	Surry
01-12	Burke	04-37	Gates	03-62	Montgomery	01-87	Swain
01-13	Cabarrus	01-38	Graham	03-63	Moore	01-88	Transylvania
01-14	Caldwell	02-39	Granville	04-64	Nash	04-89	Tyrrell
04-15	Camden	04-40	Greene	04-65	New Hanover	2 01-90	Union
04-16	Carteret	02-41	Guilford	04-66	Northampton	02-91	Vance
02-17	Caswell	04-42	Halifax	04-67	Onslow	03-92	Wake
01-18	Catawba	03-43	Harnett	03-68	Orange	02-93	Warren
03-19	Chatham	01-44	Haywood	04-69	Pamlico	04-94	Washington
01-20	Cherokee	01-45	Henderson	04-70	Pasquotank	01-95	Watauga
04-21	Chowan	04-46	Hertford	04-71	Pender	04-96	Wayne
01-22	Clay	03-47	Hoke	04-72	Perquimans	01-97	Wilkes
01-23	Cleveland	04-48	Hyde	02-73	Person	04-98	Wilson
04-24	Columbus	01-49	Iredell	04-74	Pitt	02-99	Yadkin
04-25	Craven	01-50	Jackson	01-75	Polk	01-00	Yancey

[illegible]	LAT	LONG	[illegible]	[illegible]	[illegible]	RIVER	[illegible]
34.1	35 46	37.50	79 27	54.33	Chatham	Lower Creek	WS-III
28.2	35 17	41.60	79 28	38.71	Chatham	North Prong Cr.	WS-II
27.1	35 12	33.32	82 30	32.76	Cherokee	Ben Holland Ch.	WS-I
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Cherokee	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible] 61	50.60	[illegible]	[illegible]	[illegible]
30.[illegible]	[illegible] 04	35.[illegible]	[illegible] 58	10.[illegible]	[illegible]	[illegible]	WS-I
37.[illegible]	35 04	47.36	84 01	3[illegible]	Cherokee	Hiwassee River	WS-III
30.4	35 10	29.5[illegible]	83 54	56.66	Cherokee	Valley River	
31.0	35 16	35.30	81 37	15.72	Cleveland	John Henry Moss Res.	WS-III
23.9	[illegible]	[illegible]	81 24	[illegible]	Cleveland	First Broad River	WS-II
22.1	35 10	37.27	81 [illegible]	[illegible]	Cleveland	First Broad River	WS-III
[illegible]	[illegible] 13	[illegible].23	81 35	[illegible].25	Cleveland	First Broad River S.	
34.0	34 21	23.53	78 13	41.38	Columbus	Cape Fear River	WS-III
35.1	35 04	10.00	78 53	16.01	Cumberland	Little Cross Creek	WS-II
35.2	35 05	03.00	78 51	53.00	Cumberland	Cape Fear River	WS-III
[illegible]	[illegible] 16	[illegible]	78 [illegible]	35.[illegible]	Cumberland	Little River	WS-II
[illegible]	[illegible] 16	[illegible]	78 [illegible]	57.[illegible]	Cumberland	Little River	WS-II
37.[illegible]	[illegible]	[illegible]	75 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
39.1	35 51	15.90	80 22	07.14	Davidson	#1 Yadkin River	WS-III
39.0	35 35	13.53	80 13	13.25	Davidson	Yadkin River	WS-III
30.0	35 52	16.31	80 11	3[illegible].4	Davidson	Tom-A-Lex Lake	WS-III
[illegible]	[illegible]	31.13	[illegible] 13	51.[illegible]	[illegible]	City Lake	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] Creek	
41.[illegible]	[illegible]	4 82	80 [illegible]	[illegible]	[illegible]	Tom-A-Lex Lake	WS-III
42.0	[illegible] 48	37.30	80 23	11.07	Davie	S. Yadkin River	WS-III
42.1	[illegible] 48	31.[illegible]	80 33	40.[illegible]	Davie	S. Yadkin River	
42.2	[illegible] 32	58.71	82 28	5[illegible].36	Davie	Yadkin River	
41.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Davie	Hunting Creek	WS-III
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible] 16	[illegible]			
44.1	36 09	00.46	78 59	49.05	Durham	Lake Michie	WS-II
48.3	36 06	15.00	[illegible] 52	15.60	Durham	Little River	WS-I
45.0	35 52	57.35	77 30	41.5[illegible]	Edgecombe	Tar River	WS-III
4[illegible].1	[illegible] 55	17.[illegible]	[illegible] 11	[illegible]	Forsyth	Salem Lake	WS-I
46.[illegible]	[illegible] 54	23.56	[illegible]	[illegible]	Forsyth	Yadkin River	WS-III
[illegible]	[illegible] 36	25.33	[illegible]	23.[illegible]	Forsyth	Yadkin River	
47.1	36 38	21.05	78 28	21.23	Franklin	Taylors Creek	WS-I
47.2	36 05	30.47	78 29	48.17	Franklin	Cedar Creek Branch	WS-I
48.0	36 36	13.58	78 18	24.39	Franklin	Tar River	WS-III
49.0	35 13	[illegible]	81 00	13 [illegible]	Gaston	Catawba River	WS-III
[illegible]	[illegible]	13.[illegible]	[illegible]	37.[illegible]	[illegible]	Long Creek	WS-I
50.[illegible]	[illegible]	[illegible]	[illegible]	00.[illegible]	[illegible]	[illegible]	WS-I
50.[illegible]	35 13	04.[illegible]	81 17	[illegible]	Gaston	Long Creek Res.	WS-II
51.0	35 34	[illegible]	81 [illegible]	34.47	Gaston	Indian Creek	WS-II
52.1	35 19	15.36	81 [illegible]	38.67	Gaston	S. Fork Catawba R.	WS-III
[illegible]	[illegible] 17	[illegible]	[illegible]	[illegible]	[illegible]	Long Creek	WS-III
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Gaston	South Fork Catawba R.	
[illegible]	35 34	0[illegible]	[illegible]	[illegible]	Gaston	[illegible] River	WS-III
53.1	35 19	49.55	81 07	59.79	Gaston	South Fork Catawba R.	
51.0	35 20	02.21	80 59	19.13	Gaston	Mt. Island Lake	WS-III

Reference 24

Region County

REGION AND COUNTY CODES

02-01	Alamance	03-26	Cumberland	03-51	Johnston	02-76	Randolph
01-02	Alexander	04-27	Currituck	04-52	Jones	03-77	Richmond
01-03	Alleghany	04-28	Dare	03-53	Lee	03-78	Robeson
03-04	Anson	02-29	Davidson	04-54	Lenoir	02-79	Rockingham
01-05	Ashe	02-30	Davie	01-55	Lincoln	2-01-80	Rowan
01-06	Avery	04-31	Duplin	01-56	McDowell	01-81	Rutherford
04-07	Beaufort	03-32	Durham	01-57	Macon	03-82	Sampson
04-08	Bertie	04-33	Edgecombe	01-58	Madison	03-83	Scotland
03-09	Bladen	02-34	Forsyth	04-59	Martin	2-01-84	Stanly
04-10	Brunswick	02-35	Franklin	01-60	Mecklenburg	02-85	Stokes
01-11	Buncombe	01-36	Gaston	01-61	Mitchell	02-86	Surry
01-12	Burke	04-37	Gates	03-62	Montgomery	01-87	Swain
2-01-13	Cabarrus	01-38	Graham	03-63	Moore	01-88	Transylvania
01-14	Caldwell	02-39	Granville	04-64	Nash	04-89	Tyrrell
04-15	Camden	04-40	Greene	04-65	New Hanover	2-01-90	Union
04-16	Carteret	02-41	Guilford	04-66	Northampton	02-91	Vance
02-17	Caswell	04-42	Halifax	04-67	Onslow	03-92	Wake
01-18	Catawba	03-43	Harnett	03-68	Orange	02-93	Warren
03-19	Chatham	01-44	Haywood	04-69	Pamlico	04-94	Washington
01-20	Cherokee	01-45	Henderson	04-70	Pasquotank	01-95	Watauga
04-21	Chowan	04-46	Hertford	04-71	Pender	04-96	Wayne
01-22	Clay	03-47	Hoke	04-72	Perquimans	01-97	Wilkes
01-23	Cleveland	04-48	Hyde	02-73	Person	04-98	Wilson
04-24	Columbus	01-49	Iredell	04-74	Pitt	02-99	Yadkin
04-25	Craven	01-50	Jackson	01-75	Polk	01-00	Yancey

NUS CORPORATION AND SUBSIDIARIES | **TELECON NOTE**

Reference 25

CONTROL NO. TDD No. F4-8803-42	DATE: May 3, 1988	TIME: 1115

DISTRIBUTION: Custom Finishers, Inc., High Point, North Carolina

BETWEEN: Mary Pangan, Clerk	OF: Davidson Water Co.	PHONE: (919) 475-8225

AND: Michael Profit, NUS Corporation

MP 5-3-88

DISCUSSION:

We discussed the source of Davidson's water. Davidson Water obtains its water from the Yadkin River. The water plant is located on Koontz Road off of Old 64 West, leading toward Mocksville. Davidson Water serves 30,000 connections, covering all of Davidson County (except Lexington), parts of Forsyth, Guilford and Randolf Counties. System withdraws 7 mill gal/day. The Yadkin River intake is more than 20 miles from High Point.

Reference 26

DIVISION OF HEALTH SERVICES - ENVIRONMENTAL HEALTH SECTION - WATER SUPPLY BRANCH — DATE OF RUN 07/10/90

* * * PUBLIC WATER SUPPLY DATA SHEET * * *ONLY SURFACE SOURCE

NC INVENTORY DOCUMENT (PWSI.410) AS OF JUNE 90

PWSI-ID W0410S

RE-CO-SEQ DATA-LINE CODE

02-34-010 03 NAME OF PUBLIC WATER SYSTEM: WINSTON-SALEM, CITY OF — RESPONSIBLE PERSON ADDRESS: 5725 FRYE BRIDGE ROAD

04 RESPONSIBLE PERSON CITY: CLEMMONS — STATE: NC — ZIP CODE: 27012 — PHONE- AREA CODE/NUMBER: 919-784-7597

17 RESPONSIBLE PERSON NAME: DEE BRUNDER OR SUPERVISOR NOW — LOCATION OF PUBLIC WATER SUPPLY — UPDATE CODE: C

01 OWNERS NAME: WINSTON-SALEM CITY OF — OWNERS STREET ADDRESS: PO BOX 2511

02 OWNERS CITY: WINSTON SALEM — STATE: NC — ZIP CODE: 27102 — OWNER TYPE: C

05 CITY OR COMMUNITY SERVED: WINSTON SALEM — COUNTY CODE: 034 — IND RES: 000 — RES COT REC MOH INS SCH MOT RET SST CAG PIC LOG MRR SKI BAT VIS HWY AIR OTHER: 1

SERVICE AREA CHARACTERISTICS

06 NO. CONSECUTIVE PURCHASING: 00 — INTERSTATE CARRIERS: N — PWS TYPE: C — POPULATION SERVED: 000215000 — NO. SERVICE CONNECTIONS: 0072655 — NUMBER METERS: 0060000 — CONSECUTIVE INDICATOR: 0

07 AVERAGE PRODUCTION GAL/DAY: 0032000000 — DESIGN GAL/DAY: 0052000000 — EMERGENCY GAL/DAY: 0030000000 — STORAGE CAPACITY/GALS.: 0021600000 — MAXIMUM PRODUCTION GAL/DAY: 0050000000

08 PWS BEGIN: 06/77 — LAST SURVEY DATE: 02/03/89 — BACTI AND TURBIDITY COMPLIANCE CYCLE: 01 — ACTIVITY INDICATOR: A — DEACTIVATION DATE: 00/00/00 — DEACTIVATION REASON: — ACTIVITY DATE: 020389

09

POST CODE	REG BY	STATE REG	STATE DIS	BACTI FLAG	MONTHLY MONITOR	NUMBER SAMPLES	SEASON BEGIN	SEASON END	DAILY CHECKS	SAMPLE FREQ	MCL CK SAMPLE	CHLORINE P P M	TURBIDITY FLAG	TURBIDITY UNITS
NC	B	02		L	Y	000	00/00	00/00	1	000	2	00	L	1.4

16 - - - - - - - - - SOURCE - - - - - - - -

NO.	NAME	CODE	NUMBER WELLS	AVL	RIVER BASIN	LATITUDE DEG MIN SEC	LONGITUDE DEG MIN SEC	PWSI-ID OF SELLER	WATER TREATMENTS 6 7 8 9 0 1 2 3 4 5 6 7 8
01	SALEM/THOMAS	S	00	P	0017	036 05 30	080 11 45	- -	Y B S A P N Y G
02	YADKIN/NEILSON	S		P	0017	035 58 30	080 23 45	- -	Y A S A P N Y G

Reference

27

WATER USE SURVEY

NUS CORPORATION
1927 LAKESIDE PARKWAY
SUITE 614
TUCKER, GEORGIA 30084
404-938-7710

Name and address of resident

B. E. ELLER
Rt. 9 Box 300
Winston-Salem, NC
(_____) _____

Check water source(s) used by resident

1. DRILLED WELL ✓ DEPTH 57ft. WATER LEVEL _____
2. DUG WELL _____ DEPTH _____ WATER LEVEL _____
3. SPRING _____ ARTESIAN _____ GRAVITY _____
4. SURFACE WATER _____
5. PUBLIC SUPPLY _____
6. OTHER _____

Check water use(s) and specify water source of each

DRINKING 1 NUMBER OF USERS 2 SOURCE _____

HOUSEHOLD 1 NUMBER OF USERS _____ SOURCE _____

IRRIGATION _____ ACRES _____ CROP _____ SOURCE _____

OTHER _____

ANY PROBLEMS WITH WATER? Had water checked for minerals last year. It was fine

HOW LONG HAVE SOURCES BEEN IN USE? Since 1953

ANY MONITORING WELLS ON PROPERTY? _____

PREPARED BY Water lines stop at Paint Company DATE _____

COMMENTS _____

Reference 28

DIVISION OF HEALTH SERVICES - ENVIRONMENTAL HEALTH SECTION - WATER SUPPLY BRANCH

DATE OF RUN 07/10/90

* * * PUBLIC WATER SUPPLY DATA SHEET * * * ONLY SURFACE SOURCE

NC INVENTORY DOCUMENT (PWS1.410) AS OF JUNE 90

PWSI-ID WU4105

RE-CO-SEQ DATA ELINE CODE

02-29-010

03 NAME OF PUBLIC WATER SYSTEM: LEXINGTON, TOWN OF

RESPONSIBLE PERSON ADDRESS: 28 W CENTER ST

04 RESPONSIBLE PERSON CITY: LEXINGTON

STATE: NC

ZIP CODE: 27292

PHONE- AREA CODE/NUMBER: 704-246-5820

17 RESPONSIBLE PERSON NAME: JAMES GRAY OR MANAGER NOW

LOCATION OF PUBLIC WATER SUPPLY

UPDATE CODE: C

01 OWNERS NAME: LEXINGTON, CITY OF

OWNERS STREET ADDRESS: PO BOX 649

02 OWNERS CITY: LEXINGTON

STATE: NC

ZIP CODE: 27292

OWNER TYPE: C

05 CITY OR COMMUNITY SERVED: LEXINGTON

SERVICE AREA CHARACTERISTICS

COUNTY CODE	IND RES	RES	COT	REC	MOH	INS	SCH	MOT	RET	SST	CAG	PIC	LOG	MRK	SKI	BAT	VIS	HWY	AIR	OTHER
029	000	1																		

06 NO. CONSECUTIVE PURCHASING	INTERSTATE CARRIERS	PWS TYPE	POPULATION SERVED	NO. SERVICE CONNECTIONS	NUMBER METERS	CONSECUTIVE INDICATOR
00	N	C	000023624	0009435	0008859	0

07 AVERAGE PRODUCTION GAL/DAY	DESIGN GAL/DAY	EMERGENCY GAL/DAY	STORAGE CAPACITY/GALS.	MAXIMUM PRODUCTION GAL/DAY
0005000000	0009000000	0000000000	0003000000	0006300000

08 PWS BEGIN	LAST SURVEY DATE	BACTI AND TURBIDITY COMPLIANCE CYCLE	ACTIVITY INDICATOR	DEACTIVATION DATE	DEACTIVATION REASON	ACTIVITY DATE
05/77	05/03/90	01	A	00/00/00		050390

09 POSI CODE	REG BY	STATE REG	STATE DIS	BACTI FLAG	MONTHLY MONITOR	NUMBER SAMPLES	SEASON BEGIN	SEASON END	DAILY CHECKS	SAMPLE FREQ	MCL CK SAMPLE	CHLORINE P P M	TURBIDITY FLAG	TURBIDITY UNITS
NC	8	02		L	Y	024	00/00	00/00	1	000	2	00	L	1.4

16 - - - - - - - - - SOURCE - - - - - - - -

NO.	NAME	CODE	NUMBER WELLS	AVL	RIVER BASIN	LATITUDE DEG MIN SEC	LONGITUDE DEG MIN SEC	PWSI-ID OF SELLER	WATER TREATMENTS 6 7 8 9 0 1 2 3 4 5 6 7 8
01	TOM-A-LEX LAKE	S	00	P	0017	035 52 30	080 11 45	00-00-000	Y B S R P C N Y G

← Region ← County

REGION AND COUNTY CODES

02-01	Alamance	03-26	Cumberland	03-51	Johnston	02-76	Randolph
01-02	Alexander	04-27	Currituck	04-52	Jones	03-77	Richmond
01-03	Alleghany	04-28	Dare	03-53	Lee	03-78	Robeson
03-04	Anson	02-29	Davidson	04-54	Lenoir	02-79	Rockingham
01-05	Ashe	02-30	Davie	01-55	Lincoln	201-80	Rowan
01-06	Avery	04-31	Duplin	01-56	McDowell	01-81	Rutherford
04-07	Beaufort	03-32	Durham	01-57	Macon	03-82	Sampson
04-08	Bertie	04-33	Edgecombe	01-58	Madison	03-83	Scotland
03-09	Bladen	02-34	Forsyth	04-59	Martin	201-84	Stanly
04-10	Brunswick	02-35	Franklin	01-60	Mecklenburg	02-85	Stokes
01-11	Buncombe	01-36	Gaston	01-61	Mitchell	02-86	Surry
01-12	Burke	04-37	Gates	03-62	Montgomery	01-87	Swain
201-13	Cabarrus	01-38	Graham	03-63	Moore	01-88	Transylvania
01-14	Caldwell	02-39	Granville	04-64	Nash	04-89	Tyrrell
04-15	Camden	04-40	Greene	04-65	New Hanover	201-90	Union
04-16	Carteret	02-41	Guilford	04-66	Northampton	02-91	Vance
02-17	Caswell	04-42	Halifax	04-67	Onslow	03-92	Wake
01-18	Catawba	03-43	Harnett	03-68	Orange	02-93	Warren
03-19	Chatham	01-44	Haywood	04-69	Pamlico	04-94	Washington
01-20	Cherokee	01-45	Henderson	04-70	Pasquotank	01-95	Watauga
04-21	Chowan	04-46	Hertford	04-71	Pender	04-96	Wayne
01-22	Clay	03-47	Hoke	04-72	Perquimans	01-97	Wilkes
01-23	Cleveland	04-48	Hyde	02-73	Person	04-98	Wilson
04-24	Columbus	01-49	Iredell	04-74	Pitt	02-99	Yadkin
04-25	Craven	01-50	Jackson	01-75	Polk	01-00	Yancey

Reference 29

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO:	DATE:	TIME:
	12 Oct 90	1500

DISTRIBUTION:
Sprucance Southern Inc.

BETWEEN:	OF:	PHONE:
Roger Spott Superintendent	Lexington Water System	(704) 243-2489

AND:
A.D. Douglas NUS Corporation

DISCUSSION:
Mr. Spott and I discussed intakes in the area. He indicated Lexington uses the intake in the Tom-A-Lex Lake and the intake in Old City Lake.

~~Mr. Spott stated the intake in Abbotts Creek has not been used by Lexington in use never been in use since he~~

Mr. Spott stated, as long as he can recall, the intake ~~in~~ of Abbotts Creek has never been ~~as far~~ ~~fun~~ functional. Mr. Spott has been with the water department for 15 years.

ACTION ITEMS:

NUS 067 REVISED 0685

Reference

30

DIVISION OF HEALTH SERVICES - ENVIRONMENTAL HEALTH SECTION - WATER SUPPLY BRANCH — DATE OF RUN 07/10/90

* * * PUBLIC WATER SUPPLY DATA SHEET * * ONLY SURFACE SOURCE

NC INVENTORY DOCUMENT (PWSI.410) AS OF JUNE 90

PWSI-ID W0410S

RE-CO-SEQ	DATA LINE CODE			
02-29-020	03	NAME OF PUBLIC WATER SYSTEM THOMASVILLE, CITY OF	RESPONSIBLE PERSON ADDRESS P O BOX 368	
	04	RESPONSIBLE PERSON CITY THOMASVILLE	STATE NC	ZIP CODE 27360	PHONE- AREA CODE/NUMBER 919-475-1321
	17	RESPONSIBLE PERSON NAME RANDY HAMMITT JR MANAGER NOW	LOCATION OF PUBLIC WATER SUPPLY OLD HWY 29-70	UPDATE CODE C
	01	OWNERS NAME THOMASVILLE CITY OF	OWNERS STREET ADDRESS P O BOX 368	
	02	OWNERS CITY THOMASVILLE	STATE NC	ZIP CODE 27360	OWNER TYPE C

05 CITY OR COMMUNITY SERVED: THOMASVILLE — COUNTY CODE: 026 — IND RES: 000 — RES: X — COT REC NON INS SCH MOT RET SST CAG PIC LOG MRK SKI BAT VIS HWY AIR OTHER

06 NO. CONSECUTIVE PURCHASING	INTERSTATE CARRIERS	PWS TYPE	POPULATION SERVED	NO. SERVICE CONNECTIONS	NUMBER METERS	CONSECUTIVE INDICATOR
00	N	C	000027060	0008200	0000000	0

07 AVERAGE PRODUCTION GAL/DAY	DESIGN GAL/DAY	EMERGENCY GAL/DAY	STORAGE CAPACITY/GALS.	MAXIMUM PRODUCTION GAL/DAY
0003000000	0000000000	0000000000	0001500000	0003000000

08 PWS BEGIN	LAST SURVEY DATE	BACTI AND TURBIDITY COMPLIANCE CYCLE	ACTIVITY INDICATOR	DEACTIVATION DATE	DEACTIVATION REASON	ACTIVITY DATE
06/77	05/03/90	01	A	00/00/00		050390

09 POST CODE	REG BY	STATE REG	STATE DIS	BACTI FLAG	MONTHLY MONITOR	NUMBER SAMPLES	SEASON BEGIN	SEASON END	DAILY CHECKS	SAMPLE FREQ	MCL CK SAMPLE	CHLORINE P P M	TURBIDITY FLAG	TURBIDITY UNITS
NC	P	02		L	Y	000	00/00	00/00	1	000	2	00	L	1.4

16 - - - - - - - - - SOURCE - - - - - - - -

NO.	NAME	CODE	NUMBER WELLS	AVL	RIVER BASIN	LATITUDE DEG MIN SEC	LONGITUDE DEG MIN SEC	PWSI-ID OF SELLER	WATER TREATMENTS 6 7 8 9 0 1 2 3 4 5 6 7 8
01	TOM-A-LEX LAKE	S	00	P	0017	035 52 30	080 11 45	- -	Y C S A C C Y G

Region → County

REGION AND COUNTY CODES

02-01	Alamance	03-26	Cumberland	03-51	Johnston	02-76	Randolph
01-02	Alexander	04-27	Currituck	04-52	Jones	03-77	Richmond
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03-04	Anson	02-29	Davidson	04-54	Lenoir	02-79	Rockingham
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01-06	Avery	04-31	Duplin	01-56	McDowell	01-81	Rutherford
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01-11	Buncombe	01-36	Gaston	01-61	Mitchell	02-86	Surry
01-12	Burke	04-37	Gates	03-62	Montgomery	01-87	Swain
201-13	Cabarrus	01-38	Graham	03-63	Moore	01-88	Transylvania
01-14	Caldwell	02-39	Granville	04-64	Nash	04-89	Tyrrell
04-15	Camden	04-40	Greene	04-65	New Hanover	201-90	Union
04-16	Carteret	02-41	Guilford	04-66	Northampton	02-91	Vance
02-17	Caswell	04-42	Halifax	04-67	Onslow	03-92	Wake
01-18	Catawba	03-43	Harnett	03-68	Orange	02-93	Warren
03-19	Chatham	01-44	Haywood	04-69	Pamlico	04-94	Washington
01-20	Cherokee	01-45	Henderson	04-70	Pasquotank	01-95	Watauga
04-21	Chowan	04-46	Hertford	04-71	Pender	04-96	Wayne
01-22	Clay	03-47	Hoke	04-72	Perquimans	01-97	Wilkes
01-23	Cleveland	04-48	Hyde	02-73	Person	04-98	Wilson
04-24	Columbus	01-49	Iredell	04-74	Pitt	02-99	Yadkin
04-25	Craven	01-50	Jackson	01-75	Polk	01-00	Yancey

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF NORTH CAROLINA
HIGHWAY AND PUBLIC WORKS COMMISSION

Reference
31

LEXINGTON EAST QUADRANGLE
NORTH CAROLINA-DAVIDSON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and North Carolina Geodetic Survey

Culture and drainage in part compiled from aerial photographs taken 1948
Topography by plane-table methods 1949–1950

Polyconic projection. 1927 North American datum
10,000-foot grid based on North Carolina coordinate system
1000-metre Universal Transverse Mercator grid ticks, zone 17, shown in blue
To place on the predicted North American Datum 1983 move the projection lines 10 meters south and 19 meters west as shown by dashed corner ticks

Red tint indicates area in which only landmark buildings are shown

MN GN
6° 10' MILS
0°29' 9 MILS
UTM GRID AND 1987 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

1 ½ 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225 OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

Revisions shown in purple and woodland compiled in cooperation with State of North Carolina agencies from aerial photographs taken 1984 and other sources. This information not field checked. Map edited 1987

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1987

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

LEXINGTON EAST, N. C.
35080-G2-TF-024

1950
PHOTOREVISED 1987
DMA 4955 I SW—SERIES V842

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Reference
32

"Rite in the Rain."
WEATHERPROOF

LEVEL

NOTEBOOK NO. 311

F4-1451
Classic Furniture Corp.
IDD# F4-8905-72
Thomasville/Davidson Co./Smith Co.
Project Manager - Mary McDonald

6

Davidson Water Inc.
Hwy. 52, P.O. Box 969
Welcome, N.C. 27374

ROBERT J. WALTERS
ASSISTANT MANAGER

Phone:
Lex - 704-731-2341
W-S - 919-764-2534
Thom - 919-475-8229

There was no street address indicated in the file material. Two separate buildings are possible locations of the Classic Furniture site.

On site, the "Custom Millwork Supply Site" is presently active. There is a truck on the parking lot that says "Custom Millwork Supply". There is no evidence of waste, spills on site.

We stopped & asked two elderly men if they had heard of Classic Furniture in the area. They did not know.

M. McDonald

5

Thomasville Water Company
(919)

2

9:50 6-8-89

Arrived at Davidson Co. Water Co.

Met Forest Walter.

He said there are ~~some~~ lots of private wells in the county, but most of them have water lines in front of their homes. He gave us water dist. lines map. The total # of connections are 34,000. Source = 1500-2000' south of Hwy 64 on Yadkin River.

M. McDonald

6-8-89

11:00

Arrived at Thomasville Public Utility building. Waited for Roger Brown.

11:15 Met Roger Brown. He said Davidson Water Co. surrounds Thomasville Water Co. The Fairgrove area is only partially covered by Thomasville W.C. Approx. 8,000 connections are served by the Tom-a-Lex Reservoir.

M. McDonald

3

ENDANGERED AND THREATENED SPECIES

Referen
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U.S. FISH AND WILDLIFE SERVICE

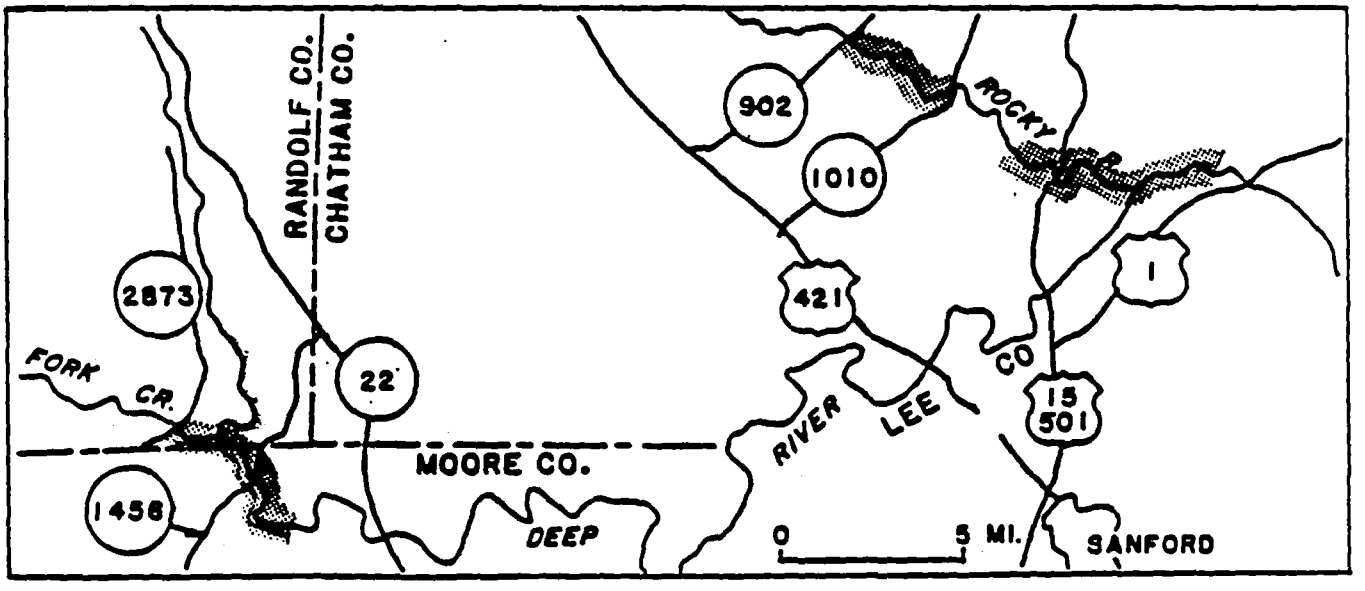
REGION 4 - ATLANTA

NORTH CAROLINA - Critical Habitat

Notropis mekistocholas, "Cape Fear shiner"

(1) Chatham County. Approximately 4.1 miles of the Rocky River from North Carolina State Highway 902 Bridge downstream to Chatham County Road 1010 Bridge;
(2) Chatham and Lee Counties. Approximately 0.5 river mile of Bear Creek, from Chatham County Road 2156 Bridge downstream to the Rocky River, then downstream in the Rocky River (approximately 4.2 river miles) to the Deep River, then downstream in the Deep River (approximately 2.6 river miles) to a point 0.3 river mile below the Moncure, North Carolina, U.S. Geological Survey Gaging Station; and
(3) Randolph and Moore Counties. Approximately 1.5 miles of Fork Creek, from a point 0.1 river mile upstream of Randolph County Road 2873 Bridge downstream to the Deep River then downstream approximately 4.1 river miles of the Deep River in Randolph and Moore Counties, North Carolina, to a point 2.5 river miles below Moore County Road 1456 Bridge.

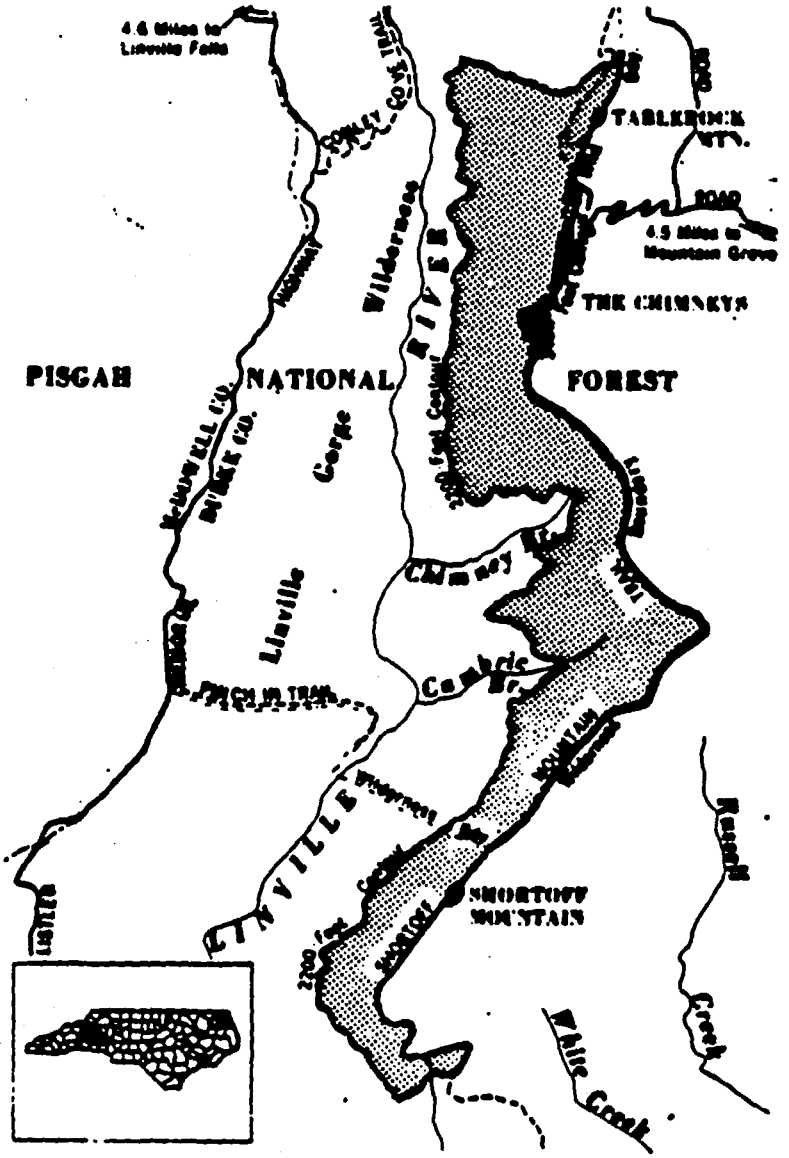
Constituent elements include clean streams with gravel, cobble, and boulder substrates with pools, riffles, shallow runs and slackwater areas with large rock outcrops and side channels and pools with water of good quality with relatively low silt loads.



NORTH CAROLINA - Critical Habitat

Hudsonia montana, "mountain golden heather"

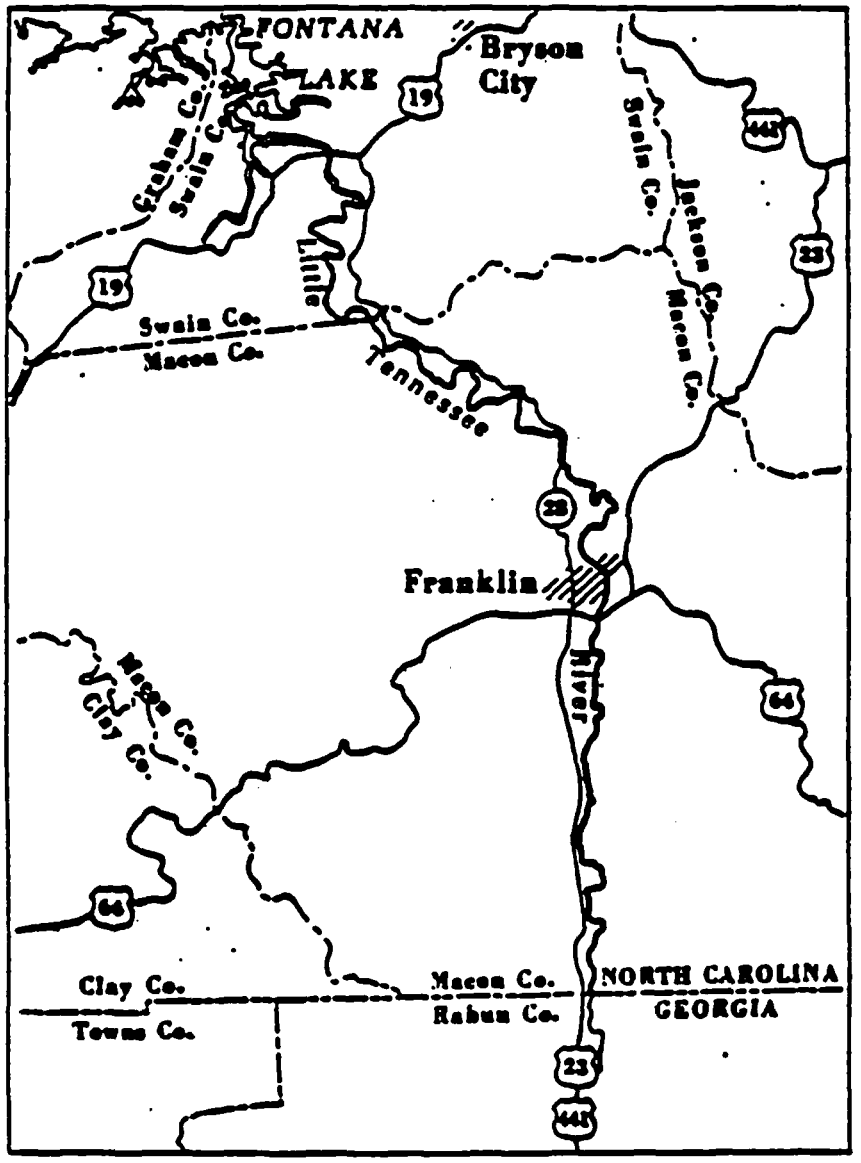
Burke County. The area bounded by the following: on the west by the 2200' contour; on the east by the Linville Gorge Wilderness Boundary north from the intersection of the 2200' contour and the Shortoff Mountain Trail to where it intersects the 3400' contour at "The Chimneys"--then follow the 3400' contour north until it reintersects the Wilderness Boundary--then follow the Wilderness Boundary again northward until it intersects the 3200' contour extending west from its intersection with the Wilderness Boundary until it begins to turn south--at this point the Boundary extends due east until it intersects the 2200' contour.



NORTH CAROLINA - Critical Habitat

Hybopsis monacha, "spotfin chub"

Macon and Swain Counties. Little Tennessee River, main channel from the backwaters of Fontana Lake upstream to the North Carolina-Georgia state line.

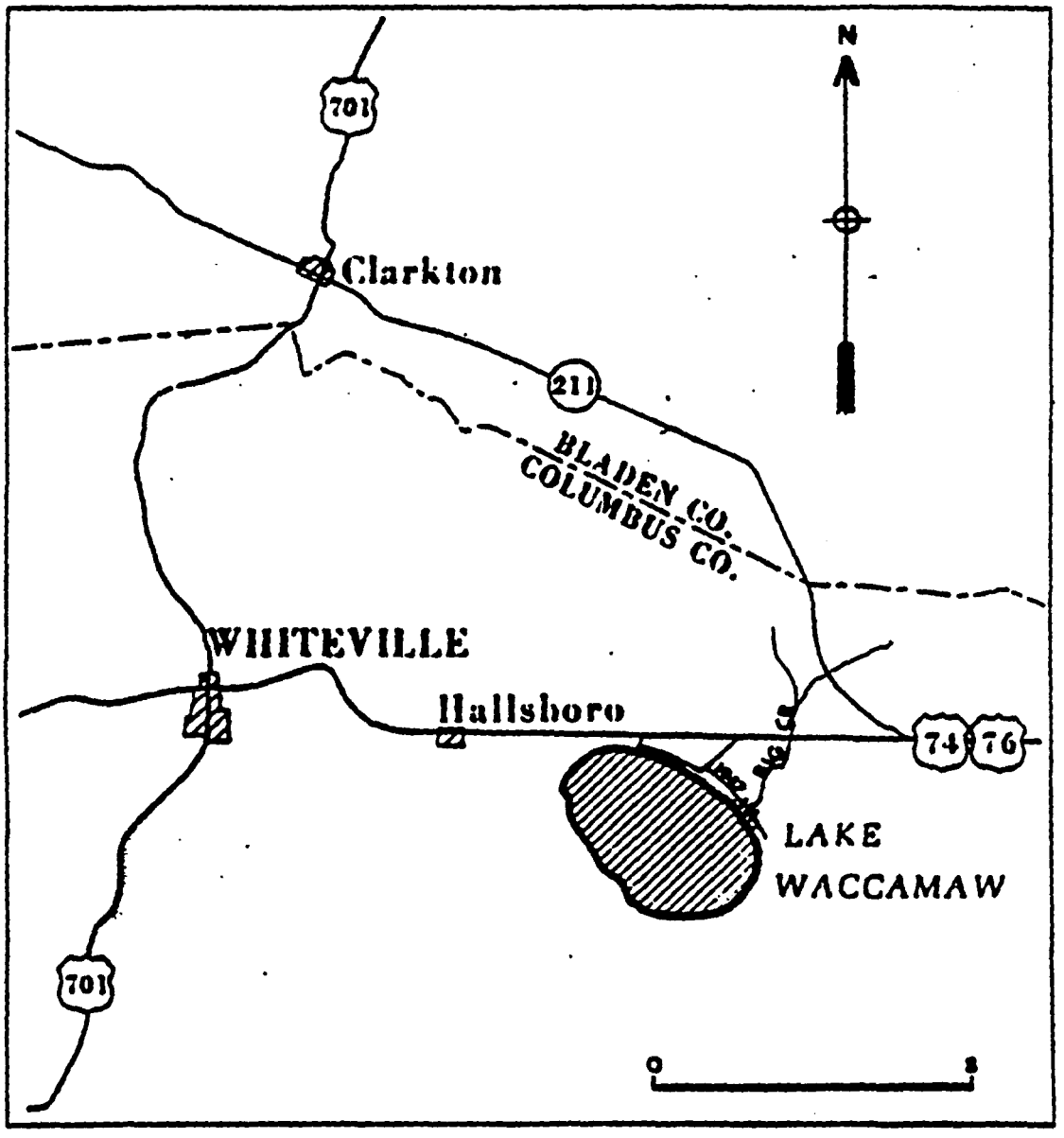


NORTH CAROLINA - Critical Habitat

Menidia extensa, "Waccamaw silverside"

Columbus County. Lake Waccamaw in its entirety to mean high water level, and Big Creek from its mouth at Lake Waccamaw upstream approximately 0.6 kilometer (0.4 mile) to where the creek is crossed by County Road 1947.

Constituent elements include high quality clear open water, with a neutral pH and clean sand substrate.



Federally Listed Species by State

NORTH CAROLINA

(E=Endangered; T=Threatened; CH=Critical Habitat determined)

Mammals	General Distribution
Bat, gray (Myotis grisescens) - E	Extreme Southwest
Bat, Indiana (Myotis sodalis) - E	West
Bat, Virginia big-eared (Plecotus townsendii virginianus) - E	Avery County
Cougar, eastern (Felis concolor cougar) - E	Entire state
Manatee, West Indian (Trichechus manatus) - E	Coastal waters
Shrew, Dismal Swamp southeastern (Sorex longirostris fisheri) - T	Dismal Swamp; Camden, Gates Pasquotank and Perquimans Counties
Squirrel, Carolina northern flying (Glaucomys sabrinus coloratus) - E	Western mountains (Yancy County)
Whale, finback (Balaenoptera physalus) - E	Coastal waters
Whale, humpback (Megaptera novaeangliae) - E	Coastal waters
Whale, right (Balaena glacialis) - E	Coastal waters
Whale, sei (Balaenoptera borealis) - E	Coastal waters
Whale, sperm (Physeter catodon) - E	Coastal waters

Birds	
Eagle, bald (Haliaeetus leucocephalus) - E	Entire state
Falcon, American peregrine (Falco peregrinus anatum) - E	Western mountains
Falcon, Arctic peregrine (Falco peregrinus tundrius) - T	Entire State
Plover, piping (Charadrius melodus) - T	Coast
Stork, wood (Mycteria americana) - E	Coast
Warbler, Bachman's (Vermivora bachmanii) - E	East
Warbler, Kirtland's (Dendroica kirtlandii) - E	Northwest, Central, Southeast
Woodpecker, ivory-billed (Campephilus principalis) - E	Southeast
Woodpecker, red-cockaded (Picoides (=Dendrocopos) borealis) - E	East

Liatris helleri (Heller's blazing star) - T	Ashe, Avery, Caldwell, Burke Counties
Lindera melissifolia (pondberry) - E	Bladen County
Lysimachia asperulaefolia (rough-leaved loosestrife) - E	Carteret, Scotland, Cumberland/Bladen, Brunswick, Pender, and Hoke Counties
Oxypolis canbyi (Canby's dropwort) - E	Scotland County
Sagittaria fasciculata (bunched arrowhead) - E	Henderson County
Sarracenia oreophila (green pitcher plant) - E	Clay County
Solidago spithamaea (Blue Ridge goldenrod) - T	Avery and Mitchell Counties

Reference
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Davidson

06/30/89 Page 1

NORTH CAROLINA NATURAL HERITAGE PROGRAM ELEMENT LIST

scientific and common name	state stat	fed stat	state rank	glob rank
ETHEOSTOMA COLLIS	SC		S3	G3
CAROLINA DARTER				
MESIC MIXED HARDWOODS FOREST, PIEDMONT SUBTYPE			S4	G5T5
AMORPHA SCHWERINII	PP		S2	G2G3
SCHWERIN'S AMORPHA				
LOTUS PURSHIANUS VAR HELLERI	SR		S2	G4G5
HELLER'S TREFOIL				
PLANTAGO CORDATA	E	C2	S1	G3
HEART-LEAF PLANTAIN				
PORTERANTHUS STIPULATUS	SR		S2	G5
INDIAN PHYSIC				

Reference
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BELEWS CREEK BOG/MARSHES

COUNTYNAME: NCFORS
QUADNAME: BELEWS CREEK
DIRECTIONS: NORTH AND SOUTH OF SR 1971 ALONG BELEWS CREEK.

OWNER: PRIVATE
SITEDESC:
SWAMPY WET AREAS NORTH AND SOUTH OF SR1971 (PARTLY PASTURED) ALONG BELEWS CREEK. SATURATED SOIL, ;ALDER, SWAMP ROSE, SKUNK CABBAGE, RUSHES. SEDGES, ARROW ARUM. BOG TURTLE (CLEMMYS MUHLENBERGI) FOUND HERE IN 1984. ALSO LOCATION FOR CARDAMINE MICRANTHERA (SRS). THOUGH SITE MAY HAVE BEEN DESTROYED (PASTURE).
SIZE: 0 PRIORITY: C
RANKCOMM: RARE PLANT AND ANIMAL SPECIES

PROTSTAT: NO PROTECTION STATUS

YADKIN RIVER BLUFFS

COUNTYNAME: NCFORS
QUADNAME: VIENNA
DIRECTIONS: HIGH BLUFFS ON E SIDE OF YADKIN RIVER & IMMEDIATELY SOUTH OF US 67
OWNER:
SITEDESC:
BLUFFS HAVE HIGH DIVERSITY OF PLANTS AND TYPIFY AN INNER PIEDMONT RIVER-SIDE COMMUNITY. MAJOR PLANT COMMUNITIES ARE ALLUVIAL WOODS, RHODODENDRON BLUFFS, CLIMAX OAK-HICKORY FOREST, BEECH-MAPLE WOODS AND OPEN MEADOWS. VALUABLE EDUCATIONAL RESOURCE FOR NEARBY (WINSTON-SALEM) INSTITUTIONS.
SIZE: 14 PRIORITY: C
RANKCOMM: NATURAL COMMUNITIES

PROTSTAT: NO PROTECTION STATUS. REGISTRY AGREEMENT EXTINGUISHED WHEN PREVIOUS OWNER SOLD PROPERTY.

BUNN FLATROCK

COUNTYNAME: NCFRAN
QUADNAME: BUNN WEST
DIRECTIONS: OFF SR 1719, APPROX. 0.5 MI N OF JCT WITH SR 1729. THEN 0.25 MI N ACROSS CULTIVATED FIELDS INTO WOODED HILLCREST
OWNER: PRIVATE
SITEDESC:
UPLAND GRANITIC FLATROCK WITH EXCELLENT ZONATION OF PRIMARY SUCCESSIONAL PLANT COMMUNITIES. OUTCROP OF ENDEMIC PORTULACA SMALLII PRESENT. PART OF ROLESVILLE GRANITE BATHOLITH. LITTLE DISTURBANCE.

SIZE: 4 PRIORITY: C
RANKCOMM: RARE PLANT SPECIES, GEOMORPHIC LANDFORM

PROTSTAT: NO PROTECTION STATUS

US 264 LOW POCOSIN (FLOATING PEAT BOG)

COUNTYNAME: NCDARE
QUADNAME: ENGELHARD NE & NW, LONG SHOAL
DIRECTIONS: ALONG US 264 FROM STUMPY POINT FIRE TOWER TO DARE/HYDE CO. LINE
OWNER: FIRST COLONY FARMS, INC. AND DEPT. OF DEFENSE-DARE BOMBING R
SITEDESC:
EASTERN SEGMENT OF WIDE BAND OF VARIOUS WETLANDS EXTENDING ACROSS SOUTHERN DARE PENINSULA. EXCEPTIONALLY WET POCOSIN IN PLACES RESEMBLES FRESHWATER MARSH AND IS UNIQUE IN DEVELOPMENTAL HISTORY. NEVER COVERED BY SWAMP FOREST. LOW SHRUB BOG MAINTAINED ITS VEGETATION TYPE FOR 3000-5000 YEARS. ELEVATION UNDER 5 FT MSL.
SIZE: 21000 PRIORITY: A
RANKCOMM: EXEMPLARY NATURAL COMMUNITY, GEOMORPHIC LANDFORM

PROTSTAT: RHA (PARTIAL). INTERIOR PORTION IN DOD DARE BOMBING RANGE PART OF REGISTERED NATURAL AREA. MAJORITY UNPROTECTED.

BEAVERDAM CREEK/GRASSY FORK HEARTLEAF PLAINTAIN S.

COUNTYNAME: NCDAVD
QUADNAME: DENTON
DIRECTIONS: ALONG BEAVERDAM CREEK ABOVE & BELOW ROAD CROSSING OF NC 49. APPROX. 0.8 MI SW OF JCT OF NC 49 AND NC 109
OWNER: PRIVATE (SOME JACOB'S CREEK STONE CO., INC.)
SITEDESC:
LARGEST KNOWN NC POPULATION OF ENDANGERED PLANT--PLANTAGO CORDATA (HEART-LEAFED PLANTAIN). GROWS PARTIALLY SUBMERGED ON GRAVEL BARS IN SMALL STREAM OF YADKIN RIVER BASIN AND ALSO ON BANKS OF THE SLATE-BOTTOMED STREAM. 1500-2000 PLANTS IN CLUMPED POPULATIONS. CANOPY OF MIXED HARDWOODS. SLATE BELT REGION.
SIZE: 175 PRIORITY: B
RANKCOMM: ENDANGERED PLANT SPECIES

PROTSTAT: RHA (PARTIAL). STONE CO. PROPERTY REGISTERED NATURAL AREA. TNC MANAGEMENT AGREEMENT WITH 2 OWNERS. REST UNPROTECTED.

BOONE'S CAVE NATURAL AREA

COUNTYNAME: NCDAVD
QUADNAME: CHURCHLAND
DIRECTIONS: IN BOONE'S CAVE STATE PARK ON THE EASTERN SIDE OF YADKIN RIVER, ENTRANCE FROM SR 1167
OWNER: NCDNRCD-BOONES CAVE SP
SITEDESC:
BOONE'S CAVE IS AN 80-FOOT LONG NATURAL CREVICE AT THE BASE OF A STEEP BLUFF ALONG THE YADKIN RIVER. THE PARK CONTAINS GOOD QUALITY EXAMPLES OF MESIC MIXED HARDWOOD FOREST AND DRY-MEXIC OAK--HICORY FOREST. MANY PLANT SPECIES TYPICAL OF THE MOUNTAIN REGION.
SIZE: 42 PRIORITY: C
RANKCOMM: NATURAL COMMUNITIES

PROTSTAT: RHA. REGISTERED NATURAL HERITAGE AREA.

FLAT SWAMP CREEK HEARTLEAF PLANTAIN SITE

COUNTYNAME: NCDAVD
QUADNAME: GRIST MOUNTAIN
DIRECTIONS: A SMALL SLATE-BOTTOMED TRIBUTARY TO FLAT SWAMP CREEK, 2.8 MILES NW OF SNYDER ON NC 47.
OWNER: PRIVATE
SITEDESC:
LARGE POPULATION (1000+ INDIVIDUALS) OF STATE ENDANGERED PLANTAGO CORDATA GROWS IN A SMALL SLATE-BOTTOMED TRIBUTARY OF FLAT SWAMP CREEK.

SIZE: 0 PRIORITY: B
RANKCOMM: ENDANGERED PLANT SPECIES

PROTSTAT: UNPROTECTED

COOLEEMEE PLANTATION ORBICULAR DIORITE AREA

COUNTYNAME: NCDAVY
QUADNAME: CHURCHLAND
DIRECTIONS: SOUTH OF US 64, 1.3 MI W OF WESTERN END OF BRIDGE OVER YADKIN RIVER
OWNER: PETER HAIRSTON, III
SITEDESC:
ONLY KNOWN OCCURRENCE IN NORTH AMERICA OF UNUSUAL ROCK TYPE. SPECTACULAR TEXTURE AND COLOR IN ROCK. DARK GREEN HORNBLENDE AND PYROXENE FORM SPHEROIDAL MASSES IN WHICH ELONGATE CRYSTALS RADIATE.

SIZE: 40 PRIORITY: A
RANKCOMM: GEOLOGIC FEATURE

PROTSTAT: RHA. REGISTERED NATURAL AREA

COOLEEMEE PLANTATION-YADKIN RIVER SLOPES

COUNTYNAME: NCDAVY
QUADNAME: CHURCHLAND
DIRECTIONS: 1.4 MI ON US 64 W OF YADKIN RIVER, LEFT ON CR 1812 FOR 0.7MI TO END OF ROAD, THROUGH WOODS, FIELD, RAVINE TO RIDGE
OWNER: PETER HAIRSTON
SITEDESC:
A PROMINENT SE-RUNNING RIDGE WITH STEEP SLOPES; YADKIN RIVER FORMS S BOUNDARY. MATURING TO MATURE UPLAND OAK-HICKORY FORESTS. UNUSUAL RIDGETOP BEECH/WHITE OAK/ RED MAPLE FOREST. MESIC MIXED HARDWOODS, DRY-MESIC OAK-HICKORY. AND PIEDMONT/ MOUNTAIN ALLUVIAL FOREST COMMUNITIES.
SIZE: 120 PRIORITY: C
RANKCOMM: NATURAL COMMUNITIES

PROTSTAT: OWNER DECLINED TO REGISTER