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562SERBSF10,633

Site Name (Subject): TRAVENOL LABS, INCORPORATED

Site ID (Document ID): NCD059140764

Document Name (DocType): Preliminary Assessment/Site Inspection (PA/SI)

Report Segment:

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SITE SCREENING INVESTIGATION REPORT

Travenol Laboratories Site
Marion, McDowell County, NC 28752
NCD509140764

SI REPORT

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

James G. Martin, Governor
David T. Flaherty, Secretary

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

August 9, 1989

Ms. Denise Bland
EPA NC CERCLA Project Officer
EPA Region IV Waste Division
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Subj: Site Screening Investigation Report
Travenol Laboratories Site
Marion, McDowell County, NC 28752
NCD059140764

Dear Ms. Bland:

This letter confirms the transmittal of the Site Screening Investigation Report for the Travenol Laboratories Site near Marion, in McDowell County, NC.

The site has been owned since 1972 by Baxter Healthcare Corporation (Baxter changed its name from Travenol Laboratories in 1989). The plant manufactures intravenous solutions for hospitals. Baxter notified EPA of the site with a CERCLA 103(c) notification. The disposal site is a small area outside the plant paint shop where during the period from 1972 to 1977 it was Baxter's practice to pour solvents on the gravel road in back of the shop. Reportedly, 440 gallons of mostly paint solvents and a small quantity of laboratory solvents was disposed of over the 5-year period.

In 1982 and EPA contractor conducted a site investigation and recommended no further action. In 1986, a preliminary assessment conducted by the NC Solid and Hazardous Waste Management Branch recommended a medium priority for inspection. This report documents the findings of the March 28, 1989, Site Screening Investigation.

Sincerely,

Bruce Nicholson

Bruce Nicholson, Environmental Engineer
Division of Solid Waste Management
Superfund Section

BIN/let/travssi
cc: Kelly Cain

NORTH CAROLINA

DHR/DHS

Travenol Laboratories
NCD059140764
Screening Site Investigation

August 1989

CERCLA

By Bruce Nicholson
Environmental Engineer
SUPERFUND BRANCH
SOLID WASTE MANAGEMENT SECTION

Table of Contents

EXECUTIVE SUMMARY

The Travenol Laboratories Site is on the plant grounds of the Baxter Healthcare Corporation (formerly Travenol Laboratories, Inc.), a pharmaceuticals plant in a mountain valley on Highway 221, eight miles north of Marion, McDowell County, NC. In a CERCLA 103(c) notification, Baxter reports having disposed of 440 gallons of mostly paint solvent wastes and a small quantity of laboratory waste on a gravel road behind the paint shop between the years 1972 and 1977. The disposals were periodic and reportedly consisted of no more than 2 to 3 gallons per event. An EPA contractor conducted a site investigation in 1982 and recommended no further action be taken. However, a subsequent preliminary assessment report in 1986 recommended the site for further investigation. This report documents the site screening investigation that was conducted.

The disposal area has since been paved and suitable soil sampling location was not available. Samples were taken from a monitoring well 100 feet downgradient (the monitoring well was placed as a precaution for the future removal of nearby underground fuel oil tanks not the paint disposal area) and from a process water well (also the nearest well 700 feet from the site) that supplies process water and drinking water to the 2,400 Baxter employees. No significant contamination was found in either sample. The area around the paint shop appeared to be well kept, and there were no visible signs of contamination. Because of the age and occasional nature of the disposal, the nonpersistent nature of the wastes, and the lack of contamination in a downgradient well indicates that the problem at this site is minor. We conclude, as did the previous site investigation, that this site should be considered for the no further action category.

1.0 BACKGROUND

1.1 Site Location

The Travenol Laboratories Site is an operating pharmaceuticals plant that manufactures intravenous solutions. The plant is located on Highway 221 approximately eight miles north of Marion, McDowell County, NC, in the community of North Cove. The site coordinates are 35° 50′ 9" North latitude and 81° 59′ 36" West longitude (See Map 1, Appendix A).

1.2 Site Layout/Description

A diagram of the plant site is shown in Figure 1. The plant is bounded to the north and northwest by the North Fork Catawba River and to the southeast by the Clinchfield Railroad. The facility is very large with the production/warehouse building alone covering approximately 26 acres, but the area of disposal covers a small area of ground approximately 15 feet x 15 feet. The blueprint of the site is included in Appendix A, and the site is also shown on Map 1 in Appendix A. Photographs of the site and the sampling locations are shown in Figures 2 through 5. Seven on-site wells supply the process and drinking water needs for the site (1). The parameters for these wells are listed in Table 1-1 below. The locations of these wells are denoted on the site blueprint in Appendix A.

Table 1-1. Parameters of Baxter Healthcare Corporation Process Wells (1).

Well No.	Well Depth, Ft.	Diameter, Inches	Static Water Level, Ft. BLS
1	480	8	10.5
2	525	8	10.8
3	300	6	9
4	450	8	36
4a	350	6	11.3
5	230	8	11.5
9	289	10	23

1.3 Ownership History

Baxter Healthcare Corporation (Baxter) is the owner of the site. The plant was built in 1972, and Baxter has been its sole occupant. The name of the company has changed throughout that time. The plant started operation under the name Travenol Laboratories, Inc. in 1972. For a period of 2 months in 1972, the company was known as Baxter-Travenol before it reverted to Travenol Laboratories. The name remained Travenol Laboratories until 1987 when the name changed to Baxter Healthcare Corporation (2). The plant produces intravenous solutions for hospital use.

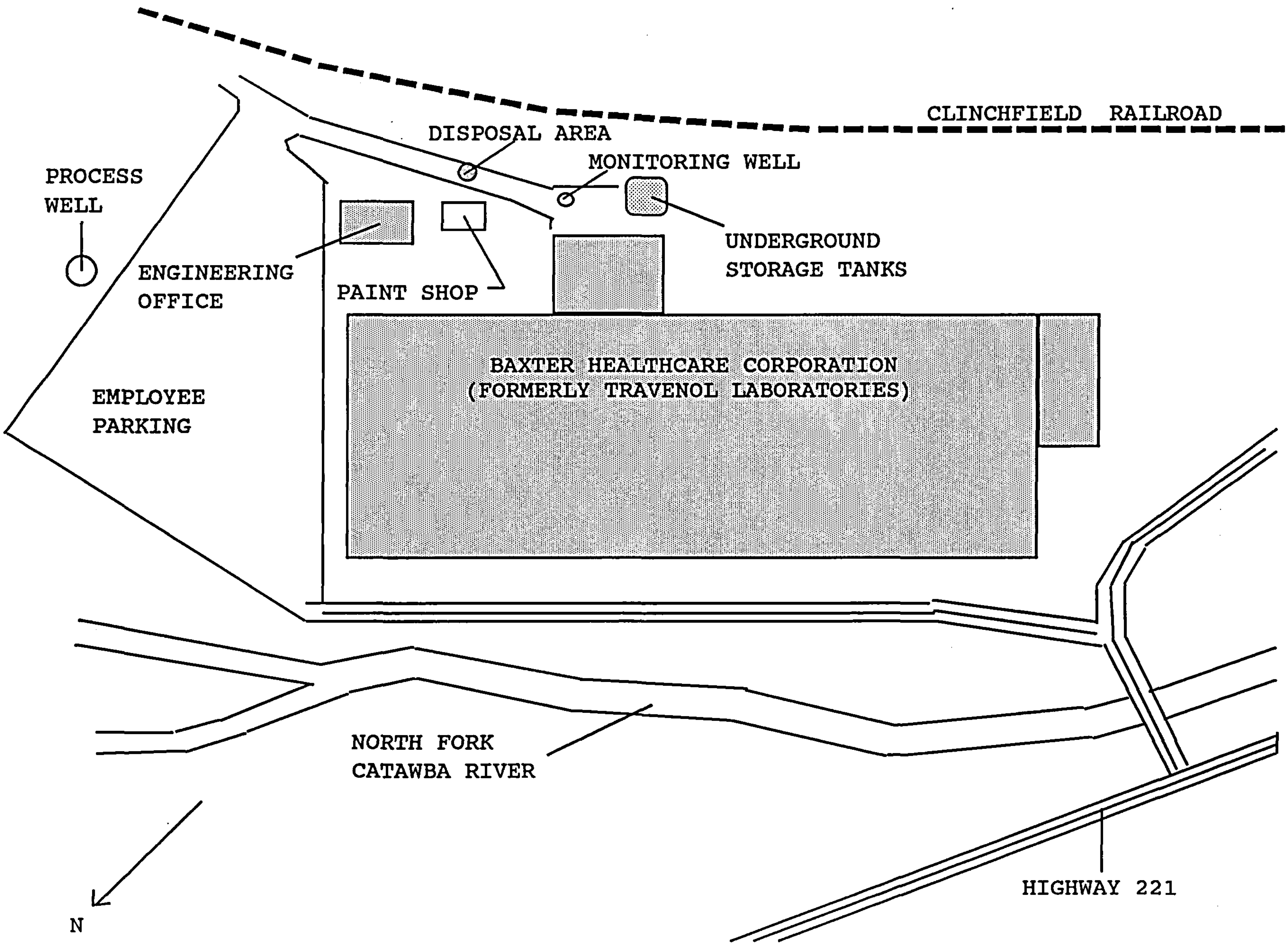

FIGURE 1. SITE LAYOUT OF TRAVENOL LABS

Figure 2


Figure 3

Figure 2. Disposal Area (Now Paved) in Foreground With Paint Shop in Background. Looking West.

Figure 3. Looking Southwest From Disposal Area, Pat DeRosa Sampling Monitoring Well in Background.

Figure 4. Sampling Monitoring Well, Looking South.

Figure 5. Process Well No. 3, Looking East.


Figure 4

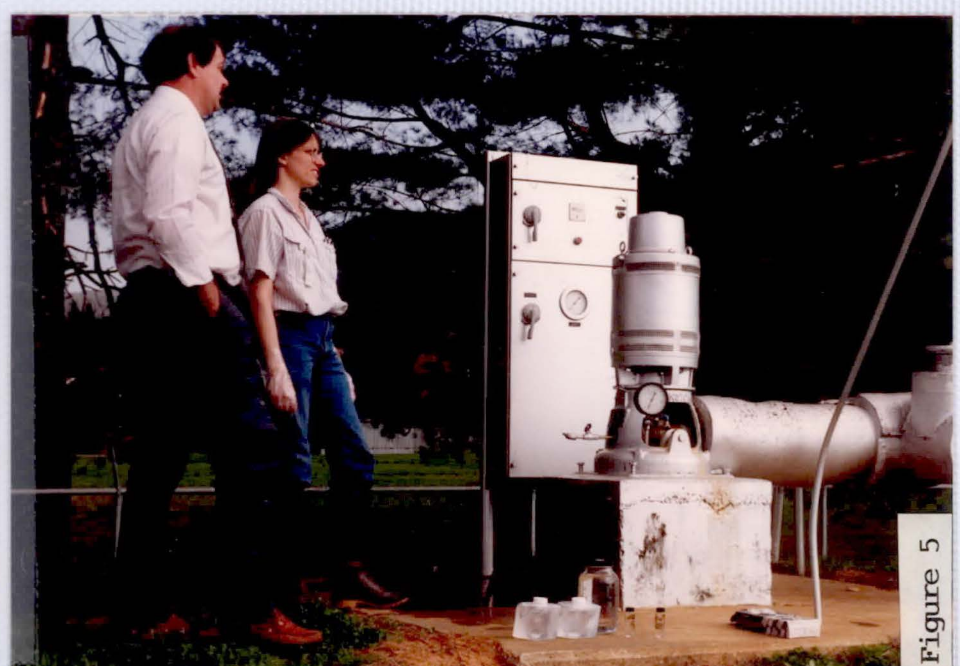
Figure 5

The area of disposal is in the northeast corner of the building. Between 1972 and 1977 a reported quantity of 440 gallons of waste paint shop solvents and a small amount of laboratory waste was disposed of on site (1,2,4). The disposal area was a gravel driveway behind the paint shop. Over the period of disposal, small quantities of the waste (reportedly no more than 2 to 3 gallons per event) were poured on the ground and allowed to evaporate. The gravel driveway has since been paved (1,4).

1.4 Permit and Regulatory History

Baxter filed a CERCLA 103(c) notification on April 29, 1981 (5). The site was inspected by Ecology and Environment, contractors for the U.S. EPA, on March 29, 1982. The gravelled area by this time had been paved over. The investigators found no evidence of waste or waste residues in the area and recommended no further action on the site. However, no samples were taken (3). A Preliminary Assessment conducted by Cheryl McMorris of the NC Superfund Branch on June 4, 1986, recommended a medium priority for inspection (4).

Baxter also filed a notification of Inactive Waste Disposal Site with the NC State Superfund Program on March 8, 1988 as required by the North Carolina General Statutes Section 130A-310.1(b) (1).

1.5 Remedial Actions To Date

No remedial action has taken place concerning the disposal of paint and laboratory wastes. Baxter is in the process of removing or has recently removed six underground storage tanks. Monitoring wells have been installed to assess these tanks and to date, no leak has been detected. Four of these are located approximately 200 feet south and east of the disposal area (2).

1.6 Summary Trip Report (5)

On March 28, 1989, Pat DeRosa and Bruce Nicholson conducted a site sampling visit to the Travenol Laboratories site. The weather was clear and warm with the temperature about 70°F. We met with the plant Environmental Coordinator, Mr. Phil Castro. We obtained a site layout map from Mr. Castro and discussed the well locations and reported disposal area. We toured the plant grounds in the area of the paint shop where the reported disposal took place. The disposal area was immediately outside the rear of the paint shop on the road that leads to the back of the plant. The road was paved and there was no clear area to take soil samples. However, Baxter had recently installed a system of three monitoring wells to monitor underground tanks (containing No. 5 fuel oil) near the disposal area. Baxter is planning to remove these tanks in the near future and, according to Mr. Castro, the monitoring wells were installed as a precautionary measure to assess the status of the tanks prior to their removal. Monitoring Well No. 1 was upgradient of the tanks but approximately 100 feet downgradient of the disposal area.

A ground water sample was taken from Monitoring Well No. 1, and a background ground water sample was taken from a process water well (Process Well No. 3) located approximately 700 feet upgradient of the disposal area. These samples were submitted to the NC Laboratory of Public Health for organic and inorganic analyses.

2.0 ENVIRONMENTAL SETTING

2.1 Topography

The Travenol Laboratories site is located in the Blue Ridge physiographic province in northern McDowell County. The plant sits in an alluvial valley adjacent to the North Fork Catawba River. The valley floor is flat and the site is approximately 1,500 feet and in elevation. The mountain ridges surrounding the valley rise to nearly 3,700 feet (6).

2.2 Surface Water

The North Fork Catawba River runs by the Baxter plant. At its closest to the site, the river is 900 feet in a northerly direction, but the drainage pattern of the disposal area takes surface runoff to a storm sewer that empties into a ditch behind the plant along the railroad tracks (see Figure 1). The storm drain enters this ditch approximately 2,000 feet from the disposal area. This ditch then flows approximately 1,000 feet and enters the North Fork Catawba River to the southeast of the plant (11). From this point the North Fork Catawba flows 9.6 miles and enters Lake James (the head waters of the Catawba River (8). The 15-stream mile target distance limit ends in the middle of Lake James. There are no surface water intakes along this waterway, and Lake James is not used as a water supply (8). The nearest intake serves the city of Morganton. It is located on the Catawba River below Lake James is over 30 stream miles from the site (8).

The North Fork Catawba River is a Class C water body; suitable for fish propagation, secondary recreation, and agriculture (19). Also, the entire length of the 3 stream-mile target distance limit is classified as trout waters suitable for propagation and maintanance of stocked trout (19).

2.3 Geology, Soils, and Ground Water

The site resides in a valley drained by the North Fork Catawba River, and consequently, alluvial deposits may predominate. These alluvial deposits in the Catawba and Yadkin River Vallies can contain high percentages of clay (11). Saprolite tends to be thinner in the Blue Ridge region and thicker in the Piedmont region of McDowell County. Below the saprolite, the crystalline rock types in the area are quartzite and layered gneiss. The quartzite is characterized as the Upper Chilhowee formation made up of vitreous white to light gray quartzite interbedded with sandy metasiltstone and slate (12). The layered gneiss is distinguished by compositional layers that show considerable variation in mineral components. This rock type generally decays to various shades of red clay (11).

Residents who live near the site obtain drinking water from wells and springs. There is no municipal supply within the four-mile target distance limit. Baxter draws process and drinking water for the plant's 2,400 employees from seven operating wells on site. These wells range from 230 feet to 525 feet deep (1). A total of 1.5 million gallons are used daily from these wells (2). Many individual private wells near the North Cove area are much shallower, particularly those bored in alluvium. Four of the five area wells for which data is available are 40 feet deep or less (11).

Soil associations in the area include the Talladega-Chandler-Tate (TCT) and Hayesville-Cecil (HC). The TCT soil association is steeply sloped, well drained, loamy in texture and acid. Stones may be present in the Talladega and Chandler soils but are less common in the Tate soils. The HC soil association is steeply sloped and well drained, with a loamy surface and clayey subsurface. The soil is acid and has moderate agricultural production potential that may be limited by the slope (13).

2.4 Climate and Meteorology (13,14)

The pertinent meterological parameters for the Travenol site are shown in Table 2-1 below:

Table 2-1. Meteorological Data For the Marion Area of McDowell County, NC

Annual Precipitation: 54 inches
Annual Evaporation : 36 inches
Net Precipitation : 18 inches

1-year, 24-hour rainfall: 3.2 inches

Average Date of Last Freezing Temperature: April 21-May 1
Average Date of First Freezing Temperature: October 10-20

Mean Annual Wind Speed/Direction: 7 m.p.h. from the NE

2.5 Land Use

The site is located in a rural area 8 miles north of Marion, NC (population, 3,684) (15). The rural community of North Cove is adjacent to the plant's northern property boundary. The community contains approximately two dozen residences and North Cove Elementary School. The school property adjoins Baxter's. The well for the school, which serves 185, is approximately 750 feet from the disposal area (6,7,15). Baxter is the largest employer in the area, but other manufacturing operations (mostly textiles or forest products) are scattered throughout the region. American

Thread Company (NCD003157377) is located in Woodlawn, NC, four miles southeast of the site. Much of the land in the area is is farmed. Christmas trees, tobacco, corn, and livestock are the major products.

2.6 Population Distribution

A house count on the USGS topographic map was performed for a four-mile radius around the Travenol Labs site. During the site visit it was determined that the houses on the USGS topographic map for the North Cove area were fairly accurate. Two additional houses were added to the houses already on the map based on the site visit. The results of the house count and community well data are shown in Table 2-2 below.

Table 2-2. Population Estimate For Travenol Labs Site (8)

Radius, miles	House Count	Residents Per House	Population	Cumulative Population
0-1	45	3.8	171	171
1-2	57	3.8	217	388
2-3	96	3.8	365	753
3-4	201	3.8	764	1,517

2.7 Water Supply

There are no municipal water systems within the target distance limit. Ground water is the only source of water for area residents. Private, community and corporate wells supply drinking water to the residents and employees in the area. The six on-site wells descibesd in Section 1.2 supply drinking water to 2,400 employees (1). In addition, there are three other community well systems within 4 miles. A house count from the USGS Topographic map was used to determine private well users, data from the NC Public Water Supply Branch was used to determine the location and number of community well users. The results of the house count and community well data are shown in Table 2-3 below.

Table 2-3. Ground Water Target Population For Travenol Labs Site (1,8,16)

Radius, miles	House Count Population	Community Well System Population	Baxter Employees	Total Population	Cumulative Population
0-1	171	185-a	2,400	2,756	2,756
1-2	217	0	--	217	2,973
2-3	365	96-b	--	461	3,344
3-4	764	475-c	--	1,239	4,673

[a] North Cove Elementary School
[b] Scenic Mobile Home Village (not included in house count)
[c] Woodlawn Heights Water System, Swiss Village Water System (not included in house count)

2.8 Critical Environments

The nearest critical habitat is that of *Hudsonia montana*, the mountain golden heather. This habitat is located east of the Linville River within the Linville Gorge Wilderness Area (17). The approximate boundary of this habitat is shown on the topographic map in Appendix A. The nearest part of this habitat is approximately 5 miles east of the site. However, this habitat is not in the same drainage basin and is unaffected by surface water drainage from the site (8).

3.0 WASTE TYPES AND QUANTITIES

Baxter reported disposal of 440 gallons of paint solvents and and a small amount of laboratory waste solvents during the five to six year period from 1972 through 1977 (2,3,4). The exact paint solvent is unknown; however, common paint solvents include toluene, xylene, petroleum naphtha, other petroleum distillates, and turpentine. The small quantity of laboratory solvents disposed include included reagents and solvents that contained nitrobenzene and pyridine (2,3,4). This waste was occasionally applied to this area at the rate of 2 to 3 gallons at a time (2).

4.0 LABORATORY DATA

Table 4-1 shows the inorganic analyses of the well samples which were taken during the March 28, 1989, site screening investigation. As is apparent from the data, no significant levels of inorganic contaminants were found. Similarly, no organic contaminants were found at levels significantly above background. Trace levels of some chlorinated species were found in the monitoring well sample, but the levels are below detection limits and can only be reported as estimated values. Further, there is no record of chlorinated solvent disposal taking place. The complete analysis data are presented in Appendix B.

Table 4-1. Results of Inorganic Analyses at Travenol Labs Site.

	Concentration, mg/l	
Substance	Monitoring Well #1	Process Well #3
Arsenic	<0.01	< 0.01
Cadmium	<0.005	< 0.005
Chromium	0.02	< 0.01
Lead	0.04	< 0.03
Mercury	<0.0002	< 0.0002
Selenium	<0.005	< 0.005
Silver	<0.05	< 0.05

5.0 TOXICOLOGICAL AND CHEMICAL CHARACTERISTICS

The petroleum distillates and aromatic compounds that may have been present in the paint solvents are not persistent compounds and may not be present after the 12 year period which has elapsed since the last disposal. Pyridine and nitrobenzene have SAX toxicity ratings of 3 and 3-2 respectively (18). However, the chemical structure of these chemicals would also tend to be nonpersistent. Chlorinated species, although there is no record of their disposal would be more persistent. They were detected at trace levels (below the detection limit). For more detailed information on the toxicity of the potential chemicals of concern, the reader is referred to Reference 16.

REFERENCES

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2. Telecon. Bruce Nicholson, NC Superfund Branch, with Phil Castro, Baxter Healthcare Corporation. July 31, 1989.

3. Letter and Attachments. Mr. Charles H. Lee, Ecology and Environment, to Mr. R. D. Stonebraker, U.S. EPA Region IV. April 19, 1982. North Carolina Cercla 103(c) Site Inspections.

4. Preliminary Assessment Report. Ms. Cheryl McMorris, NC Superfund Branch, to Ms. Denise Bland, U.S. EPA Region IV. June 4, 1986.

5. Site Sampling Visit Trip Report. Mr. Bruce Nicholson, NC Superfund Branch, to Ms. Denise Bland, U.S. EPA Region IV. April 4, 1989.

6. Telecon. Ms. Cheryl McMorris, NC Superfund Branch, with Mr. Keith Masters, NC Solid and Hazardous Waste Management Branch. April 15, 1986.

7. Hazardous Waste Database, NC Solid and Hazardous Waste Management Branch Alphabetical Listing of Hazardous Waste Facilities Excluding Small Generators. July 14, 1989.

8. United States Geological Survey Topographic Quadrangles (7.5 Minute Series). Little Switerland, 1979; Ashford, 1956; Spruce Pine, 1978; and Linville Falls, 1956.

9. 1983 Warehouse Expansion Blueprint. Travenol Laboratories Inc., November 10, 1983.

10. Memorandum. Ms. Pat DeRosa, NC Superfund Branch, to American Thread Company/Sevier Plant File. July 17, 1989. Discussion of Surface and ground water systems in the Marion Area.

11. Geology and Ground-Water Resources of the Morganton Area, North Carolina, Ground Water Bulletin No. 12. North Carolina Department of Water Resources, Raleigh, NC. March 1967.

12. Geologic Map of North Carolina. Department of Natural Resources and Community Development. Compiled by the North Carolina Geological Survey, 1985.

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13. North Carolina Atlas, Portrait of a Changing Southern State. University of North Carolina Press, Chapel Hill, NC. 1975.

14. Rainfall Frequency Atlas of the United States. Technical Paper No. 40, U.S. Department of Commerce, Washington, DC, 1963.

15. North Carolina State Government Statistical Abstract, 5th Edition. North Carolina State Data Center, Raleigh, NC. 1984.

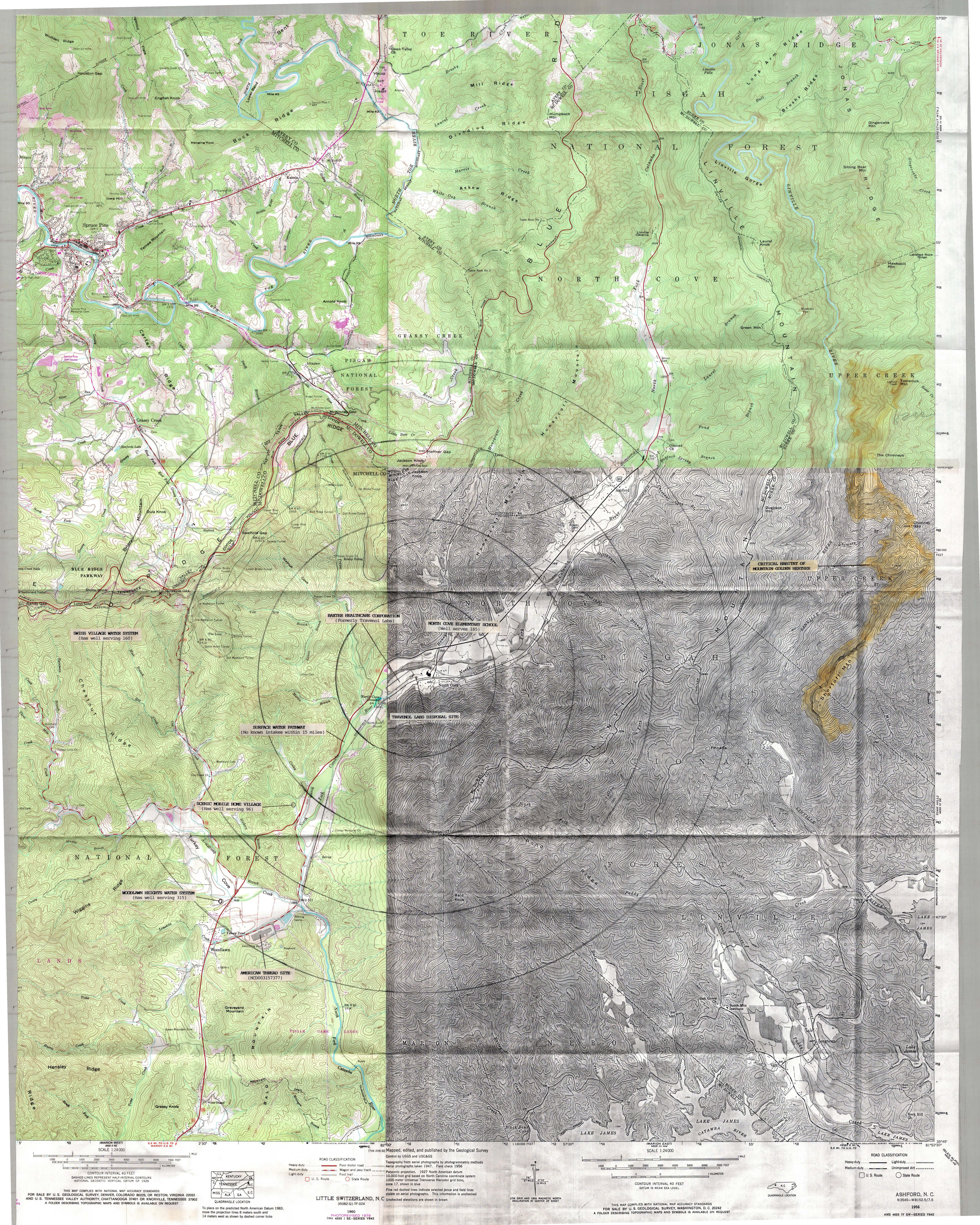
16. Community and Noncommunity Public Water Supply Database. NC Public Water Supply Branch. July 17, 1989.

17. Letter and Attachments. Mr. Warren T. Parker, U.S. Fish and Wildlife Service, to Ms. Pat DeRosa, NC Superfund Branch. June 21, 1985. Endangered Species and Critical Habitats in North Carolina.

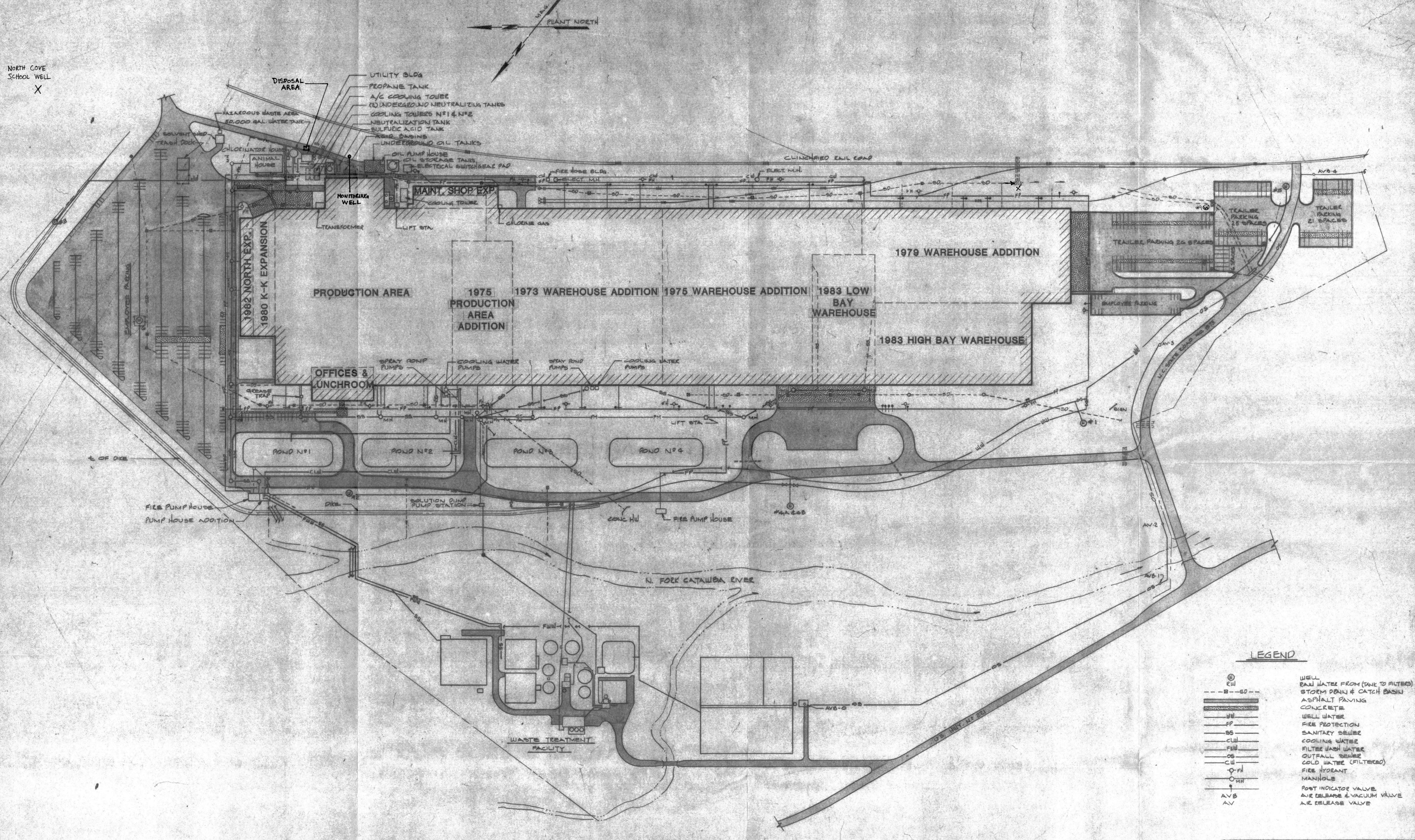
18. Dangerous Properties of Industrial Materials, 6th edition. N. I. Sax. Van Nostrand Rheinhold Company, 1984.

19. Classifications and Water Quality Standards Assigned to the Waters of the Catawba River Basin. NC Department of Natural Resources and Community Development, Raleigh, NC. June 30, 1989.

APPENDIX A
Maps & Photos



BAXTER HEALTHCARE CORPORATION
(Formerly Travenol Labs)
NORTH COVE ELEMENTARY SCHOOL
(Well serves 185)
TRAVENOL LABS DISPOSAL SITE
SWISS VILLAGE WATER SYSTEM
(Has well serving 160)
SURFACE WATER PATHWAY
(No known intakes within 15 miles)
SCENIC MOBILE HOME VILLAGE
(Has well serving 96)
WOODLAWN HEIGHTS WATER SYSTEM
(Has well serving 315)
AMERICAN THREAD SITE
(NCD003157377)
CRITICAL HABITAT OF
MOUNTAIN GOLDEN HEATHER
PISGAH NATIONAL FOREST
NORTH COVE
LITTLE SWITZERLAND, N.C.
ASHFORD, N.C.



REV. #	DESCRIPTION	APP'D.
ISSUED FOR CONSTRUCTION	DRAWN	APP'D.

1983 WAREHOUSE EXPANSION

FACILITIES ENGINEERING

TRAVENOL LABORATORIES, INC.
DEERFIELD, ILLINOIS 60015

DATE 11/10/83 — NCV-2771-UF-18 — REVISION 0

TRAVENOL LABORATORIES, INC.

NORTH COVE, NORTH CAROLINA

O'Neal Engineering Inc.
Consulting Engineers
Greenville, South Carolina

MASTER SITE PLAN

Date	Mark	Appr.	Revision	Date	Mark	Appr.	Revision	Date	Mark	Appr.	Revision	Date	Mark	Appr.	Revision
11/10/83	0		AS BUILT												

Ckd. By: BAH | Dsgn. By: BAH | Drawn By: DB
Scale: 1" = 100'
Job No.: 83027
Date: 11-10-83

Drawing Number: U18

APPENDIX B
Lab Data

DIVISION OF HEALTH SERVICES
SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH

Chain of Custody Record

Hazardous Waste Materials

Location of Sampling: ____ Generator ____ Transporter ____ Treatment Faci

____ Storage Facility ____ Disposal Facility ____ Landfill

✓ Other: CERCLIS SITE

Company's Name Travenol Labs (Currently Baxter) Telephone (704) 756-4151

Address US Hwy 221 N. Marion NC 28752

Collector's Name [signature] Telephone (919) 733-2801

signature

Date Sampled 3/28/89 Time Sampled ________

Type of Process Generating Waste Mixed Paint Shop & Laboratory Waste Solvents

Field Information

Ground water samples for organic analysis

Field Sample No. 4369 4370 4371 4372 4385

Chain of Possession:

1. [signature] — Environmental Engineer — 3/28/89 - 3/31/89
signature — title — inclusive dates

2. Lee C. Brevoort — Chem. Analyst I — 3-31-89
signature — title — inclusive dates

3. ________ ________ ________
signature — title — inclusive dates

Results reported

________ ________ ________
signature — title — date

Instructions: Complete all applicable information including signatures, and submit with analysis request forms.

N. C. Department of Human Resources
Division of Health Services

SAMPLE ANALYSES REQUEST

State Laboratory of Public Health
P. O. Box 28047
306 N. Wilmington Street
Raleigh, 27611

Site Number NCD059140764 Field Sample Number 4369 B/N

Name of Site TRAVENOL LABS INC Site Location McDOWELL COUNTY

Collected By BRUCE NICHOLSON ID# 59 Date Collected 3/28/89 Time

Type of Sample:

Environmental	Concentrate	Comments
✓ Groundwater (1)	___ Solid (5)	Sample No. 1
___ Surface Water (2)	___ Liquid (6)	Monitoring Well #1
___ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
___ Arsenic		___ Arsenic		___ Silver	
___ Barium		___ Barium		___ Sulfates	
___ Cadmium		___ Cadmium		___ Zinc	
___ Chromium		___ Chloride		___ Ph	
___ Lead		___ Chromium		___ Conductivity	
___ Mercury		___ Copper		___ TDS	
___ Selenium		___ Fluoride		___ TOC	
___ Silver		___ Iron			
		___ Lead			
		___ Manganese			
		___ Mercury			
		___ Nitrate			
		___ Selenium			

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
___ P&T:GC/MS		___ EDB		___ Methoxychlor	
✓ Acid:B/N Ext.		___ PCB's		___ Toxaphene	
___ TOX		✓ Petroleum		___ 2,4-D	
		___ Endrin		___ 2,4,5-TP (silvex)	
		___ Lindane			

MICROBIOLOGY

Parameter
___ (MF) Coliform Colonies/100mls
___ (MPN) Coliform Colonies/100mls

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received 3-31-89 KB Date Reported 5-23-89

Date Extracted BNA 4-3-89 KB, aa, PW, MW Date Analyzed BNA 4-17-89 BD

Reported By [signature] Lab Number 900866

DHS 3191 (Revised 7/85)
Solid and Hazardous Waste (Review 7/87)

#900866 - 900870

N. C. Department of Human Resources
Division of Health Services

SAMPLE ANALYSES REQUEST

State Laboratory of Public Health
P. O. Box 28047
306 N. Wilmington Street
Raleigh, 27611

Site Number NCD059140764 Field Sample Number 4370
Name of Site TRAVENOL LABS INC Site Location McDOWELL COUNTY
Collected By BRUCE NICHOLSON ID# 59 Date Collected 3/28/89 Time ______

Type of Sample

Environmental	Concentrate	Comments
✓ Groundwater (1)	___ Solid (5)	Sample No. 1
___ Surface Water (2)	___ Liquid (6)	Monitoring Well #1
___ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
___ Arsenic		___ Arsenic		___ Silver	
___ Barium		___ Barium		___ Sulfates	
___ Cadmium		___ Cadmium		___ Zinc	
___ Chromium		___ Chloride		___ Ph	
___ Lead		___ Chromium		___ Conductivity	
___ Mercury		___ Copper		___ TDS	
___ Selenium		___ Fluoride		___ TOC	
___ Silver		___ Iron			
		___ Lead			
		___ Manganese			
		___ Mercury			
		___ Nitrate			
		___ Selenium			

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
✓ P&T:GC/MS		___ EDB		___ Methoxychlor	
___ Acid:B/N Ext.		___ PCB's		___ Toxaphene	
___ TOX		___ Petroleum		___ 2,4-D	
		___ Endrin		___ 2,4,5-TP (silvex)	
		___ Lindane			

MICROBIOLOGY

Parameter
___ (MF) Coliform Colonies/100mls
___ (MPN) Coliform Colonies/100mls

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received 3-31-89 KB Date Reported ______
Date Extracted ______ Date Analyzed PT 5-2-89 nw
Reported By ______ Lab Number 890867

DHS 3191 (Revised 7/85)
Solid and Hazardous Waste (Review 7/87)

N. C. Department of Human Resources
Division of Health Services

SAMPLE ANALYSES REQUEST

State Laboratory of Public Health
P. O. Box 28047
306 N. Wilmington Street
Raleigh, 27611

Site Number NCD059140764 Field Sample Number 4371

Name of Site TRAVENOL LABS INC Site Location McDOWELL COUNTY

Collected By BRUCE NICHOLSON ID# 59 Date Collected 3/28/89 Time ______

Type of Sample:

Environmental	Concentrate	Comments
✓ Groundwater (1)	___ Solid (5)	Sample No. 2
___ Surface Water (2)	___ Liquid (6)	Process Well #2
___ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
___ Arsenic		___ Arsenic		___ Silver	
___ Barium		___ Barium		___ Sulfates	
___ Cadmium		___ Cadmium		___ Zinc	
___ Chromium		___ Chloride		___ Ph	
___ Lead		___ Chromium		___ Conductivity	
___ Mercury		___ Copper		___ TDS	
___ Selenium		___ Fluoride		___ TOC	
___ Silver		___ Iron			
		___ Lead			
		___ Manganese			
		___ Mercury			
		___ Nitrate			
		___ Selenium			

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
___ P&T:GC/MS		___ EDB		___ Methoxychlor	
✓ Acid:B/N Ext.		___ PCB's		___ Toxaphene	
___ TOX		✓ Petroleum		___ 2,4-D	
		___ Endrin		___ 2,4,5-TP (silvex)	
		___ Lindane			

MICROBIOLOGY

Parameter
___ (MF) Coliform Colonies/100mls
___ (MPN) Coliform Colonies/100mls

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received 3-31-89 XB Date Reported ______

Date Extracted BNA 4-13-89 XB, aa, mw Date Analyzed BNA 4-18-89 BD

Reported By ______ Lab Number 900858

DHS 3191 (Revised 7/85)
Solid and Hazardous Waste (Review 7/87)

N. C. Department of Human Resources
Division of Health Services

SAMPLE ANALYSES REQUEST

State Laboratory of Public Health
P. O. Box 28047
306 N. Wilmington Street
Raleigh, 27611

Site Number NCD059140764 Field Sample Number 4372
Name of Site TRAVENOL LABS INC Site Location McDOWELL COUNTY
Collected By BRUCE NICHOLSON ID# 59 Date Collected 3/28/89 Time ______

Type of Sample:

Environmental	Concentrate	Comments
✓ Groundwater (1)	___ Solid (5)	Sample No. 2
___ Surface Water (2)	___ Liquid (6)	Process Well No. 2
___ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
___ Arsenic		___ Arsenic		___ Silver	
___ Barium		___ Barium		___ Sulfates	
___ Cadmium		___ Cadmium		___ Zinc	
___ Chromium		___ Chloride		___ Ph	
___ Lead		___ Chromium		___ Conductivity	
___ Mercury		___ Copper		___ TDS	
___ Selenium		___ Fluoride		___ TOC	
___ Silver		___ Iron			
		___ Lead			
		___ Manganese			
		___ Mercury			
		___ Nitrate			
		___ Selenium			

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
✓ P&T:GC/MS		___ EDB		___ Methoxychlor	
___ Acid:B/N Ext.		___ PCB's		___ Toxaphene	
___ TOX		___ Petroleum		___ 2,4-D	
		___ Endrin		___ 2,4,5-TP (silvex)	
		___ Lindane			

MICROBIOLOGY

Parameter
___ (MF) Coliform Colonies/100mls
___ (MPN) Coliform Colonies/100mls

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received 3-31-89 LB Date Reported ______
Date Extracted ______ Date Analyzed PT 5-2-89 nw
Reported By ______ Lab Number 900869

DHS 3191 (Revised 7/85)

N. C. Department of Human Resources
Division of Health Services

SAMPLE ANALYSES REQUEST

State Laboratory of Public Health
P. O. Box 28047
306 N. Wilmington Street
Raleigh, 27611

Site Number NCD059140764 Field Sample Number 4385

Name of Site TRAVENOL LABS INC Site Location McDOWELL COUNTY

Collected By BRUCE NICHOLSON ID# 59 Date Collected 3/28/89 Time ______

Type of Sample:

Environmental	Concentrate	Comments
[illegible] Groundwater (1)	___ Solid (5)	LAB BLANK
___ Surface Water (2)	___ Liquid (6)	
___ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
___ Arsenic		___ Arsenic		___ Silver	
___ Barium		___ Barium		___ Sulfates	
___ Cadmium		___ Cadmium		___ Zinc	
___ Chromium		___ Chloride		___ Ph	
___ Lead		___ Chromium		___ Conductivity	
___ Mercury		___ Copper		___ TDS	
___ Selenium		___ Fluoride		___ TOC	
___ Silver		___ Iron			
		___ Lead			
		___ Manganese			
		___ Mercury			
		___ Nitrate			
		___ Selenium			

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
✓ P&T:GC/MS		___ EDB		___ Methoxychlor	
___ Acid:B/N Ext.		___ PCB's		___ Toxaphene	
___ TOX		___ Petroleum		___ 2,4-D	
		___ Endrin		___ 2,4,5-TP (silvex)	
		___ Lindane			

MICROBIOLOGY

Parameter
___ (MF) Coliform Colonies/100mls
___ (MPN) Coliform Colonies/100mls

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received 3-31-89 &P Date Reported ______

Date Extracted ______ Date Analyzed PT 5-2-89 nw

Reported By ______ Lab Number 900870

DHS 3191 (Revised 7/85)

STATE LABORATORY OF PUBLIC HEALTH
DIVISION OF HEALTH SERVICES, N.C. DEPARTMENT OF HUMAN RESOURCES
P.O. BOX 28047 - 306 N. WILMINGTON, ST., RALEIGH, N.C. 27611

ORGANIC CHEMICAL ANALYSIS

BASE/NEUTRAL AND ACID EXTRACTABLES	LAB NO	900866	900868				
	FIELD #	4369	4371				
COMPOUND	TYPE	(1)	(1)	( )	( )	( )	( )
	UNITS	µg/l ~~µg/kg~~	µg/l ~~µg/kg~~	µg/l µg/kg	µg/l µg/kg	µg/l µg/kg	µg/l µg/kg
N-nitrosodimethylamine	10/330	U	U				
bis(2-chloroethyl)ether	↓	↓	↓				
2-chlorophenol							
phenol							
1,3-dichlorobenzene							
1,4-dichlorobenzene							
1,2-dichlorobenzene							
bis(2-chloroisopropyl)ether							
hexachloroethane							
N-nitroso-di-n-propylamine							
nitrobenzene							
isophorone							
2-nitrophenol							
2,4-dimethylphenol							
bis(2-chloroethoxy)methane							
2,4-dichlorophenol							
1,2,4-trichlorobenzene							
naphthalene							
hexachlorobutadiene							
4-chloro-m-cresol							
hexachlorocyclopentadiene							
2,4,6-trichlorophenol							
2-chloronaphthalene							
acenaphthylene							
dimethyl phthalate							
2,6-dinitrotoluene							
acenaphthene	↓						
2,4-dinitrophenol	50/1650						
2,4-dinitrotoluene	10/330						
4-nitrophenol	50/1650						
fluorene	10/330						
4-chlorophenylphenylether	↓						
diethyl phthalate							
4,6-dinitro-o-cresol	50/1650						
diphenylamine	↓						
azobenzene							
4-bromophenylphenylether	10/330						
hexachlorobenzene	10/330						
pentachlorophenol	50/1650						
phenanthrene	10/330						
anthracene	↓						
dibutyl phthalate							
fluoranthene	↓	↓	↓				
	MDL H_2O/SOIL						

J - Estimated value.
K - Actual value is known to be less than value given.
L - Actual value is known to be greater than value given.
U - Material was analyzed for but not detected. The number is the Minimum Detection Limit. MDL
NA - Not analyzed.
1/ - Tentative identification.
2/ - On NRDC List of Priority Pollutants.

N.C. Division of Health Services
DHS 3068-0 (4/86 Laboratory)

STATE LABORATORY OF PUBLIC HEALTH
DIVISION OF HEALTH SERVICES, N.C. DEPARTMENT OF HUMAN RESOURCES
P.O. BOX 28047 - 306 N. WILMINGTON, ST., RALEIGH, N.C. 27611

ORGANIC CHEMICAL ANALYSIS

BASE/NEUTRAL AND ACID EXTRACTABLES	LAB NO	900866	900868				
	FIELD #	4369	4371				
COMPOUND	TYPE	(1)	(1)	(.)	( )	( )	( )
	UNITS	(μg/l) ~~μg/kg~~	(μg/l) ~~μg/kg~~	μg/l μg/kg	μg/l μg/kg	μg/l μg/kg	μg/l μg/kg
pyrene	10/330	u	u				
benzidine	50/1650	↓	↓				
butyl benzyl phthalate	10/330						
benz(a)anthracene	↓						
chrysene	↓						
3,3-dichlorobenzidine	50/1650						
bis(2-ethylhexyl)phthalate	10/330						
di-n-octyl phthalate	10/330						
benzo(b)fluoranthene	50/1650						
benzo(k)fluoranthene	↓						
benzo(a)pyrene							
indeno(1,2,3-cd)pyrene							
dibenzo(a,h)anthracene							
benzo(g,h,i)perylene	↓	↓	↓				
aniline	50/1650	u	u				
benzoic acid	↓	↓	↓				
benzyl alcohol							
4-chloroaniline	↓						
dibenzofuran	10/330						
2-methylnaphthalene	↓						
2-methylphenol							
4-methylphenol	↓						
2-nitroaniline	50/1650						
3-nitroaniline	↓						
4-nitroaniline							
2,4,5-trichlorophenol	↓	↓	↓				
HYDROCARBONS	+/-	slight (+)	(-)				

MDL
H2O/SOIL

J - Estimated value.
K - Actual value is known to be less than value given.
L - Actual value is known to be greater than value given.
U - Material was analyzed for but not detected. The number is the Minimum Detection Limit. MDL
NA - Not analyzed.
1/ - Tentative identification.
2/ - On NRDC List of Priority Pollutants.

N.C. Division of Health Services
DHS 3068-0 (4/86 Laboratory)

STATE LABORATORY OF PUBLIC HEALTH
DIVISION OF HEALTH SERVICES, N.C. DEPARTMENT OF HUMAN RESOURCES
P.O. BOX 28047 - 306 N. WILMINGTON, ST., RALEIGH, N.C. 27611

ORGANIC CHEMICAL ANALYSIS

PURGEABLE COMPOUNDS	LAB NO	900867	900869	900870 (lab blank)			
	FIELD #	4370	4372	4385			
COMPOUND	TYPE	(1)	(1)	(4)	( )	( )	( )
	UNITS	(µg/l) µg/kg	(µg/l) µg/kg	(µg/l) µg/kg	µg/l µg/kg	µg/l µg/kg	µg/l µg/kg
chloromethane	5 ug/l	u	u	u			
bromomethane	↓	↓	↓	↓			
dichlorodifluoromethane							
vinyl chloride							
chloroethane							
methylene chloride							
trichlorofluoromethane		↓					
ethene, 1,1-dichloro		trace					
ethane, 1,1-dichloro-		2J					
1,2-trans-dichloroethene		u					
chloroform		trace					
ethane, 1,2-dichloro-		u					
ethane, 1,1,1-trichloro-		1J					
carbontetrachloride		u					
bromodichloromethane		↓					
propane, 1,2-dichloro-							
1,3-trans-dichloropropene							
trichloroethylene							
chlorodibromomethane							
benzene							
ethane, 1,1,2-trichloro-							
1,3-cis-dichloropropene							
2-chloroethyl vinyl ether							
bromoform							
ethane, 1,1,2,2-tetrachloro-							
ethene, tetrachloro-							
toluene							
chlorobenzene							
ethylbenzene	↓	↓	↓	↓			
acetone	5 ug/l	u	u	u			
2-butanone	↓	↓	↓	↓			
carbondisulfide							
2-hexanone							
4-methyl-2-pentanone							
styrene							
vinyl acetate							
xylenes (total)	↓	↓	↓	↓			

J - Estimated value.
K - Actual value is known to be less than value given.
L - Actual value is known to be greater than value given.
U - Material was analyzed for but not detected. The number is the Minimum Detection Limit.
NA - Not analyzed.
1/ - Tentative identification.
2/ - On NRDC List of Priority Pollutants.

N.C. Division of Health Services
DHS 3068-O (4/86 Laboratory)

DIVISION OF HEALTH SERVICES
SOLID AND HAZARDOUS WASTE MANAGEMENT SERVICE

Chain of Custody Record

Hazardous Waste Materials

Location of Sampling: ___ Generator ___ Transporter ___ Treatment Facility
___ Storage Facility ___ Disposal Facility ___ Landfill
✓ Other: CERCLIS SITE

Company's Name Travenol Labs (Currently Baxter) Telephone (704) 756-4151

Address US Hwy 221 N. Marion NC 28752

Collector's Name [signature] Telephone (919) 733-2801
signature

Date Sampled 3/28/89 Time Sampled ______

Type of Process Generating Waste Mixed Paint Shop & Laboratory Waste Solvents

Field Information

~~INORGANIC SAMP~~

Groundwater samples for Inorganic Analysis

Field Sample No. 3271 3272

Chain of Possession:

1. [signature] — Environmental Engineer — 3/28/89 - 3/31/89
signature — title — inclusive dates

2. Paul J. Childers — Chemist — 3/31/89
signature — title — inclusive dates

3. ______ — ______ — ______
signature — title — inclusive dates

Results reported

______ — ______ — ______
signature — title — date

Instructions: Complete all applicable information including signatures, and submit with analysis request forms.

N. C. Department of Human Resources
Division of Health Services

SAMPLE ANALYSES REQUEST

State Laboratory of Public Health
P. O. Box 28047
306 N. Wilmington Street
Raleigh, 27611

Site Number NCD059140764 Field Sample Number 3271

Name of Site TRAVENOL LABS INC Site Location McDOWELL COUNTY

Collected By BRUCE NICHOLSON ID# 59 Date Collected 3/28/89 Time ______

Type of Sample:

Environmental	Concentrate	Comments
✓ Groundwater (1)	___ Solid (5)	Sample No. 1
___ Surface Water (2)	___ Liquid (6)	Monitoring Well #1
___ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

RECEIVED
APR
SUPERFUND BRANCH
SOLID WASTE MANAGEMENT SECTION

INORGANIC CHEMISTRY

Extractables		To			
Parameter	**Results mg/1**	**Parameter**	**Results mg/1**	**Parameter**	**Results mg/1**
___ Arsenic		✓ Arsenic	<0.01	✓ Silver	<005
___ Barium		___ Barium		___ Sulfates	
___ Cadmium		✓ Cadmium	<0.005	___ Zinc	
___ Chromium		___ Chloride		___ Ph	
___ Lead		✓ Chromium	0.02	___ Conductivity	
___ Mercury		___ Copper		___ TDS	
___ Selenium		___ Fluoride		___ TOC	
___ Silver		___ Iron			
		✓ Lead	0.04		
		___ Manganese			
		✓ Mercury	<0.0002		
		___ Nitrate			
		✓ Selenium	<0.005		

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
___ P&T:GC/MS		___ EDB		___ Methoxychlor	
___ Acid:B/N Ext.		___ PCB's		___ Toxaphene	
___ TOX		___ Petroleum		___ 2,4-D	
		___ Endrin		___ 2,4,5-TP (silvex)	
		___ Lindane			

MICROBIOLOGY

Parameter
___ (MF) Coliform Colonies/100mls
___ (MPN) Coliform Colonies/100mls

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received ______ Date Reported 4/19/89

Date Extracted ______ Date Analyzed ______

Reported By ______ Lab Number 00003 APR 4 07

N. C. Department of Human Resources
Division of Health Services

SAMPLE ANALYSES REQUEST

State Laboratory of Public Health
P. O. Box 28047
306 N. Wilmington Street
Raleigh, 27611

Site Number NCD059140764 Field Sample Number 3272

Name of Site TRAVENOL LABS INC Site Location McDOWELL [illegible]

Collected By BRUCE NICHOLSON ID# 59 Date Collected 3/28/89 Time

Type of Sample:

Environmental	Concentrate	Comments
✓ Groundwater (1)	Solid (5)	Sample No. 2
Surface Water (2)	Liquid (6)	Process Well [illegible]
Soil (3)	Sludge (7)	
Other (4)	Other (8)	

RECEIVED APR 20 1989 SUPERFUND BRANCH SOLID WASTE MANAGEMENT SECTION

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
Arsenic		✓ Arsenic	<0.01	✓ Silver	<0.05
Barium		Barium		Sulfates	
Cadmium		✓ Cadmium	<0.005	Zinc	
Chromium		Chloride		Ph	
Lead		✓ Chromium	<0.01	Conductivity	
Mercury		Copper		TDS	
Selenium		Fluoride		TOC	
Silver		Iron			
		✓ Lead	<0.03		
		Manganese			
		✓ Mercury	<0.0002		
		Nitrate			
		✓ Selenium	<0.005		

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
P&T:GC/MS		EDB		Methoxychlor	
Acid:B/N Ext.		PCB's		Toxaphene	
TOX		Petroleum		2,4-D	
		Endrin		2,4,5-TP (silvex)	
		Lindane			

MICROBIOLOGY

Parameter
(MF) Coliform Colonies/100mls
(MPN) Coliform Colonies/100mls

RADIOCHEMISTRY

Parameter	Results PCi/1
Gross Alpha	
Gross Beta	

Date Received Date Reported 4/19/89

Date Extracted Date Analyzed

Reported By Lab Number UC664 [illegible]

DHS 3191 (Revised 7/85)

APPENDIX C
References

REFERENCES

1. Notification of An Inactive Hazardous Substance or Waste Disposal Site. Mr. Phil Castro, Baxter Healthcare Corporation, to Mr William Meyer, NC Solid Waste Management Section. March 8, 1989.

2. Telecon. Bruce Nicholson, NC Superfund Branch, with Phil Castro, Baxter Healthcare Corporation. July 31, 1989.

3. Letter and Attachments. Mr. Charles H. Lee, Ecology and Environment, to Mr. R. D. Stonebraker, U.S. EPA Region IV. April 19, 1982. North Carolina Cercla 103(c) Site Inspections.

4. Preliminary Assessment Report. Ms. Cheryl McMorris, NC Superfund Branch, to Ms. Denise Bland, U.S. EPA Region IV. June 4, 1986.

5. Site Sampling Visit Trip Report. Mr. Bruce Nicholson, NC Superfund Branch, to Ms. Denise Bland, U.S. EPA Region IV. April 4, 1989.

6. Telecon. Ms. Cheryl McMorris, NC Superfund Branch, with Mr. Keith Masters, NC Solid and Hazardous Waste Management Branch. April 15, 1986.

7. Hazardous Waste Database, NC Solid and Hazardous Waste Management Branch Alphabetical Listing of Hazardous Waste Facilities Excluding Small Generators. July 14, 1989.

8. United States Geological Survey Topographic Quadrangles (7.5 Minute Series). Little Switerland, 1979; Ashford, 1956; Spruce Pine, 1978; and Linville Falls, 1956.

9. 1983 Warehouse Expansion Blueprint. Travenol Laboratories Inc., November 10, 1983.

10. Memorandum. Ms. Pat DeRosa, NC Superfund Branch, to American Thread Company/Sevier Plant File. July 17, 1989. Discussion of Surface and ground water systems in the Marion Area.

11. Geology and Ground-Water Resources of the Morganton Area, North Carolina, Ground Water Bulletin No. 12. North Carolina Department of Water Resources, Raleigh, NC. March 1967.

12. Geologic Map of North Carolina. Department of Natural Resources and Community Development. Compiled by the North Carolina Geological Survey, 1985.

References-con't.

13. <u>North Carolina Atlas, Portrait of a Changing Southern State</u>. University of North Carolina Press, Chapel Hill, NC. 1975.

14. Rainfall Frequency Atlas of the United States. Technical Paper No. 40, U.S. Department of Commerce, Washington, DC, 1963.

15. North Carolina State Government Statistical Abstract, 5th Edition. North Carolina State Data Center, Raleigh, NC. 1984.

16. Community and Noncommunity Public Water Supply Database. NC Public Water Supply Branch. July 17, 1989.

17. Letter and Attachments. Mr. Warren T. Parker, U.S. Fish and Wildlife Service, to Ms. Pat DeRosa, NC Superfund Branch. June 21, 1985. Endangered Species and Critical Habitats in North Carolina.

18. <u>Dangerous Properties of Industrial Materials</u>, 6th edition. N. I. Sax. Van Nostrand Rheinhold Company, 1984.

19. Classifications and Water Quality Standards Assigned to the Waters of the Catawba River Basin. NC Department of Natural Resources and Community Development, Raleigh, NC. June 30, 1989.

Parenterals Division

Baxter Healthcare Corporation
P.O. Box 1390
Marion, North Carolina 28752

704.756.4151

Ref. 1

Baxter/
Travenol

March 8, 1988

Superfund Unit
Division of Health Services
P.O. Box 2091
Raleigh, N.C. 27602-2091

Dear Mr. William Meyer:

Attached are Sections A and B, Notification of An Inactive Hazardous Substance or Waste Disposal Site as required by the North Carolina General Statutes Section 130A-310.1(b).

If you have any questions, please call 704-756-4151.

Sincerely,

Phil Castro

Phil Castro
Environmental Manager

N.C. Department of Human Resources
Division of Health Services

For Agency Use Only
SITE # S1S560100046

SECTION A

NOTIFICATION OF AN INACTIVE HAZARDOUS SUBSTANCE OR WASTE DISPOSAL SITE

North Carolina General Statutes Section 130A-310 provides for protection of the public from inactive hazardous substance or waste disposal sites. Notification information, required by North Carolina General Statutes Section 130A-310.1(b) must be submitted to:

Superfund Unit
Division of Health Services
P.O. Box 2091
Raleigh, NC 27602-2091

RECEIVED MAR 1 1 SUPERFUND BRANCH SOLID WASTE MANAGEMENT SECTION

Please read instructions before completing.

Please type or print in black ink.

A. SITE NAME AND PERSON REQUIRED TO NOTIFY:

1. Site Name (One site per form): Baxter Healthcare Corporation (formerly Travenol Laboratories, Inc.)

2. Person Completing Form:
   Name: Philip K. Castro
   Mailing Address: Baxter Healthcare Corporation, P.O. Box 1390
   City: Marion State: NC Zip Code: 28752
   Telephone: (704) 756-4151

   Present Owner [X]
   Past Owner [ ]
   Present Operator [ ]
   Past Operator [ ]
   Other [ ]
   (*specify*) ____

3. Present Owner:
   Name: Baxter Healthcare Corporation
   Mailing Address: P.O. Box 1390
   City: Marion State: NC Zip Code: 28752
   Telephone: (704) 756-4151

   Corporation [X]
   Partnership [ ]
   Individual [ ]
   Other Responsible Party [ ]
   (*specify*) ____

4. Other: N/A
   Mailing Address: ____
   City: ____ State: ____ Zip Code: ____
   Telephone: ( )

   Past Owner [ ]
   Present Operator [ ]
   Past Operator [ ]
   Other Responsible Party [ ]
   (*specify*) ____

5. Other: N/A
   Mailing Address: ____
   City: ____ State: ____ Zip Code: ____
   Telephone: ( )

   Past Owner [ ]
   Present Operator [ ]
   Past Operator [ ]
   Other Responsible Party [ ]
   (*specify*) ____

Site Name Baxter Healthcare Corporation

B. SITE LOCATION:

1. Street or Route Address Hwy. 221 North
   City or Town Marion, N.C. 28752
   County McDowell

2. Directions to the Site *(Use state road numbers where possible.)*

   Highway 221 North of Marion exit on Pitt Station Road (1573), turn into Baxter entrance. Site was located behind the plant, southeast corner.

3. Attach a Department of Transportation map or a USGS map showing the location of the site or facility. Label the map with the site name. Attachment I

4. Check the appropriate description of the area surrounding the site. *(More than one may apply.)*

   - [ ] Residential
   - [X] Industrial
   - [ ] Forest Land
   - [ ] Business
   - [ ] Pasture Land
   - [X] Farm Land
   - [ ] Other *(specify)* ______

C. TYPE AND YEARS OF OPERATION:

1. Type of Operation Disposal of solvents — [ ] Present [X] Past
   Standard Industrial Classification Code (SIC) 2834
   Years of Operation (Dates) from 06/72 to 12/77

2. Type of Operation ______ — [ ] Present [ ] Past
   Standard Industrial Classification Code (SIC) ______
   Years of Operation (Dates) from __/__ to __/__

3. Type of Operation ______ — [ ] Present [ ] Past
   Standard Industrial Classification Code (SIC) ______
   Years of Operation (Dates) from __/__ to __/__

D. ENVIRONMENTAL PERMIT HISTORY:

If no environmental permit has been issued, check "None" for each type of permit. Complete for each of the following.

Type of Permit	None	Permit Number	Date Issued	Expiration Date	Comments
1. NPDES	[ ]	NC0006564	0 /72	05/89	
2. Air	[ ]	1915R7	03/72	06/90	
3. RCRA	[X]		__/__	__/__	
4. RCRA interim status	[X]		__/__	__/__	
5. State	[X]		__/__	__/__	
a. Non-discharge	[X]		__/__	__/__	
b. High productivity well	[ ]	See attached sheet - Attachment II			
c. Other *(specify)* ______	[X]		__/__	__/__	
6. Local *(specify)* ______	[X]		__/__	__/__	
7. Other *(specify)* ______	[ ]	NCD059140764 ID	__/__	__/__	

EPA notification of hazardous waste activity.

Site Name Baxter Healthcare Corporation

E. CURRENT ENVIRONMENTAL PERMITS:

If no environmental permit has been issued, check "None" for each type of permit. Complete for each of the following.

Type of Permit	None	Permit Number	Date Issued	Expiration Date	Comments
1. NPDES	☐	NC0006564	10/87	05/89	
2. Air	☐	1915R7	11/87	06/90	
3. RCRA	☒		__/__	__/__	
4. RCRA interim status	☒		__/__	__/__	
5. State	☒		__/__	__/__	
a. Non-discharge	☒		__/__	__/__	
b. High productivity well	☐	See Attachment II	__/__	__/__	
c. Other (*specify*) ____	☐		__/__	__/__	
6. Local (*specify*) ____	☒		__/__	__/__	
7. Other (*specify*) ____	☒	NCD059140764	__/__	__/__	

EPA Notification of Hazardous Waste Activity

F. KNOWN OR SUSPECTED RELEASE OF HAZARDOUS SUBSTANCE OR WASTE TO THE ENVIRONMENT:

(More than one may apply.)

Environmental Media	Known	Suspected	Date of Known or Suspected Release	Likely	Unlikely	None	Comments
1. Groundwater	☐	☐	__/__	☐	☐	☐	
2. Surface water	☐	☐	__/__	☐	☐	☐	
3. Surface soil	☐	☒	1972/1977	☒	☐	☐	Solvents evaporated
4. Subsurface soil	☐	☒	1972/1977	☐	☒	☐	
5. Air	☐	☒	1972/1977	☒	☐	☐	

G. PHYSICAL STATE OF HAZARDOUS SUBSTANCE OR WASTE AS DEPOSITED: *(More than one may apply.)*

1. ☐ Solid
2. ☐ Powder
3. ☒ Liquid
4. ☐ Sludge
5. ☐ Non-Containerized Gas
6. ☐ Containerized Gas
7. ☐ Other (*describe*) ________

H. HAZARDOUS SUBSTANCE OR WASTE DISPOSAL AND STORAGE METHOD: *(More than one may apply.)*

1. ☐ Piles
2. ☒ Land treatment
3. ☐ Landfill
4. ☐ Tanks, underground
5. ☐ Tanks, above ground
6. ☐ Septic tanks
7. ☐ Impoundment
8. ☐ Underground injection
9. ☐ Drums, above ground
10. ☐ Drums, above ground, in open
11. ☐ Drums, below ground
12. ☐ Other (*specify*) ________

I. HAZARDOUS SUBSTANCE OR WASTE TYPE USED OR DISPOSED ON SITE: *(More than one may apply.)*

1. ☐ Organics
2. ☐ Inorganics
3. ☒ Solvents
4. ☐ Pesticides
5. ☐ Heavy metals
6. ☐ Acids
7. ☐ Bases
8. ☐ PCBs
9. ☐ Mixed municipal waste
10. ☐ Unknown
11. ☐ Other (*specify*) ________

Site Name Baxter Healthcare Corporation

J. HAZARDOUS SUBSTANCE OR WASTE QUANTITY: *(More than one may apply.)*

1. Pounds:
   - [ ] less than 10 pounds
   - [ ] 10 pounds or more, but less than 100 pounds
   - [X] 100 pounds or more, but less than 1000 pounds
   - [ ] 1000 pounds or more
   - [ ] Unknown

2. Drums: N/A
   - [ ] less than 10 drums
   - [ ] 10 drums or more, but less than 100 drums
   - [ ] 100 drums or more, but less than 1000 drums
   - [ ] 1000 drums or more
   - [ ] Unknown

3. Cubic Feet:
   - [ ] less than 10 cubic feet
   - [ ] 10 cubic feet or more, but less than 100 cubic feet
   - [ ] 100 cubic feet or more, but less than 1000 cubic feet
   - [ ] 1000 cubic feet or more
   - [X] Unknown

4. Gallons:
   - [ ] less than 10 gallons
   - [ ] 10 gallons or more, but less than 100 gallons
   - [X] 100 gallons or more, but less than 1000 gallons
   - [ ] 1000 gallons or more
   - [ ] Unknown

5. Total area of site:
   - [X] less than 1 acre est. 1500 ft^2
   - [ ] 1 acre or more, but less than 5 acres
   - [ ] 5 acres or more, but less than 10 acres
   - [ ] 10 acres or more
   - [ ] Unknown

K. SOURCE OF HAZARDOUS SUBSTANCE OR WASTE USED OR DISPOSED ON SITE:

(More than one may apply)

	Used On Site	On-Site Disposal	Off-Site Disposal
1. Mining	[ ]	[ ]	[ ]
2. Construction	[ ]	[ ]	[ ]
3. Textiles	[ ]	[ ]	[ ]
4. Fertilizer	[ ]	[ ]	[ ]
5. Paper/printing	[ ]	[ ]	[ ]
6. Leather tanning	[ ]	[ ]	[ ]
7. Iron/steel foundry	[ ]	[ ]	[ ]
8. Chemical, general	[ ]	[ ]	[ ]
9. Plating/polishing	[ ]	[ ]	[ ]
10. Military/ammunition	[ ]	[ ]	[ ]
11. Electrical conductors	[ ]	[ ]	[ ]
12. Transformers	[ ]	[ ]	[ ]
13. Utility companies	[ ]	[ ]	[ ]
14. Sanitary/refuse	[ ]	[ ]	[ ]
15. Photo finish	[ ]	[ ]	[ ]
16. Lab/hospital	(1) [X]	[X]	[ ]
17. Wood treating	[ ]	[ ]	[ ]
18. Battery reclamation	[ ]	[ ]	[ ]
19. Pesticides formulation, packaging and/or distribution	[ ]	[ ]	[ ]
20. Herbicide formulation, packaging and/or distribution	[ ]	[ ]	[ ]
21. Other Agrichemical formulation, packaging and/or distribution	[ ]	[ ]	[ ]
22. Dry cleaning	[ ]	[ ]	[ ]
23. Petrochemical processing or refining	[ ]	[ ]	[ ]
24. Unknown	[ ]	[ ]	[ ]
25. Other (*specify*) Paint solvents	(1) [X]	[X]	[ ]

(1) Approximately 440 gallon of paint solvent and small amounts of lab solvents were poured on a gravel drive and allowed to evaporate. Practice discontinued in 1977.

Site Name Baxter Healthcare Corporation

L. SPECIFIC HAZARDOUS SUBSTANCE OR WASTE COMPOUNDS ASSOCIATED WITH THE SITE, IF KNOWN: *(More than one may apply.)*

	Waste Compounds/ Substances	Generated On Site	Off-Site Disposal	On-Site Disposal
1.	Paint Solvents	[X]	[ ]	[X]
2.	Nitrobenzene	[X]	[ ]	[X]
3.	Pyridine	[X]	[ ]	[X]
4.		[ ]	[ ]	[ ]
5.		[ ]	[ ]	[ ]
6.		[ ]	[ ]	[ ]

M. ACCESSIBILITY OF SITE: *(More than one may apply.)*

1. [X] Security guard
2. [X] Physical barrier (steep bank, creek, walls, etc.)
   Describe physical barriers Site was a graveled drive between a storage building and a clay bank.
3. [ ] Site completely surrounded by fence
4. [X] Site partially surrounded by fence
5. [X] Locked gate
6. [ ] Unlocked gate
7. [ ] No control of access to site
8. [ ] Other *(specify)* ______

N. REMEDIAL ACTION: *(More than one may apply.)* Site was reported 6/9/81 in a memo to: U.S. Environmental Protection Agency, Region IV, Sites Notification, Atlanta, GA. 30308.

1. [X] No environmental action
2. [ ] Environmental study
3. [X] Remedial action

The practice of disposing of solvent on a graveled drive was discontinued in 1977. The drive was improved and paved.

O. AVAILABILITY OF ANALYTICAL MONITORING DATA:

Is analytical monitoring data for the site available?

[ ] YES [X] NO

IF YES: check the appropriate box to indicate the purpose for which the data was collected. *(More than one may apply.)*

- [ ] CERCLA
- [ ] RCRA
- [ ] Remedial Action
- [ ] Environmental Audit
- [ ] Other *(specify)* ______

IF DATA WAS COLLECTED: FIRST COMPLETE SECTION P. CERTIFICATION AND SIGNATURE ON THE NEXT PAGE AND THEN COMPLETE DHS 3525, SECTION B SITE DATA ADDENDUM NOTIFICATION OF AN INACTIVE HAZARDOUS SUBSTANCE OR WASTE DISPOSAL SITE.

Site Name Baxter Healthcare Corporation

P. CERTIFICATION AND SIGNATURE:

I certify that to the best of my knowledge and belief, the information supplied on this form is complete and accurate.

Signature Philip Castro Date 3/8/88

Name and Title (*Type or print*) Philip K. Castro -

Mailing Address Baxter Healthcare Corporation

P.O. Box 1390, Marion, N.C. 28752

NORTH CAROLINA

McDOWELL County

I, RICHARD R. BIDDIX, a Notary Public for said County and State, do hereby certify that PHILIP K. CASTRO personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal, this the 8 day of MARCH, 19 88

(Official Seal)

Richard R. Biddix
Notary Public

My commission expires 9-24, 19 91

N.C. Department of Human Resources
Division of Health Services

For Agency Use Only
SITE # S1S5601 00046

SECTION B

SITE DATA ADDENDUM FOR AN INACTIVE HAZARDOUS SUBSTANCE OR WASTE DISPOSAL SITE

North Carolina General Statutes Section 130A-310 provides for protection of the public from inactive hazardous substance or waste disposal sites. Notification information and site data, required by North Carolina General Statutes Section 130A-310.1(b) must be submitted to:

Superfund Unit
Division of Health Services
P.O. Box 2091
Raleigh, NC 27602-2091

Please read instructions before completing.

Please type or print in black ink.

A. SITE NAME AND PERSON REQUIRED TO NOTIFY:

1. Site Name Baxter Healthcare Corporation (formerly Travenol Laboratories, Inc.)
(One site per form)

2. Person Completing Form:
Name Philip Castro
Mailing Address P.O. Box 1390
City Marion State NC Zip Code 28752
Telephone (704-) 756-4151

Present Owner [X]
Past Owner [ ]
Present Operator [ ]
Past Operator [ ]
Other [ ]
(*specify*)

3. Present Owner:
Name Baxter Healthcare Corporation
Mailing Address P.O. Box 1390
City Marion State NC Zip Code 28752
Telephone (704-) 756-4151

Corporation [X]
Partnership [ ]
Individual [ ]
Other [ ]
(*specify*)

B. SITE LOCATION:

Street or Route Address Hwy. 221 North
City or Town Marion, N.C. 28752
County McDowell

Site Name Baxter Healthcare Corporation

C. ON-SITE WATER AND SEWER:

1. Wastewater Management

Does the site currently have an on-site wastewater management system? [XX] YES [ ] NO

Has the site previously had an on-site wastewater management system? [XX] YES [ ] NO [ ] UNKNOWN

If there is a past or present on-site wastewater treatment system, check all appropriate boxes below to describe the wastewater treatment system used at the facility. Indicate the dates of operation for each wastewater treatment system. More than one system may apply. Complete for all on-site systems, both past and present.

	Process Wastewater		Sanitary Wastewater		Dates of Operation	
	Yes	No	Yes	No	Beginning	Ending
Municipal	[ ]	[ ]	[ ]	[ ]	__/__	__/__
Pretreatment						
a. With sludge generation	[ ]	[ ]	[ ]	[ ]	__/__	__/__
b. Without sludge generation	[ ]	[ ]	[ ]	[ ]	__/__	__/__
On-site wastewater disposal						
a. Drainfield	[ ]	[ ]	[ ]	[ ]	__/__	__/__
b. Septic tank	[ ]	[ ]	[ ]	[ ]	__/__	__/__
c. Land Application	[ ]	[ ]	[ ]	[ ]	__/__	__/__
Biological treatment	[X]	[ ]	[X]	[ ]	06/72	Present
Discharge to surface water	[ ]	[ ]	[ ]	[ ]	__/__	__/__

Name of surface water North Fork Catawaba River

NPDES # NC0006564

2. Water Supply Source

Does the site now have or has it in the past had a water system? [XX] YES [ ] NO

If yes, complete the following:

	Groundwater		Surface Water		Dates of Operation	
	Yes	No	Yes	No	Beginning	Ending
Municipal or County ____	[ ]	[ ]	[ ]	[ ]	__/__	__/__
Community ____	[ ]	[ ]	[ ]	[ ]	__/__	__/__
Non-Community ____	[X]	[ ]	[ ]	[X]	06/72	__/__

If surface water source is used, name of the body of water ____

Provide the use of the surface water: [ ] Potable [ ] Production [ ] Cooling [ ] Fire protection [ ] Irrigation [ ] Other (*specify*) ____

Attach a facility or local map with intake point marked for private or on-site surface water sources. Label the map with the site name.

Site Name Baxter Healthcare Corporation

D. ON-SITE WELLS:

Does the site now have or has it in the past had any on-site wells? [XX] YES [ ] NO
If yes, complete the following:

1. Attach a facility or site map showing the location of all on-site wells. Label the attachment: "D. 1. On-Site Wells".

2. Total number of on-site wells: 6

3. For each on-site well, provide the following information:

   a. Label the corresponding well on the map required in D. 1.: ______
   b. Presently used? [XX] YES [ ] NO
   c. If not presently in use, give year abandoned: See Attachment II
   d. Type of well: [ ] Monitoring [ ] Injection [X] Production [X] Fire Protection [ ] Cooling [ ] Irrigation [X] Potable [ ] Other (*specify*) ______
   e. Permitted well? [XX] YES [ ] NO
      Permit Number See Attachment II for Items e-k
   f. Type of construction: ______
   g. Date installed: ______
   h. Depth of well: ______ ft.
   i. Size (diameter): ______ inches
   j. Depth to static water level: ______ ft.
   k. Has laboratory analysis ever indicated ground water contamination? [ ] YES [XX] NO

   Additional Section B, Part D. 3. forms are available.

E. CLOSEST OFF-SITE WELL

Provide the following information for the closest currently used off-site well within a one-mile radius of the site, where such information is known to you:

1. Owner McDowell County Schools
2. Location Address North Cove Schools
3. City Marion, N.C. 28752
4. Show the location of the well on a map of the area. Label the attachment: "E. 4. Off-Site Well".

F. ANALYTICAL MONITORING DATA

Complete for any monitoring which has been done at the site.

1. Groundwater — Has groundwater monitoring been conducted at the site? [ ] YES [XX] NO
   If yes, complete the following:

	Date	Method	Method Number	Compounds Detected	Level
a. Organics					
(1) Purgeables					
(2) Base Neutrals/Acid					
(3) PCB					
(4) Pesticides/Herbicides					
(5) Other					
b. Inorganics					

Laboratory performing analyses: ______
Does the laboratory have EPA contract laboratory status? [ ] YES [ ] NO

ATTACHMENT III

D.I. ON SITE WELLS

ATTACHMENT II

ON SITE WELL INFORMATION

A	B	C	D	E	F	H	I	J
Well #	Year Abandoned	Type Well	Permit Number	Type Construction	Date Installed	Depth Well	Size Diameter	Depth Static
1	N/A	Production	433	Open End	4/28/71	480'	8"	10'6"
2	N/A	Production	434	Open End	4/28/71	525'	8"	10'9 1/2"
3	N/A	Production	435	Open End	4/28/71	300'	6"	9'
4	N/A	Production	464	Open End	7/20/71	450'	8"	36'
4a	N/A	Production	400	Open End	2/11/71	350'	6"	11'3"
5	N/A	Production	1374	Open End	9/7/73	230'	8"	11'6"
6	8/19/81	Production	55-0069-WC-0020	Open End	8/31/79	210'	10"	28'6"
6	N/A	Production	55-0069-WC-0021	Open End	6/4/81	400'	8"	11'
7	N/A	Production	55-0069-WC-0024	Open End	(Construction) (12/17/84)	254'	6"	13'
8	N/A	N/A	55-0069-WC-0024	Open End	N/A	- Never Drilled -		
9	N/A	Production	55-0069-WS-0028	Open End	(Construction) (9/3/86)	289'	10"	23'
Test Wells Site #1	6/11/81	Test	55-0069-WC-0021					
Hole 5	6/11/81	Test	55-0069-WC-0021					
Hole 2	6/11/81	Test	55-0069-WC-0021					
Between Wells 3 & 4	6/11/81	Test	55-0069-WC-0021					
Hole 3	6/11/81	Test	55-0069-WC-0021					
J79Y5 Test Well A	5/2/83	Monitoring	(Dept. of Natural & Economic Resources)					
Test Well B	1/3/80	Monitoring	(Dept. of Natural & Economic Resources)					

ATTACHMENT IV

E.4. OFF-SITE WELL

Site Name Baxter Healthcare Corporation

2. Surface Water — Has surface water monitoring been conducted at the site? [ ] YES [XX] NO

If yes, complete the following:

	Date	Method	Method Number	Compounds Detected	Level
a. Organics					
(1) Purgeables					
(2) Base Neutrals/Acid					
(3) PCB					
(4) Pesticides/Herbicides					
(5) Other					
b. Inorganics					

Laboratory performing analyses: ______

Does the laboratory have EPA contract laboratory status? [ ] YES [ ] NO

3. Soil — Has soil testing been conducted at the site? [ ] YES [XX] NO

If yes, complete the following:

	Date	Method	Method Number	Compounds Detected	Level
a. Organics					
(1) Purgeables					
(2) Base Neutrals/Acid					
(3) PCB					
(4) Pesticides/Herbicides					
(5) Other					
b. Inorganics					

Laboratory performing analyses: ______

Does the laboratory have EPA contract laboratory status? [ ] YES [ ] NO

4. Air — Has air monitoring been conducted at the site? [ ] YES [XX] NO

If yes, complete the following:

	Date	Method	Method Number	Compounds Detected	Level
a. Organics					
b. Inorganics					
c. Particulates					
d. Visible Emissions					
e. Ambient Air Monitoring					
f. Other					

Laboratory performing analyses: ______

Does the laboratory have EPA contract laboratory status? [ ] YES [ ] NO

G. CLEANUP ACTIONS

Describe briefly any cleanup activities at the site and attach a map showing cleanup activities. Label the map with the site name.

Practive of pouring small volumes of solvents on the gravel drive was terminated in 1977. The drive was then paved.

Site Name Baxter Healthcare Corporation

List documents related to cleanup actions including, but not limited to, work plans, cleanup action plans, and remedial action plans.

Document Date	Document Name	Purpose of Document

H. RECORDATION

Is the location/existence of the disposal site recorded in the register of deeds' office in the county or counties in which the land is located? ☐ YES ☒ NO

If yes, date of recordation: ______

I. CERTIFICATION AND SIGNATURE:

I certify that to the best of my knowledge and belief, the information supplied on this form is complete and accurate.

Signature *Philip Castro* Date 3/8/88

Name and Title (*Type or print*) Philip Castro Environmental Manager

Mailing Address P.O. Box 1390
Marion, N.C. 28752

NORTH CAROLINA

McDowell County

I, Richard R. Biddix, a Notary Public for said County and State, do hereby certify that Philip K. Castro personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

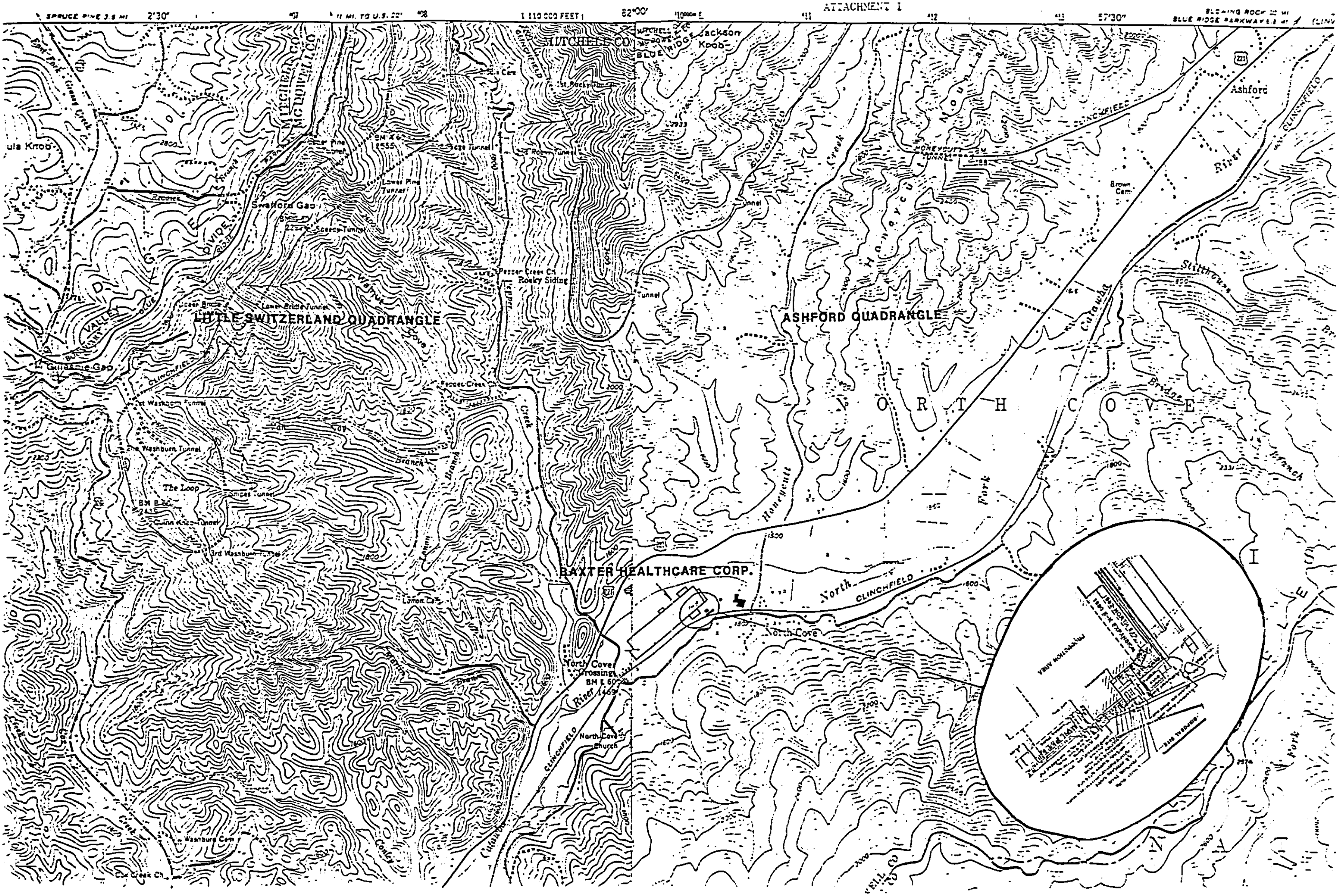
Witness my hand and official seal, this the 8 day of March, 19 88

(*Official Seal*)

Richard R. Biddix
Notary Public

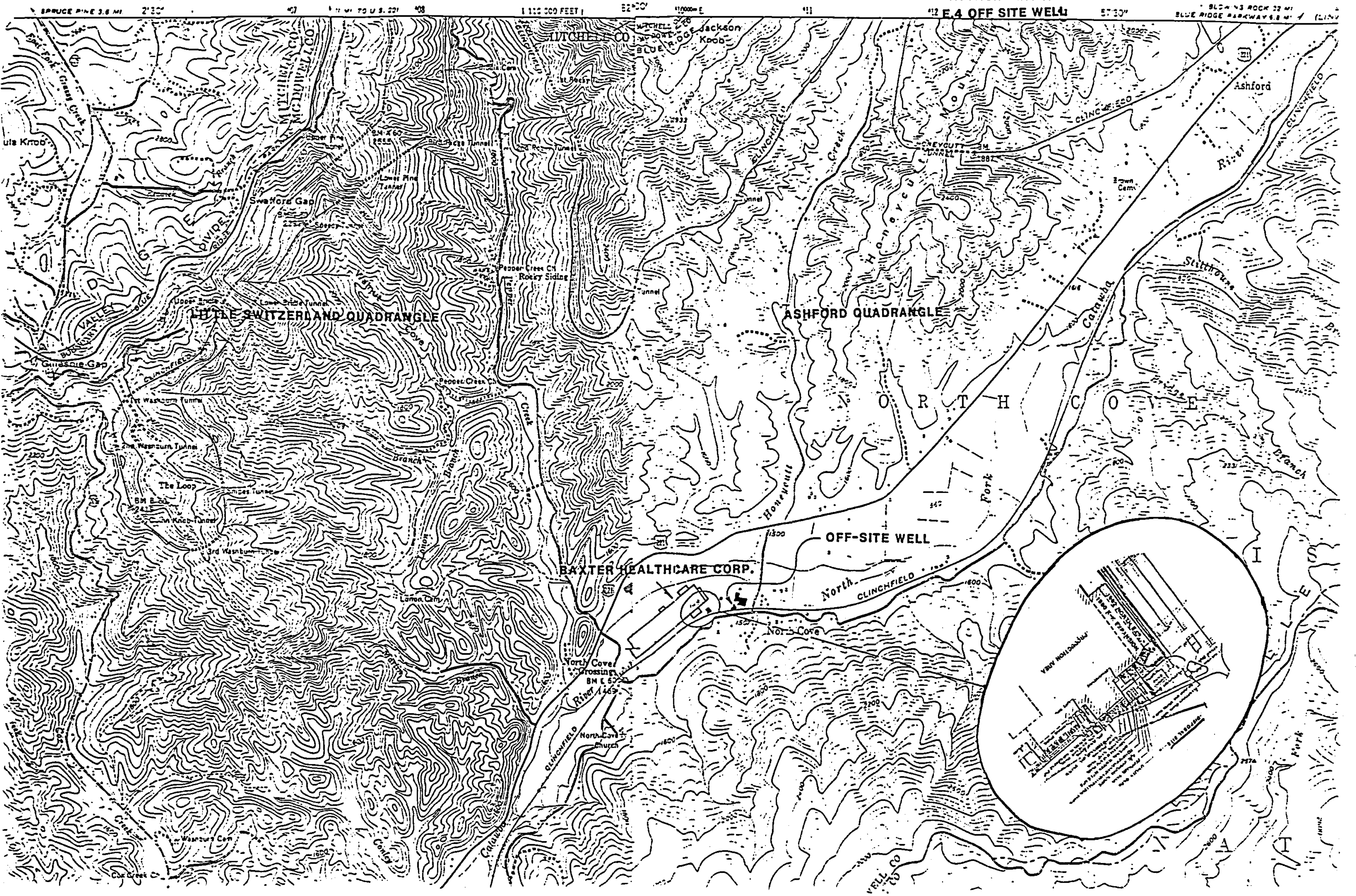
My commission expires 9/24, 19 91

ATTACHMENT I



ATTACHMENT IV

E.4 OFF SITE WELL



July 31, 1989

To: Travenol Labs File
From: Bruce Nicholson

Subj: Telecon with Mr. Phil Castro, Baxter Healthcare Corporation, Marion, North Carolina, (704)756-4151.

Mr. Castro supplied the following additional information concerning the Travenol plant:

The plant has been owned by the same company since it was built in 1972, but the name of that company has changed ov the years. The original name was Travenol Laboratories, Inc. The name became Baxter-Travenol in 1972 for approximately 2 months then the name reverted to Travenol Laboratories once again. The name remained unchanged until 1987 when Travenol Laboratories became Baxter Healthcare Corportion.

There were six underground storage tanks on site; 3 30,000-gallon No. 5 fuel oil tanks, a 2,000-gallon No. 2 fuel oil tank, a 275-gallon diesel tank, and a 1,000 gallon gasoline tank. The four fuel oil tanks ar4e located in the same field approximately 200 feet southwest of the disposal area, the gasoline tank is located between the plant and the engineering office building, and the diesel tank is located approximately 1,500 feet southwest of the site between the plant building and the railroad.

The plant employs approximately 2,400, and the onsite wells supply 1.5 million gallons per day. The water is used in the process and as drinking water. As a result of the manufacturing process, the water is used as a constituent in the intravenous solutions.

Mr. Castro said that chlorinated solvents are not currently used at the plant, and he does not recall that they were ever used.

BIN/telecons/trav2

ecology and environment, inc.
4319 COVINGTON HIGHWAY, DECATUR, GEORGIA 30035
International Specialists in the Environmental Sciences

April 19, 1982

Mr. R. D. Stonebraker, Deputy Chief
Hazardous Emergency Response Branch
Air and Hazardous Materials Division
U.S. Environmental Protection Agency
345 Courtland Street
Atlanta, Georgia 30365

Subject: North Carolina CERCLA 103 Site Inspections
TDD No. F4-8203-07

Dear Mr. Stonebraker:

Thirty sites from 27 notifiers under CERCLA 103 (c) were submitted to Ecology and Environment Incorporated's Field Investigation Team on March 23, 1982. FIT members Charles Lee and Gene Oliver were assigned to the project.

The sites were initially screened to determine those which would require on-site inspection and those which would not. Fourteen of the sites did not require inspection for the following reasons:

1. Insufficient waste quantities;
2. Refusal by or inability of site representatives to meet with the investigators;
3. Previously initiated site studies by North Carolina State officials;
4. Absence of actual disposal at the site.

There were insufficient waste quantities to warrant further investigation for the Niagra Site in Ayden, NC; Monsanto in Research Triangle Park, NC; and East Carolina Heat Treat Service in Raleigh, NC.

Company representatives refused to furnish the locations of the sites for the two Beaunit Corporation plants in Hamilton and Clinton, NC. Owners were unable to arrange a time for the inspection of the David Starling Property in Farmville, NC.

North Carolina state officials had conducted previous groundwater studies and are presently conducting ongoing monitoring of Cooper Industries in Apex, NC; DuPont/Kinston Textiles in Kinsten, NC; and Carolina Galvanizing Corporation in Aberdeen, NC.

There was no actual disposal at the Weyerhaeuser Company in Lewiston, NC: American Petrofina in Selma, NC; Helena Chemical Company in Lewisburg and Enfield, NC; and Livewire Electric Company in Goldsboro, NC.

The remaining thirteen sites were inspected during the weeks ending April 3, 1982 and April 10, 1982. These sites include Mitchell Engineering Company and Unican Security Systems of Rocky Mount; Berkley Mills, Balfour, Travenol Laboratories, Incorporated and American Thread Company of Marion; General Electric Company Plants in Hendersonville, and Mebane; Burlington Furniture Company of Robbinsville; Union Camp Corporation of Smithfield; Burlington Industries of Neuse Branch; Stanley Furniture Company of West End; Mallinckrodt Company of Raleigh; and Monsanto Corporation of Fayetteville. Individual descriptions of these sites are included in this report.

None of the site inspections revealed any apparent problems, and as a result no further action is recommended by the investigators. It is recommended, however, that the two Beaunit Corporation plants in Hamilton and Clinton, and the David Starling property in Farmville be visited by EPA representatives.

Yours truly,

Charles H. Lee

Charles H. Lee
Project Officer

CHL/lsr

Continued From Page 8

X. WATER AND HYDROLOGICAL DATA *(continued)*

H. LIST ALL DRINKING WATER WELLS WITHIN A 1/4 MILE RADIUS OF SITE

1. WELL	2. DEPTH *(specify unit)*	3. LOCATION *(proximity to population/buildings)*	4. NON-COMMUNITY *(mark 'X')*	5. COMMUNITY *(mark 'X')*

I. RECEIVING WATER

1. NAME

☐ 2. SEWERS ☐ 3. STREAMS/RIVERS

☐ 4. LAKES/RESERVOIRS ☐ 5. OTHER *(specify)*:

6. SPECIFY USE AND CLASSIFICATION OF RECEIVING WATERS

XI. SOIL AND VEGITATION DATA

ATION OF SITE IS IN:

☐ A. KNOWN FAULT ZONE ☐ B. KARST ZONE ☐ C. 100 YEAR FLOOD PLAIN ☐ D. WETLAND

☐ E. A REGULATED FLOODWAY ☐ F. CRITICAL HABITAT ☐ G. RECHARGE ZONE OR SOLE SOURCE AQUIFER

XII. TYPE OF GEOLOGICAL MATERIAL OBSERVED

Mark 'X' to indicate the type*(s)* of geological material observed and specify where necessary, the component parts.

'X'	A. OVERBURDEN	'X'	B. BEDROCK *(specify below)*	'X'	C. OTHER *(specify below)*
	1. SAND				
	2. CLAY				
	3. GRAVEL				

XIII. SOIL PERMEABILITY

☐ A. UNKNOWN ☐ B. VERY HIGH *(100,000 to 1000 cm/sec.)* ☐ C. HIGH *(1000 to 10 cm/sec.)*

☐ D. MODERATE *(10 to .1 cm/sec.)* ☐ E. LOW *(.1 to .001 cm/sec.)* ☐ F. VERY LOW *(.001 to .00001 cm/sec.)*

G. RECHARGE AREA

☐ 1. YES ☐ 2. NO 3. COMMENTS:

H. DISCHARGE AREA

☐ 1. YES ☐ 2. NO 3. COMMENTS:

I. SLOPE

1. ESTIMATE % OF SLOPE | 2. SPECIFY DIRECTION OF SLOPE, CONDITION OF SLOPE, ETC.

THER GEOLOGICAL DATA

Continued From Front

XIV. PERMIT INFORMATION

List all applicable permits held by the site and provide the related information.

A. PERMIT TYPE (e.g., RCRA, State, NPDES, etc.)	B. ISSUING AGENCY	C. PERMIT NUMBER	D. DATE ISSUED (mo., day, & yr.)	E. EXPIRATION DATE (mo., day, & yr.)	F. IN COMPLIANCE (mark 'X') 1. YES	2. NO	3. UNKNOWN

XV. PAST REGULATORY OR ENFORCEMENT ACTIONS

☐ NONE ☐ YES *(summarize in this space)*

NOTE: Based on the information in Sections III through XV, fill out the Tentative Disposition *(Section II)* information on the first page of this form.

Continued From Page 6

VIII. HAZARD DESCRIPTION *(continued)*

☐ N. FIRE OR EXPLOSION

☐ O. SPILLS/LEAKING CONTAINERS/RUNOFF/STANDING LIQUID

☐ P. SEWER, STORM DRAIN PROBLEMS

☐ Q. EROSION PROBLEMS

☐ R. INADEQUATE SECURITY

☐ S. INCOMPATIBLE WASTES

VIII. HAZARD DESCRIPTION *(continued)*

☐ T. MIDNIGHT DUMPING

☒ U. OTHER *(specify)*:

AREA NOW COVERED BY ASPHALT ACCESS ROAD WHOSE DRAINAGE RUNS TO PLANT WASTE TREATMENT SYSTEM

IX. POPULATION DIRECTLY AFFECTED BY SITE

A. LOCATION OF POPULATION	B. APPROX. NO. OF PEOPLE AFFECTED	C. APPROX. NO. OF PEOPLE AFFECTED WITHIN UNIT AREA	D. APPROX. NO. OF BUILDINGS AFFECTED	E. DISTANCE TO SITE *(specify units)*
1. IN RESIDENTIAL AREAS	0			
2. IN COMMERCIAL OR INDUSTRIAL AREAS	0			
3. IN PUBLICLY TRAVELLED AREAS	0			
4. PUBLIC USE AREAS *(parks, schools, etc.)*	0			

X. WATER AND HYDROLOGICAL DATA

A. DEPTH TO GROUNDWATER *(specify unit)*	B. DIRECTION OF FLOW	C. GROUNDWATER USE IN VICINITY
D. POTENTIAL YIELD OF AQUIFER	E. DISTANCE TO DRINKING WATER SUPPLY *(specify unit of measure)*	F. DIRECTION TO DRINKING WATER SUPPLY

G. TYPE OF DRINKING WATER SUPPLY

☐ 1. NON-COMMUNITY < 15 CONNECTIONS ☐ 2. COMMUNITY *(specify town)*: > 15 CONNECTIONS

☐ 3. SURFACE WATER ☐ 4. WELL

 Continue On Page 9

Continued From Page 4

VIII. HAZARD DESCRIPTION (continued)

☐ B. NON-WORKER INJURY/EXPOSURE

☐ C. WORKER INJURY/EXPOSURE

☐ D. CONTAMINATION OF WATER SUPPLY

☐ E. CONTAMINATION OF FOOD CHAIN

☐ F. CONTAMINATION OF GROUND WATER

CONTAMINATION OF SURFACE WATER

Continued From Front

VIII. HAZARD DESCRIPTION *(continued)*

☐ H. DAMAGE TO FLORA/FAUNA

☐ I. FISH KILL

☐ J. CONTAMINATION OF AIR

☐ K. NOTICEABLE ODORS

☐ L. CONTAMINATION OF SOIL

☐ M. PROPERTY DAMAGE

recycled per

Continued From Page 2

IV. SAMPLING INFORMATION (continued)

PHOTOS

1. TYPE OF PHOTOS

[ ] a. GROUND [ ] b. AERIAL

2. PHOTOS IN CUSTODY OF: NONE: VETOED BY PLT. MGR.

D. SITE MAPPED?

[ ] YES. SPECIFY LOCATION OF MAPS:

E. COORDINATES

1. LATITUDE (deg.-min.-sec.)

2. LONGITUDE (deg.-min.-sec.)

V. SITE INFORMATION

A. SITE STATUS

[X] 1. ACTIVE (Those industrial or municipal sites which are being used for waste treatment, storage, or disposal on a continuing basis, even if infrequently.)

[ ] 2. INACTIVE (Those sites which no longer receive wastes.)

[ ] 3. OTHER (specify): (Those sites that include such incidents like "midnight dumping" where no regular or continuing use of the site for waste disposal has occurred.)

B. IS GENERATOR ON SITE?

[ ] 1. NO [X] 2. YES (specify generator's four-digit SIC Code):

C. AREA OF SITE (in acres)

2.1

D. ARE THERE BUILDINGS ON THE SITE?

[X] 1. NO [ ] 2. YES (specify):

VI. CHARACTERIZATION OF SITE ACTIVITY

Indicate the major site activity(ies) and details relating to each activity by marking 'X' in the appropriate boxes.

'X'	A. TRANSPORTER	'X'	B. STORER	'X'	C. TREATER	'X'	D. DISPOSER
	1. RAIL		1. PILE		1. FILTRATION		1. LANDFILL
	2. SHIP		2. SURFACE IMPOUNDMENT		2. INCINERATION		2. LANDFARM
	3. BARGE		3. DRUMS		3. VOLUME REDUCTION		3. OPEN DUMP
	4. TRUCK		4. TANK, ABOVE GROUND		4. RECYCLING/RECOVERY		4. SURFACE IMPOUNDMENT
	5. PIPELINE		5. TANK, BELOW GROUND		5. CHEM./PHYS./TREATMENT		5. MIDNIGHT DUMPING
	6. OTHER (specify):		6. OTHER (specify):		6. BIOLOGICAL TREATMENT		6. INCINERATION
					7. WASTE OIL REPROCESSING		7. UNDERGROUND INJECTION
					8. SOLVENT RECOVERY	X	8. OTHER (specify): EVAPORATION FROM GRAVEL
					9. OTHER (specify):		

E. SUPPLEMENTAL REPORTS: If the site falls within any of the categories listed below, Supplemental Reports must be completed. Indicate which Supplemental Reports you have filled out and attached to this for..

[ ] 1. STORAGE [ ] 2. INCINERATION [ ] 3. LANDFILL [ ] 4. SURFACE IMPOUNDMENT [ ] 5. DEEP WELL

[ ] 6. CHEM/BIO/PHYS TREATMENT [ ] 7. LANDFARM [ ] 8. OPEN DUMP [ ] 9. TRANSPORTER [ ] 10. RECYCLOR/RECLAIMER

VII. WASTE RELATED INFORMATION

A. WASTE TYPE

[X] 1. LIQUID [ ] 2. SOLID [ ] 3. SLUDGE [ ] 4. GAS

B. WASTE CHARACTERISTICS

[ ] 1. CORROSIVE [ ] 2. IGNITABLE [ ] 3. RADIOACTIVE [X] 4. HIGHLY VOLATILE

[ ] 5. TOXIC [ ] 6. REACTIVE [ ] 7. INERT [X] 8. FLAMMABLE

[ ] 9. OTHER (specify):

C. WASTE CATEGORIES

1. Are records of wastes available? Specify items such as manifests, inventories, etc. below.

NO

Continued From Front

VII. WASTE RELATED INFORMATION *(continued)*

2. Estimate the amount *(specify unit of measure)* of waste by category; mark 'X' to indicate which wastes are present.

a. SLUDGE	b. OIL	c. SOLVENTS	d. CHEMICALS	e. SOLIDS	f. OTHER
AMOUNT	AMOUNT	AMOUNT < 440	AMOUNT	AMOUNT	AMOUNT
UNIT OF MEASURE	UNIT OF MEASURE	UNIT OF MEASURE GALLONS	UNIT OF MEASURE	UNIT OF MEASURE	UNIT OF MEASURE

a. SLUDGE ('X')
- [ ] (1) PAINT, PIGMENTS
- [ ] (2) METALS SLUDGES
- [ ] (3) POTW
- [ ] (4) ALUMINUM SLUDGE
- [ ] (5) OTHER*(specify)*:

b. OIL ('X')
- [ ] (1) OILY WASTES
- [ ] (2) OTHER*(specify)*:

c. SOLVENTS ('X')
- [ ] (1) HALOGENATED SOLVENTS
- [X] (2) NON-HALOGNTD. SOLVENTS
- [ ] (3) OTHER*(specify)*: TRACES OF SOLVENTS USED IN CHEMICAL ANALYSIS — DUMPED OVER 5 YEAR PERIOD

d. CHEMICALS ('X')
- [ ] (1) ACIDS
- [ ] (2) PICKLING LIQUORS
- [ ] (3) CAUSTICS
- [ ] (4) PESTICIDES
- [ ] (5) DYES/INKS
- [ ] (6) CYANIDE
- [ ] (7) PHENOLS
- [ ] (8) HALOGENS
- [ ] (9) PCB
- [ ] (10) METALS
- [ ] (11) OTHER*(specify)*:

e. SOLIDS ('X')
- [ ] (1) FLYASH
- [ ] (2) ASBESTOS
- [ ] (3) MILLING/MINE TAILINGS
- [ ] (4) FERROUS SMELTING WASTES
- [ ] (5) NON-FERROUS SMLTG. WASTES
- [ ] (6) OTHER*(specify)*:

f. OTHER ('X')
- [ ] (1) LABORATORY, PHARMACEUT.
- [ ] (2) HOSPITAL
- [ ] (3) RADIOACTIVE
- [ ] (4) MUNICIPAL
- [ ] (5) OTHER*(specify)*:

D. LIST SUBSTANCES OF GREATEST CONCERN WHICH ARE ON THE SITE *(place in descending order of hazard)*

1. SUBSTANCE	2. FORM *(mark 'X')* a. SOLID	b. LIQ.	c. VAPOR	3. TOXICITY *(mark 'X')* a. HIGH	b. MED.	c. LOW	d. NONE	4. CAS NUMBER	5. AMOUNT	6. UNIT
PYRIDINE		X				X			TRACE	
NITROBENZENE		X				X			TRACE	

VIII. HAZARD DESCRIPTION

FIELD EVALUATION HAZARD DESCRIPTION: Place an 'X' in the box to indicate that the listed hazard exists. Describe the hazard in the space provided.

- [ ] A. HUMAN HEALTH HAZARDS

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

REGION	SITE NUMBER (to be assigned by Hq)
04	NC0000010020

GENERAL INSTRUCTIONS: Complete Sections I and III through XV of this form as completely as possible. Then use the information on this form to develop a Tentative Disposition (Section II). File this form in its entirety in the regional Hazardous Waste Log File. Be sure to include all appropriate Supplemental Reports in the file. Submit a copy of the forms to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Tack Force (EN-335); 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME: TRAVENOL LABORATORIES, INC.

B. STREET (or other identifier): U.S. HWY. 221

C. CITY: MARION

D. STATE: NC

E. ZIP CODE: 28752

F. COUNTY NAME: McDOWELL

G. SITE OPERATOR INFORMATION

1. NAME: EDWARD J. OGLESBY, PLT. MGR.

2. TELEPHONE NUMBER:

3. STREET: 4. CITY: 5. STATE: 6. ZIP CODE:

H. ~~REALTY OWNER INFORMATION~~ (if different from operator of site)

1. NAME: CONTACT: RAYMOND T. MURPHY

2. TELEPHONE NUMBER: (312) 948-4952

3. CITY: 4. STATE: 5. ZIP CODE:

I. SITE DESCRIPTION: MEDICAL SUPPLY LAB

J. TYPE OF OWNERSHIP

☐ 1. FEDERAL ☐ 2. STATE ☐ 3. COUNTY ☐ 4. MUNICIPAL ☒ 5. PRIVATE

II. TENTATIVE DISPOSITION (complete this section last)

A. ESTIMATE DATE OF TENTATIVE DISPOSITION (mo., day, & yr.): 4/13/82

B. APPARENT SERIOUSNESS OF PROBLEM

☐ 1. HIGH ☐ 2. MEDIUM ☐ 3. LOW ☒ 4. NONE

C. PREPARER INFORMATION

1. NAME: GENE OLIVER, FIT

2. TELEPHONE NUMBER: 404-288-7711

3. DATE (mo., day, & yr.): 4/13/82

III. INSPECTION INFORMATION

A. PRINCIPAL INSPECTOR INFORMATION

1. NAME: CHARLES LEE

2. TITLE: GEOLOGIST

3. ORGANIZATION: E&E FIT

4. TELEPHONE NO. (area code & no.): 404-288-7711

B. INSPECTION PARTICIPANTS

1. NAME	2. ORGANIZATION	3. TELEPHONE NO.
CHARLES LEE	FIT	
GENE OLIVER	FIT	

C. SITE REPRESENTATIVES INTERVIEWED (corporate officials, workers, residents)

1. NAME	2. TITLE & TELEPHONE NO.	3. ADDRESS
ED OGLESBY	PLT. MGR.	
PHIL CASTRO	ENV. ENGR.	

Continued From Front

III. INSPECTION INFORMATION *(continued)*

D. GENERATOR INFORMATION *(sources of waste)*

1. NAME	2. TELEPHONE NO.	3. ADDRESS	4. WASTE TYPE GENERATED
TRAU. LABS			

E. TRANSPORTER/HAULER INFORMATION

1. NAME	2. TELEPHONE NO.	3. ADDRESS	4. WASTE TYPE TRANSPORTED
N/A			

F. IF WASTE IS PROCESSED ON SITE AND ALSO SHIPPED TO OTHER SITES, IDENTIFY OFF-SITE FACILITIES USED FOR DISPOSAL.

1. NAME	2. TELEPHONE NO.	3. ADDRESS
N/A		

G. DATE OF INSPECTION (mo., day, & yr.)	H. TIME OF INSPECTION	I. ACCESS GAINED BY: *(credentials must be shown in all cases)*
3/29/82	1000	☒ 1. PERMISSION ☐ 2. WARRANT

J. WEATHER *(describe)*

FAIR, COOL

IV. SAMPLING INFORMATION

A. Mark 'X' for the types of samples taken and indicate where they have been sent e.g., regional lab, other EPA lab, contractor, etc. and estimate when the results will be available.

1. SAMPLE TYPE	2. SAMPLE TAKEN *(mark 'X')*	3. SAMPLE SENT TO:	4. DATE RESULTS AVAILABLE
a. GROUNDWATER		N/A	
b. SURFACE WATER			
c. WASTE			
d. AIR			
e. RUNOFF			
f. SPILL			
g. SOIL			
h. VEGETATION			
i. OTHER *(specify)*			

B. FIELD MEASUREMENTS TAKEN *(e.g., radioactivity, explosivity, PH, etc.)*

1. TYPE	2. LOCATION OF MEASUREMENTS	3. RESULTS
N/A		

Date: January 29, 1982

County: McDowell

Notifier's name and address: Edward J. Oglesby

P.O. Box, Marion, N.C. 28752

Contact's name: Raymond T. Murphy (312) 948-4952

Site name and address: Travenol Laboratories, Inc.

Highway 221 N.

Site location: Marion

McDowell County

Type of waste: pyradine and nitrobenzene

What process generated the waste? general laboratory wastes

Volume of waste: 440 gallons

Method of storage or disposal: poured onto 1500 sq. ft. gravel driveway in oil unloading area and allowed to evaporate

Dates of waste activity: 1972 - 1977

Site history: 440 gallons of general laboratory waste containing pyradine and nitrobenzene were disposed of by spreading the waste over a 1500 square foot area of graveled driveway, on site, where it was allowed to evaporate.

NCD 059140764
GEN

?

*The preceding information is based on preliminary data supplied by the Environmental Protection Agency, and not on detailed site investigations.

CERCLA 103 (c) NOTIFICATION INSPECTION
TRAVENOL LABORATORIES, INC.
MARION, NC

General

The Travenol Laboratories, Inc. North Cove Facility, located on US Highway 221 outside Marion, NC, was inspected on the morning of March 29, 1982 by FIT members Charles Lee and Gene Oliver. Site representatives interviewed during this inspection were Phil Castro, the Plant Environmental Engineer, and Ed Oglesby, the Plant Manager.

Mr. Castro confirmed that during the period 1972 - 1977 approximately 440 gallons of general laboratory wastes containing traces of pyridine and nitrobenzene used as reagents were dumped onto a 1500 square foot area of gravel driveway behind the laboratory. These wastes were assumed to have evaporated immediately after they were dumped. Mr. Castro stated that the Travenol plant in Marion is engaged in the production of intravenous solutions for medical applications, and he showed us certificates documenting that current waste disposal is being handled by Triangle Resource Industries in Reidsville, North Carolina and by M&M Chemical Company in Gadsden, Alabama. In the past, wastes had also been disposed of by Chemical Waste Management in Emelle, Alabama.

Mr. Castro showed the inspectors the area behind the laboratory where the wastes had been dumped. This area is now part of a paved and curbed access road. Drainage from this road is channeled by underground sewers to the laboratory's waste treatment system. There was no apparent evidence of any wastes or waste residues in the area. Mr. Castro stated that the wastes had been dumped at the rate of two to three gallons at the time only.

Conclusions and Recommendations

This site presents no apparent hazardous waste related problem. The investigators recommend that no further action be initiated with regard to this site.

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
919/733-3446

4 June 1986

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

Dear Ms. Bland:

SUBJECT: Preliminary Assessment Report
Travenol Laboratories, Inc. NCD 059140764
US 221 North
Marion, McDowell County, NC 28752

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

Travenol Laboratories, Inc. manufactures glucose, salt solutions, and other intravenous solutions for hospitals. The company started operating at the Marion site in 1972. The facility was newly constructed, and Travenol Labs has been the sole occupant.

The majority of the hazardous waste generated at the facility is paint and cleaning solvent waste. This waste is generated through touch up painting of the building and equipment. Included in this hazardous waste are varsol solvents, turpentine, and xylene. The company also operates a laboratory which generates a small amount of laboratory solvent waste. Approximately 4,000 gallons of hazardous waste (paint and laboratory waste) was generated in 1985. The waste is stored in 55 gallon drums on the outside of the building in a hazardous waste shed. The lab waste is then manifested to Pinewood, S.C. for disposal, and the paint solvents are shipped to Oldover in Virginia for incineration. The company has been employing these waste disposal methods since 1980. Prior to 1980 the laboratory chemicals and waste were kept in a warehouse on the site. Between 1972 and 1977 the paint solvent waste was disposed of outside of the building.

The waste was poured in a small graveled area and allowed to evaporate into the air. Approximately 440 gallons of the waste was disposed of in this manner. Between 1977 and 1980 the paint waste was accumulated and kept on site. Company officials voluntarily notified under CERCLA 103(c) on April 29, 1981 and told of the company's past waste disposal practices. The site was inspected on March 29, 1982 by Charles Lee and Gene Oliver of Ecology and Environment, Inc. for EPA. The investigators did not find any evidence of wastes or waste residues in the area. They recommended that no further action be initiated with regard to the site. Groundwater and soil were not sampled by the site investigators.

There are five underground storage tanks on site. Four of the tanks were installed in 1972 and one tank was installed approximately four years ago. Three of the four tanks installed in 1972 contain number six fuel oil and the other tank contains gasoline. Number one fuel oil is in the tank that was installed four years ago. According to company officials, they have not had problems with the tanks (leaking, etc.) since their installation.

The company obtains their water supply from five wells that are located on the site. The wells are monitored regularly by company personnel. According to plant officials, the wells have never been contaminated, however, the company is only required to monitor for bacteriological contamination and some minerals. They are not required to monitor for organics or metals. The depth of the wells range from 150 to 350 feet. There is also an on-site waste water treatment plant which treats sewage waste only.

Other than the solvent evaporation area, there are no records of spills on the site. Because of past on-site disposal practices a Medium priority is assigned to the site.

On 2 June 1986, 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: Glenn Ross, Air Quality Section; Vince Schneider and Howard Bryant, Water Quality Section.

If you have any questions, please call me at (919) 733-2801.

Sincerely,

Cheryl A. McMorris, Environmental Chemist
Solid and Hazardous Waste Management Branch
Environmental Health Section

CM/tb/0249b

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

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D059140764

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Travenol Laboratories, Inc.	U.S. Hwy. 221 North

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Marion	NC	28752	McDowell	056	11

09 COORDINATES: LATITUDE 35° 50' 14" | LONGITUDE 82° 00' 03"

10 DIRECTIONS TO SITE (Starting from nearest public road) Take I-85 South to Winston Salem. In Winston Salem take I-40 west to Marion, NC. In Marion take Hwy 221 Nth. Site located about 12 mi. north of I-40, in North Cove, NC.

III RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)
Travenol Laboratories, Inc.	Deerfield Road

03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER
Deerfield	ILL	60015	(312) 348-2000

07 OPERATOR (If known and different from owner)	08 STREET (Business, mailing, residential)
Travenol Laboratories, Inc.	U.S. Hwy. 221 North

09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER
Marion	NC	28752	(704) 756-4151

13 TYPE OF OWNERSHIP (Check one)
[X] A. PRIVATE [ ] B. FEDERAL: ______________________ (Agency) [ ] C. STATE [ ] D. COUNTY [ ] E. MUNICIPAL
[ ] F. OTHER: ______________________ (Specify) [ ] G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply) (CERCLA 103c)
[X] RCRA 3001 DATE RECEIVED: [ ] B. UNCONTROLLED WASTE SITE DATE RECEIVED [ ] C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
[X] YES DATE 03/29/82
[ ] NO CONTRACTOR NAME(s): ______________________

BY (Check all that apply)
[ ] A. EPA [X] B. EPA CONTRACTOR [ ] C. STATE [ ] D. OTHER CONTRACTOR
[ ] E. LOCAL HEALTH OFFICIAL [ ] F. OTHER: ______________________

02 SITE STATUS (Check one)	03 YEARS OF OPERATION
[ ] A. ACTIVE [X] B. INACTIVE (Not a TSD) [ ] C. UNKNOWN	1972 (BEGINNING YEAR) / currently operat. (ENDING YEAR) [ ] UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED Travenol Labs., Inc. began operations at the Marion site in 1972, in a newly constructed facility. The company manufactures glucose, salt solutions, & other intravenous solutions for hospitals. The majority of the hazardous waste generated at the facility is paint

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION waste from touch up painting of the building & equipment. A small amount of laboratory solvent waste is generated. Between 1972 & 1977 the paint waste was disposed of be evaporating the waste outside in a graveled area on the site. Approx. 440 gallons of waste was disposed of in this manner. In 1982, an EPA inspection found the disposal area, uncontaminated. After 1979 the waste was shipped off-site for incineration. Five underground tanks containing fuel oil & gasoline have been on-site since 1972. 5 wells supply the site with water. A WWTP is on site to treat sewage waste. Classified as a Generator.

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)
[X] B. MEDIUM (Inspection required)
[ ] C. LOW (Inspection 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
Phil Castro, Environmental Coordinator	Travenol Laboratories, Inc.	(704) 756-4151

02 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	ORGANIZATION	03 TELEPHONE NUMBER	08 DATE
Cheryl A. McMorris/Pat DeRosa	NC DHR/DHS	SHW Mgmt. Br.	(919) 733-2801	04/16/86

POTENTIAL HAZARDOUS WASTE SITE

PRELIMINARY ASSESSMENT

PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D059140764

II. WASTE STATES, QUANTITIES, AND CHARACTERS

01 PHYSICAL STATES (Check all that apply)

[ ] A SOLID
[ ] B. POWDER, FINES
[ ] C. SLUDGE
[ ] E. SLURRY
[X] F. LIQUID
[ ] G. GAS

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

TONS ______

CUBIC YARDS ______

NO. OF DRUMS Unknown

03 WASTE CHARACTERISTICS (Check all that apply)

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

III. WASTE TYPES

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS	440	gallons	Combined paint and lab. waste
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ADICS			
BAS	BASES			
MES	HEAVY METALS			

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

CATEGORY	SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
SOL	Varsol solvents		stored in 55 gallon drums	Unknown	---
SOL	turpentine		prior to off-site	Unknown	---
SOL	Xylene	1330207	incineration	Unknown	---

V. FEEDSTOCKS (See Appendix for CAS numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			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 Haz. Waste Mgmt. Branch, Raleigh, NC.
2. [illegible]S, 7.5' Quad., Little Switzerland, NC, 1979 and Ashford, NC, 1956.
3. Telephone conversation with Keith Masters, NC DHR/DHS, Solid and Haz. Waste Mgmt. Br., on 15 April 1986.
4. Telephone conversation with Phil Castro of Travenol Laboratories, Inc. on 16 April 1986.

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

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D059140764

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. GROUNDWATER CONTAMINATION 02 [ ] OBSERVED (DATE:) [X] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED 2300 04 NARRATIVE DESCRIPTION Between 1972 and 1977 approximately 440 gallons of paint waste was disposed on site. The waste was poured into a graveled area and allowed to evaporate. Possible groundwater contamination due to these disposal practices.

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

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 Unknown (Acres) 04 NARRATIVE DESCRIPTION See II A above.

01 [X] G. DRINKING WATER CONTAMINATION 02 [ ] OBSERVED (DATE:) [X] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED 2300 04 NARRATIVE DESCRIPTION There are five wells on the site and they are the main water supply for drinking purposes. If groundwater contamination occurred it is possible that the drinking water may have been affected.

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

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

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

I. IDENTIFICATION

01 STATE: NC | 02 SITE NUMBER: D059140764

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 [ ] J. DAMAGE TO FLORA — 02 [ ] OBSERVED (DATE: ________) [ ] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED ________ 04 NARRATIVE DESCRIPTION

01 [ ] K. DAMAGE TO FAUNA — 02 [ ] OBSERVED (DATE: ________) [ ] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

01 [ ] L. CONTAMINATION OF FOOD CHAIN — 02 [ ] OBSERVED (DATE: ________) [ ] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

01 [ ] M. UNSTABLE CONTAINMENT OF WASTE (Spills/runoff/standing 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

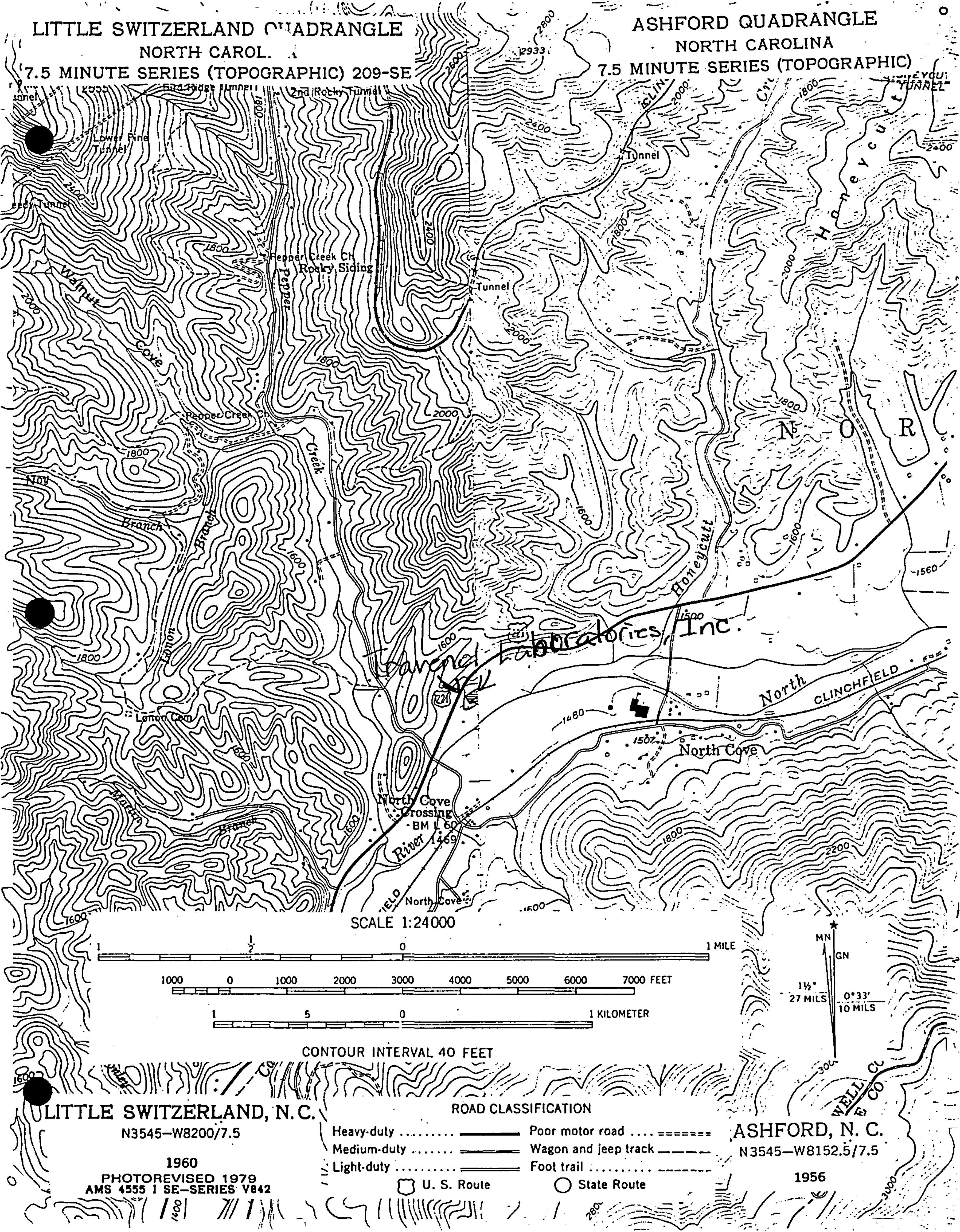
III. TOTAL POPULATION POTENTIALLY AFFECTED:

IV. COMMENTS

Groundwater and soil samples should be taken around the past disposal/evaporation area to determine if contamination occurred.

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

See Part 2, Section VI.


LITTLE SWITZERLAND QUADRANGLE
NORTH CAROL. A
7.5 MINUTE SERIES (TOPOGRAPHIC) 209-SE
ASHFORD QUADRANGLE
NORTH CAROLINA
7.5 MINUTE SERIES (TOPOGRAPHIC)
Bird Ridge Tunnel
2nd Rocky Tunnel
Lower Pine Tunnel
Tunnel
Pepper Creek Ch
Rocky Siding
Walnut Cove
Pepper Creek
Pepper Creek Ch
Noy Branch
Branch
Lonon
Lonon Cem
Honeycutt
Honeycutt
N O R
North CLINCHFIELD
North Cove
North Cove Crossing
BM L 60 1469
River
North Cove
Martin Branch
Travenol Laboratories, Inc.
SCALE 1:24000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 40 FEET
MN
GN
1½°
27 MILS
0°33'
10 MILS
LITTLE SWITZERLAND, N.C.
N3545—W8200/7.5
1960
PHOTOREVISED 1979
AMS 4555 I SE—SERIES V842
ROAD CLASSIFICATION
Heavy-duty
Medium-duty
Light-duty
Poor motor road
Wagon and jeep track
Foot trail
U. S. Route
State Route
ASHFORD, N. C.
N3545—W8152.5/7.5
1956

On Tuesday, March 28, 1989, Pat DeRosa and I conducted a site sampling visit to the Travenol Laboratories site. The weather was clear and warm with the temperature about 70°F. We met with the plant Environmental Coordinator, Mr. Phil Castro. The facility is extremely large with the production/warehouse building alone covering 26 acres. We obtained a site layout map from Mr. Castro and discussed the well locations and reported disposal area. We toured the plant grounds in the area of the paint shop where the reported disposal took place. The disposal area was immediately outside the rear of the paint shop on the road that leads to the back of the plant. The road was paved and there was no clear area to take soil samples. However, Baxter had recently installed a system of three monitoring wells to monitor underground tanks (containing No. 6 fuel oil) near the disposal area. Baxter is planning to remove these tanks in the near future and, according to Mr. Castro, the monitoring wells were installed as a precautionary measure to assess the status of the tanks prior to their removal. The results of their analyses, thus far, have indicated there are no leaks. Monitoring Well No. 1 was upgradient of the tanks but approximately 100 feet downgradient of the disposal area.

A ground water sample was taken from Monitoring Well No. 1, and a background ground water sample was taken from a process water well (process well No. 3) located approximately 700 feet upgradient of the disposal area. For reasons of business confidentiality, photographs of the site were limited to the disposal area itself and area where samples were taken. Samples will be analyzed at the NC Laboratory of Public Health for both organic and inorganic constituents.

If you have any questions concerning this site, please contact me at (919) 733-2801.

Sincerely,

Bruce Nicholson, Chemical Engineer
Solid Waste Management Section
Superfund Branch

BIN/let/travssv

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

James G. Martin, Governor
David T. Flaherty, Secretary

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

April 4, 1989

Ms. Denise Bland
EPA NC CERCLA Project Officer
EPA Region IV
345 Courtland Street, NE
Atlanta, GA 30365

Subj: Site Sampling Visit Trip Report
Travenol Laboratories Inc.
Marion, McDowell County, NC 28752
NCD059140764

Dear Ms. Bland:

The Travenol Laboratories site is an operating manufacturing plant that produces intravenous solutions for hospital use. The name of the company is now Baxter Healthcare Corporation, but this change is in name only and the ownership has remained the same. The plant is located on Highway 221, approximately 8 miles north of Marion, NC. It was constructed in 1972 and Baxter has been the sole occupant.

Baxter filed a CERCLA 103(c) notification on April 29, 1981. Between 1972 and 1977 a reported quantity of 440 gallons of waste paint shop solvents and a small amount of laboratory waste was disposed of on site. The disposal area was a gravel driveway behind the paint shop. The waste was poured on the ground and allowed to evaporate. The site was inspected by Ecology and Environment, contractors for the U.S. EPA, on March 29, 1982. The gravelled area by this time had been paved over. The investigators found no evidence of waste or waste residues in the area and recommended no further action on the site. However, no samples were taken. A Preliminary Assessment conducted by Cheryl McMorris of the NC Superfund Branch on June 4, 1986, recommended a medium priority for inspection.

Baxter also filed a notification of Inactive Waste Disposal Site with the NC State Superfund Program on March 8, 1988 as required by the North Carolina General Statutes Section 130A-310.1(b).

15 April 1986

TO: File

FROM: Cheryl A. McMorris CAM

RE: Telephone conversation with Keith Masters, NC DHR/Solid and Hazardous Waste Management Branch, [(704) 688-4237], concerning Travenol Laboratories NC D059140764.

In our telephone conversation Mr. Masters informed me that Travenol Laboratories manufactures glucose and other hospital related fluids. He said that the company has been operating approximately 15 years.

According to Mr. Masters most of the hazardous waste generated on site is paint waste. This waste is generated from painting the building and equipment at the facility. The company also generates a small amount of waste from solvent usage in the laboratory. Mr. Masters said Travenol Laboratories is actually a small generator, but the company wanted to retain its classification as a generator. Mr. Masters does not know of any hazardous substances used at the site; nor does he know of any past treatment, storage, or disposal of materials or wastes on site.

There is one well located on site. This well is the main source of water for the facility. To get rid of household wastes the company has a wastewater treatment plant on site. This WWTP treats sewage waste only. All of the other waste generated is manifested off site for disposal.

CM/tb/0176b

NORTH CAROLINA DEPARTMENT OF HUMAN RESOURCES
SOLID AND HAZARDOUS WASTE MANAGEMENT
ALPHABETIC LISTINGS OF HAZARDOUS WASTE FACILITIES EXCLUDING SMALL GENERATORS

FACILITY ID	FACILITY NAME / CONTACT	FACILITY ADDRESS		MAILING ADDRESS		G	TRN	TR	ST	DS	TELEPHONE AREA	TELEPHONE NUMBER
NCD000475562	BASF CORPORATION WILKERSON GERALD CORPTRUC	SMITH MATTRESS FACTORY RD MEBANE	27302	507 MATTRESS FACTOR MEBANE	NC 27302	X	X				919	563-5511
NCD003149705	BASF CORPORATION BILL LYNCH	4330 CHESAPEAKE DRIVE CHARLOTTE	28208	PO BOX 668846 CHARLOTTE	NC 28216	X					704	392-4313
NCD052813250	BASF CORPORATION DEAN, RAYBURN H.	U S 19 & 23 WEST ENKA	28728	SAND HILL ROAD ENKA	NC 28728	X			X		704	667-7747
NCD990866165	BASF CORPORATION COATINGS & IN MROSEK, JAY	1701 WESTINGHOUSE BLVD CHARLOTTE	28241	1701 WESTINGHOUSE B CHARLOTTE	NC 28241	X					704	588-2020
NCD049957756	BASF CORPORATION, INMONT DIVIS MICHELIS, FRANK	HWY 70 WEST MORGANTON	28655	DRAWER 1297 MORGANTON	NC 28655	X					704	584-1771
NCD046470645	BFI OF SOUTH ATLANTIC INC BLACK, ERIC	5516 ROZZELLE FERRY ROAD PAW CREEK	28130	PO BOX 666 PAW CREEK	NC 28130	X	X				704	394-1353
NCD003445939	BAKER FURNITURE COMPANY DICKERSON, RICHARD	MAGNAVOX ROAD ANDREWS	28901	PO BOX 700 ANDREWS	NC 28901	X					704	321-4251
NCTMP0001460	BAKER ROOFING COMPANY DOUG DONALD	517 MERCURY ST. RALEIGH				X						-
NCD062546995	BALCRANK PRODUCTS STOUT, MITCHAEL	115 REEMS CREEK ROAD WEAVERVILLE	28787	115 REEMS CREEK ROA WEAVERVILLE	NC 28787	X					704	645-4261
NCD980709216	BAFON-BLAKESLEE, INC. AMMONS, RUTH	1225 ATANDO AVE. CHARLOTTE	28206	1225 ATANDO AVE. CHARLOTTE	NC 28206	X	X				704	333-9682
NCD059140764	BAXTER HEALTHCARE CORPORATION CASTRO, PHILIP	US 221 N MARION	28752	PO BOX 1390 MARION	NC 28752	X					704	756-4151
NCD024617524	BELDING CORTICELLI THREAD COMP WARD, R.L.	US HIGHWAY 64 WEST HENDERSONVILLE	28739	PO BOX 130 HENDERSONVILLE	NC 28793	X					704	693-4222
NCD003213681	BENDIX HVS POSTON, B.D.	727 BENDIX DRIVE SALISBURY	28144	PO BOX 988 SALSIBURY	NC 28144	X					704	633-5281
NCD049644764	BEPCO INC. RULTI RICHARD PRODUCTION	2475 STRATFORD RD. WINSTON-SALEM	27107	2475 STRATFORD RD. WINSTON-SALEM	NC 27103	X					919	760-0740
NCD001930679	BERNHARDT FURNITURE CO PLANT N ORRELL, KEITH	MORGANTON BLVD LENOIR	28645	PO BOX 740 LENOIR	NC 28645	X					704	758-9811
NCD000329127	BERNHARDT FURNITURE CO PLANT N ORRELL, KEITH	MORGANTON BLVD LENOIR	28645	PO BOX 740 LENOIR	NC 28645	X					704	758-9811
NCD000219934	BERNHARDT FURNITURE CO PLANT N FOUST NICK PLANT MGR	MONROE STREET STATESVILLE	28677	PO BOX 740 LENOIR	NC 28645	X	X				704	873-6312

Ref. 7

See Appendix A, Map 1
(USGS Topographic Map)

See Appendix A, Map 2
(Site Blueprint)

July 17, 1989

TO: File

FROM: Pat DeRosa PD

RE: American Thread Co./Sevier Plant
NCD003157377

On July 14, 1989, I spoke by telephone with Wade Knox, Public Water Supply Branch, Black Mountain, NC (704) 669-3361 regarding public water systems in the site vicinity. Mr. Knox said that there are no surface water intakes within 15 miles downstream of the site. The nearest downstream intake is approximately 28 miles downstream on the Catawba River. This intake serves the City of Morganton. The Town of Marion is the nearest municipal water system within the site vicinity, however, Marion's distribution lines do not extend to within 4 miles of American Thread. Marion's intakes are located on Buck Creek, Clear Creek, and Mackey Creek upstream of American Thread. There are 3 community well water systems within 4 miles of the site (see attached map). These systems and the populations served are listed below:

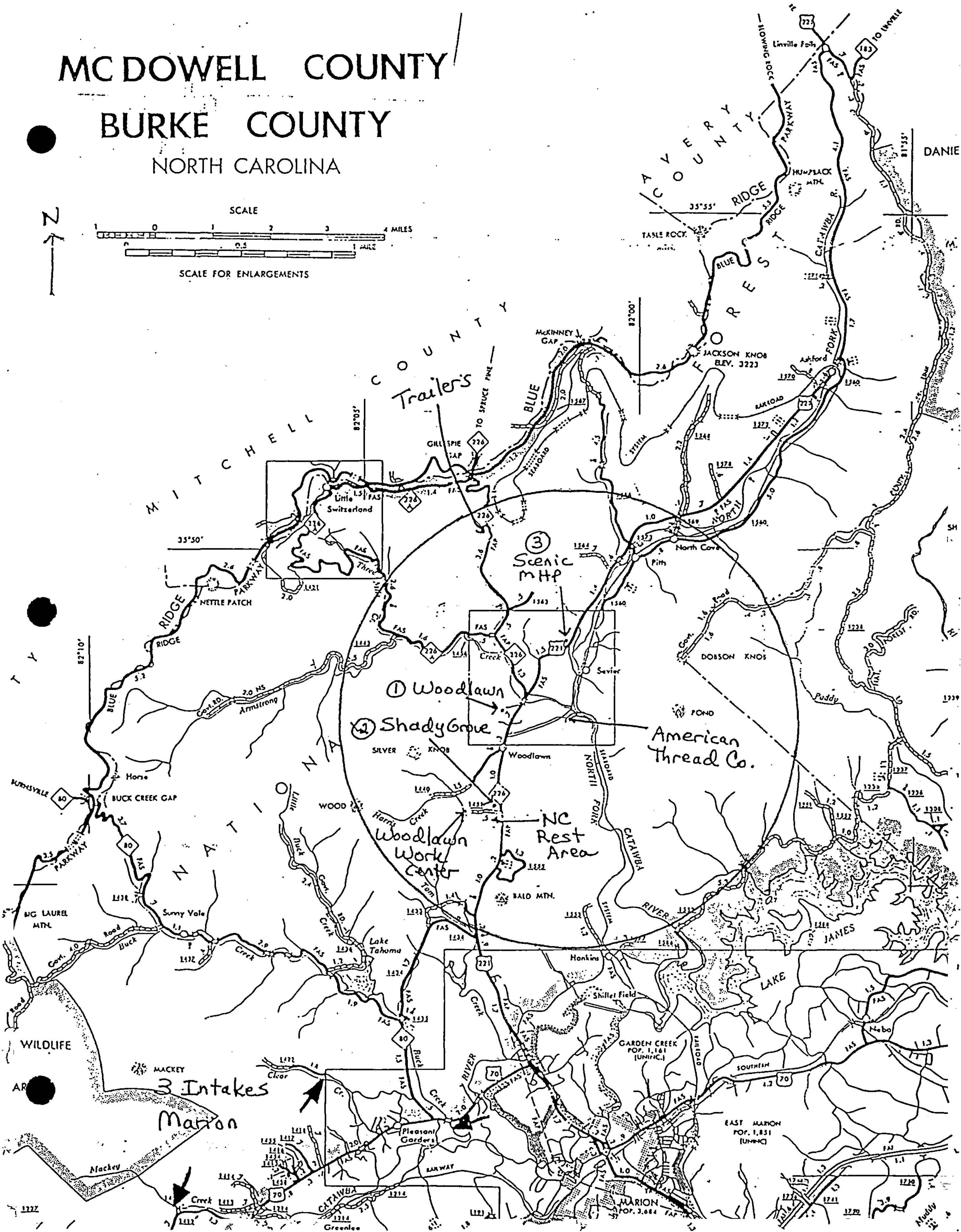
PWS Name/ID#	Population Served
1. Woodlawn Heights 0156128	315
2. Shady Grove Trailer Park 0156111 (recently deleted)	23
3. Scenic Mobile Home Village 0156117	96

Mr. Knox also noted an area north on NC 226 where there are about 35 trailers on separate small unregulated well systems.

The Shady Grove well was in use until a few years ago when mercury levels were found to exceed the MCL (.002 mg/l). Levels around .022-.025 mg/l mercury were reported. Also, pH readings for this well are around 5.3. The well is 250' deep, cased down to 140', with the lower 130' reportedly drilled through limestone. The well yielded 95 gallons/minute. This well has since been closed and another well has been drilled. Mercury levels in this well are below the MCL. Due to unexplained mercury problems at this site, the system was deleted as a PWS and service connections have been limited. Mr. Knox said that other wells surrounding the old Shady Grove well were tested and no mercury was found. The source of the mercury is still unknown. Mr. Knox also pointed out that there is a lumber/wood treating facility (H + B Lumber) located in Woodlawn.

PD/pb/amthread.pat

Attachments


MC DOWELL COUNTY
BURKE COUNTY
NORTH CAROLINA
SCALE
4 MILES
SCALE FOR ENLARGEMENTS
N
Trailer's
③ Scenic MHP
① Woodlawn
② Shady Grove
American Thread Co.
NC Rest Area
Woodlawn Work Center
3 Intakes Marion
AVERY COUNTY
MITCHELL COUNTY
BLUE RIDGE PARKWAY
NATIONAL FOREST
LAKE JAMES
NORTH FORK CATAWBA
CATAWBA RIVER
Woodlawn
Little Switzerland
Linville Falls
Sevier
North Cove
Pleasant Gardens
Lake Tahoma
Sunny Vale
Garden Creek POP. 1,161 (UNINC.)
East Marion POP. 1,851 (UNINC)
Marion POP. 3,684
Nebo
Greenlee
Honkins
Shillet Field
JACKSON KNOB ELEV. 3223
McKINNEY GAP
GILLESPIE GAP
BUCK CREEK GAP
TABLE ROCK
HUMPBACK MTN.
DOBSON KNOB
SILVER KNOB
BALD MTN.
NETTLE PATCH
MACKEY
WILDLIFE

Ref. 11

GEOLOGY AND GROUND-WATER RESOURCES of the MORGANTON AREA NORTH CAROLINA

By

Carlton T. Sumsion
Geologist, U. S. Geological Survey

Chemical Quality of Water Section
By
R. L. Laney
Chemist, U. S. Geological Survey

GROUND WATER BULLETIN NUMBER 12

NORTH CAROLINA
DEPARTMENT OF WATER RESOURCES
George E. Pickett, *Director*

Division of Ground Water
Harry M. Peek, *Chief*

PREPARED COOPERATIVELY BY THE GEOLOGICAL SURVEY
UNITED STATES DEPARTMENT OF THE INTERIOR
AND THE
NORTH CAROLINA DEPARTMENT OF WATER RESOURCES

MARCH 1967

GEOLOGY AND GROUND-WATER RESOURCES OF THE MORGANTON AREA, NORTH CAROLINA

By

Carlton T. Sumsion

ABSTRACT

The Morganton area, located in the west-central part of North Carolina, comprises Avery, Burke, Caldwell, McDowell, Mitchell, Watauga, and Yancey Counties. The area includes 2,522 square miles apportioned between the Blue Ridge and inner Piedmont physiographic provinces. From southeast to northwest, the topographic relief of gentle hills and broad valleys of the inner Piedmont gives way to the steep eastern front of the Blue Ridge, beyond which more subdued slopes toward the west prevail. Streams and drainage courses are of geologically subsequent development on fracture systems which have clearly defined patterns throughout most of the area.

Metamorphic and igneous rocks underlying the area range in composition from quartzite to gabbro. Gneissic, schistose, pyroclastic, and quartzitic rocks are the most prominent lithologic types. Structural trends in the area are varied, but generally are oriented north to northeast.

Ground water is obtained from weathered rock or saprolite and alluvium by dug and bored wells. Drilled wells derive ground water from joint and shear openings in unweathered bedrock. Wells drilled in low, flat areas and narrow, linear valleys have greater yields than wells drilled on high ground or slopes. The present rate of ground-water withdrawal has only local effect on the height of the water table. The amount of ground water contained in bedrock decreases with depth, hence drilling wells deeper than about 300 feet usually will not substantially increase well yields.

One-hundred and ten water analyses are used to determine the chemical quality of the ground water in the Morganton area. Generally, ground water is slightly acid, contains less than 150 ppm dissolved solids, is soft (less than 50 ppm hardness as $CaCO_3$), and contains less

than 0.3 ppm iron. Due to differences in duration of water-rock contact, dissolved solids are highest in water from drilled wells and dug wells and least in water from springs. Based on concentrations of chloride and nitrate, dug wells are considerably more susceptible to contamination than springs or drilled wells in the Morganton area.

Chemical analyses of ground water in the Morganton area can be divided into five types by use of pattern diagrams. Ground-water types can be mapped but are shown to extend across and change within boundaries of rock units.

INTRODUCTION

Purpose and Scope

The principal objectives of this investigation were to evaluate the occurrence, quality, and availability of ground water on a reconnaissance basis in seven counties of western North Carolina. The Morganton area project comprises Avery, Burke, Caldwell, McDowell, Mitchell, Watauga, and Yancey Counties. Data for ground-water occurrence were obtained from representative well and spring inventories throughout the area. Maximum and minimum water-level fluctuations and spring-discharge measurements were determined periodically for 63 observation wells and springs in the area. Samples of ground water for chemical analyses were collected from observation wells and springs and other selected wells supplying domestic, municipal, and industrial water systems. Water analyses were used to establish a relationship between chemical characteristics of the water and the rock type from which the water was obtained. Reconnaissance geologic mapping throughout the area in 1961 and 1962 made use of the rock exposures in road cuts, railroad cuts, quarries, barrow pits, stream-bank exposures, and similar large, unconcealed outcrops. North Carolina State Highway Commission county road maps, 2.65 miles per inch, were transferred to Geological Survey 1:250,000 scale series topographic maps for publication.

Previous Work

No previous ground-water investigations have been made in this area. This investigation was made by the Branch of Ground Water, U. S. Geological Survey, in cooperation with the North Carolina Department of Water Resources. The report was prepared under the general supervision of O. Milton Hackett, Chief, Branch of Ground Water, U. S. Geological Survey, and the immediate supervision of P. M. Brown, District Geologist, Branch of Ground Water, U. S. Geological Survey.

Acknowledgments

Grateful acknowledgment is made to the many cooperative individuals who contributed data for the well and spring inventories and provided other useful information. Well and spring inventories were, in part, collected by Tom Durham and Lannie Wilson, field assistants.

GEOGRAPHY

Location and Extent of Area

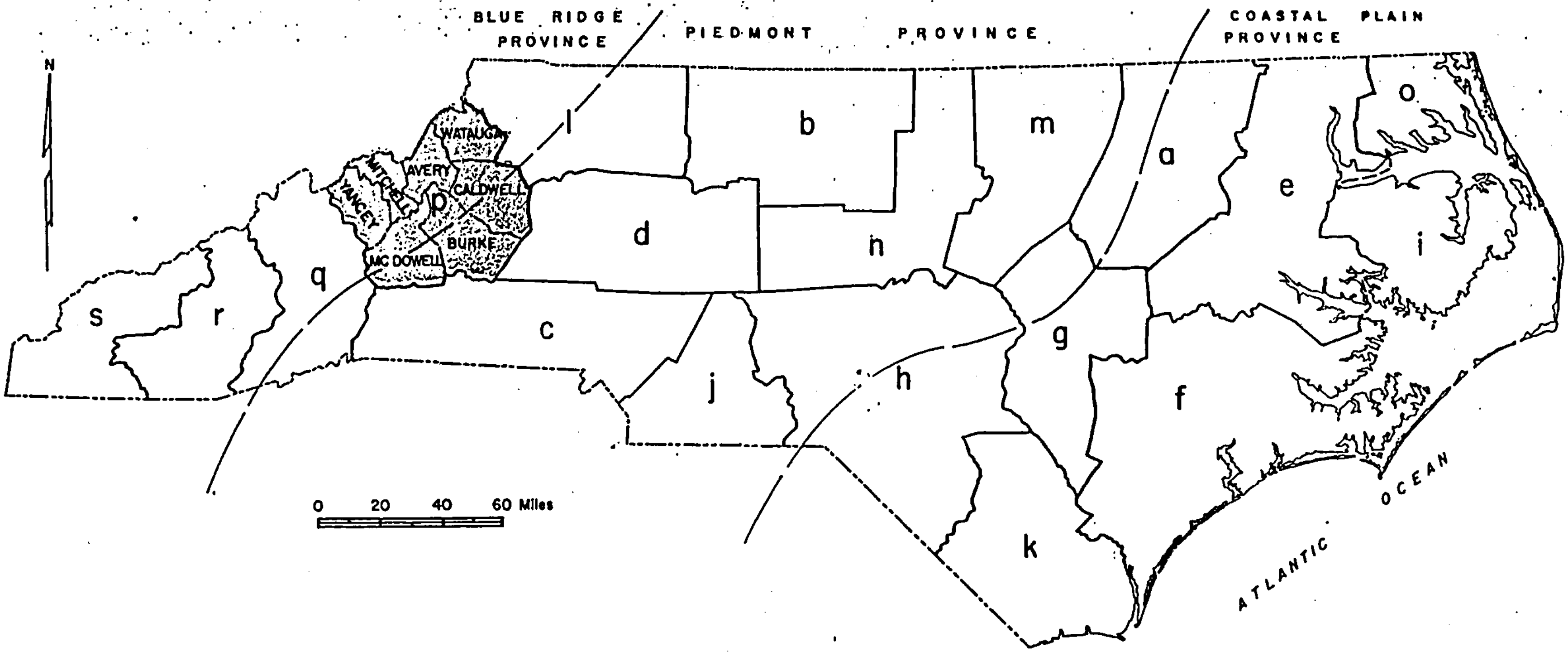
The seven counties described by this report comprise an area of 2,522 square miles of western North Carolina between 35° 32' and 36° 08' north latitude, and between 81° 20' and 82° 30' west longitude (fig. 1). The area is accessible by interstate and state highway systems, and by numerous paved or graded secondary roads. The Blue Ridge Parkway traverses the area from southwest to northeast.

Population and Economy

According to the U. S. Bureau of the Census the seven counties had a total population of 186,447 in 1960. The largest town in the area is Lenoir, county seat of Caldwell County, with a population of 10,257. The economy of the area is predominately agricultural with 592,000 acres or 36.7 percent of the total area occupied by farms. Tobacco, poultry, corn, and livestock are the principal farm products. The production of timber and other forest products supplement the farming economy. Mining industries in the Spruce Pine district of Avery, Mitchell, and Yancey Counties produce feldspar, mica, and kaolin in commercial quantities. Manufacturing, mainly of textiles and furniture, is localized in the larger towns.

Climate

Climatic data were derived from 9 offices of the U. S. Weather Bureau which provided continuous records through 1961 and 1962 in the Morganton area. Mean annual values for temperature, 51.5° F., and precipitation, 59.71 inches, in the Blue Ridge part of the area were provided by 6 weather stations. For the inner Piedmont part of the area, 3 weather stations reported a mean annual temperature of 58.2° F. and a mean annual precipitation of 52.12 inches. The highest average seasonal temperatures and precipitation occur in June, July, and August, and lowest temperatures are in January. September and October have the lowest mean monthly precipitation in the Morganton area (figs. 2 and 3).



a. Halifax area, Bulletin 51
b. Greensboro area, Bulletin 55
c. Charlotte area, Bulletin 63
d. Statesville area, Bulletin 68
e. Greenville area, Bulletin 73
f. Wilmington area, Ground-Water Bulletin 1
g. Goldsboro area, Ground-Water Bulletin 2
h. Fayetteville area, Ground-Water Bulletin 3
i. Swanquarter area, Ground-Water Bulletin 4
j. Monroe area, Ground-Water Bulletin 5
k. Southport area, Ground-Water Bulletin 6
l. Northwestern N.C. area, report in preparation
m. Raleigh area, report in preparation
n. Durham area, report in preparation
o. Elizabeth City area, report in preparation
p. Morganton area, described in this report
q. Asheville area, report in preparation
r. Waynesville area, report in preparation
s. Murphy area, report in preparation

Figure 1. Index map of North Carolina showing area of investigation by counties and physiographic divisions.

Physiography

The Morganton area lies within two major physiographic provinces; the inner Piedmont province and the Blue Ridge province. Burke, Caldwell, and McDowell Counties lie within both provinces. By definition the boundary of the provinces is at the foot of the mountains where the altitude is approximately 1,300 to 1,500 feet above mean sea level. The inner Piedmont is of gentle to moderate relief, with hills resembling monadnocks widely separated by peneplaned valleys. The topography of the Piedmont contrasts with the steep gradients and dissected ridges of the eastern Blue Ridge front. In the Blue Ridge part of the area, altitudes range from about 1,300 feet near Lake James to 6,684 feet on the summit of Mt. Mitchell. Greatest topographic relief is along the eastern front of the Blue Ridge province, where high-gradient drainage systems are tributary to the Catawba and Yadkin Rivers. The Blue Ridge topography west of the front consists mainly of subdued hills, and is of more moderate relief. Avery, Mitchell, and Yancey Counties, west of the Blue Ridge front, are drained by generally northwest-flowing streams (pl. 1). Relationships of drainage patterns to geologic features indicate that most of the streams are of subsequent development.

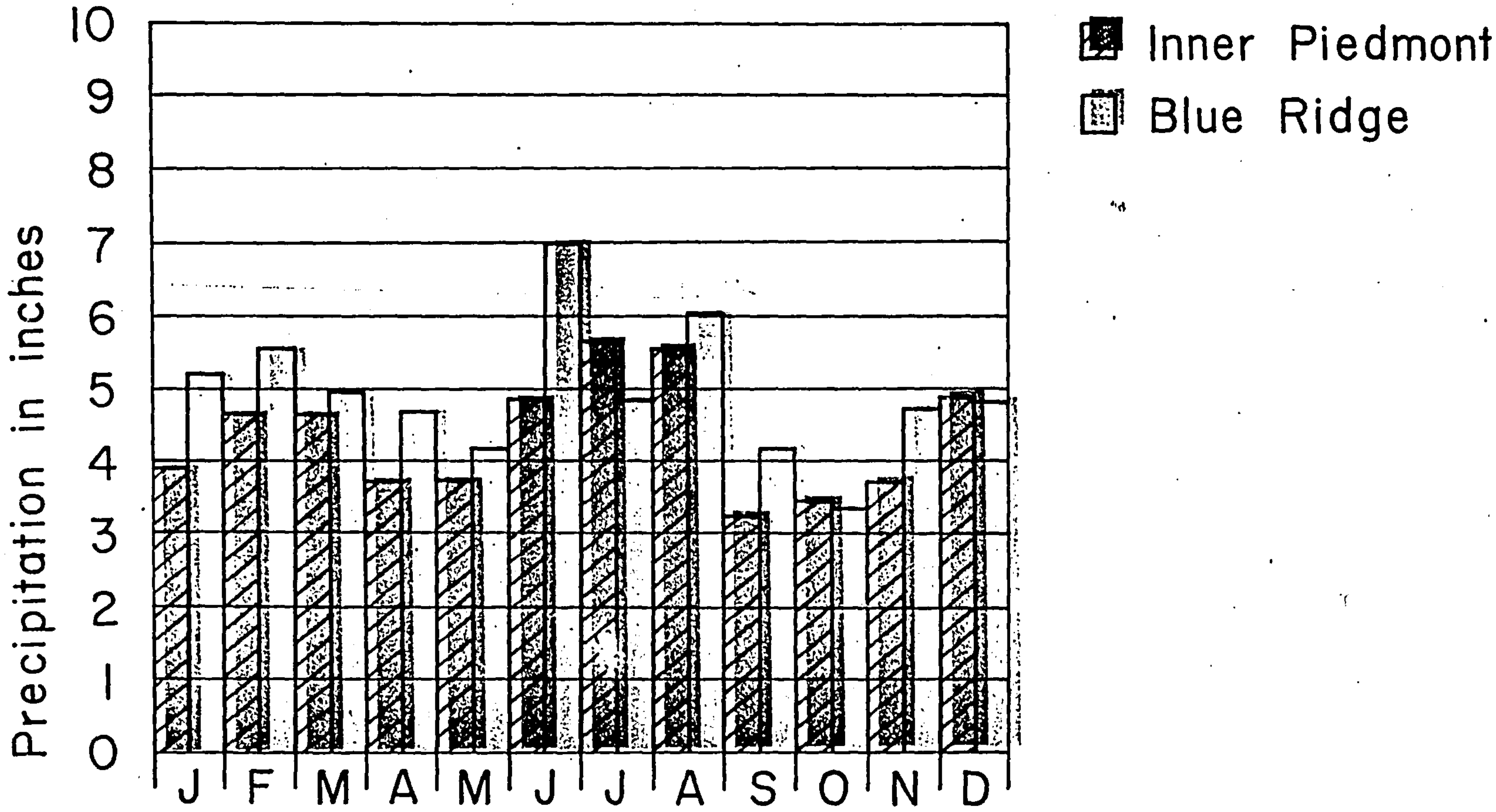


Figure 2. Mean monthly precipitation, Morganton area, 1961-62.

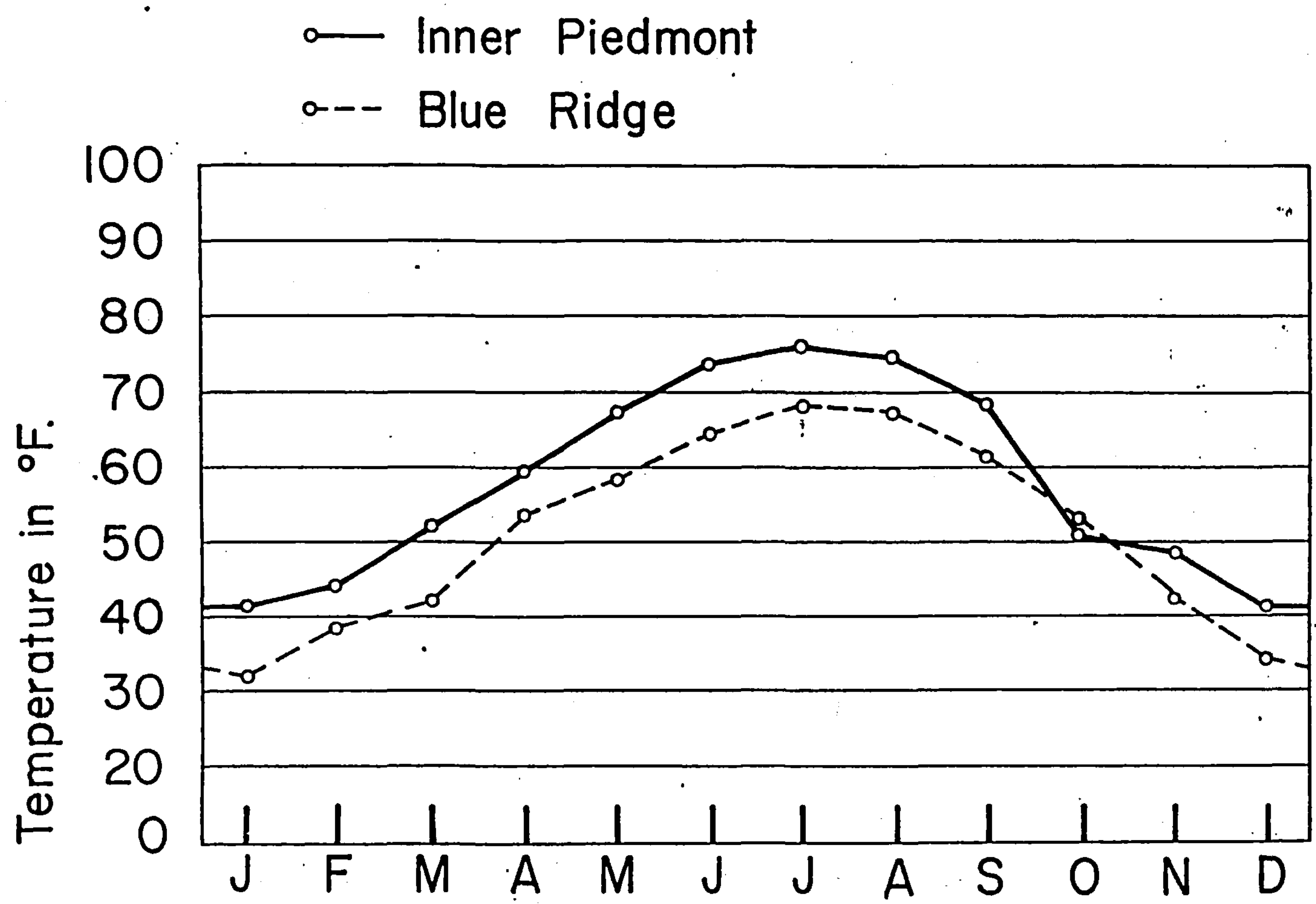


Figure 3. Mean monthly temperatures, Morganton area, 1961-62.

GEOLOGY

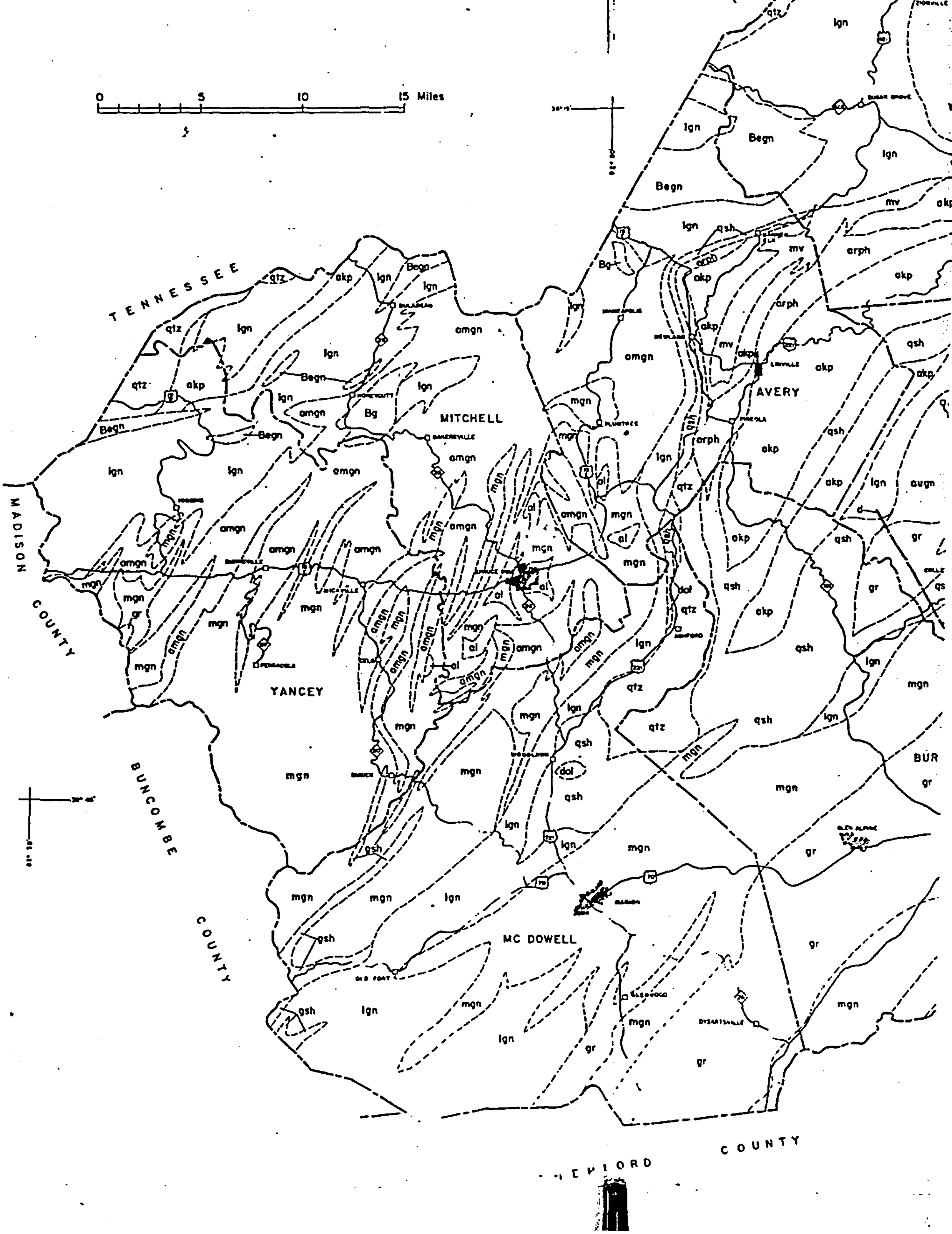
Introduction

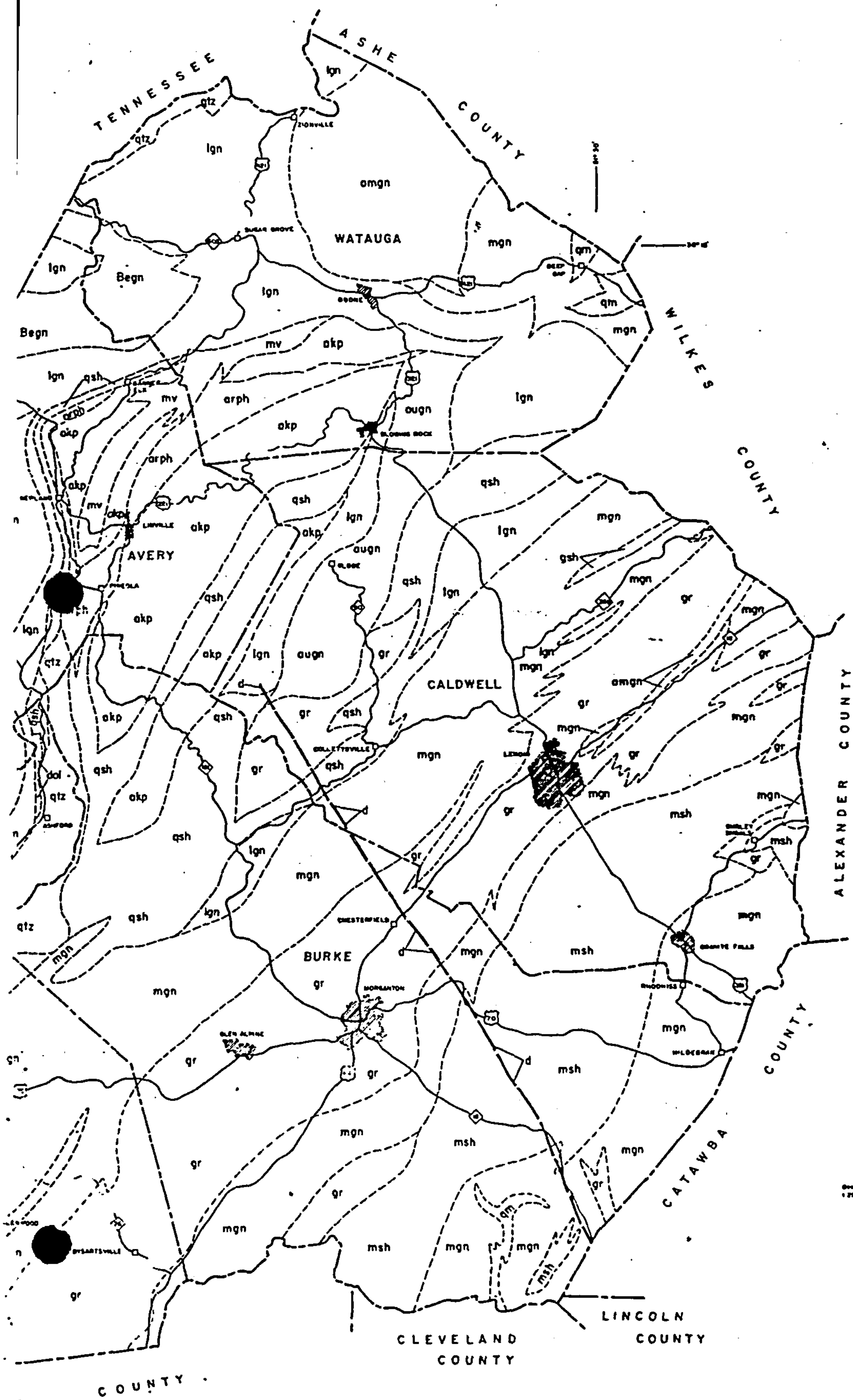
The Morganton area is underlain by a complex assemblage of metamorphic rock types. These rocks were mapped on a reconnaissance basis during this investigation. In order to facilitate map representation of rock types for their relation to quantity and quality of ground water, rock classification in this report is based on composition and physical identification rather than stratigraphic relationships. Stratigraphy in the Morganton area is complex and, in places, obscure due to recurrent regional metamorphism. Boundary transitions between rock types may be defined within a few inches or feet, or they may be represented by wide zones in which the rock types are intermixed and interlayered, showing only a progressive change in dominant rock type. Generally the change in type is gradational and the contact between types is indeterminate. Hence, rock-type boundaries should be considered approximate on the geologic map (pl. 2).

The succession of geologic events which brought about the existing complex of lithologies within the inner Piedmont and Blue Ridge provinces is not yet clearly understood. Heterogeneity of rock types associated with compositional layering indicates a diverse sedimentary and igneous origin in an environment of rapid deposition. Relict sedimentary structures, current bedding and graded bedding, are present in some compositional layers. After the deposition of these intermixed sedimentary and igneous rocks, they underwent recurrent regional metamorphism by compression which has transformed them by heat and directed pressure into a folded complex of gneisses and schists. Many of the pegmatite dikes or veins within the metamorphic complex are probably by-products of this metamorphic heat and pressure. Basic igneous stocks and dikes of gabbro and diabase intruded the metamorphic-rock complex later, mainly within the Blue Ridge part of the Morganton area. The elevation and ensuing erosion of the rock complex for a very long time is evident from the beveled appearance of the inner Piedmont and the dissected aspect of the Blue Ridge province. Throughout the inner Piedmont and in many places within the Blue Ridge province deep weathering of bedrock has produced a thick residual mantle. Mechanical weathering, though effective in exposing bedrock in areas of greater relief, is

Plate 2

Geologic map of the Morganton area, North Carolina, showing major rock type.





EXPLANATION

d	Diabase dike
Bg	Bakersville gab
al	Alaskite
qm	Quartz-monzon
msh	Sillimanite-mica
gr	Granitic gneiss
mgn	Quartz-biotite
gsh	Garnet-mica sc
lgn	Layered gneiss
amgn	Amphibolite gne
augn	Augen gneiss
Begn	Beech granite g
mv	Mafic volcanic
arph	Argillite and p
akp	Arkosic and py
qsh	Schistose and
dol	Dolomite
qtz	Quartzite

Granitic gneiss

Outcrops of this heterogeneous complex are generally granite gneiss. Intermixed and interlayered with the granite gneiss are biotite-muscovite schist, amphibolite gneiss and schist, compositionally layered gneiss, micaceous quartzite, dolomitic gneiss, and quartz-biotite-monzonite gneiss. Boundary transitions of this complex rock type are generally wide zones which show only a progressive change in dominant components. The granitic gneiss complex weathers to a reddish-clay residuum. This complex extends from southeastern McDowell County northeastward through central Burke and Caldwell Counties.

Quartz-biotite gneiss

This mica gneiss complex consists predominately of quartz-biotite gneiss and schist, compositionally layered gneiss, schistose quartzite, dolomitic gneiss, quartz-monzonite gneiss, and micaceous crystalline limestone. Its boundary transitions are rarely well defined. The mica gneiss complex weathers to reddish-clay saprolite which contains schistose layers of light-brown decayed mica. As shown on the geologic map, quartz-biotite gneiss is the most extensive rock type in the Morganton area.

Garnet-mica schist

This schist is varied in color from green, to gray, and rust. Dark-gray graphitic layers are not uncommon in this unit. Contacts of this rock are sharply defined where they are exposed. The garnet-mica schist weathers to a reddish clay in which much of the original schistosity is preserved. Several elongate units of this garnetiferous, quartz-muscovite schist extend northeastward from western McDowell County into southern Yancey County. A compositionally similar unit occurs in eastern Caldwell County.

Layered gneiss

As with other metamorphic-rock complexes in the Morganton area, the layered-gneiss complex has a wholly heterogeneous aspect (figs. 6 and 7). It is distinguished by primary compositional layering. In outcrops tens of feet wide it is generally gray, feldspathic, quartzose rock with sharply defined compositional layers which have continuity and fairly uniform thickness throughout the exposure. Layers range from less than an inch to several feet in thickness, and show considerable variation in mineral components. The layers may consist of amphibolite gneiss or schist, dolomitic gneiss, sericitic quartzite, mica gneiss, thin layers of mica schist, and light-colored, coarse-textured, quartzose, feldspathic constituents within a dark-colored, fine or aphanitic groundmass. The layered gneiss complex weathers to varied shades of red clay containing dispersed, schistose laminae of light-brown, decayed mica. It is common throughout most of the Morganton area.

Amphibolite gneiss

This rock type occurs as gneissic and schistose layers of greatly contrasting thickness. Mica gneiss and mica schist, sparsely intercalated with the amphibolite layers, impart a heterogeneous aspect to the outcrops. Amphibolite gneisses and schists, black to dark green, consist almost entirely of fine-to-coarse, elongate, amphibolite crystals. Amphibolite weathers to dark-red or red-brown clay. Amphibolite gneiss is most abundant in the Blue Ridge part of the Morganton area.

Augen gneiss

In this rock type lentoid, light-gray to white augen lie in roughly parallel alignment within a well foliated, dark-green, aphanitic groundmass of quartz, biotite, chlorite, and amphibolite. Layers of dark-gray quartzose gneiss, and dark-gray phyllite with mica schist are common within the augen gneiss. In a road cut exposure about 1/2 mile north of Aho, on the Blue Ridge Parkway, fine-grained, dark-gray, gneissic, compositional layering within the augen gneiss is highly calcitic. An elongate, north-northeast-trending body of augen gneiss extends from near Brown Mountain in western Caldwell County to the vicinity of Bamboo in Watauga County. Fresh outcrops of this rock are well exposed along highway 321 south of Blowing Rock (fig. 8).

Beech Granite

This is a coarse-grained, gneissic rock, varied in color from gray to pinkish gray. Although not common, layers of light-green quartzite, dark-gray phyllite, and feldspathic quartzite occur within

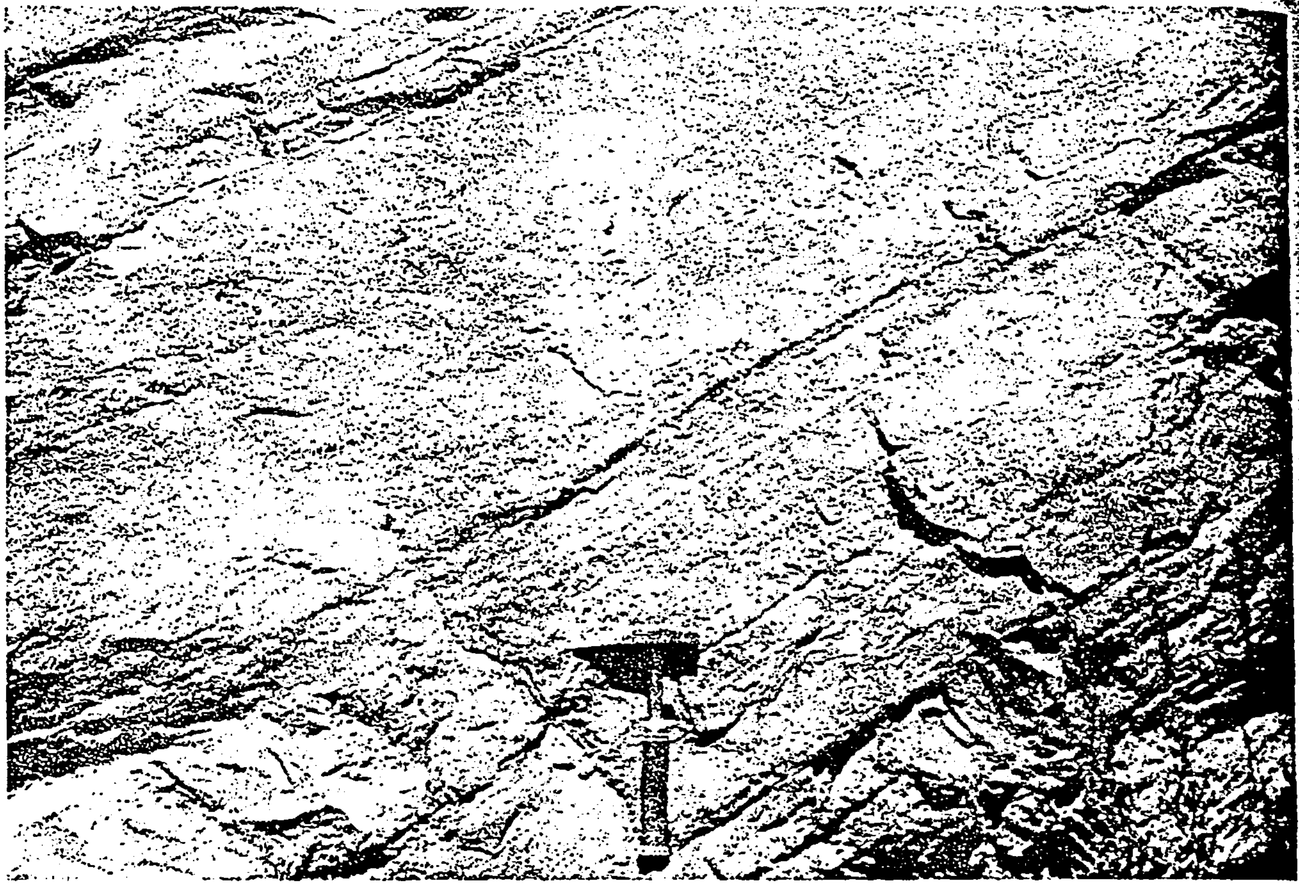


FIGURE 6. LAYERED GNEISS ALONG HIGHWAY 40, ABOUT 3 MILES NORTHWEST OF OLD FORT, McDOWELL COUNTY.

FIGURE 7. DOLOMITIC LAYERED GNEISS ALONG HIGHWAY 40, 2 MILES EAST OF MARION, McDOWELL COUNTY.

schistose quartzites; light-colored, schistose, pyroclastic rocks; mica schist; layered gneiss; mica gneiss; dark-gray phyllite; graphitic schist; light-gray quartzite; dolomitic, quartzitic rocks; and light-colored, feldspathic quartzite. They weather to varied shades of red, sandy clay. Designated as schistose, quartzitic rocks on the geologic map, they extend northeastward from McDowell County through Burke, Caldwell, and Watauga Counties.

Dolomite and limestone

Where it is exposed in quarries, bedding in the light-gray, dense, crystalline dolomite is massive, with only local thin beds and dark-gray, argillaceous partings. Linville Caverns, north of Ashford in McDowell County, is a network of solution channels developed on joint systems within the dolomite. Near Woodlawn, McDowell County, the dolomite is quarried for road metal. A small outcrop of light-gray and white dolomite, too small to define on the geologic map, is exposed in a railroad cut about $1\frac{1}{2}$ miles northwest of Bandanna in Mitchell County. Dark-blue and dark-gray, foliated, micaceous, crystalline limestone outcrops, too small to define on the geologic map, occur north and west of Marion in McDowell County (fig. 10). These small limestone outcrops appear to be aligned on a trend of approximately N. 55° E., consistent with regional structural trends.

Quartzite

The light-tan and white, massive- and cross-bedded, fine-grained quartzite locally contains dark-gray and dark-green, graphitic, argillaceous partings (fig. 11). It weathers to a light-colored, sandy earth, in some places resembling unmetamorphosed, friable sandstone. The quartzite is exposed in a large, dissected anticline near the central part of the Morganton area. A similar quartzite, coarse-grained, containing varied amounts of feldspathic constituents, light-colored pyroclastic layers, with dark-gray and black argillaceous interbeds, occurs in northern Mitchell, Watauga, and Yancey Counties.

Saprolite

Mechanical and chemical weathering of rocks in the Morganton area has formed an extensive residual mantle of soils and saprolite. Saprolite, or decomposed rock, in this area developes best on gneissic and schistose rocks containing feldspar or amphibolite minerals as these are very unstable in the presence of air and moisture. As weathering progresses, soluble products of weathering (and some colloids) are continually removed by ground-water circulation. The residuum of clay minerals, oxides of iron and aluminum, quartz, and other insoluble accessory minerals, with partly weathered rock constituents, compose saprolite. Where the mantle is more deeply developed and least affected by erosion, it may comprise a zone of soils, an intensely weathered zone of saprolite, and a transitional zone between saprolite and unweathered rock. Relict schistosity or foliation and partly weathered laminae of mica are common where the mantle has been undisturbed. The thickness of the mantle in the Morganton area ranges from less than 1 foot to over 100 feet. The saprolite mantle is deepest and best developed over low areas of the inner Piedmont and in areas of subdued relief in parts of the Blue Ridge upland.

Alluvial sediments

Much of the surface material throughout the Morganton area has been transported varied distances by alluvial processes. In the larger stream valleys coarsely stratified sediments of sizes ranging from clay to small boulders form alluvial deposits up to 50 feet thick. Auger-hole transections to test for thickness and character of sediments and for ground-water occurrence in the Catawba and Yadkin River valleys penetrated varied thicknesses of alluvium consisting of high percentages of clay. Rapid weathering processes may be partly responsible for the large amounts of clay in stream-valley sediments. Terrace deposits of coarse gravel and boulders are present along most of the larger perennial streams.

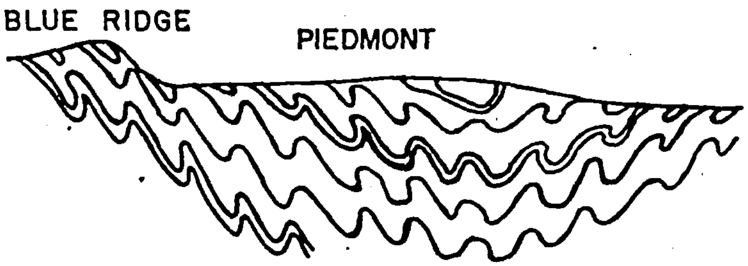
GEOLOGIC STRUCTURE

Regional Patterns

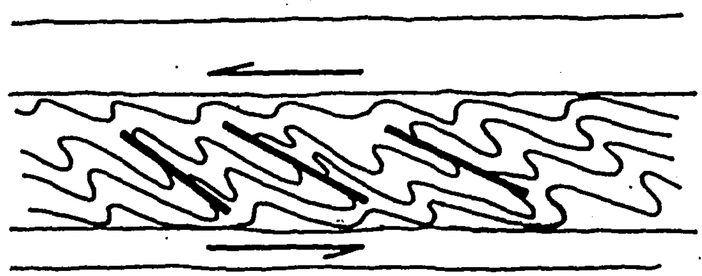
On the basis of reconnaissance data, structural geologic features of the area are interpreted to be part of the west limb of a broad, northeast-trending, composite downfold or synclinorium which extends northeastward through the central part of the State (fig. 12). Gross linear outcrop patterns on the geologic map indicate this trend. In the Piedmont province these folds have been beveled. Their structural attitudes and relationship to the synclinorium may be seen in road cuts and may be inferred by the more rapidly changing and repetitive lithologies normal to the main structural trend than parallel to it. Along the Blue Ridge front, exposures of the component anticlinal and synclinal folds and sheared recumbent folds are more common. North-northeast-trending Linville Mountain in McDowell and Burke Counties may be seen to be the resistant quartzite crest of a dissected anticlinal fold, part of the synclinorium. This fold is well exposed at the southwest side of Dobsons Knob as viewed from the vicinity of Woodlawn in McDowell County. Road-cut exposures along the Blue Ridge Parkway, such as the recumbent folds of quartzite at Wildacres Tunnel, show the complex structural nature of the west limb of the synclinorium (fig. 11). Detailed structure sections of the area await a more comprehensive geologic investigation.

Faults and joints

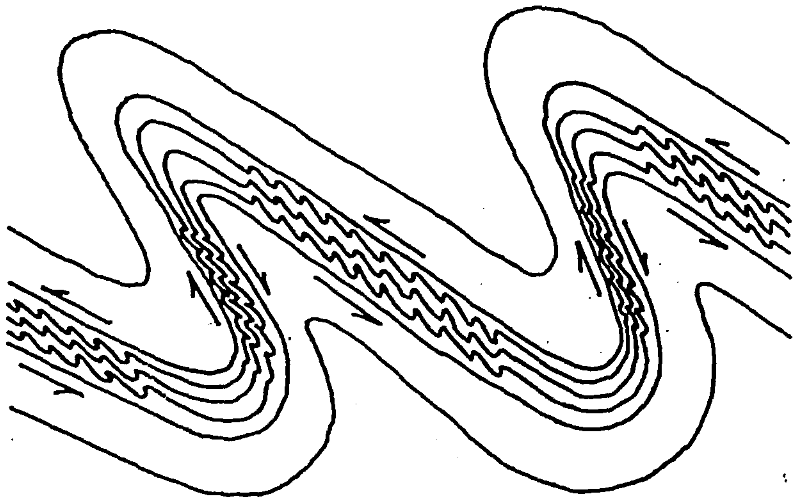
Due to the extensive mantle of saprolite, faults and joints are not readily apparent except where exposed in railroad cuts, road cuts, quarries, or similar excavations. Few such exposures fail to show a number of faults, shear zones, and joints. However, these linear structural features are generally not traceable for any great distances. Faults are very common. They are apparently of small displacement and not of regional extent. Faults generally strike northeastward and are vertical or dip at steep angles southeastward. Faults stroking northwestward, though present, are less common. The predominant joint systems strike about N. 60° E. and N. 40° W., and are vertical or dip steeply southeastward and southwestward. Less prominent joint systems trending nearly north and nearly east occur locally.



a. Diagrammatic synclinorium (not to scale).



c. Heavy lines represent shearing in drag folds of an incompetent bed.



b. Diagram showing development of drag folds in an incompetent bed between two competent beds. Arrows show direction of shear forces.

Figure 12. Diagrams of some structural features of the Morganton area (not to scale).

Shear zones

Formation of the composite downfold or synclinorium was accompanied by lateral pressure on weaker rock layers between strata more resistant to folding. This directed pressure resulted in formation of a series of parallel "drag" folds in the weaker layers (fig. 12). Continued lateral pressure caused rupture or shearing of the tightly folded weaker beds (fig. 12). The weaker or incompetent rock layers are heterogeneous gneisses and schists, and shear zones are generally present where these highly folded rocks are exposed. The zones are characterized by their fractured and brecciated or schistose nature, and may appear to be continuous in some places owing to their more-or-less parallel alignment. Discontinuous outcrops and complexity of folding preclude exact measurement of displacement on shear zones or faults.

intermediate layer by the pull of gravity. The capillary fringe consists of water held above the zone of saturation by capillary attraction; in fine silts or clayey earth it may rise several feet and in coarse gravel it may rise less than an inch. The upper surface of the zone of saturation is known as the water table. The zone of saturation is the vast system of ground-water reservoirs in permeable rock that provide water to seeps, springs, and effluent streams, and to wells. Configuration of the water table is generally a subdued reflection of topographic relief, although it may be discontinuous between joint and shear systems in bedrock. The bottom of the zone of saturation is obscure; it may be defined conditionally as the greatest depth at which ground-water circulation occurs in joint and shear systems.

Occurrence of ground water

Ground water in the Morganton area occurs in the deeply weathered residual mantle or saprolite and in joints or shear openings in bedrock. Trend of ground-water movement in saprolite or bedrock openings is more or less directly from higher interfluvial places in topography, and the water table, to lower areas, generally to effluent perennial streams. Rate of ground-water movement is dependent on hydraulic gradient and permeability of the water-saturated zone. Where relict schistosity is present in saprolite, it influences the movement of ground water, as transmission takes place more freely parallel to relict schistose layers than normal to them. Shallow wells in saprolite have long been a source of ground water for domestic use wherever the weathered mantle is of sufficient thickness and permeability to yield ground water. Although this shallow source of water continues to be of significance for individual domestic water supplies, it seldom provides sufficient water for industrial or municipal applications. Aerial photographs and topographic maps show many subsequent streams of the Morganton area in rectangular-trellis patterns which are, by reconnaissance field data, indicative of underlying joint and shear systems in bedrock. Circulation of ground water along joint and shear systems causes enlargement of these linear openings by solution with consequent increasing permeability, particularly in gneissic rock types which contain calcic plagioclase and in dolomitic rocks. Surficially the increase in permeability is manifested by development of linear depressions over the underlying pattern of joint and shear systems. These linear depressions, generally in rectangular patterns, are persistent for considerable distances and range in width from tens of feet to about a quarter of a mile. They may or may not retain perennial streams, depending on topographic circumstances. These linear zones of relatively high permeability are most obvious in the inner Piedmont, but they are present throughout the Morganton area and represent the best sites for development of ground water (pl. 1).

Dug and bored wells

The oldest source of ground water in this area is from wells dug in the water-bearing saprolite or flood-plain alluvium. Bored wells differ from the older dug wells only in the manner in which they are excavated and in their slightly greater depths; they are usually augered through saprolite to or nearly to bedrock. Dug and bored wells are the source of domestic water supplies for individual farms or outlying residences not availed of municipal water systems. Of 125 dug and bored wells inventoried, the average depth is 35 feet and the average depth to the water table is 23 feet. The deepest bored well in the area is 150 feet and the greatest depth to the water table is 120 feet. Insufficient data preclude any estimate of yields from these wells except that they provide enough water for domestic use. Quality of ground water from dug and bored wells is generally comparable to that from drilled wells as relating to hardness or dissolved minerals. Risk of contamination in shallow wells is greater because of their obvious nearness to possible surface sources of contamination. Bored wells, and perhaps some dug wells, will continue to be a source of domestic supplies for new residences in outlying areas. Caution should be taken to locate a dug or bored well at sufficient elevation or distance from any septic tank, sewage field, barn, stable, sty, or similar source of contamination. Tests for possible contamination of household-water supplies from shallow wells should be made at fairly frequent intervals. Water-table fluctuations are shown from monthly measurements of 26 dug or bored observation wells in the Morganton area, mostly in the inner Piedmont province, in figures 17, 19, 21, 23, 25, and 29.

Drilled wells

Drilled wells are a source of ground water for individual, industrial, and municipal water systems throughout the area. They are drilled and cased through the residual saprolite mantle and obtain ground water from fractures or similar openings in unweathered bedrock. The available quantity of ground water from drilled wells is dependent on the degree to which the source rock is fractured and permeable to ground-water movement. At greater depths, beyond about 300 feet, fractures or similar openings in bedrock decrease in size and number; hence the average optimum depth of drilled wells is not over 300 feet (table 4). Inventories of drilled wells show that most are about 6 inches in diameter. Larger well diameters will provide greater yields due to increased number of intersected rock openings and greater rock surface from which ground water will be available. A few industrial and municipal wells are 8 or 12 inches in diameter. Drilled wells will generally yield greater quantities of water from topographically low or flat areas and from draws or swales, as these features generally represent differential weathering of more fractured and permeable underlying bedrock (table 5). No attempt has been made to relate yield of wells to the many rock types of the area due to the deficiency of representative wells in each rock type. Fractures and similar openings appear to be of more consequence to yield of drilled wells than rock type. Hardness of ground water from drilled wells is generally low. Locally, dissolved iron may be sufficient to preclude ground water from some industrial uses. Iron in ground water of this area is probably derived from pyroxene, amphibole, and iron-sulphide minerals. Iron may also come from ground water contact with well casing, pump parts, and other iron objects. Where the well head is properly sealed, possibility of contamination of water in drilled wells from surface sources is unlikely. Present rates of ground-water withdrawal have no discernable effect on the water table. Ground-water use in the Morganton area is negligible in comparison to the amount of water available as recharge.

Springs

High annual precipitation in the area of this investigation favors a large number of springs, particularly in the Blue Ridge province. Saturation of residual mantle and fracture zones in bedrock results in discharge of ground water from the storage reservoirs where the water table

McDowell County

(Area, 442 square miles; 1960 population, 27,742)

McDowell County is situated in the southwest part of the area of investigation (fig. 1). In common with Burke and Caldwell Counties, it lies partly in the inner Piedmont province and partly in the Blue Ridge physiographic province. From southeast to northwest monadnock-like hills separated by moderately wide, linear valleys in southeast McDowell County yield to deeply dissected, rugged slopes of the eastern Blue Ridge front near the Catawba River. Altitudes range from less than 1,000 feet in the southeast corner to 5,665 feet above mean sea level on High Pinnacle at the northwest corner of the county. McDowell County lies mostly within the Catawba River drainage basin. Tributaries of the Broad River drain a small part of southern McDowell County. The Catawba River courses northeastward near the Blue Ridge-inner Piedmont boundary and is impounded in Lake James. Streams and drainage courses appear to be of subsequent development, as they are mostly coincident to joint and shear systems.

Marion, the county seat, is the largest town and Old Fort is the only other town of substantial size in McDowell County. Agriculture dominates the economy to which forest products are supplementary. About 23 percent of the county is farmland. Manufacturing, mainly of furniture and textiles, is localized in and near Marion and Old Fort. Quarrying, about 8 miles north of Marion, produces dolomite used mostly for road metal. The northwest boundary of McDowell County is traversed by nearly 40 miles of the scenic Blue Ridge Parkway.

Mica gneiss predominates in exposures of the complex metamorphic rock types of this area (pl. 2). Layered gneiss, granitic gneiss, and quartzite are other prominent rock types. Structural trends range from nearly north to northeast. A deeply weathered residual mantle of saprolite overlies most of the inner Piedmont part of McDowell County. Saprolite is thin or absent on the Blue Ridge front.

Surface water is the source of municipal supplies for Marion and Old Fort. The water is filtered, chlorinated, and additionally treated before use. Drilled wells furnish water to many farms and outlying residences. Most of the drilled wells are less than 200 feet deep. Of 27 such wells the average depth is 110 feet and the average yield is 14.5 gallons per minute. Drilled wells having the highest yields are located in: low, flat areas; relatively narrow, linear valleys; or draws. Dug and bored wells are common throughout the inner Piedmont portion of McDowell County, providing domestic water for farms and residences. Of 60 dug and bored wells the average depth is 39 feet and the average depth to the water table is 27 feet. Insufficient data preclude statistical representation of yields from dug and bored wells. Springs are more commonly used in the Blue Ridge part of McDowell County. The community of Little Switzerland procures its municipal water supply from springs.

Analyses of ground water from McDowell County are shown in table 17. Water from wells 29 and 64 contained more than 0.3 ppm iron. Water from wells 39 and 64 contained high concentrations of chloride and/or nitrate. Analysis of water from well 6 is noteworthy. Water from this well had the highest pH (9.1) of any water sampled in the Morganton area, a strong "rotten egg" odor (hydrogen sulfide), and relatively high sodium and sulfate concentrations. This well probably is receiving water from pegmatite containing sodic feldspar and sulfides.

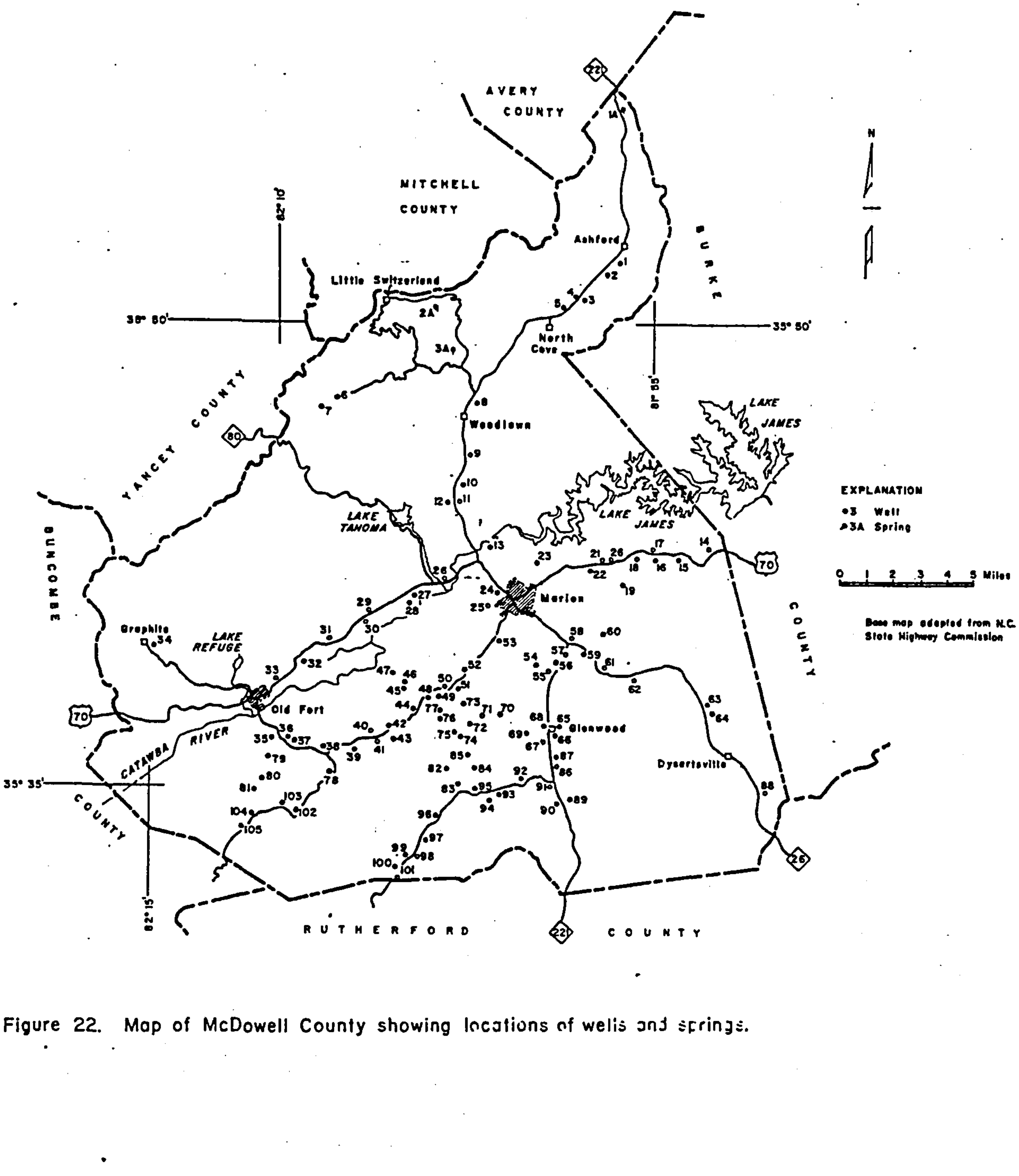


Figure 22. Map of McDowell County showing locations of wells and springs.

TABLE 15. RECORDS OF WELLS IN McDOWELL COUNTY

Well No.	Location	Owner	Type of Well	Depth (ft)	Diameter (in)	Depth of casing (ft)	Water bearing material	Water level (ft)	Yield (gpm)	Drawdown (ft)	Topography	Remarks
1	Ashford	S. C. Gouge	Bored	37	24	37	Alluvium	25	—	—	Flat	Hard water
2	1.1 Mi. S of Ashford	Sam Brown	do	27	24	27	do	20	—	—	do	Slightly hard water
3	1.5 Mi. N of North Cove	C. Weathers	Drilled	120	6	80	Quartzite	30	—	—	do	do
4	1.6 Mi. N of North Cove	J. G. Childers	Bored	40	30	40	do	20	—	—	do	
5	0.8 Mi. N of North Cove	B. McCall	do	16	30	16	Alluvium	10	—	—	do	Observation well
6	6.8 Mi. W of Woodlawn	N. C. State Fish Hatchery	Drilled	253	6	20	Amphibolite gneiss	4.9	12.0	—	Slope	SO_2 in water, not potable
7	7.2 Mi. W of Woodlawn	do	do	120	6	20	do	1	—	—	do	
8	0.6 Mi. N of Woodlawn	L. J. Robinson	do	190	6	150	Quartzite	25	—	—	do	
9	1.6 Mi. S of Woodlawn	Ray Byrd	Bored	16	30	16	Saprolite	4	—	—	Flat	Bedrock at 16 feet
10	2.7 Mi. N of Marion	Bill Nichols	do	7	18	7	Alluvium	2	—	—	do	Observation well
11	2.1 Mi. N of Marion	R. Lavender	do	60	30	60	Saprolite	5	—	—	Slope	
12	2.0 Mi. N of Marion	G. Biddix	do	12	30	12	do	3	—	—	Flat	
13	1.1 Mi. N of Marion	J. Lauder	Drilled	137	6	137	Layered gneiss	—	11.0	—	Slope	
14	6.6 Mi. E of Marion	K. Thombs	do	115	6	34	Biotite gneiss	72	9.0	—	Hilltop	
15	5.3 Mi. E of Marion	Z. B. Adams	Bored	40	30	40	do	25	—	—	Slope	
16	4.5 Mi. E of Marion	C. E. Edwards	Drilled	139	6	139	do	60	3.5	—	do	
17	4.3 Mi. E of Marion	G. Mace	do	130	6	130	do	—	—	—	do	Iron in water
18	3.8 Mi. E of Marion	O. Aldridge	do	68	6	68	Biotite gneiss	—	—	—	do	Slightly hard water
19	4.5 Mi. E of Marion	G. C. Welch	do	136	6	100	do	4	7.5	—	do	
20	4.0 Mi. E of Marion	Hollifield and Church	Bored	24	24	24	Saprolite	12	—	—	Flat	
21	3.7 Mi. E of Marion	G. Holland	do	16	24	16	do	7	—	—	do	Observation well
22	3.5 Mi. E of Marion	Lingerfelt	Dug	20	4'x4'	—	do	14	—	—	do	
23	2.0 Mi. NE of Marion	V. Davis	Drilled	237	6	100	Biotite gneiss	60	—	—	Slope	
24	0.7 Mi. NW of Marion	W. F. Morris	do	325	6	80	do	80	2.5	—	do	
25	1.0 Mi. W of Marion	J. G. Hollifield	Bored	67	24	67	Saprolite	54	7.0	—	do	
26	2.0 Mi. NW of Marion	P. E. Edwards	Drilled	84	6	74	Mica gneiss	—	20.0	—	Flat	
27	5.0 Mi. NW of Marion	G. Crawford	do	310	6	—	Layered gneiss	—	11.0	—	do	
28	5.2 Mi. W of Marion	W. V. Shuford	do	64	6	44	do	8	8.0	—	do	
29	6.2 Mi. W of Marion	Sam Parker	Dug	21	36	—	Saprolite	3	—	—	do	Observation well
30	5.5 Mi. NE of Old Fort	T. M. Burnett	Drilled	85	6	85	do	—	25.0	—	do	
31	4.0 Mi. NE of Old Fort	W. R. McDaniel	Dug	40	30	40	do	—	—	—	Slope	
32	2.8 Mi. NE of Old Fort	S. N. Allison	Drilled	57	6	35	Layered gneiss	32	—	—	do	
33	1.3 Mi. NE of Old Fort	R. E. Evans	do	63	6	50	do	—	75.0	—	Flat	
34	Graphite	—	Bored	19	18	19	Saprolite	11	—	—	Slope	
35	1.3 Mi. S of Old Fort	M. Wilson	Drilled	100	6	80	Layered gneiss	—	15.0	—	Slope	
36	1.3 Mi. SE of Old Fort	G. R. Early	do	120	6	60	do	—	8.5	—	do	
37	1.6 Mi. SE of Old Fort	T. B. Faw	Dug	36	36	36	Saprolite	30	8.0	—	Flat	Often cloudy
38	3.9 Mi. SE of Old Fort	Church	Bored	75	30	75	do	67	—	—	Slope	
39	4.8 Mi. SE of Old Fort	R. P. Cathey	Dug	48	40	—	do	43	—	—	do	Observation well
40	5.8 Mi. SE of Old Fort	—	Bored	28	30	28	do	12	—	—	Flat	
41	6.0 Mi. SE of Old Fort	J. Reel	Drilled	79	6	62	Mica gneiss	50	7.5	—	do	
42	6.3 Mi. SE of Old Fort	B. W. Simpson	do	115	6	75	do	15	—	—	do	
43	6.0 Mi. SE of Old Fort	A. F. Hill	Bored	45	30	45	Saprolite	27	—	—	Slope	
44	1.2 Mi. SW of Providence	F. J. Day	do	48	30	48	do	32	—	—	do	
45	2.0 Mi. W of Providence	C. Wall	Drilled	302	6	58	Layered gneiss	—	20.0	—	do	

TABLE 15. RECORDS OF WELLS [illegible] McDOWELL COUNTY (Continued)

Well No.	Location	Owner	Type of Well	Depth (ft)	Diameter (in)	Depth of casing (ft)	Water bearing material	Water level (ft)	Yield (gpm)	Drawdown (ft)	Topography	Remarks
46	2.2 Mi. W of Providence	C. Wall	Drilled	296	6	58	Mica gneiss	—	20.0	—	Slope	
47	2.5 Mi. W of Providence	R. Daves	—do—	28	6	24	Saprolite	12	8.0	—	Flat	
48	0.9 Mi. SW of Providence	A. Shelton	Bored	38	30	38	—do—	20	—	—	—do—	
49	0.7 Mi. SW of Providence	C. Barlow	—do—	44	30	44	—do—	30	—	—	—do—	
50	Providence	J. Davis	Dug	37	30	37	—do—	27	—	—	Slope	
51	—do—	R. W. Wilson	Drilled	72	6	72	Layered gneiss	60	22.0	—	Flat	
52	1.0 Mi. NE of Providence	R. O. McCurry	Bored	38	30	38	Saprolite	22	—	—	Slope	
53	1.6 Mi. SW of Marion	M. Sultles	Drilled	132	6	91	Mica gneiss	50	10.0	—	Slope	
54	2.5 Mi. S of Marion	D. Potide	—do—	184	6	65	—do—	—	25.0	—	Draw	
55	2.8 Mi. S of Marion	M. Williams	—do—	161	6	64	—do—	—	20.0	—	Slope	
56	2.5 Mi. SE of Marion	J. C. Bowman	—do—	130	6	68	—do—	—	3.5	—	—do—	
57	2.8 Mi. SE of Marion	E. Ross	—do—	210	6	79	—do—	5	15.0	—	Flat	
58	2.2 Mi. SE of Marion	P. Sherrill	—do—	100	6	100	Mica gneiss	—	15.0	—	—do—	
59	2.9 Mi. SE of Marion	P. Hunter	Bored	62	24	62	Saprolite	42	—	—	—do—	
60	3.5 Mi. SE of Marion	J. J. Harris	—do—	58	30	58	—do—	38	—	—	—do—	
61	3.5 Mi. SE of Marion	H. Whitson	Dug	50	30	50	—do—	44	—	—	Hilltop	
62	5.8 Mi. NW of Dysartsville	D. Peters	Drilled	67	6	67	Mica gneiss	—	10.0	—	—do—	
63	2.5 Mi. NW of Dysartsville	R. Berryhill	Dug	17	30	17	Saprolite	12	—	—	Flat	
64	6.4 Mi. SE of Marion	Z. Martin	—do—	54	5'x5'	—	—do—	45	—	—	Hilltop	Observation well
65	Glenwood	J. D. Pyatt	Bored	30	30	30	—do—	15	—	—	Flat	
66	0.2 Mi. SW of Glenwood	N. England	—do—	26	24	26	—do—	6	—	—	—do—	
67	0.6 Mi. SW of Glenwood	E. Barker	Dug	27	36	—	—do—	22	—	—	—do—	Observation well
68	0.4 Mi. W of Glenwood	F. Holland	Bored	150	30	150	—do—	120	—	—	Slope	
69	0.8 Mi. W of Glenwood	E. Higgins	—do—	55	30	55	—do—	40	—	—	Flat	
70	2.3 Mi. NW of Glenwood	W. B. Shufford	Drilled	64	6	48	Mica gneiss	—	8.0	—	Slope	
71	1.5 Mi. SE of Providence	W. H. Pace	Dug	22	30	22	Saprolite	11	—	—	Flat	
72	1.2 Mi. SE of Providence	G. Gardner	Bored	51	30	51	—do—	36	—	—	—do—	
73	0.7 Mi. SE of Providence	G. Little	Dug	60	30	60	—do—	50	—	—	Slope	
74	2.4 Mi. N of Sugar Hill	L. R. Webb	—do—	18	30	18	—do—	12	—	—	Flat	Bottom on bedrock
75	2.6 Mi. N of Sugar Hill	C. Birchfield	Bored	34	36	34	—do—	18	—	—	—do—	
76	1.3 Mi. S of Providence	K. Wilson	Drilled	120	6	120	Layered gneiss	—	12.0	—	Slope	Bedrock @ 60 feet
77	0.9 Mi. S of Providence	W. F. Stroud	—do—	187	6	100	—do—	55	8.0	—	Hilltop	
78	4.3 Mi. SE of Old Fort	P. Elliot	Dug	20	30	20	Saprolite	15	—	—	Flat	
79	2.1 Mi. S of Old Fort	J. Thomas	Bored	28	18	28	—do—	23	—	—	Slope	Observation well
80	3.1 Mi. S of Old Fort	E. A. Williams	—do—	40	30	40	—do—	34	—	—	—do—	
81	3.6 Mi. SW of Old Fort	C. Davis	Drilled	222	6	55	Layered gneiss	50	10.0	—	Flat	Bedrock @ 55 feet
82	1.1 Mi. NW of Sugar Hill	H. E. Hensley	Dug	35	36	35	Saprolite	32	—	—	Slope	
83	0.4 Mi. NW of Sugar Hill	G. Ray	Bored	65	30	65	—do—	46	—	—	—do—	Slightly hard water
84	1.0 Mi. NE of Sugar Hill	W. R. Cable	—do—	69	30	69	—do—	55	—	—	—do—	
85	2.2 Mi. N of Sugar Hill	C. Jenkins	—do—	20	30	20	—do—	12	—	—	Flat	
86	1.6 Mi. S of Glenwood	L. L. Parker	—do—	30	30	30	—do—	20	—	—	—do—	
87	1.4 Mi. S of Glenwood	A. F. Hunt	Drilled	150	6	150	Mica gneiss	120	25.0	—	Draw	
88	2.0 Mi. SE of Dysartsville	K. Fortune	—do—	60	6	40	Saprolite	22	4.0	—	Slope	
89	3.0 Mi. S of Glenwood	G. C. Smith	Dug	18	30	18	—do—	14	—	—	Hilltop	Hard water with SO_2
90	3.2 Mi. S of Glenwood	J. E. Butler	—do—	15	30	15	—do—	11	—	—	Flat	Hard water
91	2.3 Mi. S of Glenwood	A. W. Ward	—do—	35	30	35	—do—	25	—	—	—do—	—do—
92	3.7 Mi. SW of Glenwood	N. Lewis	Bored	40	30	40	—do—	30	—	—	Slope	—do—
93	1.5 Mi. E of Sugar Hill	H. E. Greene	Drilled	148	6	135	Granitic gneiss	100	13.0	—	—do—	

94	1.0 Mi. E of Sugar Hill—	F. Richardson——	Drilled	196	6	158	Granitic gneiss——	100	28.0	——	Slope—	Hard water——
95	0.3 Mi. E of Sugar Hill—	F. Conner——	Bored—	40	30	40	Saprolite——	30	——	——	Flat—	
96	1.3 Mi. SW of Sugar Hill-	F. Lawing——	—do—	48	30	48	—do——	30	——	——	—do—	
97	2.3 Mi. SW of Sugar Hill-	W. E. Ledbetter—	—do—	10	30	10	—do——	7	——	——	—do—	
98	3.1 Mi. SW of Sugar Hill-	C. Weathers——	—do—	40	30	40	—do——	20	20.0	——	—do—	
99	3.2 Mi. SW of Sugar Hill-	R. M. Wilkerson—	Drilled	272	6	262	Layered gneiss——	70	11.0	——	Slope—	Hard water——
100	3.9 Mi. SW of Sugar Hill-	J. H. Harris——	Bored—	85	30	85	Saprolite——	70	——	——	Flat—	Bottom on bedrock—
101	4.0 Mi. SW of Sugar Hill-	Church——	Drilled	140	6	140	Layered gneiss——	80	10.0	——	—do—	
102	6.0 Mi. SE of Old Fort—	P. L. Jordan——	Bored—	23	24	23	Saprolite——	14	——	——	Slope—	Hard water——
103	5.5 Mi. S of Old Fort—	E. Davis——	—do—	65	30	65	—do——	59	——	——	—do—	
104	5.0 Mi. S of Old Fort—	J. Elliott——	—do—	20	18	20	—do——	10	——	——	Flat—	
105	5.5 Mi. SW of Old Fort—	E. W. Davis——	Drilled	52	8	11	Layered gneiss——	17	9.0	——	Slope—	Bedrock @ 11 feet—

TABLE 16. RECORDS OF SPRINGS IN McDOWELL COUNTY

Well No.	Location	Owner	Type of Well	Depth (ft)	Diameter (in)	Depth of casing (ft)	Water-bearing material	Water level (ft)	Yield (gpm)	Drawdown (ft)	Topography	Remarks
1A	5.6 Mi. N of Ashford		Unimproved				Quartzite		3.0		Slope	49° F., 4-9-62
2A	0.4 Mi. W of Gillespie Gap		Reservoir				Amphibolite gneiss		4.0		do	53° F., 3-30-62
3A	2.3 Mi. N of Woodlawn	O. Washburn	do				Layered gneiss		1.8		Draw	Observation spring

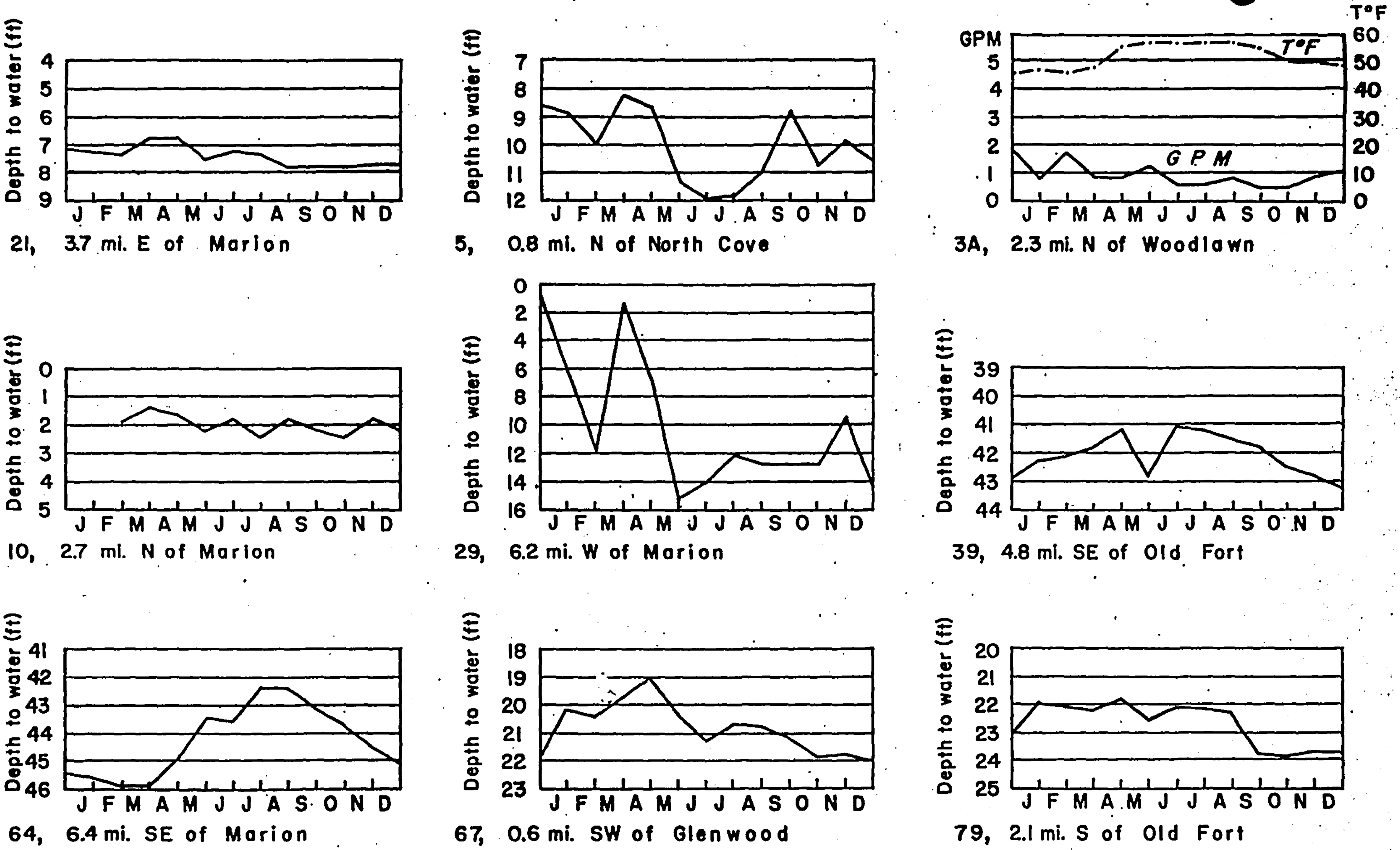


Figure 23. McDowell County observation well and spring hydrographs, 1962.

TABLE 17.- CHEMICAL ANALYSES OF GROUND WATER IN McDOWELL COUNTY

Number	Rock type 1/	Water type 2/	Source and depth (ft.) 3/	Date of collection	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Residue at 180°C	Dissolved solids: Calculated	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color
				Chemical analyses, in parts per million																						
5	qtz	II	B - 16	Jan. 15, 1962.	5.6	0.1	0.02	0.01	14	0.8	2.4	2.0	0.1	52	0.4	0.5	0.1	0.2	0.0	--	52	38	0	86	7.6	0
6	amgn	IV	Dr-253	Oct. 26, 1961.	17	.0	.02	.00	4.5	.1	23	.4	.1	* 17	20	6.0	.6	.8	.0	--	91	11	0	129	9.1	--
21	mgn	I	B - 16	Jan. 15, 1962.	5.7	.4	.07	.01	10	5.9	1.5	1.4	.2	64	.2	1.7	.0	1.1	.0	58	60	52	0	102	6.0	10
29	lgn	I	Du- 21	Jan. 15.......	5.2	.1	.62	.00	11	.8	2.4	2.9	.1	33	4.8	3.4	.0	.5	.0	--	47	30	2	76	6.0	10
36	lgn	IV	Dr-120	Jan. 12, 1963.	31	--	.00	--	3.2	.5	6.1	1.2	--	31	.2	.3	.2	.0	--	--	58	10	0	50	6.5	--
39	mgn	C	Du- 48	Jan. 15, 1962.	7.8	.1	.12	.02	1.6	3.9	8.3	2.9	.1	8	.2	20	.0	7.4	.0	67	56	20	14	96	5.3	0
64	gr	C	Du- 54	Jan. 15.......	5.6	.0	.73	.08	1.3	.4	2.0	.5	.1	3	.2	2.0	.0	5.9	.0	24	20	4	2	35	5.9	5
67	gr	IV	Du- 27	Jan. 15.......	7.6	.0	.11	.01	.4	.3	1.8	.9	.1	6	.2	2.3	.0	.1	.0	--	17	2	0	20	5.2	0
77	lgn	II	Dr-187	Jan. 12, 1963.	20	--	.04	--	22	2.1	5.6	.8	--	80	9.6	1.0	.5	.0	--	--	102	64	0	144	7.6	--
88	gr	IV	Dr- 60	Jan. 12.......	14	--	.12	--	1.1	.7	2.0	.7	--	13	.2	1.0	.0	.0	--	--	26	6	0	22	5.8	--
3A	lgn	I	S	Jan. 15, 1962.	16	.0	.09	.00	3.3	1.5	2.0	1.0	.0	24	.2	.5	.0	.1	.0	33	37	14	0	38	6.3	5

1/ Rock Type

qm - quartz-monzonite gneiss
msh - sillimanite-mica schist
gr - granitic gneiss
mgn - quartz-biotite gneiss
lgn - layered gneiss
amgn - amphibolite gneiss
augn - augen gneiss
Begn - Beech Granite
arph - argillite and phyllite
akp - arkosic and pyroclastic rocks
qsh - schistose quartzitic rocks
qtz - quartzite

2/ Water Type

I - calcium, magnesium, sodium bicarbonate
II - calcium, sodium, magnesium bicarbonate
III - calcium-sodium, magnesium bicarbonate
IV - sodium, calcium, magnesium bicarbonate
V - magnesium, calcium, sodium bicarbonate
D - dissolved solids too low to reflect effects of lithology upon water composition
C - excessive chloride and/or nitrate masks effects of lithology upon water composition

3/ Source

S - spring
Dr - drilled well
Du - dug well
B - bored well

* Carbonate (CO_3) 10 ppm

Reference 12, the Geologic Map of North Carolina, is not in a reproducible format. Therefore, it is not included in this report.

NORTH CAROLINA ATLAS

PORTRAIT OF A CHANGING SOUTHERN STATE

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Foreword by JAMES E. HOLSHOUSER, JR.

The University of North Carolina Press · Chapel Hill

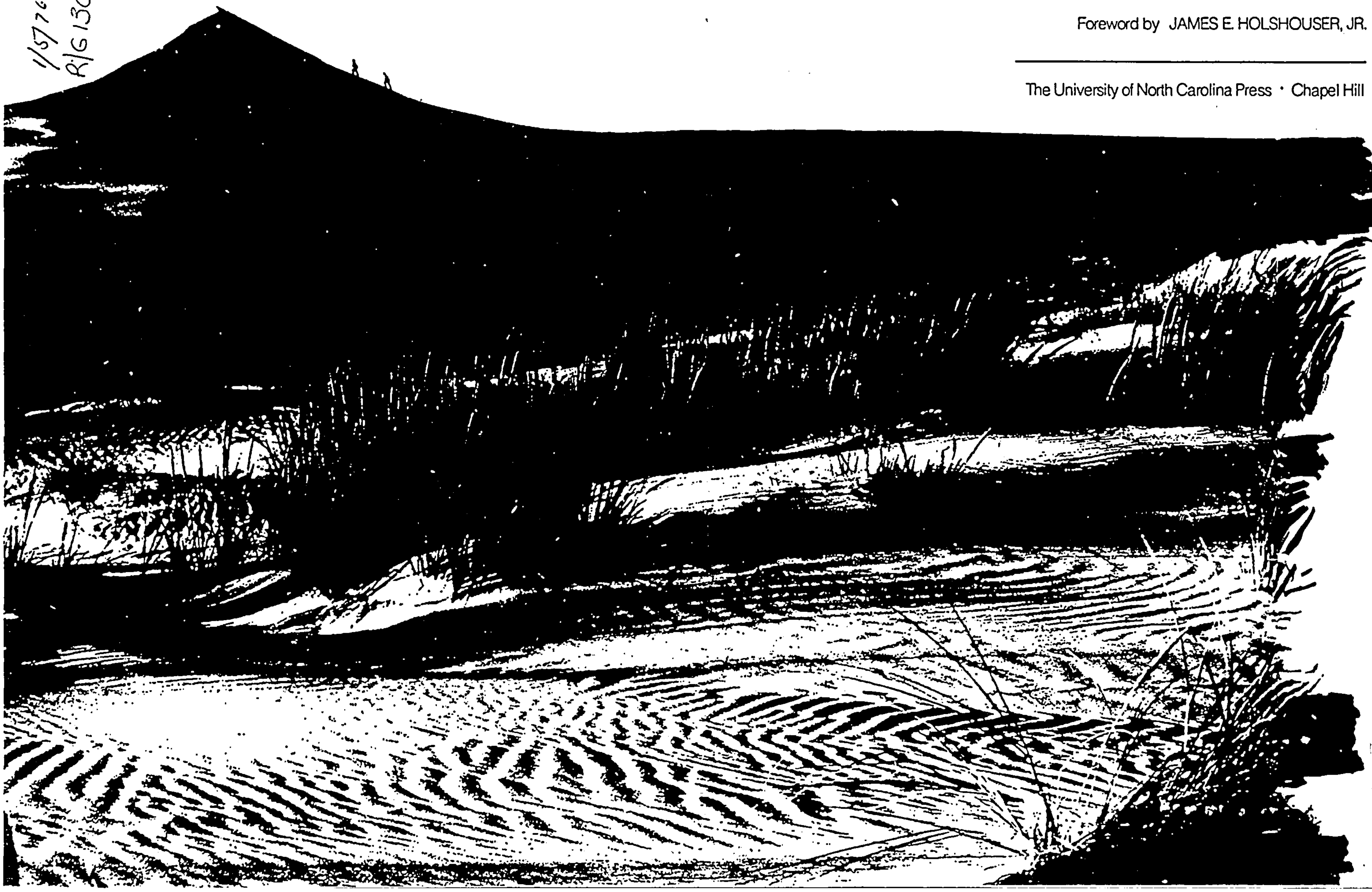
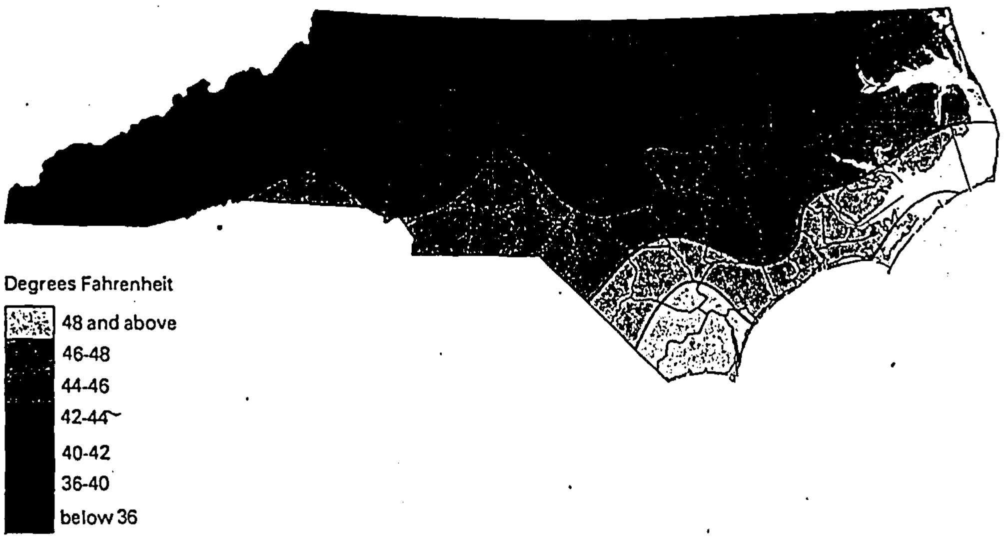
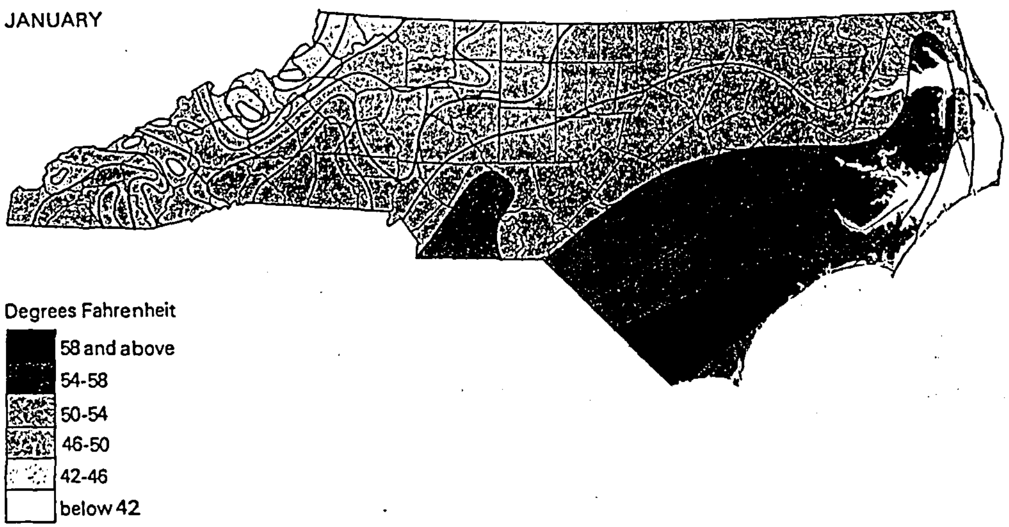


Figure 5.2. Average January Temperatures in N.C.



Source: U.S. Department of Commerce, *Weather and Climate in North Carolina,* 1972.

Figure 5.3. Mean Maximum Temperature in N.C.



Source: U.S. Department of Commerce, *Weather and Climate in North Carolina,* 1972.

Seasonal Changes in Climate

Winter The alternate passage of low- and high-pressure systems over the state during winter months results in changing weather conditions. Moisture and warmer temperatures are characteristically associated with frequently passing low-pressure cells. Lows are followed by polar highs, which bring lower temperatures and clear skies. However, even when under the influence of these polar highs, temperatures seldom fall below 10° F., and midday temperatures reach into the forties, making the winter season very tolerable by northern standards.

January average temperatures shown in Figure 5.2 illustrate the mildness of winters. Only at the highest elevations do temperatures average below freezing. The mean temperature for January at Mount Mitchell is 28.7° F., the lowest in the state. Yet, at Asheville, located on the lee side of the mountains, temperatures for January average 39.4° F.

Nowhere else in North Carolina is the local contrast in temperatures as great as in the western counties. Temperature contrasts are least where the climate is mildest. Hatteras, on the Outer Banks, has a January mean of 48.0° F., and only thirteen days each year when temperatures of 32° F. and below are recorded.

The tendency for January isotherms to parallel the coast shows the influence of the Atlantic Ocean. Wilmington, in southeastern North Carolina, the most subtropical area in the state, exemplifies the maritime effect. This coastal city has a January mean temperature of 47.8° F., and an average of only eight days during January when temperatures dip to 32° F. or less, as compared with eighteen days at Raleigh and nineteen at Asheville.

In the Piedmont, latitude is the primary control on temperature, and the isotherms maintain a zonal pattern. As might be expected, temperature averages lie between those exhibited by the surrounding regions. Charlotte has a mean January temperature of 42.3° F., Greensboro, 39.0° F., and Raleigh, 42.7° F.

However, whereas Asheville averages eighty-three days each year when temperatures drop below freezing, Winston-Salem has freezing temperatures eighty-eight days annually, and Greensboro has eighty-four days with freezing temperatures.

January Mean Maximum and Minimum Temperatures Figure 5.3 illustrates the temperature pattern across North Carolina on a typical afternoon of the coldest month. The cool waters of the East Coast are responsible for the isotherms taking an abrupt inland turn to the north before resuming the northeast-southwest pattern usually found on temperature maps. This distribution indicates that midday temperatures in January are highest a short distance inland from the coast unlike the pattern of mean temperatures that indicates a smooth gradient from the coast westward. Also, in the mountains, isotherms of mean maximum temperature are more numerous and some "islands" or "pockets" of cool temperatures exist. The greater ranges of temperature are associated with mountain valleys where nights are cold and days are warm, causing patterns of maximum temperatures to contrast significantly with mean temperature distributions.

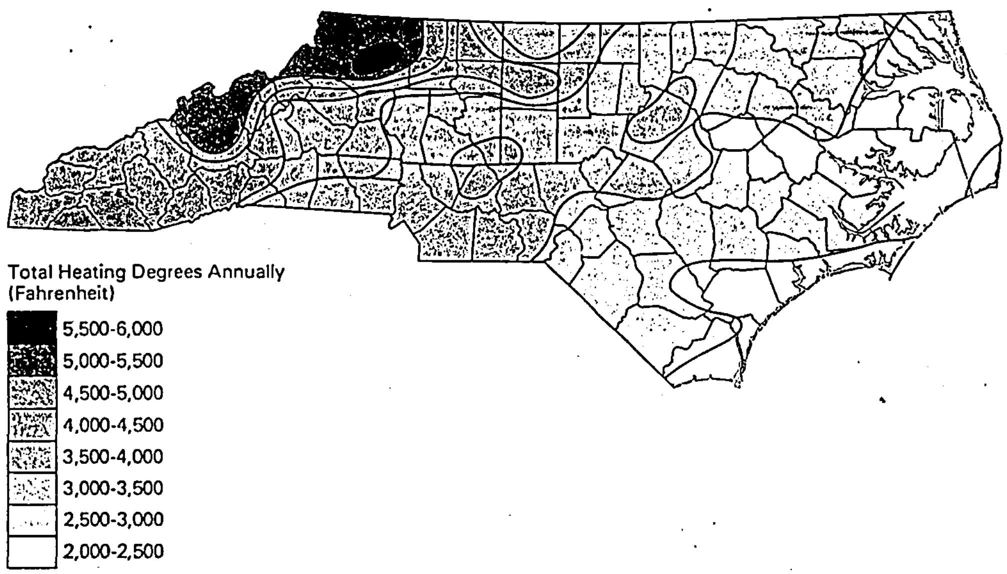
The moderating effect of the ocean becomes evident in Figure 5.3, where January mean minimum temperatures are shown. Isotherms on this map reflect characteristic nighttime temperatures. The pattern reveals that temperatures are milder along the coast and decrease inland fairly rapidly. Once again, the temperature pattern is more complex in the highlands region. Generally, mean minimum temperatures are well below freezing in the Mountain region, at freezing levels throughout the Piedmont, and above freezing in the Coastal Plain. A comparison of Figures 5.3 and 5.4 indicates that during January the daily range of temperature is about 20° F. everywhere in the state.

Average Annual Heating Degree Days There are climatically significant measurements of heat energy variation other than the direct determination of temperature, the cyclical occurrence of certain temperature levels, or the periodicity of temperature realms. These measurements relate to temperature efficiency in terms of human comfort or plant growth. One of these less common indexes is the *heating degree day*. This measurement is a cold season index and is based on the assumption that a temperature of 65° F. within a building is the minimum thermal threshold for normal human comfort. The negative departure of daily mean temperature from this standard figure is recorded as heating degree day units. For example, a daily temperature average of 40° F. would be listed as twenty-five heating degree days. Developed by heating engineers, this index permits a relatively accurate measurement of fuel consumption, and removes the guesswork from the calculation of fuel needs. The accumulation of heating degree day units at given locations is totaled annually and averaged for a period of years. To those persons interested in climate, this indirect measurement of heat energy provides additional insight into the thermal environment.

Figure 5.4. Mean Minimum Temperature in N.C.

Source: U.S. Department of Commerce, *Weather and Climate in North Carolina*, 1972.

Figure 5.5. Average Annual Heating Degree Days in N.C.



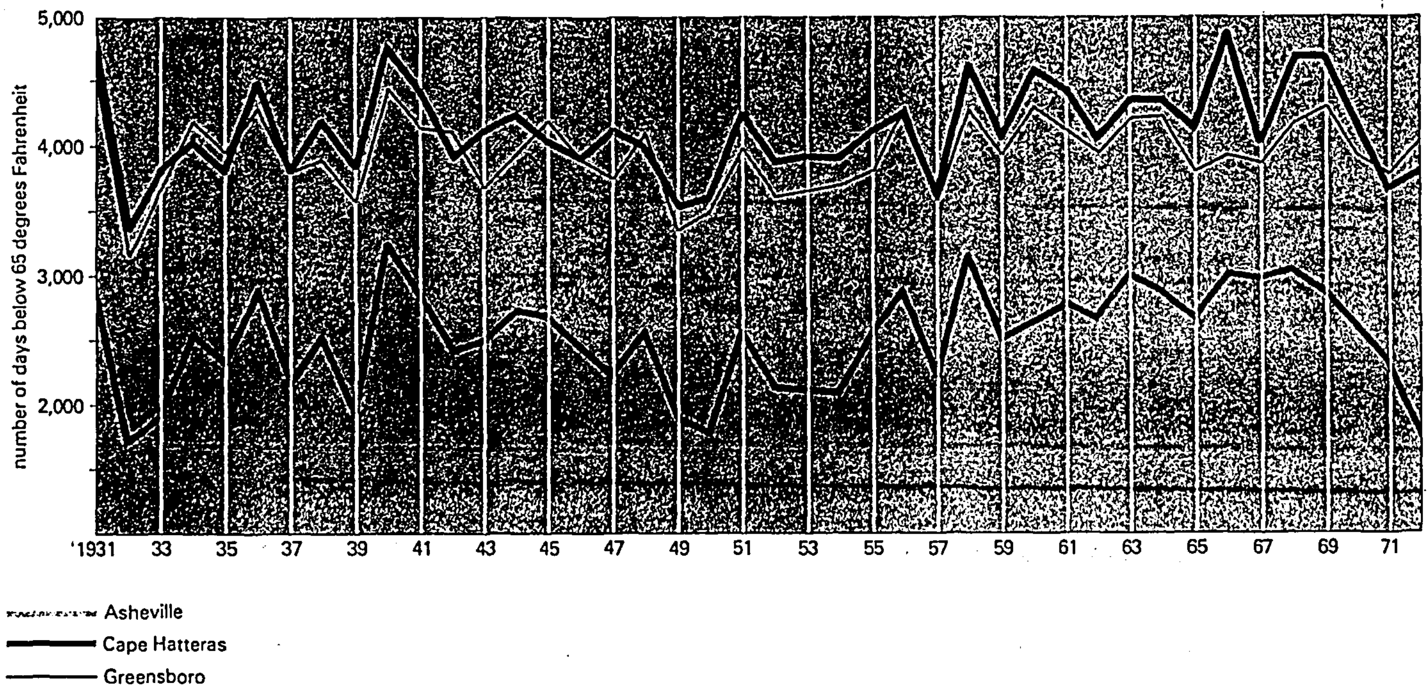
Source: U.S. Department of Commerce, *Weather and Climate in North Carolina*, 1972.

Figure 5.5 is a very generalized map showing the distribution of heating degree days in North Carolina. Figure 5.6 shows the variation through time for three North Carolina cities. Values increase from 2,347 units at Wilmington to 3,805 at Greensboro, and in the Mountains more than 4,000 heating degree days are common for certain valleys and higher elevations. However, because of generalization on the map, actual figures in many of the higher areas are undoubtedly much greater. Compared with the eastern and central parts of the state, the values in the Mountains appear extreme and the cost of home heating expensive. However, in contrast with northern states such as North Dakota and Minnesota, where values in excess of 10,000 units are accumulated, heating costs in North Carolina's Mountain region can be seen in a different perspective.

Winter Precipitation For the winter months of January, February, and March, precipitation ranges from 3 to 4 inches per month for the Piedmont and Coastal Plain, and from 4 to 6 inches per month for the Mountains. In the middle and eastern counties, precipitation in excess of 0.01 inches usually falls ten to eleven days each month. In the western counties, the number of wet days is somewhat higher, with some places in the Mountains having as many as sixteen days with precipitation.

Cold season precipitation is related to the passing of low-pressure cells (cyclones) and usually occurs as rainfall. Snowfall amounts are small almost everywhere in the state. Using a water equivalence ratio of 12 inches of snow to 1 inch of water, only a few Mountain stations record as much as one-third of their winter precipitation totals as snowfall. As illustrated in Figure 5.7, snowfall totals increase dramatically as one moves in a westward direction. Mount Mitchell, reporting an average snowfall of 58 inches annually, leads the state in this category. Laurinburg, in the southeast, shows an average of only half an inch of snow per year. Unlike northern states, which are attuned to the problems accordant with heavy deposits of snow and sleet, unexpectedly severe winter storms cause considerable inconvenience and even disaster in the Piedmont and Coastal Plain. Hatteras, which averages 1.1 inches of snow yearly, has received as much as 12 inches in one day. Likewise, Raleigh, normally getting 7 inches each year, has had 17.8 inches dropped on it in a twenty-four hour period, and Winston-Salem has received up to 21 inches of snow during December, a month when no more than 1.9 inches are expected. Fortunately, however, the snow cover seldom remains longer than a week before melting.

Figure 5.6. Annual Heating Degree Days at Cape Hatteras, Greensboro, and Asheville, N.C., 1931-1973



Source: U.S. Department of Commerce, *Climatological Summary,* 1972.

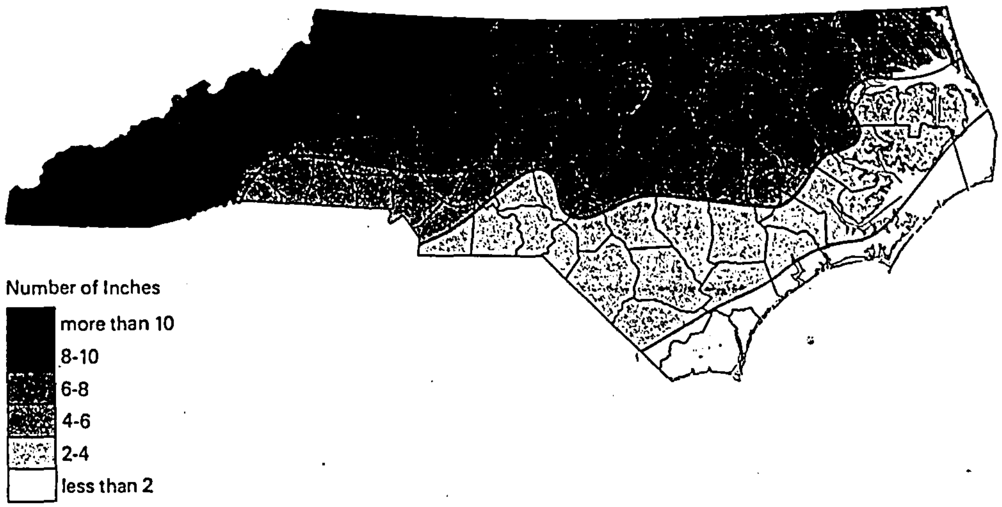
When high-pressure systems (anticyclones) dominate, clear to partly cloudy weather prevails. Receiving, on the average, 50 to 60 percent of total possible sunshine, North Carolina receives more hours of winter sunshine than do states to the north and to the immediate west. Sunshine is more prevalent in the southeast around Wilmington, and diminishes rapidly as the Mountains are approached. The Mountains receive about one-third less sunshine than does the rest of North Carolina.

Spring For many North Carolinians, this season is the most preferable of all. With the northward shifting of the noon sun, the storm track normal to North Carolina during the winter retreats northward and fewer and fewer cyclonic storms occur. Cold spells are less numerous and periods of high temperatures and balmy days become longer and more pronounced. Rainfall diminishes slightly in April, but increases toward the summer as cyclonic activity gives way to thundershowers and their heavy downpours. Although more precipitation is received in the state during May and June, there are fewer hours and days in which rainfall occurs, indicating a higher precipitation intensity.

Mean temperatures range from the fifties in April to the seventies in June for all places save those at high elevations. The days are marked by cool nights and warm afternoons with relative humidities at optimal levels for human comfort. As the daylight period lengthens, sunshine percentages and totals increase to their highest values for the year. For the eastern two-thirds of the state, sunshine during April, May, and June is received approximately 70 percent of the time and in amounts exceeding three hundred hours for the latter part of the season.

Average Date of the Last Freeze in Spring As illustrated by Figure 5.8, the beginning of the freeze-free season varies across the state from 1 March to 10 May, a difference in time of over two months. As expected, the milder climate along North Carolina's coast engenders early dates, whereas the more severe climate of the Mountains retards the start of the freeze-free period longer than elsewhere. In most areas of the Coastal Plain, the last spring freeze generally occurs by the first of April. The Piedmont has its last freezes between 1 and 10 April, about ten to fifteen days later than the Coastal Plain. In the Mountains, there is greater variation in mean dates for both the beginning and the end of the freeze season. Because air chills more quickly at higher elevations, and because cold air is denser than warm air, the cold air drains into the valleys where it is contained and continues to lose heat by radiation. The result of this process is that in certain Mountain areas some valleys are more often colder than their slopes at intermediate altitudes. Lying between the below-freezing temperatures of the valleys and the higher elevations are "verdant" or "thermal" belts.

Figure 5.7. Average Annual Snowfall in N.C.

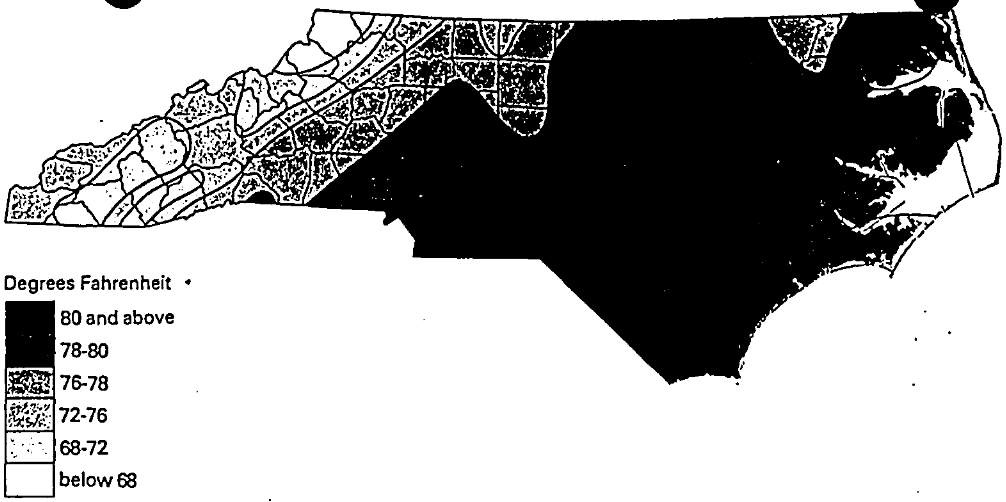


Source: U.S. Department of Commerce, *Climatological Summary,* 1966.

Figure 5.8. Average Date of Last Freezing Temperature in N.C.

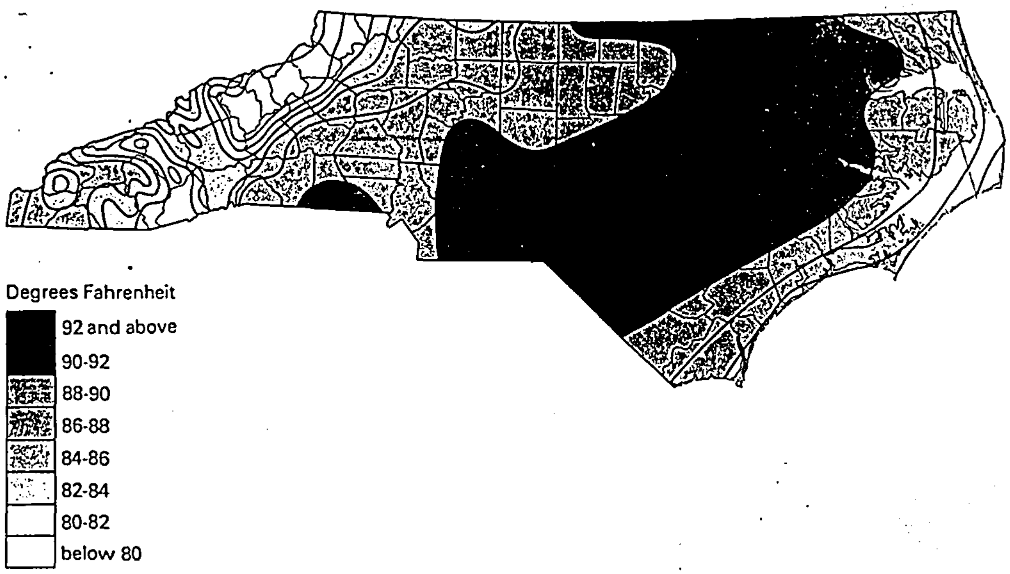
Source: U.S. Department of Commerce, *Weather and Climate in North Carolina,* 1972.

Figure 5.9. Average July Temperature in N.C.



Source: U.S. Department of Commerce, *Weather and Climate in North Carolina,* 1972.

Figure 5.10. Mean Maximum July Temperature in N.C.



Source: U.S. Department of Commerce, *Weather and Climate in North Carolina,* 1972.

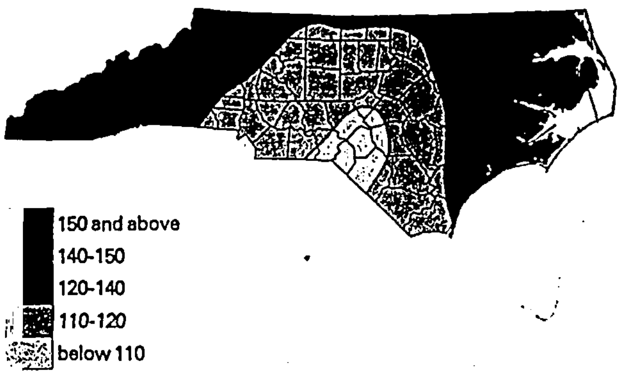
These strip-like regions have longer freeze-free seasons and thereby show earlier dates for the end of the freeze period than their surroundings. They support frost-susceptible vegetation long after the greenery has disappeared in nearby areas. Often in early winter or even in midwinter a contrasting belt of green flanked above and below by brown may be seen. These green belts are characteristically located along slopes that face the winter sun, are protected from cold northern winds, and have cold air drainage to lower valleys. The blossoming of dogwood and redbud moves across the state in a pattern similar to that of the end of the freeze season to blanket North Carolina with color and beauty.

Summer Summer is characterized by its high temperatures, high humidities, high amounts of rainfall, and high physiological stress. Except for the amelioration of these climatic elements in the Mountains, and the relief afforded by sea breezes along the coast, elsewhere in the state summer is a season of extremes. Mean monthly minimum temperatures for July and August are in the upper seventies and eighties and mean maximum temperatures reach into the nineties.

However, to quote a popular adage, "it's not the heat but the humidity," and North Carolina's temperatures in combination with the high water vapor amounts prevalent during the summer months are definitely uncomfortable. In addition, high sunshine percentages and a predominance of southerly winds tend to aggravate an already unpleasant climatic condition. Only the periodic passage of cool, dry air masses from the north and sea breezes in the coastal areas alleviate the discomfort of summer weather for North Carolina's low-lying counties.

July Average Temperatures The pattern of mean temperatures in July is similar to the pattern in January (Figure 5.9). However, in the Piedmont and Coastal Plain, isotherms are fewer in number and farther apart. In the Mountains, the reverse is true. The widespread isotherms east of the Mountains indicate that temperature averages across central and eastern North Carolina exhibit little contrast. From the western Piedmont to the coast, the difference in mean temperatures is only 4° F. Although the influence of the ocean is not evident in the arrangement of isotherms, the high temperatures of the Coastal Plain are made less severe by the cooling power of the sea breeze. Hatteras, on the Outer Banks, records a temperature of 90° F. on the average of only one day each year, while Wilmington, a short distance from the coast, has an occurrence of 90° F. temperatures about twenty-four days annually. In contrast with these locations, Raleigh and Winston-Salem mean temperatures for July are slightly lower, but the average number of days on which a temperature of 90° F. or above is experienced increases to more than forty.

igure 5.16. Mean Number of Days with 0.01 or More Inches of Precipitation per Year in N.C.



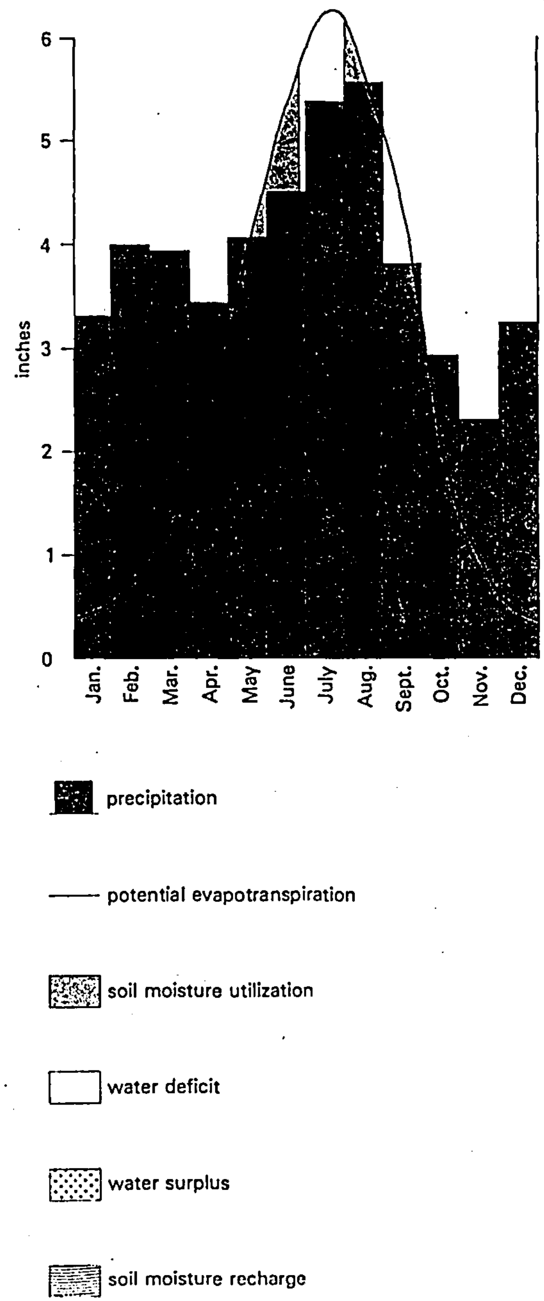
ource: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

is determined by the balance between incoming precipitation and outgoing evaporation and transpiration (evapotranspiration). In temperature regions where annual precipitation exceeds evapotranspiration, forests normally flourish. Conversely, in those areas where evaporation and transpiration incur water losses greater than the supply provided by precipitation and soil moisture storage, forests give way to grasses and desert plants. This relationship between incoming and outgoing moisture is known as the *water balance concept*, and is utilized to calculate a region's water profiles and budgets as well as to classify its climate.

However, merely comparing precipitation to evapotranspiration on an annual basis is not adequate in understanding precipitation effectiveness. The efficiency of rainfall depends not only on total rainfall supply but also upon a region's temperature regime and the degree of correlation between its evaporation and rainfall regimes. Although a region may have an appreciable surplus of precipitation over evapotranspiration in terms of annual totals, nevertheless it may still show seasonal moisture deficiencies. In North Carolina, for instance, during summer months, temperatures and evaporation rates are highest and transpiration is at its peak. At this time, despite the fact that rainfall reaches its highest monthly levels, many places in the state will record moisture deficits. When such deficits occur, soil moisture is utilized until replenishment is provided by rainfall, or until depletion of soil moisture storage is complete. Beyond this point, wilting occurs and plants eventually die or go into dormancy. For domesticated crops, periods of water deficiency must be offset by irrigation to insure against soil moisture exhaustion, especially for high-value crops. Although many areas in North Carolina show water deficits during the course of the warm season, droughts are usually minor.

The water balance of individual stations can be shown graphically. Figure 5.17 is a water balance climograph showing Raleigh's annual budget of water supply and expenditure presented on a monthly basis. The climograph is based on the primary asumption that ten inches of water is required to saturate the soil in the Raleigh area. The period from January to May is a time when soil moisture storage is complete and precipitation exceeds potential evapotranspiration (the maximum loss of water possible). All precipitation during this time is listed as surplus water since none is required by the soil. From May to September, the months of greatest rainfall, water loss nonetheless is greater than water receipt and soil moisture storage is depleted. Water deficits are recorded as actual evapotranspiration drops below potential evaporation levels. From September to December, soil moisture storage is recharged and the soil is once again brought to the saturation point. When the ten-inch

Figure 5.17. Water Balance, Raleigh, N.C.



Source: Glenn T. Trewartha, Arthur H. Robinson, and Edwin H. Hammond, eds., *Elements of Geography*, 5th ed. (New York: McGraw-Hill Book Co., 1967).

Autumn is the driest season of the year and rainfall amounts drop below 3 inches throughout central and eastern North Carolina during October and November. Cyclonic activity increases as thunderstorms become less frequent until by late November they seldom occur.

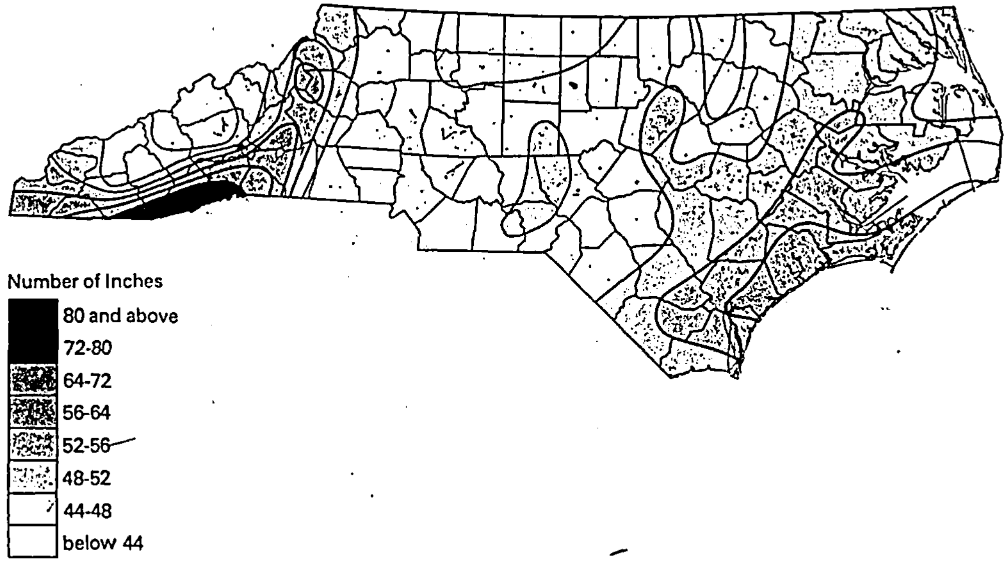
As illustrated in Figure 5.14, freezes begin early in October in the Mountains and slowly move eastward toward the coast. In early December, the freeze-free season reluctantly comes to a close in the Wilmington-Southport area. Deciduous trees begin their dormancy period and the color of the state gradually changes from the quiet greens of summer to the fiery reds and brilliant yellows of fall. By late autumn the highlands, now a mottled brown and green, show an occasional sprinkling of white as temperatures in the Mountains fall below freezing and the possibility of snow increases. However, in the Piedmont and Coastal Plain, tennis, sailing, and picnicking, for example, continue into November and football games played late in the season are often attended by fans dressed in warm-season attire.

Annual Precipitation and Humidity

Although a considerable variation in the distribution of rainfall exists throughout the state, everywhere precipitation is high (Figure 5.15). In the Coastal Plain, rainfall totals average from 44 to 55 inches; the highest amounts were received at the Outer Banks. Across the Piedmont, yearly rainfall averages range from 43 to 48 inches, with the northern and southern sectors having the lower totals. The greatest variability in rainfall distribution is found in the Mountains. Here, south-facing slopes along the North Carolina-South Carolina border receive as much as 80 inches of precipitation each year. Nearby, Asheville, lying in a sheltered valley, records only 37 inches, the lowest rainfall average reported in the state. More commonly, average annual precipitation in the Mountains ranges from 44 to 58 inches. For the state as a whole, an average total of 50 inches is representative.

The distribution of rainfall throughout the year is reasonably uniform. Although there are no pronounced wet and dry seasons, a profile of average annual precipitation indicates a bimodal distribution, i.e., two periods of higher rainfall separated by two periods during the year when rainfall amounts are lower than the norm. Generally, the highest precipitation totals are associated with the summer months. In the fall, the season of the least rainfall, the lowest yearly totals usually occur in October or November. Precipitation increases slightly during the winter season and then decreases to a secondary low in April. This precipitation regime is common to the state and varies only slightly from place to place.

Figure 5.15. Average Annual Precipitation in N.C.



Source: U.S. Department of Commerce, *Weather and Climate in North Carolina*, 1972.

Although rainfall is heaviest in the summer, evaporation and transpiration losses are also great. Consequently, the summer season is deficient in its supply of soil moisture and irrigation may be required to sustain crop needs.

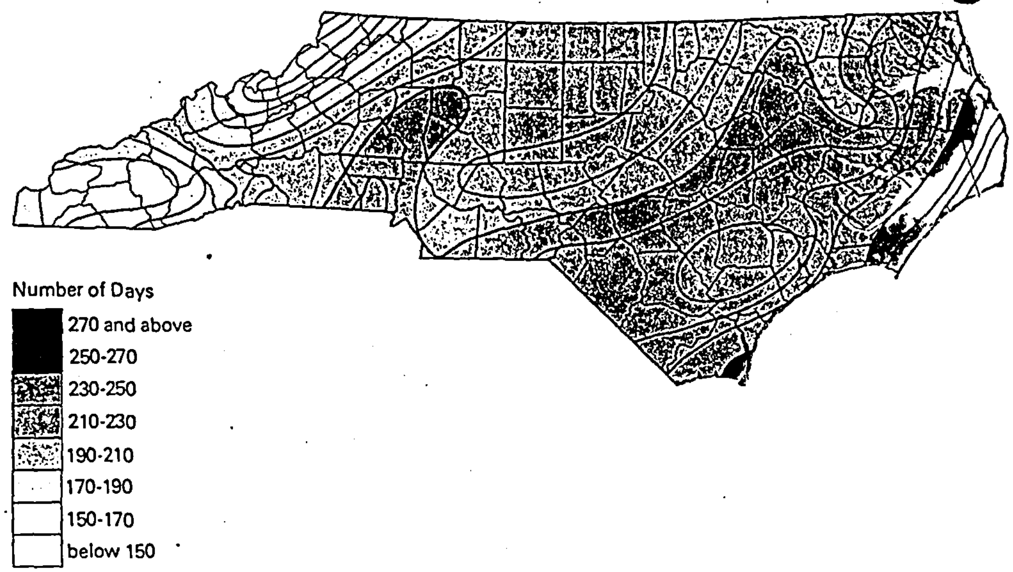
Although it is considered to be a wet state, North Carolina nevertheless has its occasional "bout with drought." Recently, the Piedmont and Inner Coastal Plain suffered through an especially severe drought. In 1968, negative rainfall departures amounting to as much as 26 inches were computed by individual stations within this area. On the other hand, 1972 proved to be an abnormally wet year. During that year, Raleigh, which has an average annual precipitation of 46.35 inches, experienced a total rainfall of 51.74 inches. Raleigh's weather records may be used to illustrate the variations in yearly precipitation amounts. In the capital city, annual totals have varied from a low of 30 inches in 1933 to a high of 64 inches in 1936. On a monthly basis, rainfall variation for July has ranged from 12.36 inches in 1931 to as little as 0.38 inches in 1953. Yet precipitation variability in North Carolina is moderate compared with those states where rainfall totals are significantly less and consequently precipitation patterns and regimes are more unpredictable.

Average Number of Days with 0.01 Inches of Precipitation or More Figure 5.16 shows the pattern of days with measurable precipitation in North Carolina. The Mountains have the greatest number of days with measurable precipitation, averaging 10 to 20 more rainy days per year than the coast and 20 to 30 days more than the southern Piedmont. In the northwest corner of the state precipitation occurs 4 out of every 10 days. By contrast, the sandhills in the Southern Piedmont experiences precipitation on only 30 percent of the days. In fact, a "tongue" of fewer rainy days penetrates the state from south to north, through North Carolina's central counties. For the state as a whole, 125 days with measurable precipitation is a representative figure.

Water Balance

The "wetness" or "dryness" of any region is mirrored by its natural vegetation. Indigenous plant life is an indicator of a region's precipitation effectiveness and its capacity to support plant growth. The minimal moisture requirements of plant communities are quite specific, and in situ vegetation reflects the amounts of water annually and seasonally available for its use. As the size of a bank account depends upon the balance between deposits and withdrawals, so precipitation effectiveness

Figure 5.13. Average Length of Freeze-Free Season in N.C.



Source: U.S. Department of Commerce, *Weather and Climate in North Carolina*, 1972.

Figure 5.14. Average Date of First Freezing Temperature in N.C.

Source: U.S. Department of Commerce, *Weather and Climate in North Carolina*, 1972.

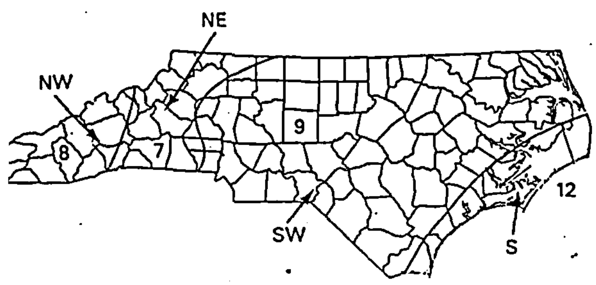
of heat energy units to reach maturity, the accumulation of growing degree day units is a means of determining crop maturation. For instance, when 1,500 units have accumulated, peas are ready to be harvested. Therefore, the growing degree day index is a measure of a region's thermal efficiency in enhancing plant growth.

Once again, spatial patterns relating to heat energy show maximum values along the coast and lowest values in the Mountains. Coastal North Carolina has twice the accumulation of growing degree day units than are found in the Appalachians. The pattern across the Coastal Plain and eastern Piedmont indicates surprising uniformity. Variation in the growing degree day index amounts to less than 1,000 units throughout this area. As the highlands are approached, growing degree day totals diminish rapidly. Most middle-latitude crops requiring a lengthy growth period can be easily accommodated by the temperature regime of the eastern two-thirds of North Carolina. However, the western third of the state shows a thermal efficiency comparable to that of New England, central Wisconsin, or eastern Montana. Since most vegetable crops reach maturity within a limit of 4,000 growing degree day units, each year North Carolina's thermal climate permits at least one harvest of vegetables in the Mountains and two harvests of vegetables in the eastern sections of the state.

Average Length of the Freeze-Free Season Known also as the frost-free period and somewhat erroneously as the growing season, the freeze-free season refers to that segment of time between the mean date of the last day in the spring when a low temperature of 32° F. occurs, and the first day in fall of the same occurrence. Of particular interest to agriculturalists is that the length of this thermal phenomenon partially dictates the type of crops that may be cultivated. Since freezing temperatures are destructive to most domestic plants, the beginning and the length of the growth period are regulated by the freeze-free season. In North Carolina, this season is of sufficient duration to accommodate most middle-latitude crops. A look at Figure 5.13 will show that the freeze-free period varies from almost 300 days at Hatteras to 150 days in the Mountains. Throughout the Piedmont, an average of 200 days is representative.

Autumn Gradually the heat and humidities of summer give way to the mild and comfortable weather of fall. Like the spring season, the fall is a very pleasant time for North Carolinians. Days remain hot through November and nights are agreeably cool. Normal daily temperatures average 55° F. in October; 45° F. to 55° F. in November; and 35° F. to 50° F. in December. Daily temperatures range 20° F. to 25° F. for the entire season.

gure 5.21. Prevailing Winds and Mean Annual Wind S[illegible]d in N.C.



ource: U.S. Department of Commerce, *Climatic Summary of the .S.*, 1972.

ote: Wind speeds are noted in miles per hour.

ind speeds have been averaged for each zone of revailing winds. Winds tend to diminish in speed estward from the coast where sea breezes and offshore torms contribute to velocities that average twelve miles er hour. Throughout the Inner Coastal Plain and the iedmont, the mean wind speed is nine miles per hour, nd in the western counties, representative wind speeds re seven and eight miles per hour. On a daily basis, ind velocities are lowest before dawn and highest round midafternoon. Seasonally, winter, with greater emperature and pressure contrasts, shows the most apid air movement and summer is the time of lowest ind speeds.

hunderstorms Thunderstorms are vertically deeloped storm systems that involve lightning and thuner. Produced by instability in the atmosphere, these torms are sustained by the conversion of water vapor nto rain and hail, which causes the release of enormous mounts of energy. This energy results in vigorous pdrafts of rapidly moving air. The intensity and turbuence of an individual thunderstorm is related to the egree of atmospheric instability and the supply of latent nergy released by the condensing of water vapor. In tructure, the typical thunderstorm is a collection of onvective cells each averaging a mile or more in iameter. A cell is comprised of columns of rapidly ising air separated and counterbalanced by downdrafts f slower moving air. Associated with thunderstorms and heir bulbous facade are heavy downpours of rain, hail, usty and squally winds, and of course, lightning and hunder.

Because thunderstorm development and frequency is enhanced by (1) atmospheric instability that is linked to high surface temperatures, (2) atmo[illegible]ric moisture that supplies the latent energy requirements, and (3) some triggering device to start the convection process, thunderstorms occur more frequently in regions of warm temperatures and high humidities. North Carolina's climate is conducive to thunderstorm development and the state experiences violent local storms forty to fifty days each year. For the United States, Florida and the Gulf Coast lead in the number of days with thunderstorms. Here, seventy to ninety days per year with thunderstorms is normal. In the northern states and along the West Coast, thunderstorm activity drops off because of colder temperatures over land and coastal waters. North Carolina's pattern of thunderstorm activity shows fewest storms off the northeast coast where coastal waters also are cooler. Inland, thunderstorms are more frequent, increasing to fifty days as the Mountains are approached. In the Mountains, the higher frequency of storm activity (all types) and the triggering supplied by mountain and frontal slopes results in the most thunderous area to be found in the state (Figure 5.22).

Hurricanes In the latter half of the year, the United States is visited by hurricanes. Originating over tropical oceans as small cyclones, under favorable conditions hurricanes become large, intense storm systems. Their winds exceed seventy-five miles per hour and spiral counterclockwise around an "eye" of very low pressure. Sustained by the ocean that breeds them, these storms are driven by the heat released from condensing water vapor. Covering tens of thousands of square miles, hurricanes move slowly and deliberately, at speeds between fifteen and fifty miles per hour, delivering prodigious amounts of precipitation to areas over which they pass. Moving out of the tropics, hurricanes of the Atlantic Ocean generally invade the Gulf of Mexico, or veer northward toward the middle latitudes, occasionally penetrating the continent, or skirting the coastline as far north as New England. Hurricanes are sea monsters and diminish in intensity as they move inland and away from their source of energy. Although capable of great destruction, hurricanes nevertheless benefit the southeastern states to a substantial degree. As the eastern states are subject to periodic summer droughts, the vast amounts of water delivered to this region by these giant tropical storms have served more than once to alleviate or terminate the disastrous effects of drought conditions. However, hurricanes are killer storms, and their long-range benefits are obscured by the more obvious death, destruction, and damage accompanying them. On the average, the Atlantic Ocean generates six hurricanes a

Figure 5.22. Average um er o Thunderstorms

Source: Glenn T. Trewartha, Arthur H. R(Hammond, eds., *Elements of Geography,* McGraw-Hill Book Co., 1967).

year, but as many as eleven in one y(observed. North Carolina has experi(cially disastrous hurricanes since 1(extending as it does into the ocean, i hurricanes more than any other area (Figure 5.23). Its low-lying sandy sur: vulnerable to the combined effects o tides, and flooding associated with t.

In the Mountains, the effects of altitude reduce mean temperature values sharply. The temperature gradient in July is even steeper than in January. East to west across Caldwell County, mean temperatures drop from 76° F. to 68° F. and Mount Mitchell remains the coolest site in the state with a July average of 59° F. At Asheville, the warmest month averages 73.8° F. and only seven days during the summer show temperatures reaching to 90° F. With daily minimum temperatures in the fifties and sixties the allure of the Mountains for summer recreation becomes evident.

July Average Maximum and Minimum Temperatures The temperatures typically recorded during an afternoon in July are shown in Figure 5.10. In the Coastal Plain, isotherms representing mean maximum temperature are aligned parallel to the shoreline signifying the effect of the cool ocean and sea breeze. At Cape Hatteras, the summer daytime maximum is 84° F. Inland, temperatures increase and reach their highest values in the Fayetteville area where scorching temperatures in excess of 92° F. are experienced. In the Piedmont, maximum temperatures average between 88° F. and 92° F. Toward the Mountains, midday highs drop to more pleasant levels. In Swain and Haywood counties, afternoon temperatures are generally in the low seventies and most western counties record mean July maximums under 80° F.

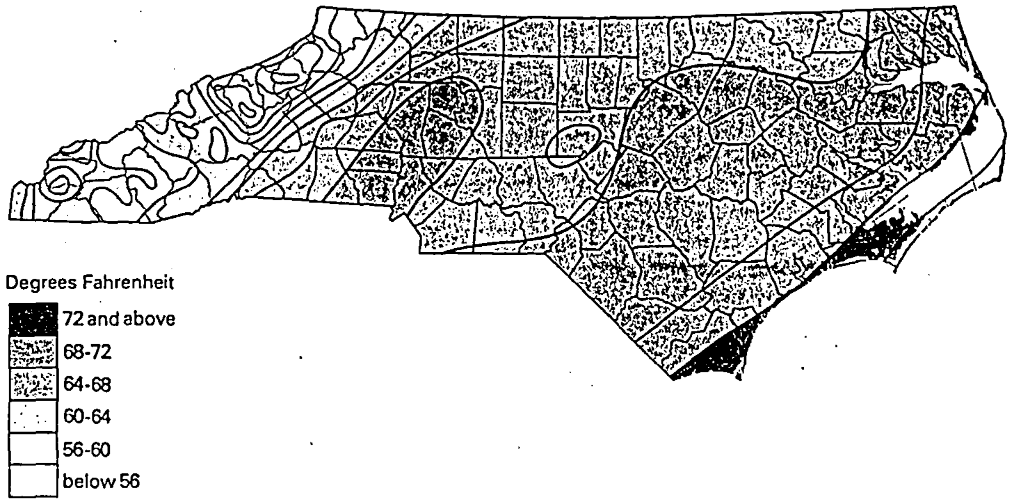
Although isotherms of mean minimum temperature exhibit a pattern similar to the pattern of maximum July temperatures, in the outer Coastal Plain absolute temperature values are reversed (Figure 5.11). Minimum temperatures represent nighttime conditions and their distribution indicates that the effect of the ocean is to warm adjacent areas. Farther inland, the more rapidly cooling land causes the temperatures to be lower. Thus the maps showing average July maximum and minimum temperatures portray the daily relative change in influence from ocean to land and back again along the coastal fringe of North Carolina. Over the Piedmont and the Inner Coastal Plain, July average minimums show little change with distance, ranging only 4° F. from 66° F. to 70° F. In the Mountains, 50° F. and 60° F. temperatures indicate the characteristically cool weather associated with this region during summer nights.

Summer is the season of greatest precipitation in North Carolina. Thunderstorms are the predominant mechanism for precipitation delivery and occur mainly in the afternoon or evening. They come on an average of ten to twelve days per month. July and August show the highest rainfall amounts with many sections of the state reporting 5 to 7 inches of rain for each of these months. The coastal region around Wilmington and the southwestern counties are the rainiest areas in the state having over 8 inches of precipitation and an average of fourteen rain days in July. By August the hurricane season has arrived and these storms may contribute a significant percentage of rainfall to monthly totals and continue to do so well into the fall.

Average Growing Degree Days Similar in its derivation to the heating degree day concept, the *growing degree day* is based on the positive departure of mean daily temperature from an established temperature value representing the start of the active growth period for plants.

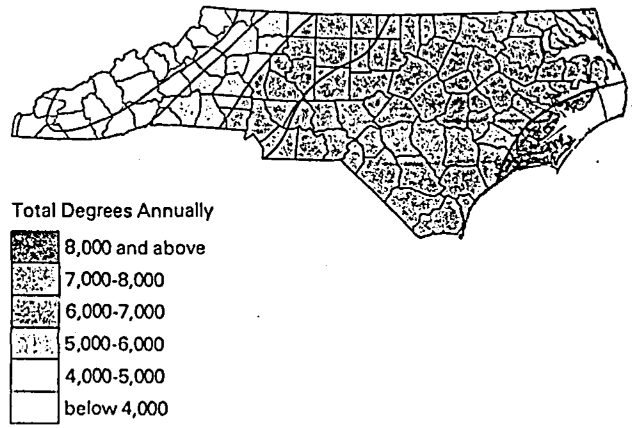
Although each plant has its own base temperature for seed germination and active growth, a mean daily temperature of 40° F. will represent the beginning of the growth period for most crops. To determine growing degree day units for example, a daily mean temperature of 50° F. will indicate ten growing degree days or a 10° F. departure from the base minimum of 40° F. These units are then accumulated for the year and averaged over a period of time to provide us with the data for preparing Figure 5.12. Since each plant requires a certain amount

Figure 5.11. Mean Minimum July Temperature in N.C.



Source: U.S. Department of Commerce, *Weather and Climate in North Carolina*, 1972.

Figure 5.12. Average Annual Growing Degree Days in N.C.



Source: U.S. Department of Commerce, *Climatological Summary*, 1966.

soil m[illegible]ture requirement is satisfied, additional precipitatio[illegible] drain to the underground water table or run off the land as surplus water.

Figure 5.18 provides the water balance deficits for the state and shows that everywhere except for the Asheville area and the northern Piedmont, the annual water deficit is less than one inch. By contrast, Figure 5.19 gives water balance surpluses. Being a wet state, North Carolina's water budget indicates surpluses exceeding deficits by large amounts. While most of the Piedmont and Coastal Plain have surplus water up to 15 inches, the Outer Banks and the Mountains show surpluses above 15 inches. In the southwest corner of the state, water surpluses amount to as much as 30 inches.

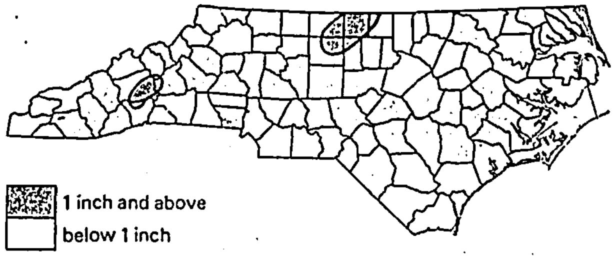
Mean annual evaporation for North Carolina is shown in Figure 5.20. Evaporation rates and totals are related to temperature, wind velocity, and relative humidity. Where temperatures are highest and humidities lowest, evaporation intensities will be greatest. Since temperatures throughout the Coastal Plain and the Piedmont are highest for the state and since humidity percentages are greater in the vicinity of the ocean, evaporation totals are lower in the Mountains and along the coast, and highest in the southern Piedmont and Coastal Plain. A comparison of the maps showing precipitation, evaporation, water surplus, and water deficit will provide the reader with a fairly complete picture of North Carolina's water balance.

Winds and Storms

Three types of storms and their associated winds are common to North Carolina: cyclonic and convectional thunderstorms, hurricanes, and tornadoes. These storms are integral parts of the state's climatic pattern. In analyzing the importance of winds, direction and speed are major considerations.

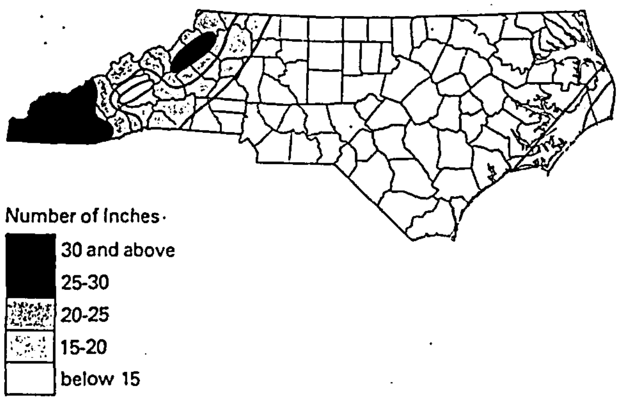
Although prevailing winds (winds that persist in blowing from one direction more so than any other) characterize given geographical areas, wind direction changes frequently. A northwesterly wind (coming from the northwest) will be, relatively speaking, a cooling and drying wind, whereas a southeasterly wind will bring warm, moist air to the state. The passage of cyclones and anticyclones with their characteristic wind patterns will change the wind's direction so that it may come across North Carolina from any point of the compass.

Figure 5.18. Water [illegible]ance Deficit in N.C.



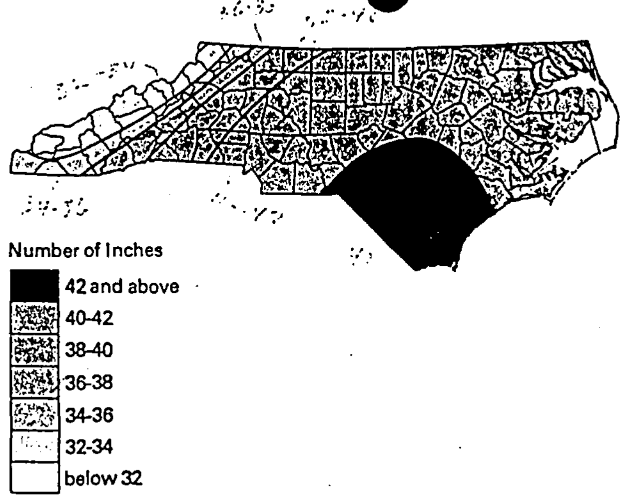
Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

Figure 5.19. Water Balance Surplus in N.C.



Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

Figure 5.20. Mean Annual Evap[illegible]ion in N.C.



Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

The velocity of the wind is relevant to ventilation of air pollutants, evaporation rates, and thus cooling and chilling indexes. On those occasions when winds reach gale force and higher, their velocities are of singular importance because of their destructive capabilities. Damaging winds are usually associated with infrequent hurricanes and tornadoes and, at times, with severe thunderstorms.

The prevailing winds and mean wind speeds averaged for the year are given in Figure 5.21. For the eastern two-thirds of the state, winds blow most frequently from the southwest and south. Throughout the Mountains and the western Piedmont, winds prevail from northerly directions. This annual pattern of prevailing winds persists for most months of the year except September and October when winds are dominantly from the northeast. During these months, the clockwise flow of air from seasonal anticyclones lying poleward of North Carolina, and the counterclockwise winds associated with an increased number of offshore storms cause northeasterlies to prevail across the state.

In the Piedmont and the Mountains, there are less striking differences in the age of soils. Since the entire area has been eroded, there are no old, preserved original depositional surfaces as in the Upper and Middle Coastal Plain. Soils of the steeper hillslopes along the near drainageways are thinner and "younger" than those of the more gently rolling slopes away from the rivers, but there are not the great contrasts in properties due to age as are found in the Coastal Plain. The oldest, most highly weathered and leached soils in North Carolina are those of the old remnantal depositional surfaces on the tops of the interstream divides in the upper Coastal Plain, above the Coats Scarp.

Rainfall and temperature have some limited influence on soil variety in North Carolina, but not nearly as much as parent material, local landscape position, and soil age. Soils of the southern portion of the Mountains receive larger amounts of rainfall and are more highly leached and weathered than others, even though they are on steep hillslopes and are rather young soils. This is especially true for soils of the warmer south-facing slopes. These soils contain large amounts of gibbsite, an aluminum ore mineral generally found to a significant extent in the highly weathered soils of the warm humid tropics. In contrast, soils of northeastern North Carolina are less leached, more fertile, and browner than other soils of the state. Differences in soils from place to place in the state are not always obvious from casual examination of the land; however, they may be important to environmental, engineering, or agricultural decisions. To show these differences, soils have been described, classified, and mapped throughout the state.

Soil Classification

The problem of classifying soils is extremely complicated. Soils are formed through the interaction of five variable factors—climate, vegetation and microorganisms, parent material, slope, and time. As these variables change from place to place a very great number of combinations can result. To accommodate these many possible combinations, a comprehensive soil classification system, the 7th Approximation, was published in 1960 with a lengthy supplement added in 1967. In the new International System of Soil Classification, ten broad kinds of soil, or soil *orders*, are recognized. Each soil order is composed of soils with similar genetic layers or horizons, formed by the same kind and intensity of soil-forming factors. As shown in Table 7.1, six of these ten soil orders are found in North Carolina. Each of these orders is subdivided into successively smaller, more narrowly defined classes. That is, each of the orders is subdivided into several subclasses or *suborders*. Each of these suborders is further subdivided into a number of *great groups*. A great group is composed of soils having similar *profiles* (the same kind, arrangement, and thickness of genetic layers—A horizons or topsoil, and B horizons or subsoils). They have developed with similar soil-forming factors (similar kinds of vegetation, climate, parent rock, and landscape position).

The great groups are further subdivided into *subgroups*, these into *families*, and finally the families are each subdivided into several *soil series*, the basic soil taxonomic and map unit. Soil series are designed to illustrate and describe what soils are like in individual fields, tracts, and lots, and are ordinarily used for the detailed surveys and classifications. The soil series are composed of soils similar in color, texture, reaction, consistency, and chemical and mineralogical properties in all their genetic layers or horizons. The characteristic county soil maps display soils at the series level of classification.

Soil Resources in North Carolina

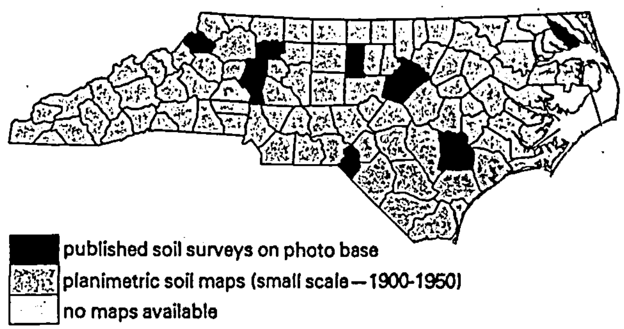
The broad soil pattern of North Carolina is illustrated in Figure 7.14. This map has been generalized from county surveys to show broad soil resource areas (soil orders) composed of combinations of certain great groups that occur together. Table 7.1 summarizes general characteristics of each of the six soil orders found in the state. Soils belonging to the same great group have generally similar kinds of physical and chemical properties, vegetation associations, agricultural and nonfarm use potentials, and utilization problems. Therefore, soil orders are probably the most feasible of units or classes for examining soil resources in broad general terms. At this scale, natural vegetation and agricultural land use can generally be correlated with soil type.

Soil Type and Vegetation By comparing Figures 7.1-7.6 with Figure 7.14, a general correlation can be demonstrated between soil and the natural vegetation patterns. Histosols and Spodosols in the Lower Coastal Plain are associated with pine flatwoods, pocosins, and savanna types of vegetation. Entisols of the sandhills are associated with longleaf pine and oak-hickory vegetation types while Entisols along the Outer Banks support maritime forests and salt marshes. Other great groups of the Coastal Plain are in wetland vegetation, upland oak-hickory, and pines. The great groups of the Piedmont are in old field pines and upland oak-hickory. Some cove forests of yellow poplar occur in the upper Piedmont and foothills.

Table 7.1. Soil Orders Represented in N.C.

Soil Order	*Characteristics*
Alfisols	Well-developed subsoils, generally brown or yellowish in color and not as acid, leached, and weathered as the more common Ultisols (formed from "basic" parent material that has more dense clayey subsoils).
Entisols	Recent or juvenile soils with little or no soil development.
Histosols	Organic soils, the peats, and the mucks of the Blacklands.
Inceptisols	Modest subsoil development formed on rather young Coastal Plain landscapes or on steeper slopes where geologic erosion nearly keeps pace with soil development.
Spodosols	Very acid, sandy soils with subsoil accumulations of humus and aluminum.
Ultisols	Soils with prominent subsoils of clay accumulation—very acid, highly leached, and weathered.

Figure 7.14. Status of Soil Mapping in N.C., June 1974



Source: U.S. Department of Agriculture, Soil Conservation Service, Raleigh, N.C.

The Dystrochrepts of the higher mountains are associated with spruce-fir, heath balds, "beech gaps," and *cove forests*. Other great groups of the Mountains support oak forests, old field pine, and yellow poplar in the coves.

Soil Type and Agriculture A close association can also be demonstrated between soil properties and localization of certain types of specialized agricultural production. The smooth slopes, high organic-matter content, good moisture-supplying capacity, and responsiveness of the Umbaquults and Ochraquults soils of the Lower Coastal Plain and Tidewater are in part responsible for the concentration of corn-soybean production in this area. Sloping land, highly erodible soils with acid clay subsoils, and low summer-moisture supply of the Hapludults and associated soils of the Piedmont are factors related to the greater specialization in pastures and small grain.

The North Carolina peach-growing industry is concentrated in the sandhills, mainly on the Quartzipsamment soils such as the Lakeland soil type. The good air drainage of the rolling hills, plus the early warming, ease of root penetration, and good tilth of the sands are among the factors responsible for this localization.

The North Carolina blueberry industry is concentrated on Haplaquod soils in the southern Tidewater region. The highbush type of blueberry now used for main production is adapted to these very sandy acid soils with an organic pan or hardpan in the subsoil. (Rabbiteye blueberries are suited to a wider range of soil conditions.)

Peanut production in North Carolina is concentrated in seventeen counties in the northern portion of the Middle Coastal Plain. This production is mainly on Paleudults and Hapludults, soils that have good natural drainage, a sandy loam topsoil, and a friable, sandy clay loam subsoil. The sandy loam surface soils are well suited to peanut "pegging," and the well-drained friable subsoils provide excellent soil moisture and physical conditions for peanut growth. Furthermore, these soils occur on relatively smooth land suited for the machine culture of peanuts.

Apple production is concentrated in the western part of the state, on shallow Hapludults and Dystrochrepts of the Blue Ridge and foothills. Here, the good air drainage provided by the slopes and the excellent growth and timely ripening permitted by the cooler climate combine with the good physical conditions of the soils to encourage this expanding enterprise.

Factors other than soil properties are responsible for localization of patterns of production of some other field crops in North Carolina. Cotton, for example, tends to be concentrated in three producing areas in North Carolina—two on the Coastal Plain and one in the southwestern Piedmont—and soil properties are not a major contributing factor to this localization (see chapter 10).

Pulpwood production is somewhat concentrated on the Ochraquults of the northern Tidewater, where the sandy loams provide good moisture retention without year-round high water tables to enhance site quality.

Soil Type and Nonfarm Urban Uses There is an increasing interest in nonfarm urban uses of soil resources. Although there is a store of information available on soil from an agronomy viewpoint, little has been published concerning the compatibility of soils with various urban uses. In examining the compatibility of the land with nonfarm urban uses for specific sites, a map showing soil series should be consulted, or perhaps even a field examination made. For more general planning purposes, however, *soil association* maps have proven very useful. The soil association classification is derived by grouping together several similar soil series. In compiling the maps, county surveys of soil series are checked in the field for association boundaries. A brief discussion of the feasibility of soils with urban land uses in each of North Carolina's three major physiographic regions is presented below. The spatial pattern of North Carolina's soil associations is shown in Figures 7.15, 7.16, and 7.17. Limitations and general characteristics of each soil association are summarized in Tables 7.2, 7.3, and 7.4.

Mountains The major soil characteristics affecting nonfarm land use in the Mountain area are slope and thickness of the soil mantle over rock or other impermeable layers. The most desirable soils for residential, industrial, and recreational purposes are those having slopes under 12 percent and a soil thickness greater than thirty-six inches. The greater the slope, the greater the potential for excessive sediment and erosion losses from site clearing. The effectiveness of soil areas as waste treatment systems, where public sewage disposal is not available, is mainly associated with the thickness and permeability of the soil and slope gradient. Slope, depth to hard or bed rock, support and slippage potentials of the soil, and natural drainage are strongly related to problems associated with roads and parking facilities.

Although flood-prone land in the Mountain area is not extensive, problems of sediment control and active erosion are serious where nonfarm uses would involve removal of vegetative cover. Further, watersheds are subject to flash flooding at low points within the watershed boundary. This flooding potential increases drastically as urban development increases. Thus, as in other regions of the state, hazards are involved in nonfarm uses of flood-prone areas.

Considering these limitations, approximately 18 percent of the North Carolina Mountain area is suitable for nonfarm uses when public utilities (sewer lines) are not available. With widespread public sewer lines and minimal development expenses, approximately 32 percent of the area might be compatible with nonfarm urban uses.

Piedmont Soil characteristics that affect nonfarm urban uses in the Piedmont include the following: slope, the amounts and kinds of clay, the thickness of the soil mantle over hard rock, and the presence of any impermeable strata. Considering these limitations, about two-thirds of the soil resources of the Piedmont have one or more characteristics that impose moderate to severe limitations for urban-suburban use.

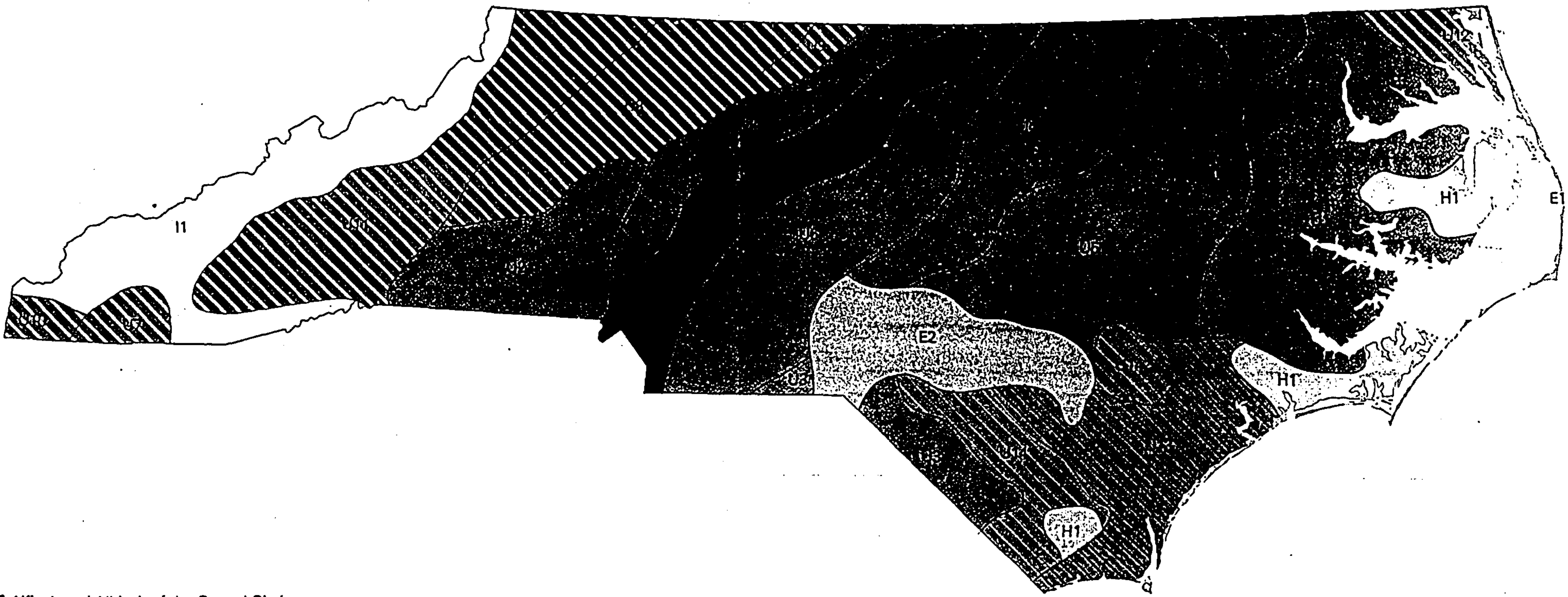
In urban-suburban development of Piedmont soils, the following considerations should be noted:

1. The control of erosion and the resulting sediment is closely related to slope and the erodibility of the Piedmont soil. Nonfarm developments that require removal of vegetation and that expose the soil for long periods of time lead to severe soil losses by erosion. Where slopes exceed 12 percent, nonfarm uses frequently require extensive grading, cutting, and filling.

2. The percolation of subsurface horizons in Piedmont soils is variable. Some soil areas are underlain by dense clays of very low percolation rates and thus are not suitable as waste sinks. Piedmont soils are not well adapted to high density development unless waste treatment systems are available. Percolation rates of the soils restrict their use as waste sinks. They are, however, generally satisfactory if the quantity of waste is controlled, and if soils are not subjected to saturation for long periods of time.

3. Some soil resource areas consist of clayey, plastic soils that create serious problems for foundations, streets, and all building appurtenances. The recognition and modification of these resource areas for urban-suburban uses are essential.

Figure 7.15. Soil Resources



- **(black)** *Alfisols* and *Ultisols* of the Central Piedmont
  Hapludalfs (60%) - Paleudults (15%) - Hapludults (15%) - Other (10%)
- **E1** Mainly *Entisols* of the Outer Banks
  Quartzipsamments (56%) - Humaquods (21%) - Psammaquents (17%) - Other (6%)
- **E2** Mainly *Entisols* of the Sandhills
  Quartzipsamments (43%) - Paleudults (26%) - Fragiudults (22%) - Other (9%)
- **H1** *Histosols* (Organic Soils) of the Lower Coastal Plain
  Medosaprists (80%) - Humaquepts (20%)
- **I1** Mainly *Inceptisols* of the Higher Mountains
  Dystrochrepts (71%) - Hapludults (18%) - Other (11%)
- **U1** *Ultisols* of Lower and Middle Coastal Plain
  Ochraquults (50%) - Hapludults (42%) - Other (8%)
- **U2** *Ultisols* of Upper Piedmont and Foothills
  Hapludults (59%) - Rhodudults (24%) - Paleudults (9%) - Other (8%)
- **U3** *Ultisols* of Upper Coastal Plain—Southern Portion
  Paleudults (73%) - Paleaquults (18%) - Other (9%)
- **U4** *Ultisols* of Upper and Eastern Piedmont
  Hapludults (88%) - Other (12%)
- **U5** *Ultisols* of Upper Coastal Plain
  Paleudults (84%) - Other (16%)
- **U6** *Ultisols* of Central Piedmont
  Hapludults (63%) - Rhodudults (16%) - Other (21%)
- **U7** *Ultisols* and *Inceptisols* of the Southern Mountains
  Hapludults (63%) - Rhodudults (17%) - Dystrochrepts (11%) - Other (9%)
- **U8** *Ultisols* and *Inceptisols* of the Upper Piedmont and Foothills
  Hapludults (75%) - Dystrochrepts (20%) - Other (5%)
- **U9** *Ultisols* and *Inceptisols* of Upper Piedmont
  Hapludults (68%) - Dystrochrepts (26%) - Other (6%)
- **U10** *Ultisols*, *Inceptisols* and Rockland of the Southern Mountains
  Hapludults (55%) - Dystrochrepts (25%) - Rockland (11%) - Other (9%)
- **U11** *Ultisols* and *Inceptisols* of Blue Ridge and Foothills
  Hapludults (40%) - Dystrochrepts (30%) - Other (30%)
- **U12** *Ultisols* and *Histosols* of Northeast Coastal Plain
  Umbraquults (70%) - Medosaprists (22%) - Other (8%)
- **U13** *Ultisols* and *Spodosols* of the Lower and Middle Coastal Plain
  Ochraquults (60%) - Haplaquods (20%) - Psammaquents (10%) - Other (10%)
- **U14** *Ultisols* and *Entisols* of Middle Coastal Plain
  Hapludults (48%) - Psammaquents (16%) - Ochraquults (8%) - Other (28%)

Source: S. W. Buol, ed., *Soils of the Southern States and Puerto Rico* (Raleigh: Agricultural Experiment Station, N.C. State University, 1973).

4. High density development in and close to natural drainageways is hazardous. Although flood-prone land areas are not extensive, they severely restrict urban-suburban uses and their use should be restricted to recreation, green belts, and park uses. As the hydrologic characteristics in watersheds are changed by urban development, the flooding potential is greatly increased.

Coastal Plain In the Coastal Plain, physical limitations on urban-suburban development are largely related to internal and external drainage, soil texture, and the organic content. In urban-suburban development of the Coastal Plain regions, the following soil characteristics are most significant:

1. Erosion and sediment control are not major problems and are confined to the more sloping lands of the Upper Coastal Plain. Flooding, however, is a problem and floodplain land areas are generally best suited for recreational activities or farm uses.

2. Many soils are seasonally wet. This limits the usefulness of the land area as waste sinks, and generally renders the land area unstable for foundations and traffic ways.

3. Soils of either slow or rapid percolation will contribute to pollution problems where soils are used as waste sinks. Both types are present in the Coastal Plain.

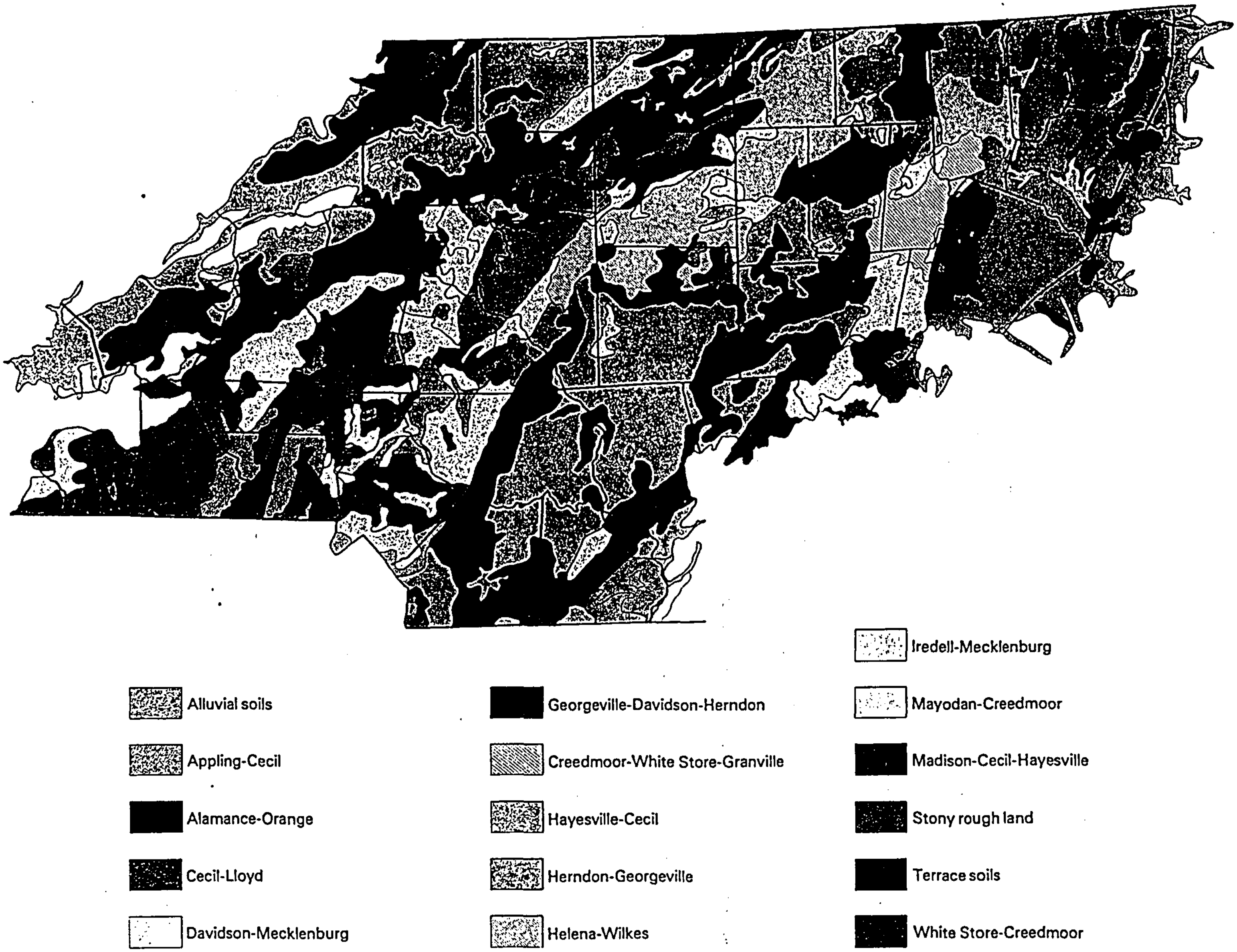
4. The organic soils and soils with organic hard pans present special problems in urban-suburban development in the Coastal Plain. These soils are very poorly suited for many nonfarm uses. They are not suitable as waste disposal areas, even when intensively drained.

High water tables, clayey soils with slow percolation rates, organic soils, and soils with impermeable hard pans are the principal limitations on about two-thirds of the soils in the region. All nonfarm uses of these soils will encounter waste disposal problems and pollution hazards without extensive modification. Urban-suburban uses of these soils generally require that special measures be undertaken to correct soil limitations prior to development for failure to correct results in environmental deterioration. The other third of soil resources is well-drained and has characteristics very favorable for engineering uses. Percolation rates are favorable, providing good waste disposal areas where soils are not subject to continuous saturation.

Table 7.2. Characteristics and Use Limitations of Soils in the Mountain Region of N.C.

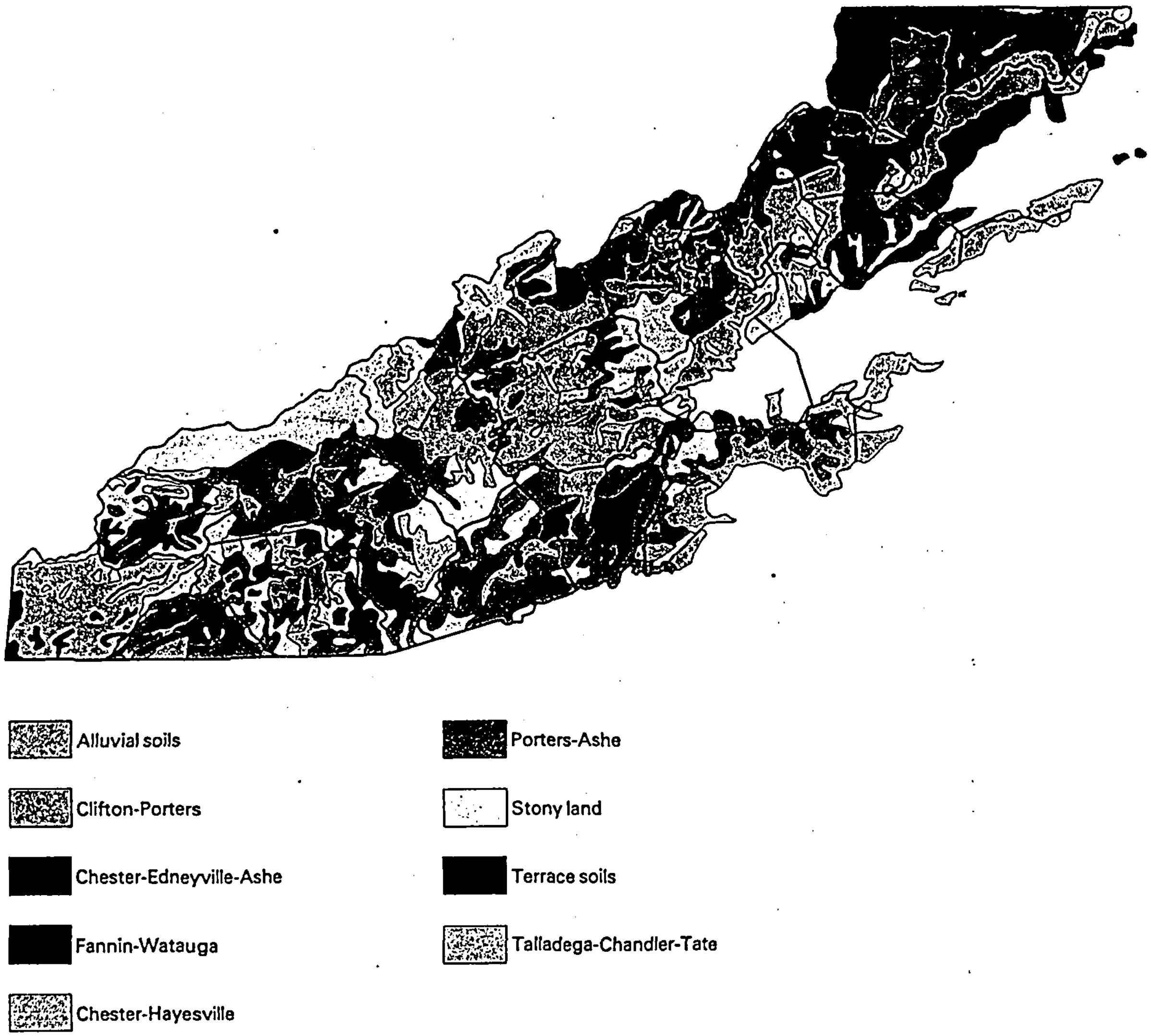
		Use Limitations	
Soil Association	*Soil Characteristics*	*Agriculture*	*Nonfarm Urban*
Braddock-Dyke-Delanco	Gently sloping to sloping, well-drained soils. Loamy surface soils and clayey subsoils.	Highly productive soils. Major hazard is erosion. Acid soils.	Moderate percolation rates are major limitations.
Chester-Edneyville-Ashe	Sloping to steep, well-drained soils. Loamy surface soils and clayey or loamy subsoils.	Moderate to high production potential. Slope and erosion are major limitations. Acid soils.	Good percolation rates but uses limited by slopes and in places rock close to surface.
Chester-Hayesville	Sloping to steep well-drained soils. Loamy surface soils and clayey subsoils.	Moderate production potential. Slope and erosion are major limitations. Acid soils.	Uses primarily limited by slope.
Clifton-Porters	Sloping to very steep well-drained soils. Loamy surface soils and clayey or loamy subsoils.	High production potential. Slope and erosion are limiting factors. Slightly acid.	Slope and rock close to surface are major limitations.
Fannin-Watauga	Sloping to very steep well-drained soils. Micaceous loamy surface soils and micaceous clayey or loamy subsoils.	Moderate production potential. Slope and erosion are major limitations. Acid soils.	Slope and lack of stability of micaceous material limit uses. Sediment control a major problem.
Porters-Ashe	Steep and very steep well-drained soils. Loamy surface soils and loamy subsoils.	High to moderate production potential. Slope is limiting factor. Slightly acid to acid soils.	Slope and rock close to surface limit uses.
Stony land	Steep and very steep well-drained soils. Loamy soil material more than 50% stone and rock ledges.	Low production potential. Stones and slope limit use.	Stones, rock ledges, and outcrops are major limitations.
Talladega-Chandler-Tate	Sloping to very steep well-drained soils. Talladega and Chandler micaceous loamy texture and Tate nonmicaceous loamy texture.	Low production potential for Talladega and Chandler. High production potential for Tate. Slope and erosion are limiting factors. Acid soils.	Talladega and Chandler are limited by slope, unstable micaceous soils, and rock close to surface. Tate has water problems from seepage.

Figure 7.17. Soil Associations in N.C. Piedmont



Source: Modified from William D. Lee, *The Soils of North Carolina* (Raleigh: N.C. State University, 1955).

Figure 7.16. Soil Associations in N.C. Mountains



Source: Modified from William D. Lee, *The Soils of North Carolina* (Raleigh: N.C. State University, 1955).

Local Soil Resources in North Carolina

To provide the public with soil information relevant to local analysis, systematic field examinations are made and their findings published as soil maps, together with careful descriptions of the soil properties. Each of the soils is fitted into the International System of Soil Classification, including the aggregation of soil series into great groups and orders. The maps are compiled at a county level, are larger in scale, and thus show much greater detail than can be shown in this publication. The maps and reports are prepared as an inventory of our soil resources by the Soil Conservation Service with the assistance and cooperation of the North Carolina Agricultural Experiment Station. Figure 7.18 shows the status of county soil mapping in the state. Copies of county maps are available in soil conservation district offices, county Agricultural Extension offices, North Carolina Agricultural Experiment Station in Raleigh, and the United States Government Printing Office.

Land Use and Conservation in North Carolina Multicounty Planning Regions

As shown in Figure 7.19a, forest is the predominant land use in the state, accounting for more than 50 percent of the total land use in each of the seventeen state planning regions in 1970. Further, the percentage of state land in forest is increasing at the expense of cropland. In the Mountains and Coastal Plain, there are large additional acreages of forest on federal lands. Urban-suburban uses are very dynamic, increasing throughout the state. The percent of land in urban and suburban uses is greater in the Piedmont where approximately 10 percent of the total land is used for urban and suburban purposes and increasing. Recreation is a significant nonfarm use for the Mountain area, increasing the percentage of total land used for urban-suburban purposes.

As illustrated in Figure 7.19b, the predominant portion of the Piedmont has potentially large percentages (70-80 percent) of good to fair agricultural land (Class 2-4). However, only in the Coastal Plain area is there a substantial area of prime agricultural land (Class 1). In contrast, more than 50 percent of the total land in the Mountain region is not well suited to agriculture (Class 5-8).

As shown in Figure 7.19c, more than three-fourths of the land in the state would benefit from drainage and erosion control. In the Coastal Plain the problem is related to poor drainage while in the Mountain region, steep slopes contribute to erosion and management problems. In the Piedmont, main resource management problems result from clayey, slowly permeable soils, short summer droughts, and subsoil acidity and lime needs. Many

Figure 7.18. l Associations in N.C. Coastal Plain

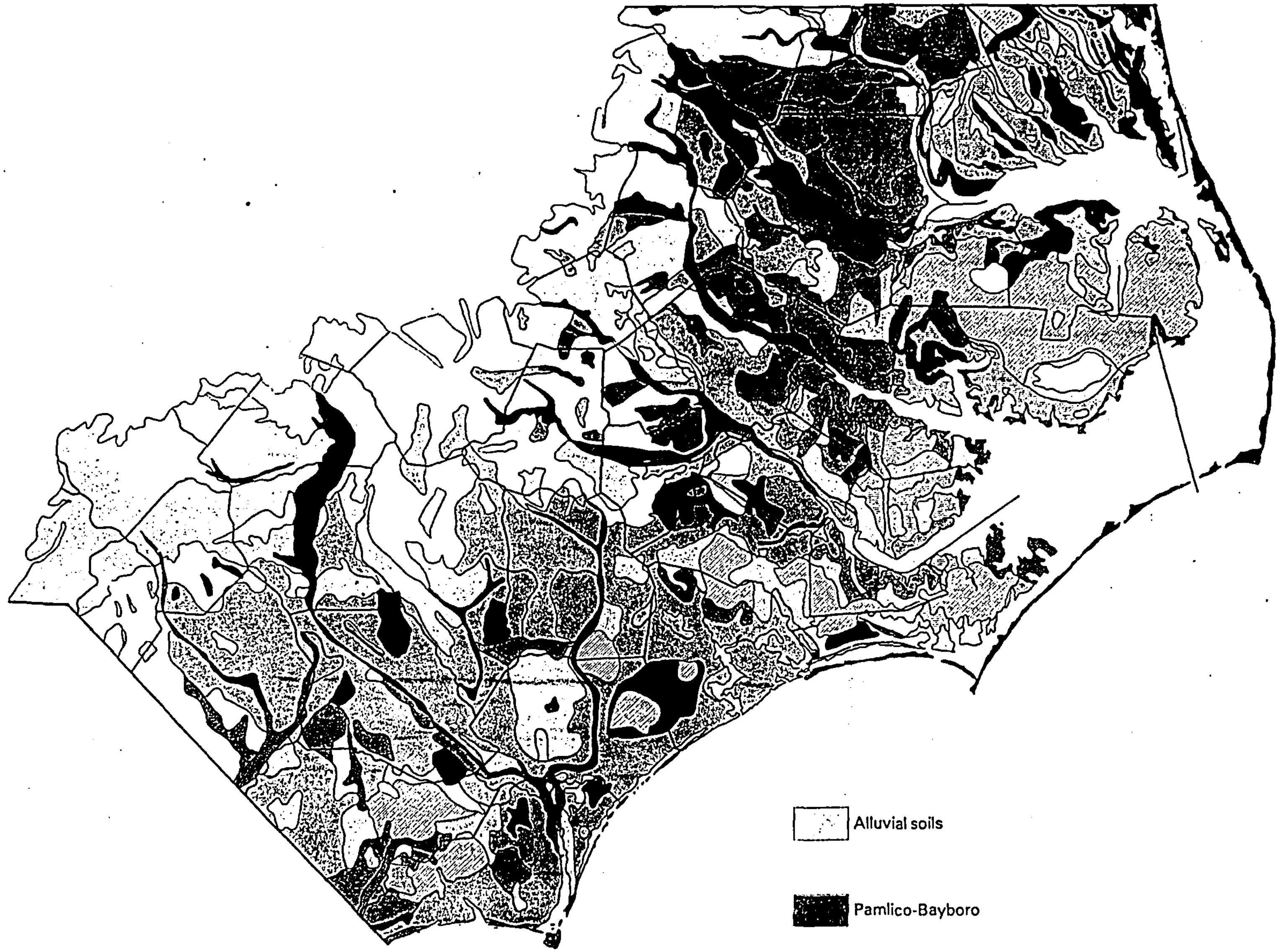


Table 7.3. Characteristics and Use Limitations of Soils in the Piedmont Region of N.C.

Soil Association	*Soil Characteristics*	*Use Limitations* — *Agriculture*	*Use Limitations* — *Nonfarm-urban*
Altavista-Wickham-Augusta	Gently sloping soils that are well to somewhat poorly drained. Sandy and loamy surfaces with clayey subsoils.	Potential productivity high. Some drainage needed. Acid soils requiring lime and other nutrients. Some low-lying areas flood.	Well-drained soils are adapted to all uses. Other soil areas limited by high water tables and flooding potential.
Appling-Cecil-Louisburg	Gently sloping to steep soils that are well drained. Sandy to clayey surface soils with clayey subsoils or lacking subsoils.	Potential productivity high to moderate. Slope and erosion are major limitations. Acid soils.	Slope and percolation rates are major limitations.
Cecil-Lloyd	Gently sloping to steep soils that are well drained. Sandy to clayey surface with clayey subsoils.	Potential productivity high to moderate. Slope and erosion are major limitations. Acid soils.	Slope and percolation rates are major limitations.
Chewacla-Congaree	Floodplain soils that are well to somewhat poorly drained. Loamy textures.	High production potential but may have severe flooding hazard.	Flooding is major limitation. High water table limits some uses.
Creedmoor-White Store-Granville	Nearly level to steep soils, somewhat poorly to well drained. Sandy surface soils. Creedmoor and White Store have impermeable clayey subsoils and Granville a permeable loamy subsoil.	Creedmoor and White Store have low to moderate production potential; Granville moderate to high. Very acid soils and susceptible to erosion. Strongly acid soils.	Very slow percolation, high water table and high shrink-swell clay limit use of White Store and Creedmoor. Granville soils suitable for most uses.
Davidson-Mecklenburg-Lloyd	Gently sloping to steep soils with loamy surface soils and clayey subsoils. Well drained.	High to moderate production potential. Slope and erosion major limitations. Slightly acid.	Slope and percolation rates are limitations.
Georgeville-Davidson-Herndon	Gently sloping to steep well-drained soils. Loamy surface soils and clayey subsoils.	High to moderate production potential. Slope and erosion major limitations. Slightly acid to acid.	Slope and percolation rates limit certain uses.
Hayesville-Cecil	Sloping to very steep well-drained soils. Loamy surface soils and clayey subsoils.	Moderate production potential. Limited by slope and erosion. Acid soils.	Slope limits many uses.
Helena-Wilkes-Enon	Sloping to very steep well-drained soils with loamy surface soils and plastic, impermeable, clayey subsoils.	Moderate production potential, limited by slope, erosion, and plastic clay subsoils. Slightly acid to strongly acid soils.	Slope, very slow percolation, and shrink-swell clays limit use.
Herndon-Georgeville	Sloping to steep well-drained soils with loamy surface soils and clayey subsoils.	Moderate production potential. Slope and erosion limit use. Acid soils.	Slope and percolation rates limit uses.
Iredell-Mecklenburg-Enon	Gently sloping to steep well-drained soils. Loamy surface soils and plastic, impermeable, clayey subsoils.	Moderate potential for grass land and low for crops. Slope, erosion, and plastic clay subsoils are limitations. Slightly acid.	Very slow percolation rates. Slopes and high shrink-swell clays limit uses.
Madison-Cecil-Hayesville	Strongly sloping to very steep well-drained soils. Loamy surface soils and clayey subsoils.	Moderate production potential. Slope and erosion limiting factors. Acid soils.	Slope and moderate percolation rates limit some uses.
Mayodan-Creedmoor	Gently sloping to strongly sloping soils that are well to imperfectly drained. Loamy surface soils and clayey subsoils.	Moderate production potential. Slope, erosion, and drainage are limiting factors. Acid soils.	Percolation rates and high water tables limit uses.
Orange-Herndon	Gently sloping to sloping soils that are well to imperfectly drained. Loamy surface soil with clayey subsoils that are impermeable and plastic or moderately permeable.	Low to moderate production potential. Slope, erosion limit Herndon; Orange limited by imperfect drainage and plastic clay subsoil.	Moderate percolation rates and slopes are limitations in using Herndon soils. Orange soils limited by high shrink-swell clays, very slow percolation, and water tables.
White Store-Creedmoor	Nearly level to gently sloping soils that are imperfectly drained. Loamy surface soils with plastic impermeable, clayey subsoils.	Low to moderate production potential. Drainage and plastic clay subsoils limit uses. Strongly acid soils.	Very slow percolation rates and high shrink-swell clays are major limitations.

Piedmont areas are severely eroded and the sloping lands are very susceptible to erosion unless conservation measures are practiced.

Soil deficiencies are characteristic to all regions of the state. Thus, for the best result in agricultural activities, considerable fertilization is required. As shown in Figure 7.19d, approximately one-half of the soils need lime, one-third need phosphorus, and one-fifth need potassium. Lime requirements are relatively uniform throughout the state except for the Inner Coastal Plain where the need is not as great as elsewhere in the state. Phosphate requirements are greatest in the Mountains and potassium deficiencies are substantially greater in planning regions J, K, and L.

Vegetation—Arthur W. Cooper
Soils—Ralph J. McCracken and Louis E. Aull

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Table 7.4. Characteristics and Use Limitations of Soils in the Coastal Plain Region of N.C.

		Use Limitations	
Soil Association	*Soil Characteristics*	*Agriculture*	*Nonfarm Urban*
Barth-Pactolus-Chipley	Nearly level, imperfectly drained soils. Sandy surface soils and sandy subsoils.	Moderate production potential. Drainage and low-water holding capacity limiting factors. Acid soils.	High water tables and rapid percolation rates. Low filtering capacity for wastes.
Bladen-Leaf	Nearly level, poorly drained soils. Loamy surface soils and plastic clayey subsoils.	Moderate production potential. Drainage and slowly permeable, plastic clay subsoils limit uses. Acid soils.	High water tables, very slow percolation rates, and surface water ponding limit uses.
Chipley-Barth-Leon	Nearly level, imperfectly drained soils. Sandy surface soils and sandy subsoils.	Moderate to low production potential. Drainage and low water-holding capacity are major problems. Leon soils have organic hardpan. Acid soils.	High water tables, low filtering capacity limit uses. Leon soils have restrictive hardpans.
Coastal beach-Dune sand	Nearly level to sloping soils. Excessively drained sands.	Low production potential. Very droughty and subject to salt damage. Acid to alkaline.	Erosion by wind and water is severe. Difficult to stabilize.
Coxville-Bladen-Lenoir	Nearly level, imperfectly drained soils. Loamy surface soils and plastic clayey subsoils.	Moderate production potential. Drainage and slowly permeable plastic, clay subsoils limit uses. Acid soils.	High water tables, very slow percolation rates, and surface water ponding are major hazards.
Craven-Lenoir-Coxville	Nearly level to sloping imperfectly drained soils. Loamy surface soils and plastic clayey subsoils.	Moderate production potential. Drainage, slow permeability, and erosion on sloping areas are principal limitations. Acid soils.	High water tables and very slow percolation rates are limiting factors.
Dorovan-Pamlico-Ponzer	Level, very poorly drained soils. Organic soils.	Moderate production potential. Drainage, water control are essential. Require special management. Strongly acid.	High water tables and unstable organic materials limit use. Very poorly suited for nonfarm urban uses.
Dunbar-Lynchburg	Level to gently sloping, imperfectly drained soils. Loamy surface soils and loamy to clayey subsoils.	High production potential. Drainage needed for most crops. Acid soils.	High water tables are major limiting factor. Percolation rates moderately rapid to slow.
Kalmia-Lumbee-Roanoke	Level, well to poorly drained soils. Sandy to loamy surface soils and loamy to clayey subsoils.	High to moderate production potential. Kalmia soils high production and good physical properties. Lumbee soils need drainage and Roanoke soils have plastic clay subsoils and are poorly drained. Acid soils.	Kalmia soils well suited. Lumbee soils have high water tables. Roanoke soils have high water tables, very slow percolation rates, and are subject to water ponding and occasional flooding.
Lakeland-Wagram	Gently sloping to sloping, well drained soils. Sandy surface soils and sandy subsoils.	Moderate production potential. Susceptible to drought and excessive leaching. Acid soils.	Poor filters when used for waste disposal. Other characteristics favorable.
Lenoir-Coxville	Level to gently sloping imperfectly drained soils. Loamy surface soils and plastic, clayey subsoils.	Moderate production potential. Drainage and slowly permeable clay subsoils are limiting factors.	High water tables and very slow percolation rates limit uses.
Lynchburg-Rains	Nearly level to gently sloping, imperfectly drained soils. Sandy surface soils and loamy subsoils.	High production potential. Drainage needed. Acid soils.	High water tables are limiting factor. Percolation rates are moderately rapid.
Mantachie-Kinston-Bibb	Nearly level soils on stream floodplains. Imperfectly drained and loamy textures.	High to moderate production potential. Drainage and flooding are limitations. Acid soils.	High water tables and flooding limit uses.
Norfolk-Orangeburg	Nearly level to sloping, well-drained soils. Sandy surface soils and loamy subsoils.	High production potential. Erosion a moderate hazard on slopes. Acid soils.	No limitations in use.
Pamlico-Bayboro	Level, very poorly drained soils. Loamy, organic surface soils and loamy to clayey subsoils.	High production potential for adapted crops. Drainage and water control are needed. Acid soils.	High water tables and difficulty of managing waste are severe limitations. Percolation rates are moderate to slow.
Portsmouth-Hyde	Level, very poorly drained soils. Loamy, high organic surface soils and loamy to clayey subsoils.	High production potential for adapted crops. Drainage and water control are needed. Acid soils.	High water tables and water management are severe limitations. Percolation rates moderately slow.
Rutlege-Plummer	Level, poorly drained sands.	Low production potential. Wet sands with low available water when drained.	High water tables and low filtering properties limit uses.
Swamp-Tidal marsh	Level, very poorly drained soils that flood frequently.	Not suited.	Not suited.

soil moisture requirement is satisfied, additional precipitation will drain to the underground water table or run off the land as surplus water.

Figure 5.18 provides the water balance deficits for the state and shows that everywhere except for the Asheville area and the northern Piedmont, the annual water deficit is less than one inch. By contrast, Figure 5.19 gives water balance surpluses. Being a wet state, North Carolina's water budget indicates surpluses exceeding deficits by large amounts. While most of the Piedmont and Coastal Plain have surplus water up to 15 inches, the Outer Banks and the Mountains show surpluses above 15 inches. In the southwest corner of the state, water surpluses amount to as much as 30 inches.

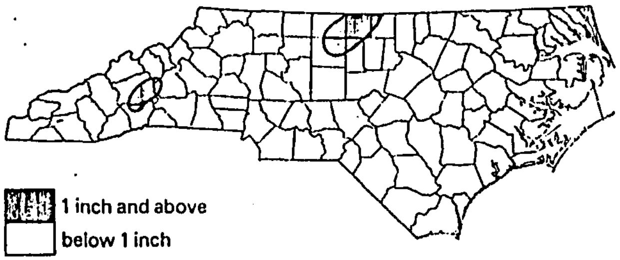
Mean annual evaporation for North Carolina is shown in Figure 5.20. Evaporation rates and totals are related to temperature, wind velocity, and relative humidity. Where temperatures are highest and humidities lowest, evaporation intensities will be greatest. Since temperatures throughout the Coastal Plain and the Piedmont are highest for the state and since humidity percentages are greater in the vicinity of the ocean, evaporation totals are lower in the Mountains and along the coast, and highest in the southern Piedmont and Coastal Plain. A comparison of the maps showing precipitation, evaporation, water surplus, and water deficit will provide the reader with a fairly complete picture of North Carolina's water balance.

Winds and Storms

Three types of storms and their associated winds are common to North Carolina: cyclonic and convectional thunderstorms, hurricanes, and tornadoes. These storms are integral parts of the state's climatic pattern. In analyzing the importance of winds, direction and speed are major considerations.

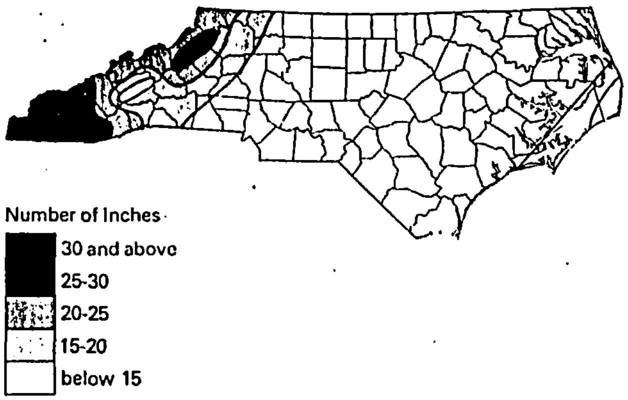
Although prevailing winds (winds that persist in blowing from one direction more so than any other) characterize given geographical areas, wind direction changes frequently. A northwesterly wind (coming from the northwest) will be, relatively speaking, a cooling and drying wind, whereas a southeasterly wind will bring warm, moist air to the state. The passage of cyclones and anticyclones with their characteristic wind patterns will change the wind's direction so that it may come across North Carolina from any point of the compass.

Figure 5.18. Water Balance Deficit in N.C.



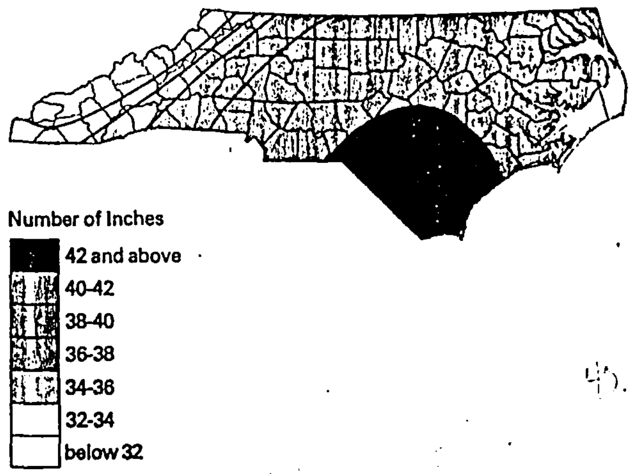
Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

Figure 5.19. Water Balance Surplus in N.C.



Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

Figure 5.20. Mean Annual Evaporation in N.C.



Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

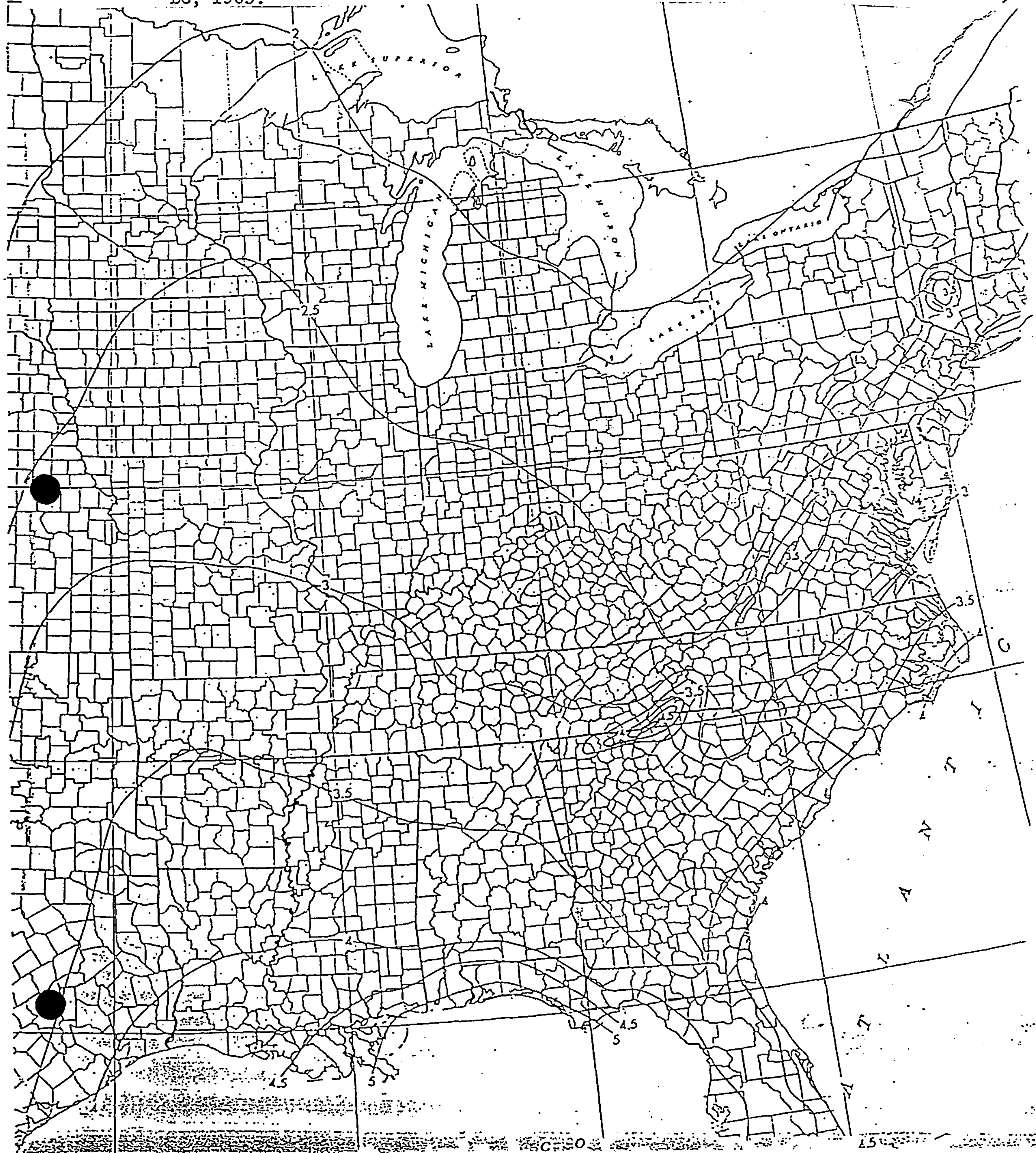
The velocity of the wind is relevant to ventilation of air pollutants, evaporation rates, and thus cooling and chilling indexes. On those occasions when winds reach gale force and higher, their velocities are of singular importance because of their destructive capabilities. Damaging winds are usually associated with infrequent hurricanes and tornadoes and, at times, with severe thunderstorms.

The prevailing winds and mean wind speeds averaged for the year are given in Figure 5.21. For the eastern two-thirds of the state, winds blow most frequently from the southwest and south. Throughout the Mountains and the western Piedmont, winds prevail from northerly directions. This annual pattern of prevailing winds persists for most months of the year except September and October when winds are dominantly from the northeast. During these months, the clockwise flow of air from seasonal anticyclones lying poleward of North Carolina, and the counterclockwise winds associated with an increased number of offshore storms cause northeasterlies to prevail across the state.

Ref. 14

JR RAINFALL (INCHES)

Rainfall Frequency Atlas of the United States, Technical Paper No. 40, US Department of Commerce, US Government Printing Office, Washington, DC, 1963.



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North Carolina State Government

Statistical Abstract

North Carolina State Data Center

Research and Planning Services
Office of State Budget and Management

Table 17

NORTH CAROLINA POPULATION OF INCORPORATED PLACES AND THEIR PERCENTAGE GROWTH
1970 TO 1980

City	County Location	1970 Census	1980 Census	Percentage Change
Aberdeen	Moore	1,592	1,945	22.2%
Ahoskie	Hertford	5,105	4,887	-4.3
Alamance	Alamance	NA	320	NA
Albemarle	Stanly	11,126	15,110	35.8
Alexander Mills	Rutherford	988	643	-34.9
Alliance	Pamlico	577	616	6.8
Andrews	Cherokee	1,384	1,621	17.1
Angier	Harnett	1,431	1,709	19.4
Ansonville	Anson	694	794	14.4
Apex	Wake	2,234	2,847	27.4
Arapahoe	Pamlico	212	467	120.3
Archdale	Guilford, Randolph	4,874	5,745	17.9
Arlington	Yadkin	711	872	22.6
Asheboro	Randolph	10,797	15,252	41.3
Asheville	Buncombe	57,929	53,583	-7.5
Askewville	Bertie	247	227	-8.1
Atkinson	Pender	325	298	-8.3
Atlantic	Carteret	NA	NA	NA
Atlantic Beach	Carteret	300	941	213.7
Aulander	Bertie	947	1,214	28.2
Aurora	Beaufort	620	698	12.6
Autryville	Sampson	213	228	35.2
Ayden	Pitt	3,450	4,361	26.4
Bailey	Nash	724	685	-5.4
Bakersville	Mitchell	409	373	-8.8
Banner Elk	Avery	754	1,087	44.2
Bath	Beaufort	231	207	-10.4
Battleboro	Edgecombe, Nash	562	632	12.5
Bayboro	Pamlico	665	759	14.1
Bear Grass	Martin	99	82	-17.2
Beaufort	Carteret	3,368	3,826	13.6
Belhaven	Beaufort	2,259	2,430	7.6
Belmont	Gaston	5,054	4,607	-8.8
Belville	Brunswick	59	102	72.9
Belwood	Cleveland	736	613	-16.7
Benson	Johnson	2,267	2,792	23.2
Bessemer City	Gaston	4,991	4,787	-4.1
Bethel	Pitt	1,514	1,825	20.5
Beulaville	Duplin	1,156	1,060	-8.3
Biltmore Forest	Buncombe	1,298	1,499	15.5
Biscoe	Montgomery	1,244	1,334	7.2
Black Creek	Wilson	449	523	16.5
Black Mountain	Buncombe	3,204	4,083	27.4
Bladenboro	Bladen	783	1,428	82.4
Blowing Rock	Caldwell, Watauga	801	1,337	66.9
Boiling Spring Lakes	Brunswick	245	998	307.8
Boiling Springs	Cleveland	2,284	2,381	4.2
Bolivia	Brunswick	185	252	36.2
Bolton	Columbus	534	563	5.4
Boone	Watauga	8,754	10,191	16.4
Boonville	Yadkin	687	1,028	49.6
Bostic	Rutherford	289	476	64.7
Brevard	Transylvania	5,243	5,323	1.5
Bridgeton	Craven	520	461	-11.3
Broadway	Lee	694	908	30.8
Brookford	Catawba	590	467	-20.8
Brunswick	Columbus	206	223	8.3
Bryson City	Swain	1,290	1,556	20.6
Bunn	Franklin	284	505	77.8
Burgaw	Pender	1,744	1,586	-9.1

City	County Location	1970 Census	1980 Census	Percentage Change
Edenton	Chowan	4,956	5,357	8.1
Elizabeth City	Camden, Pasquotank	14,381	14,004	-2.6
Elizabethtown	Bladen	1,418	3,551	150.4
Elk Park	Avery	503	535	6.4
Elkin	Surry, Wilkes	2,899	2,858	-1.4
Ellenboro	Rutherford	465	560	20.4
Ellerbe	Richmond	913	1,415	55.0
Elm City	Wilson	1,201	1,561	30.0
Elon College	Alamance	2,150	2,873	33.6
Emerald Isle	Carteret	122	865	609.0
Enfield	Halifax	3,272	2,995	-8.5
Erwin	Harnett	2,852	2,828	-0.8
Eureka	Wayne	263	303	15.2
Everetts	Martin	198	213	7.6
Fair Bluff	Columbus	1,039	1,095	5.4
Fairmont	Robeson	2,827	2,658	-6.0
Faison	Duplin	598	636	6.4
Faith	Rowan	506	552	9.1
Falcon	Cumberland, Sampson	357	339	-5.0
Falkland	Pitt	130	118	-9.2
Fallston	Cleveland	301	614	104.0
Farmville	Pitt	4,424	4,707	6.4
Fayetteville	Cumberland	53,510	59,507	11.2
Forest City	Rutherford	7,179	7,688	7.1
Fountain	Pitt	434	424	-2.3
Four Oaks	Johnston	1,057	1,049	-0.8
Foxfire	Moore	9	153	1,600.0
Franklin	Macon	2,336	2,640	13.0
Franklinton	Franklin	1,459	1,394	-4.5
Franklinville	Randolph	794	607	-23.6
Fremont	Wayne	1,596	1,736	8.8
Fuquay-Varina	Wake	3,576	3,110	-13.0
Garland	Sampson	656	885	34.9
Garner	Wake	4,923	10,073	104.6
Garysburg	Northampton	231	1,434	520.8
Gaston	Northampton	1,105	883	-20.1
Gastonia	Gaston	47,322	47,333	0.0
Gatesville	Gates	338	363	7.4
Germanton	Stokes	NA	NA	NA
Gibson	Scotland	502	533	6.2
Gibsonville	Alamance, Guilford	2,019	2,865	41.9
Glen Alpine	Burke	797	645	-19.1
Godwin	Cumberland	129	233	80.6
Gold Point	Martin	108	NA	NA
Goldsboro	Wayne	26,960	31,871	18.2
Goldston	Chatham	364	353	-3.0
Graham	Alamance	8,172	8,674	6.1
Grainger	Lenoir	NA	NA	NA
Granite Falls	Caldwell	2,388	2,580	8.0
Granite Quarry	Rowan	1,344	1,294	-3.7
Greenevers	Duplin	424	477	12.5
Greensboro	Guilford	144,076	155,642	8.0
Greenville	Pitt	29,063	35,740	23.0
Grifton	Lenoir, Pitt	1,860	2,179	17.2
Grimesland	Pitt	394	453	15.0
Grover	Cleveland	555	597	7.6
Halifax	Halifax	335	253	-24.5
Hamilton	Martin	579	638	10.2
Hamlet	Richmond	4,627	4,720	2.0
Harmony	Iredell	377	470	24.7

Burlin[illegible]	Alamance	35,930	37,266	3.7
Burnsv[illegible]	Yancey	1,348	1,452	7.7
Calabash	Brunswick	154	128	-16.9
Calypso	Duplin	462	689	49.1
Cameron	Moore	204	225	10.3
Candor	Montgomery	561	868	54.7
Canton	Haywood	5,158	4,631	-10.2
Cape Carteret	Carteret	616	944	53.2
Carolina Beach	New Hanover	1,663	2,000	20.3
Carrboro	Orange	5,058	7,336	45.0
Carthage	Moore	1,034	925	-10.5
Cary	Wake	7,686	21,763	183.2
Casar	Cleveland	339	346	2.1
Cashiers	Jackson	230	553	140.4
Castalia	Nash	265	358	35.1
Caswell Beach	Brunswick	28	110	292.9
Catawba	Catawba	565	509	-9.9
Centerville	Franklin	123	135	9.8
Cerro Gordo	Columbus	322	295	-8.4
Chadbourn	Columbus	2,213	1,975	-10.8
Chadwick Acres	Onslow	12	15	25.0
Chapel Hill	Durham, Orange	26,199	32,421	23.7
Charlotte	Mecklenburg	241,420	314,447	30.2
Cherryville	Gaston	5,258	4,844	-7.9
China Grove	Rowan	1,788	2,081	16.4
Chocowinity	Beaufort	566	644	13.8
Claremont	Catawba	788	800	11.7
Clarkton	Bladen	662	664	0.3
Clayton	Johnston	3,103	4,091	31.8
Cleveland	Rowan	614	595	-3.1
Clinton	Sampson	7,157	7,552	5.5
Clyde	Haywood	814	1,008	23.8
Coakley	Edgecombe	NA	NA	NA
Coats	Harnett	1,051	1,385	31.8
Cofield	Hertford	318	465	46.2
Colerain	Bertie	373	284	-23.9
Columbia	Tyrrell	902	758	-16.0
Columbus	Polk	731	727	-0.5
Como	Hertford	211	89	-57.8
Concord	Cabarrus	18,464	16,942	-8.2
Conetoe	Edgecombe	160	215	34.4
Conover	Catawba	3,355	4,245	26.5
Conway	Northampton	694	678	-2.3
Cornelius	Mecklenburg	1,296	1,460	12.7
Cove City	Craven	485	500	3.1
Cramerton	Gaston	2,142	1,869	-12.7
Creedmoor	Granville	1,405	1,641	16.8
Creswell	Washington	633	426	-32.7
Crossnore	Avery	264	297	12.5
Dallas	Gaston	4,059	3,340	-17.7
Danbury	Stokes	152	140	-7.9
Davidson	Iredell, Mecklenburg	2,931	3,241	10.6
Delview	Gaston	11	7	-36.4
Denton	Davidson	1,017	949	-6.7
Dillsboro	Jackson	215	179	-16.7
Dobson	Surry	933	1,222	31.0
Dorches	Nash	686	885	29.0
Dover	Craven	585	600	2.6
Drexel	Burke	1,431	1,392	-2.7
Dublin	Bladen	283	477	68.6
Dudley	Wayne	199	NA	NA
Dundarrach	Hoke	53	NA	NA
Dunn	Harnett	8,302	8,962	7.9$
Durham	Durham	95,438	100,831	5.7
Earl	Cleveland	195	206	5.6
East Arcadia	Bladen	556	461	-17.1
East Bend	Yadkin	485	602	24.1
East Laurinburg	Scotland	487	536	10.1
East Spencer	Rowan	2,217	2,150	-3.0
Eden	Rockingham	15,871	15,672	-1.3
Harrells	Duplin, Sampson	249	255	2.4
Harrellsville	Hertford	165	151	-8.5
Harrisburg	Cabarrus	1,098	1,433	30.5
Hassell	Martin	160	109	-31.9
Havelock	Craven	3,012	17,718	488.2
Haw River	Alamance	1,944	1,858	-4.4
Hayesville	Clay	428	376	-12.1
Haywood	Chatham	NA	190	NA
Hazelwood	Haywood	2,057	1,811	-12.0
Henderson	Vance	13,896	13,522	-2.7
Hendersonville	Henderson	6,443	6,862	6.5
Hertford	Perquimans	2,023	1,941	-4.1
Hickory	Burke, Catawba	20,569	20,757	0.9
High Point	(a)	63,229	63,380	0.2
High Shoals	Gaston, Lincoln	563	586	4.1
Highlands	Macon	583	653	12.0
Hildebran	Burke	521	628	20.5
Hillsborough	Orange	1,444	3,019	109.1
Hobgood	Halifax	530	483	-8.9
Hoffman	Richmond	434	389	-10.4
Holden Beach	Brunswick	136	232	70.6
Holly Springs	Wake	697	688	-1.3
Holly Ridge	Onslow	415	465	12.0
Hollyville	Pamlico	NA	100	NA
Hookerton	Greene	441	460	4.3
Hope Mills	Cumberland	1,866	5,412	190.0
Hot Springs	Madison	653	678	3.8
Hudson	Caldwell	2,820	2,888	2.4
Huntersville	Mecklenburg	1,538	1,294	-15.9
Indian Beach	Carteret	245	54	-78.0
Indian Trail	Union	405	811	100.2
Jackson	Northampton	762	720	-5.5
Jackson Springs	Moore	NA	NA	NA
Jacksonville	Onslow	16,289	17,056	4.7
Jamestown	Guilford	1,297	2,148	65.6
Jamesville	Martin	533	604	13.3
Jason	Greene	NA	NA	NA
Jefferson	Ashe	943	1,086	15.2
Jonesville	Yadkin	1,659	1,752	5.6
Jupiter	Buncombe	208	NA	NA
Kelford	Bertie	295	254	-13.9
Kenansville	Duplin	762	931	22.2
Kenly	Johnston, Wilson	1,370	1,433	4.6
Kernersville	Forsyth	4,815	6,802	41.3
Kill Devil Hills	Dare	357	1,796	403.1
Kings Mountain	Cleveland, Gaston	8,465	9,080	7.3
Kinston	Lenoir	23,020	25,234	9.6
Kittrell	Vance	427	225	-47.3
Knightdale	Wake	815	985	20.9
Kure Beach	New Hanover	394	611	55.1
LaGrange	Lenoir	2,679	3,147	17.5$
Lake Lure	Rutherford	456	488	7.0
Lake Waccamaw	Columbus	924	1,133	22.6
Landis	Rowan	2,297	2,092	-8.9
Lansing	Ashe	283	194	-31.4
Lasker	Northampton	114	96	-15.8
Lattimore	Cleveland	257	237	-7.8
Laurel Park	Henderson	581	764	31.5
Laurinburg	Scotland	8,859	11,480	29.6
Lawndale	Cleveland	544	469	-13.8
Lawrence	Edgecombe	NA	NA	NA
Leggett	Edgecombe	120	99	-17.5
Lenoir	Caldwell	14,705	13,748	-6.5
Lewiston	Bertie	327	459	40.4
Lexington	Davidson	17,205	15,711	-8.7
Liberty	Randolph	2,167	1,997	-7.8
Lilesville	Anson	641	588	-8.3
Lillington	Harnett	1,155	1,948	68.7
Lincolnton	Lincoln	5,293	4,879	-7.8
Lindon	Cumberland	205	365	78.0

City	County Location	1970 Census	1980 Census	Percentage Change
Linville	Avery	NA	244	NA
Littleton	Halifax	903	820	-9.2
Locust	Stanly	1,484	1,590	7.1
Long Beach	Brunswick	493	1,844	274.0
Long View	Burke, Catawba	3,360	3,587	6.8
Louisburg	Franklin	2,941	3,238	10.1
Love Valley	Iredell	40	55	37.5
Lowell	Gaston	3,307	2,917	-11.8
Lucama	Wilson	610	1,070	75.4
Lumber Bridge	Robeson	117	171	46.2
Lumberton	Robeson	16,961	18,241	7.5
McAdenville	Gaston	950	947	-0.3
McDonald	Robeson	80	117	46.3
McFarlan	Anson	140	133	-5.0
Macclesfield	Edgecombe	536	504	-6.0
Macon	Warren	179	153	-14.5
Madison	Rockingham	2,018	2,806	39.0
Maggie Valley	Haywood	159	202	27.0
Magnolia	Duplin	614	592	-3.6
Maiden	Catawba, Lincoln	2,416	2,574	6.5
Manteo	Dare	547	902	64.9
Marietta	Robeson	70	NA	NA
Marion	McDowell	3,335	3,684	10.5
Mars Hill	Madison	1,623	2,126	31.0
Marshall	Madison	982	809	-17.6
Marshville	Union	1,405	2,011	43.1
Matthews	Mecklenburg	783	1,648	110.5
Maury	Greene	421	NA	NA
Maxton	Robeson, Scotland	1,885	2,711	43.8
Mayodan	Rockingham	2,875	2,627	-8.6
Maysville	Jones	912	877	-3.8
Mebane	Alamance, Orange	2,573	2,782	8.1
Mesic	Pamlico	369	390	5.7
Micro	Johnston	300	438	46.0
Middleburg	Vance	149	185	24.2
Middlesex	Nash	729	837	14.8
Mildred	Edgecombe	NA	NA	NA
Milton	Caswell	235	235	0.0
Minnesott Beach	Pamlico	41	171	317.1
Mint Hill	Mecklenburg	2,262	7,915	249.9
Mocksville	Davie	2,529	2,637	4.3
Monroe	Union	11,282	12,639	12.0
Montreat	Buncombe	581	741	27.5
Mooresboro	Cleveland	453	405	-8.6
Mooresville	Iredell	8,808	8,575	-2.6
Morehead City	Carteret	5,233	4,359	-16.7
Morganton	Burke	13,625	13,763	1.0
Morrisville	Wake	209	251	20.1
Morven	Anson	562	765	36.1
Mount Airy	Surry	7,325	6,862	-6.3
Mount Gilead	Montgomery	1,286	1,423	10.7
Mount Holly	Gaston	5,107	4,530	-11.3
Mount Olive	Duplin, Wayne	4,914	4,876	-0.8
Mount Pleasant	Cabarrus	1,174	1,210	3.1
Murfreesboro	Hertford	4,418	3,007	-31.9
Murphy	Cherokee	2,082	2,070	-0.6
Nags Head	Dare	414	1,020	146.4
Nashville	Nash	1,670	2,678	60.4
Navassa	Brunswick	487	439	-9.9
New Bern	Craven	14,660	14,557	-0.7
Rockwell	Rowan	999	1,339	34.0
Rocky Mount	Edgecombe, Nash	34,284	41,283	20.4
Rolesville	Wake	533	381	-28.5
Ronda	Wilkes	465	457	-1.7
Roper	Washington	649	795	22.5
Rose Hill	Duplin	1,448	1,508	4.1
Roseboro	Sampson	1,235	1,227	-0.6
Rosman	Transylvania	407	512	25.8
Rowland	Robeson	1,358	1,841	35.6
Roxboro	Person	5,370	7,532	-86.4
Roxobel	Bertie	347	278	-19.9
Rural Hall	Forsyth	1,289	1,336	3.6
Ruth	Rutherford	360	381	5.8
Rutherford College	Burke	821	1,108	35.0
Rutherfordton	Rutherford	3,245	3,434	5.8
Salemburg	Sampson	669	742	10.9
Salisbury	Rowan	22,515	22,677	0.7
Saluda	Polk	546	607	11.2
Sanford	Lee	11,716	14,773	26.1
Saratoga	Wilson	391	381	-2.6
Scotland Neck	Halifax	2,869	2,834	-1.2
Seaboard	Northampton	611	687	12.4
Seagrove	Randolph	354	294	-16.9
Selma	Johnston	4,356	4,762	9.3
Seven Devils	Avery, Watauga	0	54	0
Seven Springs	Wayne	188	166	-11.7
Severn	Northampton	356	309	-13.2
Shady Forest	Brunswick	17	43	152.9
Shallotte	Brunswick	597	680	13.9
Sharpsburg	(b)	789	997	26.4
Shelby	Cleveland	16,328	15,310	-6.2
Siler City	Chatham	4,689	4,446	-5.2
Simpson	Pitt	383	407	6.3
Sims	Wilson	205	192	-6.3
Smithfield	Johnston	6,677	7,288	9.2
Snow Hill	Greene	1,359	1,374	1.1
Southern Pines	Moore	5,937	8,620	45.2
Southern Shores	Dare	75	395	NA
Southport	Brunswick	2,220	2,824	27.2
Sparta	Alleghany	1,304	1,687	29.4
Speed	Edgecombe	142	95	-33.1
Spencer	Rowan	3,075	2,938	-4.5
Spencer Mountain	Gaston	300	169	-43.7
Spindale	Rutherford	3,848	4,246	10.3
Spring Hope	Nash	1,334	1,254	-6.0
Spring Lake	Cumberland	3,968	6,273	58.1
Spruce Pine	Mitchell	2,333	2,282	-2.2
St. Pauls	Robeson	2,011	1,639	-18.5
Staley	Randolph	239	204	-14.6
Stallings	Union	726	1,826	151.5
Stanfield	Stanly	458	463	1.1
Stanley	Gaston	2,336	2,341	0.2
Stantonsburg	Wilson	869	920	5.9
Star	Montgomery	892	816	-8.5
Statesville	Iredell	20,007	18,622	-6.9
Stedman	Cumberland	505	723	43.2
Stem	Granville	242	222	-8.3
Stoneville	Rockingham	1,030	1,054	2.3
Stonewall	Pamlico	335	360	7.5
Stovall	Granville	405	417	3.0

New London	Stanly	285	454	59.3
Newland	Avery	524	722	37.8
Newport	Carteret	1,735	1,883	8.5
Newton	Catawba	7,857	7,624	-3.0
Newton Grove	Sampson	546	564	3.3
Norlina	Warren	969	901	-7.0
Norman	Richmond	157	252	60.5
North Wilkesboro	Wilkes	3,357	3,260	-2.9
Norwood	Stanly	1,896	1,818	-4.1
Oak City	Martin	559	475	-15.0
Oakboro	Stanly	568	587	3.3
Ocean Isle Beach	Brunswick	78	143	83.3
Old Fort	McDowell	676	752	11.2
Old Sparta	Edgecombe	NA	NA	NA
Oriental	Pamlico	445	536	20.4
Orrum	Robeson	162	167	3.1
Oxford	Granville	7,178	7,603	5.9
Pantego	Beaufort	218	185	-15.1
Parkton	Robeson	550	564	2.5
Parmele	Martin	373	484	29.8
Patterson Springs	Cleveland	478	731	52.9
Peachland	Anson	556	506	-9.0
Pembroke	Robeson	1,982	2,698	36.1
Pikeville	Wayne	580	662	14.1
Pilot Mountain	Surry	1,309	1,090	-16.7
Pine Knoll Shores	Carteret	62	646	941.9
Pine Level	Johnston	983	953	-3.1
Pinebluff	Moore	570	935	64.0
Pinehurst	Moore	1,056	NA	NA
Pinetops	Edgecombe	1,379	1,465	6.2
Pineville	Mecklenburg	1,948	1,525	-21.7
Pink Hill	Lenoir	522	644	23.4
Pittsboro	Chatham	1,447	1,332	-7.9
Plymouth	Washington	4,774	4,571	-4.3
Polkton	Anson	845	762	-9.8
Polkville	Cleveland	494	528	6.9
Pollocksville	Jones	456	318	-30.3
Powellsville	Bertie	247	320	29.6
Princeton	Johnston	1,044	1,034	-1.0
Princeville	Edgecombe	654	1,508	130.6
Proctorville	Robeson	157	205	30.6%
Raeford	Hoke	3,180	3,630	14.2
Raleigh	Wake	122,830	150,255	22.3
Ramseur	Randolph	1,328	1,162	-12.5
Randleman	Randolph	2,312	2,156	-6.7
Ranlo	Gaston	2,092	1,774	-15.2
Raynham	Robeson	75	83	10.7
Red Oak	Nash	359	314	-12.5
Red Springs	Robeson	3,383	3,607	6.6
Reidsville	Rockingham	13,636	12,492	-8.4
Rennert	Robeson	175	178	1.7
Rhodhiss	Burke, Caldwell	784	727	-7.3
Rich Square	Northampton	1,254	1,057	-15.7
Richfield	Stanly	306	373	21.9
Richlands	Onslow	935	825	-11.8
Roanoke Rapids	Halifax	13,508	14,702	8.8
Robbins	Moore	1,059	1,256	18.5
Robbinsville	Graham	777	1,370	76.3
Robersonville	Martin	1,910	1,981	3.7
Rockingham	Richmond	5,852	8,300	41.8
Sunset Beach	Brunswick	108	304	181.5
Surf City	Pender	166	391	135.5
Swansboro	Onslow	1,207	976	-19.1
Sylva	Jackson	1,561	1,699	8.8
Tabor City	Columbus	2,400	2,710	12.9
Tar Heel	Bladen	87	118	35.6
Tarboro	Edgecombe	9,425	8,634	-8.4
Taylorsville	Alexander	1,231	1,103	-10.4
Teachey	Duplin	219	373	70.3
Thomasville	Davidson	15,230	14,144	-7.1
Topsail Beach	Pender	108	264	144.4
Trent Woods	Craven	719	1,177	63.7
Trenton	Jones	539	407	-24.5
Troutman	Iredell	797	1,360	70.6
Troy	Montgomery	2,429	2,702	11.2
Tryon	Polk	1,951	1,796	-7.9
Turkey	Sampson	329	417	26.7
Unionville	Union	NA	NA	NA
Valdese	Burke	3,182	3,364	5.7
Vanceboro	Craven	758	833	9.9
Vandemere	Pamlico	379	335	-11.6
Vass	Moore	885	828	-6.4
Waco	Cleveland	245	322	31.4
Wade	Cumberland	315	474	50.5
Wadesboro	Anson	3,977	4,206	5.8
Wagram	Scotland	718	617	-14.1
Wake Forest	Wake	3,148	3,780	20.1
Wallace	Duplin, Pender	2,905	2,903	-0.1
Walnut Cove	Stokes	1,213	1,147	-5.4
Walnut Creek	Wayne	81	343	323.5
Walstonburg	Greene	176	181	2.8
Warrenton	Warren	1,035	908	-12.3
Warsaw	Duplin	2,701	2,910	7.7
Washington	Beaufort	8,961	8,418	-6.1
Washington Park	Beaufort	517	514	-0.6
Watha	Pender	181	196	8.3
Waxhaw	Union	1,248	1,208	-3.2
Waynesville	Haywood	6,488	6,765	4.3
Weaverville	Buncombe	1,280	1,495	16.8
Webster	Jackson	181	200	10.5%
Weldon	Halifax	2,304	1,844	-20.0%
Wendell	Wake	1,929	2,222	15.2
West Jefferson	Ashe	889	822	-7.5
Whispering Pines	Moore	362	1,160	220.4
Whitakers	Edgecombe, Nash	926	924	-0.2
White Lake	Bladen	232	968	317.2
Whiteville	Columbus	4,195	5,565	32.7
Wilkesboro	Wilkes	2,038	2,335	14.6
Williamsboro	Vance	NA	59	NA
Williamston	Martin	6,570	6,159	-6.3
Wilmington	New Hanover	46,169	44,000	-4.7
Wilson	Wilson	29,347	34,424	17.3
Windsor	Bertie	2.199	2,126	-3.3
Winfall	Perquimans	581	634	9.1%
Wingate	Union	2,569	2,615	1.8
Winston-Salem	Forsyth	133,683	131,885	-1.3
Winterville	Pitt	1,437	2,052	42.8
Winton	Hertford	917	825	-10.0
Woodfin	Buncombe	2,831	3,260	15.2
Woodland	Northampton	744	861	15.7
Woodville	Bertie	253	212	-16.2
Wrightsville Beach	New Hanover	1,701	2,910	71.1
Yadkinville	Yadkin	2,232	2,216	-0.7
Yaupon Beach	Brunswick	334	569	70.4
Youngsville	Franklin	555	486	-12.4
Zebulon	Wake	1,839	2,055	11.7
North Carolina Municipal Population		2,210,008	2,476,041	15.6

(a) Davidson, Guilford, and Randolph counties.
(b) Edgecombe, Nash, and Wilson counties.
NA - Not Available

SOURCE: U.S. Department of Commerce, Bureau of the Census.
Office of State Budget and Management, Research and Planning Services.

7/17/89 GRID--0354600/0355400-0815500/0825430 PAGE 0001

PWID	PWMANAME	PWMAARCO	PWMAPNUM	PWPLSOC1	PWPLPOPL	PWPLTYPE	PWPLACTV	PWPLLAT1	PWPLLON1
0100010	BURNSVILLE WATER TRTMT PLT	704	6822420	S	000002000	C	A	0355232	0821643
0100103	MT MITCHELL LANDS	704	8984348	G	000000300	C	A	0354620	0821215
0100104	MT MITCHELL LANDS WEST	704	8984348	G	000000200	C	A	0354610	0821230
0100417	MT. MITCHELL BAPTIST CHURCH	704	6754692	G	000000145	N	A	0354620	0821130
0100425	CLEAR CREEK CAMPGROUND	704	6754510	G	000000150	N	A	0354650	0821755
0100435	ROBINSON BROTHERS S S	704	6754011	G	000000030	N	A	0355230	0821730
0100446	BANK CREEK UNION CH		0000000	G	000000050	N	A	0355325	0822240
0100452	LOW GAP FWB CHURCH	704	6826609	G	000000080	N	A	0355240	0821730
0100454	TOE RIVER RANCH CAMPGROUND	704	6822110	G	000000050	N	A	0355325	0821200
0100459	ARTHUR MORGAN SCHOOL	704	6754262	G	000000040	N	A	0354900	0821100
0100484	TIP OF THE TOE RESTAURANT	704	6754996	G	000000025	N	A	0354835	0821200
0100485	MT. COVE CAMP GROUND	704	6755862	G	000000050	N	A	0354630	0821055
0100486	MT MITCHEL GOLF CLUB	704	6754923	G	000000100	N	A	0354710	0821745
0100487	MT MITCHELL STATE PARK	704	6754611	S	000000100	N	A	0354603	0821600
0100488	SOUTH TOE ELEM SCHOOL	704	6754321	G	000000212	N	A	0354915	0821120
0100491	CRAB TREE MEADOWS	704	2590712	G	000000200	N	A	0354740	0821030
0100492	MT. MITCHELL LODGE INC.	704	6755011	G	000001000	N	A	0354628	0821200
0100494	CAROLINA HEMLOCKS CMPGP	704	6826146	G	000000708	N	A	0354800	0821226
0100495	HICKORY SPRINGS MANUFACTURING	704	6784101	G	000000065	N	A	0355230	0821330
0111440	PINEY MTN BAPTIST CHURCH	704	6892314	G	000000125	N	A	0354620	0823130
0111442	D & D GROCERY	704	6269894	G	000000063	N	A	0354700	0822920
0111447	BILLIE KAY APPAREL	704	6455615	G	000000065	N	A	0354600	0823300
0111450	IVY HILL BAPTIST CHURCH	704	6456457	G	000000080	N	A	0354700	0822912
0111451	LOCUST GROVE BAPTIST CHURCH	704	6455872	G	000000090	N	A	0354630	0823350
0111457	COLLEGE INN	704	6459053	G	000000040	N	A	0354640	0823240
0111459	WHEELERS GROCERY	704	6262508	G	000000051	N	A	0354630	0822730
0111460	OHIO ELECTRIC MOTORS	704	6262901	G	000000100	N	A	0354630	0822730
0111470	BARNARDSVILLE CHURCH OF GOD	704	6262625	G	000000086	N	A	0354630	0822730
0111472	BARNARDSVILLE ELEMENTARY	704	6262930	G	000000360	N	A	0354630	0822030
0111474	BARNARDSVILLE FREE WILL BAPTIS	704	6262542	G	000000060	N	A	0354630	0822730
0111475	BARNARDSVILLE UNITED METHODIST	704	6262470	G	000000071	N	A	0354630	0822730
0111478	BARNADSVILLE BAPTIST CHURCH	704	6262680	G	000000075	N	A	0354630	0822730
0112426	SOUTH MOUNTAIN INC	704	5841105	G	000000060	C	A	0354625	0815515
0112427	OAK GROVE BAPT CH	704	5843216	G	000000260	N	A	0354630	0815530
0156101	AMERICAN THREAD PLANT	704	7564111	S	000000026	C	A	0354738	0820112
0156112	SWISS VILLAGE WTR SYST	704	7659712	G	000000160	C	A	0355100	0820345
0156117	SCENIC MOBILE HOME VILLAGE	704	4521625	G	000000096	C	A	0354846	0820117
0156128	WOODLAWN HEIGHTS WATER SYSTEM	704	4782785	G	000000315	C	A	0354740	0820215
0156431	SKYLINE HOTEL AND RESTAURANT	704	7659394	G	000001000	N	A	0355110	0820400
0156441	NORTH COVE BAPTIST CHURCH		0000000	G	000000060	N	A	0354920	0820011
0156443	NORTH COVE CHURCH OF GOD	704	7564973	G	000000065	N	A	0355230	0815730
0156444	CONCORD METH CH		0000000	G	000000100	N	A	0355250	0815610
0156461	TONY'S TEXACO	704	7564551	G	000000350	N	A	0354800	0820200
0156466	NORTH COVE ELEMENTARY SCHOOL		0000000	G	000000185	N	A	0355010	0815845
0156492	TRAVENOL LABORATORIES INC.	704	7564151	G	000002300	N	A	0355030	0815900
0156516	THE CHALET	704	7654089	G	000000350	N	A	0355110	0820550
0156527	WOODLAWN WORK CENTER	704	6522144	G	000000045	N	A	0355230	0820730
0158015	MARSHALL, TOWN OF	704	6493031	G	000001000	C	A	0354800	0824100
0158025	FAIRVIEW WATER ASSOC	704	6227392	G	000000050	C	A	0355350	0825145
0158101	BALD MOUNTAIN DEV CORP	704	6894111	G	000000336	C	A	0355340	0825135
0158402	WALNUT SCHOOL	704	6492636	G	000000180	N	A	0355130	0824530
0158403	ENON BAPT CH		0000000	G	000000075	N	A	0355145	0824215
0158405	L & M MARKET	704	6892541	G	000000100	N	A	0354930	0823015
0158411	ROCK BLUFF RECREATION AREA	704	6223202	G	000000060	N	A	0355245	0825030

Ref. 16

United States Department of the Interior
FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES FIELD STATION
100 OTIS STREET, ROOM 224
ASHEVILLE, NORTH CAROLINA 28801

Ref. 17

June 21, 1985

Ms. Pat Derosa
Solid and Hazardous Waste Management Branch
Environmental Health Section
North Carolina Department of Human Resources
P. O. Box 2091
Raleigh, North Carolina 27602

Dear Ms. Derosa,

In response to your telephone conversation with John Fridell on May 30, 1985, we are enclosing the following items of information:

A. North Carolina county distribution records of Federally listed, proposed and status review species,

B. map of the critical habitat of the threatened spotfin chub (Hybopsis monacha),

C. map of the critical habitat of mountain golden heather (Hudsonia montana), and

D. copy of the U.S. Fish and Wildlife Service interagency Section 7 consultation process guidelines (included for your information)

The abbreviations following the species names on the North Carolina species distribution records (A. above) indicate Federal status, i.e., E - endangered, T - threatened, PE - proposed endangered, PT - proposed threatened and SR - under status review. Status review species are not legally protected under the Endangered Species Act. However, they are subject to being listed and agencies should be cognizant of their potential presence in a project area.

Since additions and deletions are made to the list of species on a regular basis, questions regarding updates of the list should be made to this office.

We hope this information will be of use to you. If we can be of any further assistance, please call John Fridell or Nora Murdock at (704) 259-0321.

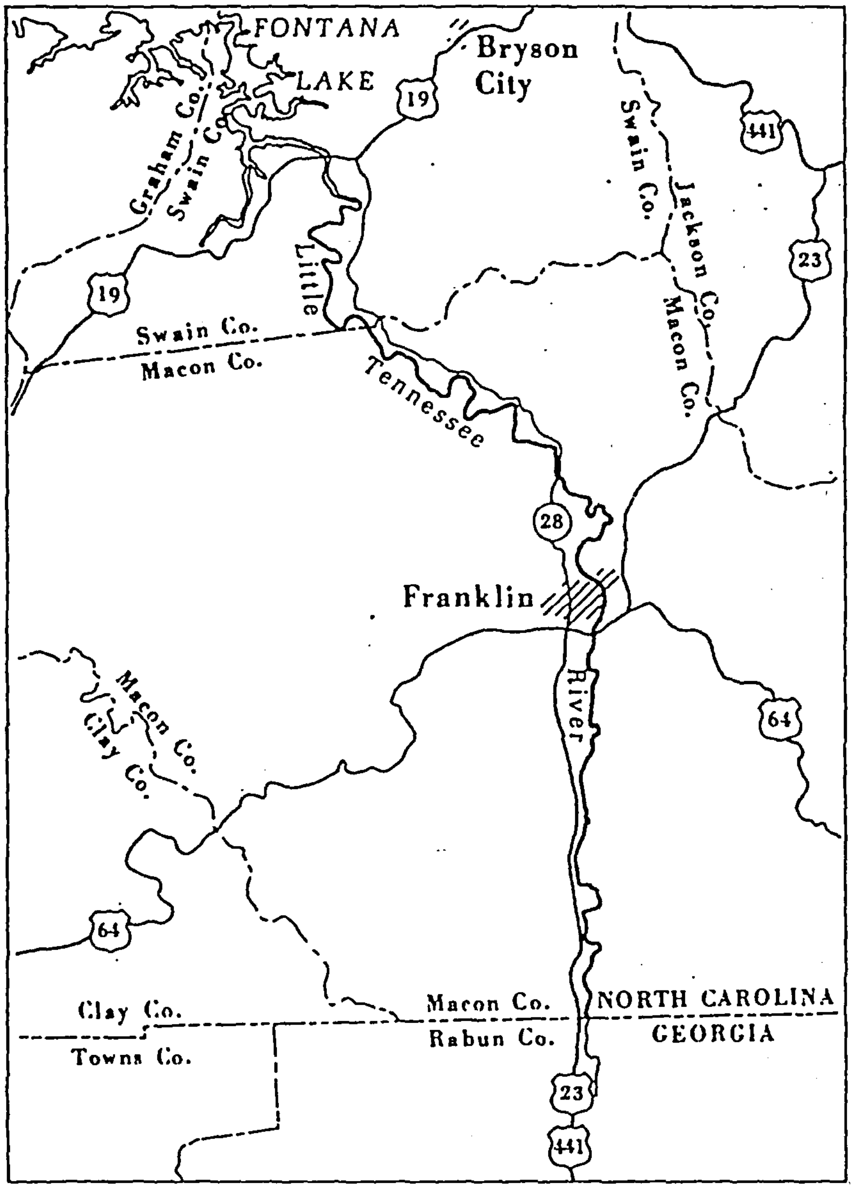
Sincerely yours,

Warren T. Parker
Field Supervisor

NORTH CAROLINA - Critical Habitat

Hybopsis monacha, "spotfin chub"

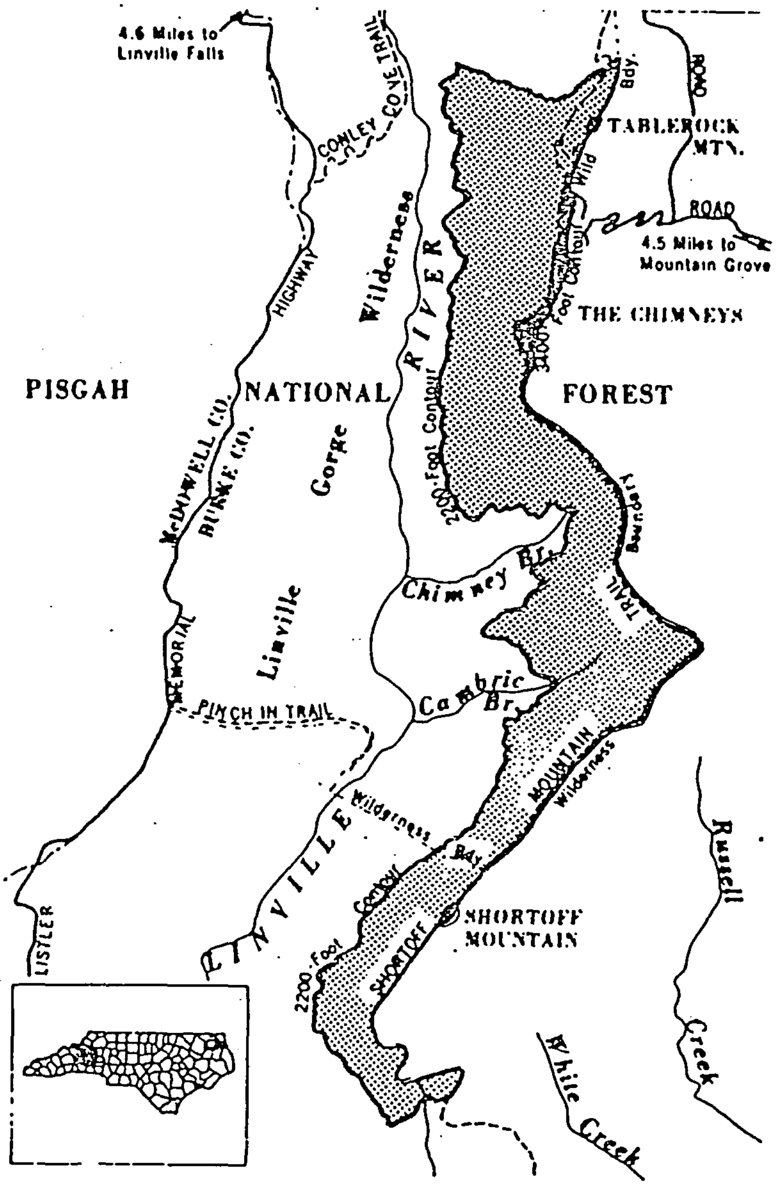
Macon and Swain Counties. Little Tennessee River, main channel from the backwaters of Fontana Lake upstream to the North Carolina-Georgia state line.



NORTH CAROLINA - Critical Habitat

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.



12 August 1986

TO: CERCLA Unit Staff

FROM: Pat DeRosa PD

RE: Critical Habitats of Federally Listed Endangered Species in N.C.

I spoke by telephone today with John Fridell, US Fish and Wildlife Service (704) 259-0321 to request an update on critical habitats in NC. Mr. Fridell informed me that the only change since our previous correspondence of June 21, 1985 has been a "Proposal to List the Cape Fear Shiner as an Endangered Species with Critical Habitats" in NC. (FR Vol. 51, No. 133, July 11, 1986). A copy of the proposed rule is attached for your information.

PD/tb/0221b

Master

12 August 1986

TO: CERCLA Unit Staff

FROM: Pat DeRosa

RE: Critical Habitats of Federally Listed Endangered Species in N.C.

I spoke by telephone today with John Fridell, US Fish and Wildlife Service (704) 259-0321 to request an update on critical habitats in NC. Mr. Fridell informed me that the only change since our previous correspondence of June 21, 1985 has been a "Proposal to List the Cape Fear Shiner as an Endangered Species with Critical Habitats" in NC. (FR Vol. 51, No. 133, July 11, 1986). A copy of the proposed rule is attached for your information.

PD/tb/0221b

$$R = \frac{C_{TRS}}{C_{SC}} \times 100 \quad \text{Eq. 15A-A}$$

7. Bibliography

American Society for Testing and Materials. Annual Book of ASTM Standards. Part 31: Water, Atmospheric Analysis. Philadephia, Pennsylvania. 1974. p. 40–42.

2. Blosser, R.O., H.S. Oglesby, and A.K. Jain. A study of Alternate SO_2 Scrubber Designs Used for TRS Monitoring. National Council of the Paper Industry for Air and Stream Improvement, Inc., New York, New York. Special Report 77–05. July 1977.

3. Curtis, F., and G.D. McAlister. Development and Evaluation of an Oxidation/Method 6 TRS Emission Sampling Procedure. Emission Measurement Branch, Emission Standards and Engineering Division, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. February 1980.

4. Gellman, I. A Laboratory and Field Study of Reduced Sulfur Sampling and Monitoring Systems. National Council of the Paper Industry for Air and Stream Improvement, Inc., New York, New York. Atmospheric Quality Improvement Technical Bulletin No. 81. October 1975.

5. Margeson, J.H., J.E. Knoll, M.R. Midgett, B.B. Ferguson, and P.J. Schworer. A Manual Method for TRS Determination. Journal of Air Pollution Control Association. 35:1280–1286. December 1985.

[FR Doc. 86–15268 Filed 7–10–86; 8:45 am]

BILLING CODE 6560–50–M

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Proposal to List the Cape Fear Shiner as an Endangered Species with Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: The Service proposes to list the Cape Fear shiner (*Notropis mekistocholas*) as an endangered species with critical habitat under the Endangered Species Act of 1973, as amended. This fish has recently undergone a reduction in range and population. It is currently known from only three small populations in the Cape Fear River drainage in Randolph, Moore, Lee, and Chatham Counties, North Carolina. Due to the species' limited distribution, any factor that degrades habitat or water quality in the short river reaches it inhabits—e.g., land use changes, chemical spills, wastewater discharges, impoundments, changes in stream flow, or increases in agricultural runoff—could threaten the species' survivial. Comments and information pertaining to this proposal are sought from the public.

DATES: Comments from all interested parties must be received by September 9, 1986. Public hearing requests must be received by August 25, 1986.

ADDRESSES: Comments and materials concerning this proposal should be sent to Field Supervisor, Endangered Species Field Office, U.S. Fish and Wildlife Service, 100 Otis Street, Room 224, Asheville, North Carolina 28801. Comments and materials received will be available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Richard G. Biggins, at the above address (704/259–0321 or FTS 672–0321).

SUPPLEMENTARY INFORMATION:

Background

The Cape Fear shiner (*Noropis mekistocholas*), the only endemic fish known from North Carolina's Cape Fear River drainage, was discovered in 1962 and described by Snelson (1971). This fish has been collected from nine stream reaches in North Carolina (Bear Creek, Rocky River, and Robeson Creek, Chatham County; Fork Creek, Randolph County; Deep River, Moore and Randolph Counties; Deep River, Chatham and Lee Counties; and Cape Fear River, Kenneth Creek, and Parkers Creek, Harnett County (Snelson 1971, W. Palmer and A. Braswell, North Carolina State Museum of Natural History, personal communication 1985, Pottern and Huish 1985, 1986). Based on a recently completed Service-funded study (Pottern and Huish 1985, 1986) involving extensive surveys in the Cape Fear River Basin (including all historic sites) and a review of historical fish collection records from the Cape Fear, Neuse, and Yadkin River systems, the fish is now restricted to only three populations. The strongest population (101 individuals collected in 1984 and 1985) is located around the junction of the Rocky River and Deep River in Chatham and Lee Counties where the fish inhabits the Deep River from the upstream limits of the backwaters of Locksville Dam upstream to the Rocky River then upstream from the Rocky River to Bear Creek and upstream from Bear Creek to the Chatham County Road 2156 Bridge. A few individuals were collected just downstream of the Locksville Dam, but because of the limited extent of Cape Fear shiner habitat at this site, it is not believed this is a separate population. Instead, it is thought these fish represent a small number of individuals that periodically drop down from the population above Locksville Dam pool.

The second population, represented by the collection of a specimen near State Highway Bridge 902 in Chatham County, is located above the Rocky River Hydroelectric Dam. This population was historically the best, but the area yielded only the one specimen after extensive surveys by Pottern and Huish (1985). The third population was found in the Deep River system in Randolph and Moore Counties. This population is believed to be small (Pottern and Huish 1985, 1986). Three individuals were found above the Highfalls Hydroelectric Reservoir; one in Fork Creek, Randolph County, and two in the Deep River, Moore County. The species was also found downstream of the highfalls Dam. However, the extent of suitable habitat in this stream reach is limited, and it is thought that these individuals likely result from downstream movement from above the reservoir where Cape Fear shiner habitat is more extensive.

The Caper Fear shiner is small, rarely exceeding 2 inches in length. The fish's body is flushed with a pale silvery yellow, and a black band runs along its sides (Snelson 1971). The fins are yellowish and somewhat pointed. The upper lip is black, and the lower lip bears a thin black bar along its margin. The Cape Fear shiner, unlike most other members of the large genus *Notropis*, feeds extensively in plant material, and its digestive tract is modified for this diet by having an elongated, convoluted intestine. The species is generally associated with gravel, cobble, and boulder substates and has been observed to inhabit slow pools, riffles, and slow runs (Snelson 1971, Pottern and Huish 1985). In these habitats, the species is typically associated with schools of other related species, but it is never the numerically dominant species. Juveniles are often found in slackwater, among large rock outcrops in mid-stream, and in flooded side channels and pools (Pottern and Huish 1985). No information is presently available on breeding behavior, fecundity, or longevity.

The Cape Fear shiner may always have existed in low numbers. However, its recent reduction in range and its small population size (Pottern and Huish 1985, 1986) increases the species' vulnerability to a catastrophic event, such as a toxic chemical spill. Dam construction in the Cape Fear system has probably had the most serious impact on the species by inundating the species' rocky riverine habitat. Dams the Rocky River could jeopardize this population, and as the other populations are extremely small and tenuous, the species' survival could be threatened.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by this species in determining to propose this rule. Based on this evaluation, the preferred action is to list the Cape Fear shiner (*Notropis mekistocholas*) as an endangered species. Because of the species' restricted range and vulnerability of these isolated populations to a single catastrophic accident, threatened status does not appear to be appropriate for this species (see "Critical Habitat" section for a discussion of why critical habitat is being proposed for the Cape Fear shiner).

Critical Habitat

Critical habitat, as defined by section 3 of the Act means: (i) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection, and (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Section 4(a)(3) of the Act requires that critical habitat be designated to the maximum extent prudent and determinable concurrently with the determination that a species is endangered or threatened. Critical habitat is being proposed for the Cape Fear shiner to include: (1) Approximately 5 miles of the Rocky River in Chatham County, North Carolina; (2) approximately 8 miles of Bear Creek, Rocky River, and Deep River in Chatham and Lee Counties, North Carolina; (3) approximately 6 miles of Fork Creek and Deep River in Randolph and Moore Counties, North Carolina.

(See "Regulation Promulgation" section for this proposed rule for the precise description of critical habitat.) These stream sections contain gravel, cobble, and boulder substrates with pools, riffles, and shallow runs for adult fish and slackwater areas with large rock outcrops and side channels and pools for juveniles. These areas also provide water of good quality with relatively low silt loads.

Section 4(b)(8) requires, for any proposed or final regulation that designates critical habitat, a brief description and evaluation of those activities (public or private) that may adversely modify such habitat or may be affected by such designation. Activities which presently occur within the designated critical habitat include, in part, fishing, boating, scientific research, and nature study. These activities, at their present use level, do not appear to be adversely impacting the area.

There are also Federal activities that do or could occur within the Deep River Basin and that may be affected by protection of critical habitat. These activities include, construction of impoundments (in particular, U.S. Army Corps of Engineers reservoirs under study for the upper Deep River), stream alterations, bridge and road construction, and discharges of municipal and industrial wastes, and hydroelectric facilities. These activities could, if not carried out with the protection of the species in mind, degrade the water and substrate quality of the Deep River, Rocky River, Bear Creek, and Fork Creek by increasing siltation, water temperatures, organic pollutants, and extremes in water flow. If any of these activities may affect the critical habitat area and are the result of a Federal action, section 7(a)(2) of the Act, as amended, requires the agency to consult with the Service to ensure that actions they authorize, fund, or carry out, are not likely to destroy or adversely modify critical habitat.

Section 4(b)(2) of the Act requires the Service to consider economic and other impacts of designating a particular area as critical habitat. The Service will consider the critical habitat designation in light of all additional relevant information obtained at the time of final rule.

Available to Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Endangered Species Act provides for possible land acquisition and cooperation with the States and requires that recovery actions be carried out for all listed species. Such actions are initiated by the Service following listing. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to it critical habitat, if any is being proposed or designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR Part 402 (see revision at 51 FR 19926; June 3, 1986). Section 7(a)(4) requires Federal agencies to confer informally with the Service on any action that is likely to jeopardize the continued existence of a proposed species or result in the destruction or adverse modification of proposed critical habitat. If a species is subsequently listed, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service. The Service is presently aware of only two Federal actions under consideration (Randleman and Howards Mill Reservoirs) that may affect the species and the proposed critical habitat. The Service has been in contact with the U.S. Army Corps of Engineers concerning the potential impacts of these projects on the species and its habitat. The Act and implementing regulations found at 50 CFR 17.21 set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take, import or export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It also is illegal to prossess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions would apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered wildlife species under certain circumstances. Regulations governing permits are at 50 CFR 17.22 and 17.23. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities. In some instances, permits may be issued during a specified period of time to relieve undue economic hardship that would be suffered if such relief were not available.

presently under study by the U.S. Department of the Army, Corps of Engineers (COE), for the Deep River and changes in flow regulation at existing hydroelectic facilities could further threaten the species. The deterioration of water quality has likely been another factor in the species' decline. The North Carolina Department of Natural Resources and Community Development (1983) classified water quality in the Deep River, Rocky River, and Bear Creek as good to fair, and referred to the Rocky river below Siler City as an area where their sampling indicates degradation. That report also stated: "Within the Cape Fear Basin, estimated average annual soil losses from cropland ranged from 3 tons per acre in the lower basin to 12 tons in the headwaters." The North Carolina State Division of Soil and Water Conservation considers 5 tons of soil loss per acre as the maximum allowable.

The Cape Fear shiner was one of 29 fish species included in a March 18, 1975, Notice of Review published by the Service in the Federal Register (40 FR 12297). On December 30, 1982, the Service announced in the Federal Register (47 FR 58454) that the Cape Fear shiner, along with 147 other fish species, was being considered for possible addition to the list of Endangered and Threatened Wildlife. On April 4, 1985, the Service notified Federal, State, and local governmental agencies and interested parties that the Asheville Endangered Species Field Station was reviewing the species' status. That notification requested information on the species' status and threats to its continued existence. Twelve responses to the April 4, 1985, notification were received. The COE, Wilmington District; North Carolina Division of Parks and recreation, Natural Heritage Program; and the North Carolina State Museum of Natrual History provided for the species. Concern for the species' welfare was also expressed by private individuals. The other respondents provided no information on threats, and did not take a position on the species' status. The Cape Fear shiner was included in the Services' September 18, 1985, Notice of review of Vertebrate Wildlife (50 FR 37958) as a category 1 species, indicating that the Service had substantial biological data to support a proposal to list the species as endangered or threatened.

Summary of Factors Affecting the Species

Section 4(a)(1) of the Endangered Species Act (16 U.S.C. 1531 *et seq.*) and regulations (50 CFR Part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal Lists. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to the Cape Fear shiner (*Notropis mekistocholas*) are as follows:

A. *The present or threatened destruction, modification, or curtailment of its habitat or range.* A review of historic collection records (Snelson 1971, W. Palmer and A. Braswell personal communication 1985), along with recent survey results (Pottern and Huish 1985, 1986), indicates that the Cape Fear shiner is presently restricted to only three populations (see "Background" section). Three historic populations have apparently been extirpated (Pottern and Huish 1985, 1986). Robeson Creek, Chatham County, was believed lost when Jordan Lake flooded part of the creek. The reasons for the loss of populations from Parkers Creek and Kenneth Creek in Harnett County are not known. The shiner has also not been recollected (Pottern and Huish 1985) from the Cape Fear River in Harnett County. However, review of historical and current collection records reveals that only one specimen has ever been collected from this river, and the fish likely was a stray individual from an upstream or tributary population. Since much of the Deep, Haw, and Cape Fear Rivers and their major tributaries has been impounded for hydroelectric power, and much of the rocky shoal habitat inundated, other populations and population segments that were never discovered have likely been lost to these reservoirs.

Of the three remaining populations, only the one located around the confluence of the Deep and Rocky Rivers in Chatham and Lee Counties (inhabiting a total of about 7.3 river miles) appears strong (Pottern and Huish 1985). The second population in the Rocky River, above the Rocky River hydroelectric facility, was the source of the type specimens used to describe the species (Snelson 1971). Historic records (W. Palmer and A. Braswell, personal communication 1985) reveal that collections of 15 to 30 specimens could be expected in this stretch of the Rocky River (State Route 902 or Chatham County Road 1010 Bridge) during a sampling visit in the late 1960s and early 1970s. Pottern and Huish (1985) sampled the Rocky River throughout this reach on numerous occasions and were able to collect only one specimen. The reason for the apparent decline in this population is unknown. The third population, located in the Deep River system in Moore and Randolph Counties, is represented by the collection of six individuals (Pottern and Huish 1986). Three individuals were taken from below the dam. As the available habitat below the dam is limited, it is believed these fish are migrants from the upstream population.

Potential threats to the species and its habitat could come from such activities as road construction, stream channel modification, changes in stream flows for hydroelectric power, impoundments, land use changes, wastewater discharges, and other projects in the watershed if such activities are not planned and implement with the survival of the species and the protection of its habitat in mind. The species is also potentially threatened by two U.S. Army Corps of Engineers projects presently under review for the Deep River. The Randleman Dam project would consist of a reservoir of the Deep River in Randolph County, above known Cape Fear shiner habitat. The Howards Mill Reservoir would be on the Deep River in Moore and Randolph Counties and would flood presently used Cape Fear shiner habitat.

B. *Overutilization for commercial, recreational, scientific, or educational purposes.* Most of the present range of the Cape Fear shiner is relatively inaccessible and overutilization of the species has not been and is not expected to be a problem.

C. *Disease or predation.* Although the Cape Fear shiner is undoubtedly consumed by predatory animals, there is no evidence that this predation is a threat to the species.

D. *The inadequacy of existing regulatory mechanisms.* North Carolina State law (Subsection 113–272.4) prohibits collecting wildlife and fish for scientific purposes without a State permit. However, this State law does not protect the species' habitat from the potential impacts of Federal actions. Federal listing will provide protection for the species under the Endangered Species Act by requiring a Federal permit to take the species and requiring Federal agencies to consult with the Service when projects they fund, authorize, or carry out may affect the species.

E. *Other natural or manmade factors affecting its continued existence.* The major portion of the best Cape Fear shiner population is located at the junction of the Deep and Rocky Rivers in Chatham and Lee Counties. A major toxic chemical spill at the U.S. Highway 15–105 Bridge upstream of this site on

Public Comments Solicited

The Service intends that any final action from this proposal will be as accurate and as effective as possible. Therefore, any comments or suggestions from the public, other concerned governmental agencies, the scientific community, industry, or any other interested party concerning any aspect of this proposal are hereby solicited. Comments particularly are sought concerning:

(1) Biological, commercial trade, or other relevant data concerning any threat (or lack thereof) to this species;

(2) The location of any additional populations of this species and the reasons why any habitat should or should not be determined to be critical habitat as provided by section 4 of the Act;

(3) Additional information concerning the range and distribution of this species;

(4) current or planned activities in the subject area and their possible impacts on this species; and

(5) Any foreseeable economic and other impacts resulting from the proposed designation of critical habitat.

Final promulgation of the regulations on this species will take into consideration the comments and any additional information received by the Service, and such communications may lead to adoption of a final regulation that differs from this proposal.

The Endangered Species Act provides for a public hearing on this proposal, if requested. Requests must be filed within 45 days of the date of the proposal. Such requests must be made in writing and addressed to the Endangered Species Field Office, 100 Otis Street, Room 224, Asheville, North Carolina 28801.

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the Federal Register on October 25, 1983 (48 FR 49244).

References Cited

North Carolina Department of Natural Resources and Community Development. 1983. Status of Water Resources in the Cape Fear River Basin. 135 pp.

Pottern, G.B., and M.T. Huish. 1985. Status survey of the Cape Fear shiner (*Notropis mekistocholas*). U.S. Fish and Wildlife Service Contract No. 14-16-0009-1522. 44 pp.

Pottern, G.B., and M.T. Huish. 1986. Supplement to the status survey of the Cape Fear shiner (*Notropis mekistocholas*). U.S. Fish and Wildlife Service Contract No. 14-16-0009-1522. 11 pp.

Snelson, F.F. 1971. *Notropis mekistocholas*, a new cyprinid fish endemic to the Cape Fear River basin, North Carolina. Copeia 1971:449-462.

Author

The primary author of this proposed rule is Richard G. Biggins, Endangered Species Field Office, 100 Otis Street, Room 224, Asheville, North Carolina 28801 (704/259-0321 or FTS 672-0321).

List of Subjects in 50 CFR Part 17

Endangered and threatened wildlife, Fish, Marine mammals, Plants (agriculture).

Proposed Regulations Promulgation.

PART 17—[AMENDED]

Accordingly, it is hereby proposed to amend Part 17, Subchapter B of Chapter I, Title 50 of the Code of Federal Regulations, as set forth below:

1. The authority citation for Part 17 continues to read as follows:

Authority: Pub. L. 93-205, 87 Stat. 884; Pub. L. 94-359, 90 Stat. 911; Pub. L. 95-632; 92 Stat. 3751; Pub. L. 96-159, 93 Stat. 1225; Pub. L. 97-304, 96 Stat. 1411 (16 U.S.C. 1531 *et seq.*).

2. It is proposed to amend § 17.11(h) by adding the following, in alphabetical order under "FISHES," to the List of Endangered and Threatened Wildlife:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species: Common name	Species: Scientific name	Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
FISHES							
Shiner, Cape Fear	*Notropis mekistocholas*	U.S.A. (NC)	Entire	E		17.95(e)	NA

3. It is further proposed to amend § 17.95(e) by adding critical habitat of the "Cape Fear shiner," in the same alphabetical order as the species occurs in § 17.11(h).

§ 17.95 Critical habitat—fish and wildlife.

(e) * * *

* * * * *

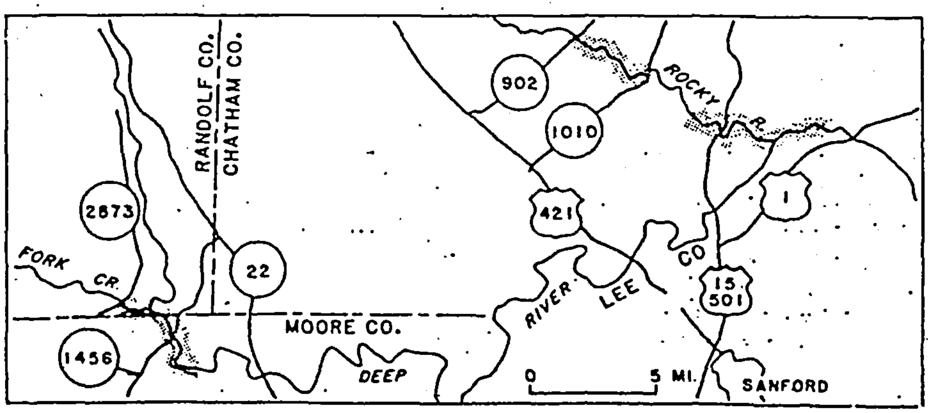
Cape Fear Shiner

(Notropis mekistocholas)

(1) *North Carolina.* 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) *North Carolina.* Chatham and Lee Counties. Approximately 0.5 miles of Bear Creek, from Chatham County Road 2156 Bridge downstream to the Rocky River, then downstream in the Rocky River (approximately 4.2 miles) to the Deep River, then downstream in the Deep River (approximately 2.6) in Chatham and Lee Counties, to a point 0.3 river miles below the Moncure, North Carolina, U.S. Geological Survey Gaging Station; and

(3) *North Carolina.* Randolph and Moore Counties. Approximately 1.5 miles of Fork Creek, from a point 0.1 creek miles upstream of Randolph County Road 2873 Bridge downstream to the Deep River then downstream appoximately 4.1 miles to the Deep River in Randolph and Moore Counties, North Carolina, to a point 2.5 river miles below Moore County Road 1456 Bridge.



SYNS:

P-NITROBENZALDEHYDE OXIME	P-NITROBENZALDOXIM
4-NITROBENZALDEHYDE OXIME	

TOXICITY DATA: 3-1	CODEN:
orl-rat LD50:180 mg/kg	GISAAA 24(9),15,59
skn-rat LD50:7100 mg/kg	GISAAA 24(9),15,59
ipr-rat LD50:120 mg/kg	GISAAA 24(9),15,59

THR: HIGH via orl and ipr routes. An irr. Animal exper show injury to eyes, skn and liver. LOW skn.
Disaster Hazard: Dangerous; see nitrates, organic.

NITROBENZENE

CAS RN: 98953 NIOSH #: DA 6475000
mf: $C_6H_5NO_2$; mw: 123.12

Bright yellow crystals or yellow, oily liquid, odor of volatile almond oil. Poisonous. mp: 6°; bp: 210°-211°; ulc: 20-30, lel = 1.8% @ 200°F, flash p: 190°F (CC); d: 1.205 @ 15°/4°, autoign. temp.: 900°F, vap. press: 1 mm @ 44.4°, vap. d: 4.25. Volatile with steam; sol in about 500 parts water; very sol in alc, benzene, ether, oils.

SYNS:

ESSENCE OF MIRBANE	NITROBENZEEN (DUTCH)
MIRBANE OIL	NITROBENZEN (POLISH)
NCI-C60082	NITROBENZOL

TOXICITY DATA: 3-2	CODEN:
skn-rbt 500 mg/24H MOD	28ZPAK -,61,72
eye-rbt 500 mg/24H MLD	28ZPAK -,61,72
orl-wmn TDLo:200 mg/kg:BLD	ATXKA8 28,208,71
unk-man LDLo:35 mg/kg	85DCAI 2,73,70
orl-rat LD50:640 mg/kg	AGGHAR 17,217,59
skn-rat LD50:2100 mg/kg	GISAAA 24(9),15,59
ipr-rat LD50:640 mg/kg	AGGHAR 17,217,59
scu-rat LDLo:800 mg/kg	HBAMAK 4,1375,35
scu-mus LDLo:286 mg/kg	PSEBAA 42,844,40
orl-dog LDLo:750 mg/kg	HBAMAK 4,1375,35
ivn-dog LDLo:150 mg/kg	XPHBAO 271,79,41
orl-cat LDLo:2000 mg/kg	XPHBAO 271,78,41
skn-cat LDLo:25 gm/kg	HBAMAK 4,1375,35
orl-rbt LDLo:700 mg/kg	PCOC** -,805,66
skn-rbt LDLo:600 mg/kg	HBAMAK 4,1375,35
ipr-gpg LDLo:500 mg/kg	RMSRA6 16,449,1896
scu-gpg LDLo:500 mg/kg	HBAMAK 4,1375,35
orl-mam LDLo:1000 mg/kg	JIDHAN 13,87,31

Aquatic Toxicity Rating: TLm96:100-10 ppm WQCHM* 2,-,74.
TLV: AIR: 1 ppm (skin) DTLVS* 4,303,80.
Toxicology Review: 27ZTAP 3,101,69. OSHA Standard: Air: TWA 1 ppm (skin) (SCP-P) FEREAC 39, 23540,74. DOT: Poison B, Label: Poison FEREAC 41,57018,76. Selected by NTP Carcinogenesis Bioassay as of December 1980. "NIOSH Manual of Analytical Methods" VOL 3 S217. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.
THR: MOD via oral, dermal, scu and ivn routes. Causes cyanosis due to formation of methemoglobin. A common air contaminant. Skn, eye irr. Rapidly absorbed through skn, vapor hazardous. Do not get into eyes; skn, clothing. Avoid breathing vapor. Use with adequate ventilation. In case of contact, immediately remove all contaminated clothing including shoes. Flu skn, eyes with plenty of H_2O for at least 15 mins. C a physician for eyes. Wash clothing before reusing. M cause headache, drowsiness, nausea, vomiting, meth moglobinemia with cyanosis.
Fire Hazard: Mod, when exposed to heat, flame or oxidi ers.
Explosion Hazard: Mod, when exposed to heat or flan Reacts violently with HNO_3, ($AlCl_3$ + C_6H_5OH), (ai line + glycerine), N_2O_4, $AgClO_4$.
Disaster Hazard: See nitrates.
To Fight Fire: Water, foam, CO_2, dry chemical.
Incomp: Aluminum trichloride; aniline, gycerol, si phuric acid; oxidants; phosphorous pentachloride; p tassium; potassium hydroxide; sulphuric acid.

o-NITROBENZENEARSONIC ACID

CAS RN: 5410297 NIOSH #: CY 59500
mf: $C_6H_6AsNO_5$; mw: 247.05

TOXICITY DATA: 3	CODEN:
orl-rat LDLo:100 mg/kg	NCNSA6 5,13,53

Reported in EPA TSCA Inventory, 1980.
THR: HIGH orl. See also arsenic compounds.
Disaster Hazard: When heated to decomp it emits ve tox fumes of NO_x and As.

p-NITROBENZENEAZOSALICYLIC ACID

CAS RN: 2243767 NIOSH #: VO 53100
mf: $C_{13}H_9N_3O_5$; mw: 287.25

SYNS:

5-(P-NITROPHENYL)AZO)SALICYLIC ACID	C.I. 14030

TOXICITY DATA:	CODEN:
mma-sat 500 ug/plate	MUREAV 56,249,78

Reported in EPA TSCA Inventory, 1980.
THR: MUT data.
Disaster Hazard: When heated to decomp it emits to fumes of NO_x.

m-NITROBENZENEBORONIC ACID

CAS RN: 13331276 NIOSH #: CY 898000
mf: $C_6H_6BNO_4$; mw: 166.94

TOXICITY DATA: 3	CODEN:
ivn-mus LD50:180 mg/kg	CSLNX* NX#01859

Reported in EPA TSCA Inventory, 1980.
THR: HIGH ivn. See also boron compounds.
Disaster Hazard: When heated to decomp it emits to fumes of NO_x.

4-NITROBENZENEDIAZONIUM AZIDE

mf: $C_6H_4N_6O_2$; mw: 192.14

THR: No data. See also azides.

PYRIBENZAMINE HYDROCHLORIDE

CAS RN: 154698 NIOSH #: US 3150000
mf: $C_{16}H_{21}N_3 \cdot ClH$; mw: 291.86

Insol in benzene, ether, ethylacetate.

SYNS:
N-BENZYL-N-DIMETHYLAMINOETHYL ALPHA-AMINOPYRIDINEHYDROCHLORIDE
2-(BENZYL(2-(DIMETHYLAMINO)ETHYL)AMINO)PYRIDINE HYDROCHLORIDE
N-BENZYL-N',N' -DIMETHYL-N-2-PYRIDYL-ETHYLENEDIAMINE HYDROCHLORIDE
N-BENZYL-N-ALPHA-PYRIDYL-N',N' -DIMETHYL-AETHYLENDIAMIN-HYDROCHLORID (GERMAN)
N,N-DIMETHYL-N'-(2-PYRIDYL)-N '-BENZYLETHYLENEDIAMINE HYDROCHLORIDE
PYRABENZAMINE
N(SUP 1)-ALPHA-PYRIDYL-N(SUP 1)-BENZYL-N,N-DIMETHYL ETHYLENEDIAMINE MONOHYDROCHLORIDE
TRIPELENNAMINE HYDROCHLORIDE

TOXICITY DATA: 3	CODEN:
dns-rat:lvr 100 umol/L	ENMUDM 3,11,81
ipr-mus LD50:47 mg/kg	CTOXAO 16,17,80
unk-man LDLo:15 mg/kg	85DCAI 2,73,70
orl-rat LDLo:200 mg/kg	TXAPA9 1,42,59
ivn-rat LD50:16 mg/kg	JPETAB 94,197,48
orl-mus LD50:121 mg/kg	JPETAB 113,72,55
ipr-mus LD50:50 mg/kg	JPETAB 113,72,55
scu-mus LD50:41 mg/kg	JPETAB 113,72,55
ivn-mus LD50:12 mg/kg	ARZNAD 14,940,64
ivn-dog LDLo:49 mg/kg	JPETAB 113,72,55
ivn-rbt LD50:12 mg/kg	JPETAB 94,197,48
orl-gpg LD50:155 mg/kg	JPETAB 113,72,55
scu-gpg LD50:30 mg/kg	JPETAB 113,72,55

Toxicology Review: 27ZTAP 3,148,69.
THR: HIGH unk, orl, ivn, ipr, scu.
Disaster Hazard: When heated to decomp it emits very tox fumes of NO_x and HCl.

PYRIDAPHENTHION

CAS RN: 119120 NIOSH #: TF 2275000
mf: $C_{14}H_{17}N_2O_4PS$; mw: 340.36

SYNS:
O,O-DIETHYL O-(2,3-DIHYDRO-3-OXO-2-PHENYL-6-PYRIDAZINYL)PHOSPHOROTHIOATE
O,O-DIETHYLPHOSPHOROTHIOATE, O-ESTER WITH 6-HYDROXY-2-PHENYL-3(2H)-PYRIDAZINONE
O-(1,6)-DIHYDRO-6-OXO-1-PHENYLPYRIDAZIN-3-LY), O,O-DIETHYL PHOSPHOROTHIOATE
ENT 23,968

TOXICITY DATA: 3-2	CODEN:
orl-rat LD50:850 mg/kg	FMCHA2 -,D223,80
skn-rat LD50:2100 mg/kg	FMCHA2 -,D223,80
orl-mus LD50:459 mg/kg	NEZAAQ 27,111,72
ipr-mus LD50:64 mg/kg	28ZEAL 4,170,69

THR: HIGH ipr. MOD orl, skn.
Disaster Hazard: When heated to decomp it emits very tox fumes of SO_x, PO_x and NO_x.

PYRIDINE

CAS RN: 110861 NIOSH #: UR 8400000
mf: C_5H_5N; mw: 79.11

Colorless liquid, sharp, penetrating, empyreumatic odor, burning taste. Flammable. bp: 115.3°, lel = 1.8%, uel = 12.4%, fp: −42°, flash p: 68°F (CC), d: 0.982, autoign. temp.: 900°F, vap. press: 10 mm @ 13.2°, vap. d: 2.73. Volatile with steam. Misc with water, alc, ether.

SYNS:
AZABENZENE
NCI-C55301
PYRIDIN (GERMAN)
PIRIDINA (ITALIAN)
PYRIDINE (DOT)
PIRYDYNA (POLISH)

TOXICITY DATA: 2	CODEN:
skn-rbt 10 mg/24H MLD	AMIHBC 4,119,51
eye-rbt 2 mg SEV	AMIHBC 4,119,51
mma-sat 6 mmol/L/2H	CNREA8 39,4152,79
orl-rat LD50:891 mg/kg	BIOFX* 14-4/70
ihl-rat LC50:4000 ppm/4H	AMIHBC 4,119,51
ipr-rat LD50:866 mg/kg	NTIS** PB195-158
scu-rat LD50:1000 mg/kg	PSEBAA 62,19,46
ipr-mus LDLo:1200 mg/kg	JCINAO 25,908,46
ivn-dog LD50:880 mg/kg	TXCYAC 4,165,75
skn-rbt LD50:1121 mg/kg	BIOFX* 14-4/70
orl-gpg LDLo:4000 mg/kg	JPHYA7 17,272,1894
ipr-gpg LDLo:870 mg/kg	JPHYA7 17,272,1894

Aquatic Toxicity Rating: TLm96:1000-100 ppm WQCHM* 4,-,74.
TLV: Air: 5 ppm (skin) DTLVS* 4,353,80. *Toxicology Review:* PAREAQ 4,1,52; 27ZTAP 3,122,69. OSHA Standard: Air: TWA 5 ppm (SCP-L) FEREAC 39,-23540,74. DOT: Flammable Liquid, Label: Flammable Liquid FEREAC 41,57018,76. Currently Tested by NTP for Carcinogenesis by Standard Bioassay Protocol as of December 1980. "NIOSH Manual of Analytical Methods" VOL 3 S161. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.
THR: MUT data. A skn, eye irr. MOD orl, dermal scu ivn and ihal. Is mildly irr to skn and can cause CNS depression. Kidney, liver damage and GI upset also.
Fire Hazard: Dangerous; when exposed to heat, flame or oxidizers.
Spontaneous Heating: No.
Explosion Hazard: Severe, in the form of vapor, when exposed to flame or spark. Reacts violently with chlorosulfonic acid, CrO_3, maleic anhydride, HNO_3, oleum, perchromates, β-propiolactone, $AgClO_4$, H_2SO_4, formamide; SO_3; I.
Disaster Hazard: Dangerous; when heated to decomp it emits highly tox fumes of cyanides; can react vigorously with oxidizing materials.
To Fight Fire: Alcohol foam.

PYRIDINE-2-ALDOXIME

CAS RN: 873698 NIOSH #: TJ 5100000
mf: $C_6H_6N_2O$; mw: 122.14

SYN: P2A

TOXICITY DATA: 3	CODEN:
ipr-rat LD50:299 mg/kg	BJPCAL 13,202,58
ipr-mus LD50:200 mg/kg	NTIS** AD691-490

THR: HIGH ipr.

THR: MOD orl. A skn irr. See also aldehydes.
Disaster Hazard: When heated to decomp it emits acrid smoke and fumes.

TOLUENE

CAS RN: 108883 NIOSH #: XS 5250000
mf: C_7H_8; mw: 92.15

Colorless liquid, benzol-like odor. Flammable. mp: −95° to −94.5°, bp: 110.4°, flash p: 40°F (CC), ulc: 75-80, lel = 1.27%, uel = 7%, d: 0.866 @ 20°/4°, autoign. temp.: 896°F, vap. press: 36.7 mm @ 30°, vap. d: 3.14. Insol in water; sol in acetone; misc in absolute alc, ether, chloroform.

SYNS:

METHYLBENZENE	TOLUEEN (DUTCH)
METHYLBENZOL	TOLUEN (CZECH)
NCI-C07272	TOLUOL
PHENYLMETHANE	TOLUOLO (ITALIAN)

TOXICITY DATA: 3	CODEN:
cyt-rat-scu 12 gm/kg/12D-I	GTPZAB 17(3),24,73
ihl-rat TCLo:1500 mg/m3/24H (1-8D preg)	TXCYAC 11,55,78
ihl-rat TCLo:1000 mg/m3/24H (7-14D preg)	FMORAO 28,286,80
orl-mus TDLo:9 gm/kg (6-15D preg)	TJADAB 19,41A,79
orl-mus TDLo:15 gm/kg (6-15D preg)	TJADAB 19,41A,79
orl-mus TDLo:30 gm/kg (6-15D preg)	TJADAB 19,41A,79
ihl-mus TCLo:500 mg/m3/24H (6-13D preg)	TXCYAC 11,55,78
unk-rat LD50:6900 mg/kg	GISAAA 45(12),64,80
unk-mus LD50:2000 mg/kg	GISAAA 45(12),64,80
eye-hmn 300 ppm	JIHTAB 25,282,43
skn-rbt 435 mg MLD	UCDS** 7/23/70
eye-rbt 870 ug MLD	UCDS** 7/23/70
eye-rbt 2 mg/24H SEV	28ZPAK -,23,72
cyt-rat-ihl 610 mg/m3/16W-I	GISAAA 42(1),32,77
ihl-hmn TCLo:200 ppm:CNS	JAMAAP 123,1106,43
ihl-man TCLo:100 ppm:PSY	WEHSAL 9,131,72
orl-rat LD50:5000 mg/kg	AMIHAB 19,403,59
ihl-rat LCLo:4000 ppm/4H	AIHAAP 30,470,69
ipr-rat LDLo:800 mg/kg	TXAPA9 1,156,59
ihl-mus LC50:5320 ppm/8H	JIHTAB 25,366,43
ipr-mus LD50:1120 ug/kg	AGGHAR 18,109,60
skn-rbt LD50:14 gm/kg	UCDS** 7/23/70
scu-frg LDLo:920 mg/kg	AEPPAE 130,250,28

Aquatic Toxicity Rating: TLm96:100-10 ppm WQCHM* 4,-,74.
TLV: Air: 100 ppm DTLVS* 4,400,80. *Toxicology Review:* AEHLAU 22,373,71; CTOXAO 11(5),549,77; FNSCA6 2,67,73; MUREAV 47(2),75,78; CTOXAO 11(5),549,77; 27ZTAP 3,144,69. OSHA Standard: Air: TWA 200 ppm; CL 300; Pk 500/10M (SCP-V) FEREAC 39,23540,74. DOT: Flammable Liquid, Label: Flammable Liquid FEREAC 41,57018,76. Occupational Exposure to Toluene recm std: Air: TWA 100 ppm; CL 200 ppm/10M NTIS**. Currently Tested by NTP for Carcinogenesis by Standard Bioassay Protocol as of December 1980. Reselected by NTP Carcinogenesis Bioassay as of December 1980. "NIOSH Manual of Analytical Methods" VOL 1 127, VOL 3 S343. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80. EPA TSCA 8E No. 02780079P-Followup Sent as of April, 1979.
THR: MUT data. A skn, eye irr. A hmn CNS, PSY. MOD ihl, ipr, scu; HIGH ipr; LOW orl, skn. Toluene is derived from coal tar, and commercial grades usually contain small amounts of benzene as an impurity. Acute poisoning, resulting from exposures to high conc of the vapors, are rare with toluene. Inhal of 200 ppm of toluene for 8 hrs may cause impairment of coordination and reaction time; with higher conc (up to 800 ppm) these effects are increased and are observed in a shorter time. In the few cases of acute toluene poisoning reported, the effect has been that of a narcotic, the workman passing through a stage of intoxication into one of coma. Recovery following removal from exposure has been the rule. An occasional report of chronic poisoning describes an anemia and leucopenia, with biopsy showing a bone marrow hypoplasia. These effects, however, are less common in people working with toluene, and they are not as severe.

Exposure to conc up to 200 ppm produces few symptoms. At 200-500 ppm, headache, nausea, eye irr, loss of appetite, a bad taste, lassitude, impairment of coordination and reaction time are reported, but are not usually accompanied by any laboratory or physical findings of significance. With higher conc, the above complaints are increased and in addition, anemia, leucopenia and enlarged liver may be found in rare cases.

A common air contaminant.
Fire Hazard: Slight, when exposed to heat, flame or oxidizers.
Explosion Hazard: Mod, when exposed to flame or reacted with (H_2SO_4 + HNO_3), N_2O_4, $AgClO_4$, BrF_3, UF_6.
Disaster Hazard: Mod dangerous; when heated it emits irr fumes; can react vigorously with oxidizing materials.
To Fight Fire: Foam, CO_2, dry chemical.
For further information see Vol. 2, No. 1 of *DPIM Report.*

p-TOLUENEBORONIC ACID, CYCLIC-2-METHYL-2-PROPYLTRIMETHYLENE ESTER

CAS RN: 2430468 NIOSH #: XS 7875000
mf: $C_{14}H_{21}BO_2$; mw: 232.16

SYNS:

DIOSSOBORONO	5-METHYL-5-PROPYL-2-(P-TOLYL)-1,3,2-DIOXABORINANE
2-METHYL-2-PROPYL-1,3-PROPANEDIOL-P-METHYLBENZENEBORONATE	

TOXICITY DATA: 2	CODEN:
ipr-rat LD50:1600 mg/kg	27ZQAG -,319,72
ipr-mus LD50:3350 mg/kg	27ZQAG -,319,72

THR: MOD ipr. See also boron compounds and esters.
Disaster Hazard: When heated to decomp it emits acrid smoke and fumes.

TOLUENEBORONIC ACID, CYCLIC NEOPENTANETETRYL ESTER

CAS RN: 7091410 NIOSH #: XS 7950000
mf: $C_{19}H_{22}B_2O_4$; mw: 336.03

SYNS:

DL-4-BENZAMIDO-N,N-DIPROPYL-GLUTARAMIC ACID	N-BENZOYL-N',N'-DI-N-PROPYL-DL-ISOGLUTAMINE
(±)-4- (BENZOYLAMINO)-5-(DI-PROPYLAMINO)-5-OXOPENTA-NOIC ACID	

TOXICITY DATA: 2-1	CODEN:
orl-mus LD50:7350 mg/kg	12VXA5 9,1007,76
ivn-mus LD50:2211 mg/kg	12VXA5 9,1007,76

THR: MOD ivn; LOW orl.

Disaster Hazard: When heated to decomp it emits tox fumes of NO_x.

XYLENE

CAS RN: 1330207 NIOSH #: ZE 2100000

mf: C_8H_{10}; mw: 106.18

SYNS:

DIMETHYLBENZENE	XYLENEN (DUTCH)
KSYLEN (POLISH)	XYLOL
XILOLI (ITALIAN)	XYLOLE (GERMAN)

TOXICITY DATA: 3-2-1	CODEN:
ihl-rat TCLo:1000 mg/m3/24H (9-14D preg)	TXCYAC 11,55,78
eye-hmn 200 ppm	JIHTAB 25,282,43
skn-rbt 100% MOD	AMIHAB 14,387,56
skn-rbt 500 mg/24H MOD	28ZPAK -,24,72
eye-rbt 87 mg MLD	AMIHAB 14,387,56
eye-rbt 5 mg/24H SEV	28ZPAK -,24,72
ihl-hmn TCLo:200 ppm:IRR	JIHTAB 25,282,43
ihl-man LCLo:10000 ppm/6H	BMJOAE 3,442,70
orl-rat LD50:4300 mg/kg	AMIHAB 14,387,56
ihl-rat LC50:5000 ppm/4H	NPIRI* 1,123,74
scu-rat LD50:1700 mg/kg	NPIRI* 1,123,74
ipr-mus LD50:1570 ug/kg	AGGHAR 18,109,60
ipr-gpg LDLo:2000 mg/kg	AIHAAP 35,21,74
ipr-mam LDLo:2000 mg/kg	AJHYA2 7,276,27

Aquatic Toxicity Rating: TLm96:100-10 ppm WQCHM* 2,-,74.

Toxicology Review: 27ZTAP 3,153,69. OSHA Standard: Air: TWA 100 ppm (SCP-U) FEREAC 39,23540,74. Occupational Exposure to Xylene recm std: Air: TWA 100 ppm; CL 200 ppm/10M NTIS**. "NIOSH Manual of Analytical Methods" VOL 1 127, VOL 3 S318. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.

THR: A hmn eye irr; A skn eye irr. A hmn IRR and MOD ipr, scu, ihl; LOW orl.

Disaster Hazard: When heated to decomp it emits acrid smoke and fumes.

XYLENE

CAS RN: 1330207 NIOSH #: ZE 2190000

A clear liquid. bp: 138.5°, flash p: 100°F (TOC), d: 0.864 @ 20°/4°, vap. press: 6.72 mm @ 21°. Composition as nonaromatics .07%, toluene 14%, ethyl benzene 19.27%, p-xylene 7.84%, m-xylene 65.01%, o-xylene 7.63%, C9 and aromatics .04% (TXAPA9 33,543,75)

SYNS:

AROMATIC HYDROCARBONS, MIXED	NCI-C55232

TOXICITY DATA: 2	CODEN:
ihl-rat LC50:6700 ppm/4H	TXAPA9 33,543,75

Currently Tested by NTP for Carcinogenesis by Standard Bioassay Protocol as of December 1980. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8E No. 12770025—Status Report Prepared as of April, 1979.

THR: MOD via inhal and oral routes. Some temporary corneal effects are noted, as well as some conjunctival irr by instillation. Irr can start @ 200 ppm. Very little dermal toxicity.

Fire Hazard: Mod, in the presence of heat or flame; can react with oxidizing materials.

To Fight Fire: Foam, CO_2, dry chemical.

Disaster Hazard: When heated to decomp it emits acrid smoke and fumes.

m-XYLENE

CAS RN: 108383 NIOSH #: ZE 2275000

mf: C_8H_{10}; mw: 106.18

Colorless liquid; mp: −47.9°; bp: 139°; lel = 1.1%; uel = 7.0%; flash p: 77°F; d: 0.864 @ 20°/4°; vap press: 10 mm @ 28.3°; vap d: 3.66; autoign temp: 986°F. Insol in water; misc with alc, ether and some organic solvents.

SYNS:

M-DIMETHYLBENZENE	1,3-DIMETHYLBENZENE
1,3-XYLENE	M-XYLOL

TOXICITY DATA: 3-2	CODEN:
ihl-rat TCLo:3000 mg/m3/24H (7-14D preg)	TXCYAC 18,61,80
orl-mus TDLo:12 mg/kg (12-15D preg)	APTOD9 19,A22,80
orl-mus TDLo:30 mg/kg (6-15D preg)	APTOD9 19,A22,80
ihl-man TCLo:424 mg/m3/6H/6D	TOLED5 1000(Sp. Iss. I),74,8
skn-rbt 10 ug/24H open SEV	AIHAAP 23,95,62
orl-rat LD50:5000 mg/kg	AMIHAB 19,403,59
ihl-rat LCLo:8000 ppm/4H	AIHAAP 23,95,62
ihl-mus LCLo:2010 ppm/24H	JPBAA7 46,95,38

TLV: Air: 100 ppm DTLVS* 4,439,80. *Toxicology Review:* MUREAV 47(2),75,78. Occupational Exposure to Xylene recm std: Air: TWA 100 ppm; CL 200 ppm/10M NTIS**. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.

THR: HIGH-MOD orl, ihl. A common air contaminant. Eye irr @ 200 ppm.

Fire Hazard: Dangerous, when exposed to heat or flame, can react with oxidizing materials.

Explosion Hazard: MOD, in the form of vapor when exposed to heat or flame.

Disaster Hazard: Dangerous; keep away from open flame. When heated to decomp it emits acrid smoke.

To Fight Fire: Foam, CO_2, dry chemical.

For further information see Vol. 1, No. 7 of *DPIM Report.*

o-XYLENE

CAS RN: 95476 NIOSH #: ZE 2450000
mf: C_8H_{10}; mw: 106.18

Colorless liquid; d: 0.880 @ 20°/4°; mp: −25.2°; bp: 144.4°; flash p: 62.6°F. Lel = 1.0%; uel = 6.0%. Insol in water; misc in absolute alc; ether.

SYNS:
O-DIMETHYLBENZENE, 1,2-DIMETHYLBENZENE, O-METHYLTOLUENE, O-XYLOL, 1,2-XYLENE

TOXICITY DATA: 3-2	CODEN:
ihl-rat TCLo:150 mg/m3/24H (7-14D preg)	TXCYAC 18,61,80
ihl-rat TCLo:1500 mg/m3/24H (7-14D preg)	TXCYAC 18,61,80
ihl-rat TCLo:3000 mg/m3/24H (7-14D preg)	TXCYAC 18,61,80
orl-rat LDLo:5000 mg/kg	AMIHAB 19,403,59
ihl-rat LCLo:6125 ppm/12H	JPBAA7 46,95,38
ihl-mus LCLo:6920 ppm	AEPPAE 143,223,29

Aquatic Toxicity Rating: TLm96:100-10 ppm WQCHM* 2,-,74.
TLV: Air: 100 ppm DTLVS* 4,440,80. *Toxicology Review:* MUREAV 47(2),75,78. Occupational Exposure to Xylene recm std: Air: TWA 100 ppm; CL 200 ppm/10M NTIS**. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.
THR: HIGH-MOD orl, ihl. Eye irr @ 200 ppm. A common air contaminant.
Fire Hazard: Dangerous, when exposed to heat or flame.
Explosion Hazard: Slight, in the form of vapor, when exposed to heat or flame.
Disaster Hazard: When heated to decomp it emits acrid smoke and fumes.
To Fight Fire: Foam, CO_2, dry chemical.
Incomp: Oxidizing materials.

p-XYLENE

CAS RN: 106423 NIOSH #: ZE 2625000
mf: C_8H_{10}; mw: 106.18

Clear plates; bp: 138.3°; lel: 1.1%; uel = 7.0%; flash p: 77°F (CC); d: 0.8611 @ 20°/4°; vap press: 10 mm @ 27.3°; vap d: 3.66; autoign temp: 986°F. mp: 13°-14°. Insol in water; sol in alc, ether, organic solvents.

SYNS:
P-DIMETHYLBENZENE, 1,4-DIMETHYLBENZENE, P-METHYLTOLUENE, P-XYLOL, 1,4-XYLENE

TOXICITY DATA: 3-2-1	CODEN:
ihl-rat TCLo:3000 mg/m3/24H (9-10D preg)	TXCYAC 19,263,81
ihl-rat TCLo:150 mg/m3/24H (7-14D preg)	TXCYAC 18,61,80
ihl-rat TCLo:3000 mg/m3/24H (7-14D preg)	TXCYAC 18,61,80
orl-mus TDLo:12 mg/kg (12-15D preg)	APTOD9 19,A22,80
orl-rat LD50:5000 mg/kg	AMIHAB 19,403,59
ihl-rat LCLo:4912 ppm/24H	JPBAA7 46,95,38
ihl-mus LCLo:3460 ppm	AEPPAE 143,223,29

Aquatic Toxicity Rating: TLm96:100-10 ppm WQCHM* 2,-,74
TLV: Air: 100 ppm DTLWS* -,30,76. *Toxicology Review:* MUREAV 47(2),75,78. Occupational Exposure to Xylene recm std: Air: TWA 100 ppm; CL 200 ppm/10M NTIS**. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.
THR: LOW orl, ihl. Eye irr @ 200 ppm. May be narcotic in high concs. Chronic tox not established; but is less tox than benzene.
Fire Hazard: Dangerous, when exposed to heat or flame; can react with oxidizing materials.
Explosive Hazard: MOD, in the form of vapor, when exposed to heat or flame.
Disaster Hazard: When heated to decomp it emits acrid smoke and fumes.
To Fight Fire: Foam, CO_2, dry chemical.
Incomp: Acetic acid + air; HNO_3; 1,3-dichloro-5,5-dimethyl-2,4-imid-azolidindione.

m-XYLENEDIAMINE

CAS RN: 1477550 NIOSH #: ZE 4025000
mf: $C_8H_{12}N_2$; mw: 136.22

TOXICITY DATA: 2	CODEN:
orl-rat LD50:930 mg/kg	HURC** -,-,73

Reported in EPA TSCA Inventory, 1980.
THR: MOD orl. See also amines.
Disaster Hazard: When heated to decomp it emits tox fumes of NO_x.

m-XYLENE-alpha,alpha'-DIISOCYANATE

CAS RN: 3634831 NIOSH #: ZE 4375000
mf: $C_{10}H_8N_2O_2$; mw: 188.20

SYN: XYLYLENDIISOKYANAT (CZECH)

TOXICITY DATA: 2	CODEN:
skn-rbt 500 mg/24H SEV	28ZPAK -,166,72
eye-rbt 5 mg/24H SEV	28ZPAK -,166,72
orl-rat LDLo:4960 mg/kg	28ZPAK -,166,72

THR: A skn, eye irr. MOD orl.
Disaster Hazard: When heated to decomp it emits very tox fumes of NO_x and CN^-.

m-XYLENE-alpha,alpha'-DIOXIRANE

CAS RN: 64038524 NIOSH #: ZE 4550000
mf: $C_{12}H_{14}O_2$; mw: 190.26

SYN: RESORCINDIGLYCIDYLETHER (CZECH)

TOXICITY DATA: 1	CODEN:
skn-rbt 500 mg/24H MOD	28ZPAK -,136,72
eye-rbt 250 ug/24H SEV	28ZPAK -,136,72
orl-rat LD50:4190 mg/kg	28ZPAK -,136,72

STATE OF NORTH CAROLINA
DEPARTMENT OF
NATURAL RESOURCES AND
COMMUNITY DEVELOPMENT

Classifications and Water Quality Standards Assigned to The Waters of The Catawba River Basin

Division of Environmental Management
Raleigh, North Carolina

Reprint from North Carolina Administrative Code: 15 NCAC 2B .0308
Current through: June 30, 1989

SECTION .0300 - ASSIGNMENT OF STREAM CLASSIFICATIONS

.0301 CLASSIFICATIONS: GENERAL

(a) Schedule of Classifications. The classifications assigned to the waters of the State of North Carolina are set forth in the schedules of classifications and water quality standards assigned to the waters of the river basins of North Carolina, 15 NCAC 2B .0302 to .0317 which are on file in the Office of the Attorney General of North Carolina. These classifications are based upon the existing or contemplated best usage of the various streams and segments of streams in the basin, as determined through studies and evaluations and the holding of public hearings for consideration of the classifications proposed.

(b) Stream Names. The names of the streams listed in the schedules of assigned classifications were taken as far as possible from United States Geological Survey topographic maps. Where topographic maps were unavailable, U.S. Corps of Engineers maps, U.S. Department of Agriculture soil maps, and North Carolina highway maps were used for the selection of stream names.

(c) Classifications. The classifications assigned to the waters of North Carolina are denoted by the letters WS-I, WS-II, WS-III, B, C, SA, SB, and SC in the column headed "class." A brief explanation of the "best usage" for which the waters in each class must be protected is given as follows:

Fresh Waters

Class WS-I:	waters protected as water supplies which are in natural and uninhabited or predominantly undeveloped (not urbanized) watersheds; no point source discharges are permitted and local land management programs to control nonpoint source pollution are required; suitable for all Class C uses;
Class WS-II:	waters protected as water supplies which are in low to moderately developed (urbanized) watersheds; discharges are restricted to primarily domestic wastewaters or industrial non-process waters specifically approved by the commission; local land management programs to control nonpoint source pollution are required; suitable for all Class C uses;
Class WS-III:	water supply segment with no categorical restrictions on watershed development or discharges; suitable for all Class C uses;
Class B:	primary recreation and any other usage specified by the "C" classification;
Class C:	fish and wildlife propagation, secondary recreation, agriculture, and other uses requiring waters of lower quality.

Tidal Salt Waters

Class SA:	shellfishing for market purposes and any other usage specified by the "SB" and "SC" classification;
Class SB:	primary recreation and any other usage specified by the "SC" classification;
Class SC:	fish and wildlife propagation, secondary recreation, and other uses requiring waters of lower quality.

Supplemental Classifications

Trout Waters:	Suitable for natural trout propagation and maintenance of stocked trout;
Swamp Waters:	Waters which have low velocities and other natural characteristics which are different from adjacent streams;
NSW:	Nutrient sensitive waters which require limitations on nutrient inputs;
ORW:	outstanding resource waters which are unique and special waters of exceptional state or national recreational or ecological significance which require special protection to maintain existing uses.

(d) Water Quality Standards. The water quality standards applicable to each classification assigned are those established in 15 NCAC 2B .0200, Classifications and Water Quality Standards Applicable to the Surface Waters of North Carolina, as adopted by the North Carolina Environmental Management Commission.

(e) Index Number

.0308 CATAWBA RIVER BASIN

Name of Stream	Description	Class	Classification Date	Index No.
CATAWBA RIVER (Lake James below elevation 1200)	From North Fork Catawba River to Bridgewater Dam	WS-III&B	2/1/86	11-(23)
North Fork Catawba River	From source to Armstrong Creek	C Tr	3/1/62	11-24-(1)
Locust Spring Branch	From source to North Fork Catawba River	C Tr	7/1/73	11-24-2
Laurel Branch	From source to North Fork Catawba River	C Tr	7/1/73	11-24-3
Pond Branch	From source to North Fork Catawba River	C Tr	7/1/73	11-24-4
Dogback Spring Branch	From source to North Fork Catawba River	C Tr	7/1/73	11-24-5
Chestnut Cove Branch	From source to Dogback Spring Branch	C Tr	7/1/73	11-24-5-1
Stillhouse Branch	From source to North Fork Catawba River	C Tr	7/1/73	11-24-6
Bridge Branch	From source to North Fork Catawba River	C Tr	7/1/73	11-24-7
Honeycutt Creek	From source to North Fork Catawba River	C Tr	7/1/73	11-24-8
Stillhouse Branch	From source to North Fork Catawba River	C Tr	7/1/73	11-14-9
Pepper Creek	From source to North Fork Catawba River	C Tr	7/1/73	11-24-10
Lonon Branch	From source to Pepper Creek	C Tr	7/1/73	11-24-10-1
Van Noy Branch	From source to Lonon Branch	C Tr	7/1/73	11-24-10-1-1
Martin Branch	From source to North Fork Catawba River	C Tr	3/1/62	11-24-11
Conley Branch	From source to North Fork Catawba River	C Tr	3/1/62	11-24-12
North Fork Catawba River	From Armstrong Creek to Lake James, Catawba River	C	3/1/62	11-24-(13)
Armstrong Creek	From source to American Thread Company Water Supply Dam	WS-III Tr	2/1/86	11-24-14-(1)
Bee Rock Creek	From source to Armstrong Creek	WS-III Tr	2/1/86	11-24-14-2
House Branch	From source to Bee Rock Creek	WS-III Tr	2/1/86	11-24-14-2-1
Cow Creek	From source to Armstrong Creek	WS-III Tr	2/1/86	11-24-14-3
Middle Fork Cow Creek	From source to Cow Creek	WS-III Tr	2/1/86	11-24-14-3-1
North Fork Cow Creek	From source to Cow Creek	WS-III Tr	2/1/86	11-24-14-3-2
Pups Branch	From source to Armstrong Creek	WS-III Tr	2/1/86	11-24-14-4
Bad Fork	From source to Armstrong Creek	WS-III Tr	2/1/86	11-24-14-5
Roses Creek	From source to Armstrong Creek	WS-III Tr	2/1/86	11-24-14-6
South Fork Roses Creek	From source to Roses Creek	WS-III Tr	2/1/86	11-24-14-6-1
Rich Branch	From source to Armstrong Creek	WS-III	2/1/86	11-24-14-7
Roaring Fork	From source to Armstrong Creek	WS-III Tr	2/1/86	11-24-14-8
Long Branch	From source to Armstrong Creek	WS-III	2/1/86	11-24-14-9
Three Mile Creek	From source to Armstrong Creek	WS-III	2/1/86	11-24-14-10
Buchanan Creek	From source to Three Mile Creek	WS-III	2/1/86	11-24-14-10-1
Sycamore Branch	From source to Three Mile Creek	WS-III	2/1/86	11-24-14-10-2

APPENDIX D
SI Form

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D089140764

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Travenol Laboratories	Highway 221 (8 miles North of Marion)

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Marion	NC	28752	McDowell	56	11

09 COORDINATES: LATITUDE 35 50 09 · LONGITUDE 81 59 36

10 TYPE OF OWNERSHIP (Check one): ☐ A. PRIVATE ☐ B. FEDERAL ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☒ F. OTHER Corporate ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION	02 SITE STATUS	03 YEARS OF OPERATION
3 /28 /89 (MONTH, DAY, YEAR)	☒ ACTIVE ☐ INACTIVE	1972 (BEGINNING YEAR) / currently operating (ENDING YEAR) ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply)

☐ A. EPA ☐ B. EPA CONTRACTOR ________ (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR ________ (Name of firm)

☒ E. STATE ☐ F. STATE CONTRACTOR ________ (Name of firm) ☐ G. OTHER ________ (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO.
Bruce Nicholson	Environmental Engineer	NC DHR/DHS	(919) 733-2801
09 OTHER INSPECTORS	**10 TITLE**	**11 ORGANIZATION**	**12 TELEPHONE NO.**
Pat DeRosa	Environmental Chemist	NC DHR/DHS	(919) 733-2801
			( )
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO
Mr. Phil Castro	Environmental Coordinator	Baxter Healthcare Corp P.O. Box 1390, Marion, NC 28752	(704) 756-4151
			( )
			( )
			( )
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
☒ PERMISSION ☐ WARRANT	10 AM-4PM	Sunny, Low 70's

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO.
Mr. Phil Castro	Baxter Healthcare Corporation	(704) 756-4151

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE
Bruce Nicholson	NC DHR/DHS	Superfund Sec.	919-733-2801	08 /07 /89 (MONTH DAY YEAR)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D059140764

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	440	Gallons	Mostly Paint Solvent Wastes.
PSD	PESTICIDES			Small amount of lab solvent waste.
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	Toluene*		Pour on ground.		
SOL	Xylene*		No more than 2-3		
SOL	Turpentine*		Gallons per event		
SOL	Pyridine		Disposal practice		
SOL	Nitrobenzene		Conducted 1972-1977		
	*Probable, not documented.	These are	common paint solvents.		

V. FEEDSTOCKS *(See Appendix for CAS Numbers)*

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

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

NC DHR/DHS Superfund Branch Files

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D059140764

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) [X] POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 3,344
04 NARRATIVE DESCRIPTION
within 3 mile radius

01 [X] B. SURFACE WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) [X] POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______
04 NARRATIVE DESCRIPTION
No surface water intakes within 15 miles.

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

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

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: ______) ☐ POTENTIAL [X] ALLEGED
03 AREA POTENTIALLY AFFECTED: 1500 $ft.^2$ (Acres)
04 NARRATIVE DESCRIPTION
Known disposal on gravel road in back of paint shop.

01 [X] G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) [X] POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______
04 NARRATIVE DESCRIPTION
See groundwater above, as all drinking water is supplied from ground water.

01 [X] H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ______) [X] POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: 2,400
04 NARRATIVE DESCRIPTION
Approximately 2,400 employees use drinking water from on site wells.

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

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

EPA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D059140764

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)*

NC DHR/DHS Superfund Branch files

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D059140764

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	NC0006564	1972	05/89	
☐ B. UIC				
☐ C. AIR	1915R7	03172	06/90	
☐ D. RCRA	None			
☐ E. RCRA INTERIM STATUS	None			
☐ 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		
☐ E. TANK, BELOW GROUND		
☐ F. LANDFILL		
☐ G. LANDFARM		
☐ H. OPEN DUMP		
X I. OTHER Pour on Ground (Specify)	440	Gallons

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

☒ A. BUILDINGS ON SITE

06 AREA OF SITE

1500 ft^2 (Acres)

07 COMMENTS

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

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

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

Disposal has already occurred. Paint wastes and lab solvents are now handled as a hazardous waste in accordance with RCRA regulations.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ☐ YES X NO

02 COMMENTS

Last disposal in 1977 and area has been paved since.

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

NC DHR/DHS Superfund Branch files

EPA

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

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D059140764

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY *(Check as applicable)*

	SURFACE	WELL
COMMUNITY	A. ☐	B. ☒
NON-COMMUNITY	C. ☐	D. ☒

02 STATUS

ENDANGERED	AFFECTED	MONITORED
A. ☐	B. ☐	C. ☐
D. ☐	E. ☐	F. ☐

03 DISTANCE TO SITE

A. 2.3 (mi)
B. 0.15 (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY *(Check one)*

☒ A. ONLY SOURCE FOR DRINKING
☒ 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 3,344 within 3 miles

03 DISTANCE TO NEAREST DRINKING WATER WELL 0.13 (mi) (700 ft.)

04 DEPTH TO GROUNDWATER 10 (ft)

05 DIRECTION OF GROUNDWATER FLOW ____

06 DEPTH TO AQUIFER OF CONCERN 10 (ft)

07 POTENTIAL YIELD OF AQUIFER ____ (gpd)

08 SOLE SOURCE AQUIFER ☐ YES ☐ NO

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

See site investigation report. Seven on site wells between 230 and 500 feet deep. Nearest well, 700 feet away is 300 feet deep. Nearest off site well is 750 feet away.

10 RECHARGE AREA

☒ YES ☐ NO

COMMENTS Net precipitation = 18 inches

11 DISCHARGE AREA

☐ YES ☐ NO

COMMENTS

IV. SURFACE WATER

01 SURFACE WATER USE *(Check one)*

☒ 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
North Fork Catawba River	☐	0.57 (mi)
	☐	(mi)
	☐	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN *Does not include 2,400 employees.

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. 171 NO. OF PERSONS	B. 388 NO. OF PERSONS	C. 753 NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION 0.15 (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE 110

04 DISTANCE TO NEAREST OFF-SITE BUILDING 0.15 (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)*

Rural and sparsely populated. School adjacent to Baxter property.

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D059140764

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE *(Check one)*

☐ A. 10^{-6} – 10^{-8} 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^{-6} 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
______ (ft)	______ (ft)	______

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
18 (in)	3.2 (in)	~2 %	SW	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. ______ (mi) OTHER B. ______ (mi)

12 DISTANCE TO CRITICAL HABITAT *(of endangered species)*

5.0 (mi)

ENDANGERED SPECIES: Mountain Golden Heather

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS; NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AG LAND
A. ______ (mi)	B. < 1 (mi)	C. ______ (mi)	D. ______ (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

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

NC DHR/DHS Superfund Branch files

EPA

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

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D059140764

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER	2	NC Laboratory of Public Health	Rec'd
SURFACE WATER			
WASTE			
AIR			
RUNOFF			
SPILL			
SOIL			
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☒ GROUND ☐ AERIAL

02 IN CUSTODY OF NC Superfund Branch
(Name of organization or individual)

03 MAPS ☒ YES ☐ NO

04 LOCATION OF MAPS NC Superfund Branch

V. OTHER FIELD DATA COLLECTED *(Provide narrative description)*

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

NC DHR/DHS Superfund Branch Files

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
NC	D059140764

II. CURRENT OWNER(S)

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE
Baxter Healthcare Corporation		P.O. Box 1390		Marion	NC	28752

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

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

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

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

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D059140764

II. CURRENT OPERATOR *(Provide if different from owner)*

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 YEARS OF OPERATION	09 NAME OF OWNER

OPERATOR'S PARENT COMPANY *(If applicable)*

10 NAME	11 D+B NUMBER

12 STREET ADDRESS *(P.O. Box, RFD #, etc.)*	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

III. PREVIOUS OPERATOR(S) *(List most recent first; provide only if different from owner)*

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 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

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 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

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 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

PREVIOUS OPERATORS' PARENT COMPANIES *(If applicable)*

10 NAME	11 D+B NUMBER

12 STREET ADDRESS *(P.O. Box, RFD #, etc.)*	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

10 NAME	11 D+B NUMBER

12 STREET ADDRESS *(P.O. Box, RFD #, etc.)*	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

10 NAME	11 D+B NUMBER

12 STREET ADDRESS *(P.O. Box, RFD #, etc.)*	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

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

NC DHR/DHS Superfund Branch files

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

EPA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D059140764

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER

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

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

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

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

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D059140764

II. PAST RESPONSE ACTIVITIES

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

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
NC	D059140764

II PAST RESPONSE ACTIVITIES *(Continued)*

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

01 ☐ S. CAPPING/COVERING — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ T. BULK TANKAGE REPAIRED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

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

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

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

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D059140764

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ☐ YES ☒ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

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

EPA FORM 2070-13 (7-81)

APPENDIX E
Safety Form

SITE HEALTH AND SAFETY PLAN

A. General Information

Site Name Travenol Laboratories ID # NCD059140764

Location North Cove, McDowell County, NC Date 3-2-89

Purpose of Visit ___ PA X SI ___ Other: ___

Proposed Date of Investigation 3-9-89

Date of Briefing 3-3-89

Date of Debriefing 3-13-89

Priority Ranking ___ Low X Medium ___ High

Site Investigation Team

Personnel		Responsibilities
Team 1	Bruce Nicholson	team leader, sampling
Team 1	Pat DeRosa	sampling
Team 2		
Team 2		

Plan Preparation:

Prepared By: David Lilley, Industrial Hygienist *David Lilley*

Reviewed By: Jack Butler, Environmental Engineer *Jack Butler*

B. SITE/WASTE CHARACTERISTICS

Waste Type(s) X Liquid X Solid ___ Sludge ___ Gas

Characteristics ___ Corrosive X Ignitable ___ Radioactive

X Volatile X Toxic ___ Reactive ___ Other

List Known or Suspected Hazards (physical, chemical biological or radioactive) on Site and their toxicological effects. Also, if known, list chemical amounts

HAZARD	WARNING PROPERTIES AND EFFECTS	TLV	
Varsol (stoddard solvent)	Odor Threshold(OT) = 1-30 ppm	100 ppm	
turpentine	OT = 100-200 ppm	100 ppm	
xylene	OT = 0.05 - 200 ppm	100 ppm	
methanol	OT = 1.5 - 200 ppm	200 ppm	skin
ethanol	OT = 5 - 100 ppm	1000 ppm	
methylene chloride	OT = 25-30 ppm (can adapt to odor)	50 ppm	
toluene	OT = 0.17 - 40 ppm	100 ppm	

HAZARD	WARNING PROPERTIES AND EFFECTS	TLV
benzene	OT = 1.4 - 85 ppm	10 ppm
ethyl acetate	OT = 0.056 - 50 ppm	400 ppm
lead	OT = no data	0.15 mg/m^3

ID # NCD059140764

Facility Description: Size ? Buildings ?

Disposal Methods Being Investigated surface disposal of paint wastes onto a graveled area.

Unusual Features on Site (dike integrity, power lines, terrain, etc.): Five underground storage tanks containing fuel oil and gasoline are located in the area.

History of the Site: See attached sheet

C. HAZARD EVALUATION

The site can be toured and surface soil and process water can be sampled in level D. PE gloves will be worn while taking water samples, and PE gloves over nitrile gloves will be worn while taking soil samples. While augering, the HNU (10.2 eV probe) will be used to monitor breathing zone air. If levels exceed 5 ppm, evacuate. Periodic air samples using the explosimeter will also be taken in the auger hole. If levels exceed 10% but are less than 20% of the LEL, proceed with caution. If levels exceed 20%, evacuate. Tyvek suits (saranex in wet conditions) are recommended to keep clothing clean.

D. WORK PLAN INSTRUCTION

Map or Sketch Attached? yes

Perimeter Identified? no

Command Post Identified? no

Zones of Contamination Identified? no

Personal Protective Equipment

Level of Protection ___ A ___ B ___ C X D

Modifications Goggles and PVC gloves will be worn while preparing acid preserved samples. Avoid breathing acid vapors.

Travenol Laboratories, Inc. manufactures glucose, salt solutions, and other intravenous solutions for hospitals. The company started operating at the Marion site in 1972. The facility was newly constructed, and Travenol Labs has been the sole occupant.

The majority of the hazardous waste generated at the facility is paint and cleaning solvent waste. This waste is generated through touch up painting of the building and equipment. The company also operates a laboratory which generates a small amount of laboratory solvent waste. The waste is stored in 55 gallon drums on the outside of the building in a hazardous waste shed. The lab waste is then manifested to Pinewood, SC for disposal, and the paint solvents are shipped to Oldover in Virginia for incineration. The company has been employing these waste disposal methods since 1980. Prior to 1980 the laboratory chemicals and waste were kept in a warehouse on the site. Between 1972 and 1977 the paint solvent waste was disposed of outside of the building.

The waste was poured in a small graveled area and allowed to evaporate into the air. Approximately 400 gallons of the waste was disposed of in this manner. Between 1977 and 1980, the paint waste was accumulated and kept on site. Company officials voluntarily notified under CERCLA 103(c) on April 29, 1981 and told of the company's past waste disposal practices. The site was inspected on March 29, 1982 by Charles Lee and Gene Oliver of Ecology and Environment, Inc. for EPA. The investigators did not find any evidence of wastes residues in the area. They recommended that no further action be initiated with regard to the site. Groundwater and soil were not sampled by the site investigators.

ID # NCD059140764

Surveillance Equipment:

X	H Nu		Detector Tubes and Pumps
X	Explosimeter		02 Meter
	TLD		Radiation Monitor

Decontamination Procedures

_____ Level C Respirator wash, respirator removal, suit wash (if needed,) suit removal, boot wash, boot removal and glove removal.

X Level D Boot wash and rinse and boot removal, suit removal, glove and goggle removal.

Modifications Dispose of trash properly

Work Schedule/Limitations Sampling is to consist of surface and subsurface soil sampling, and process water sampling.

EMERGENCY PRECAUTIONS

Route of Exposure	First Aid
Eye Contact	flush with water immediately
Skin contact	soap and water wash
Ingestion	get medical attention promptly
Inhalation	artificial respiration

ID # NCD059140764

Location of Nearest Phone: on-site (this is an operating facility)

Hospital (Address and Phone Number)

McDowell Hospital

100 Rankin Street, Marion, NC (704) 652-2125

Emergency Transportation Systems (Phone Numbers)

Fire 911

Ambulance 911

Rescue Squad 911

Emergency Route to Hospital Take SR 1560 south approximately 0.8 mile; turn right on SR 1573 and go approximately 0.3 mile; turn left onto route 221 and travel south approximately 14 miles to where route 70 veers to the left, turn right onto Court Street ~~and~~ follow the sign to the hospital.

PREVAILING WEATHER CONDITIONS AND FORECAST ________

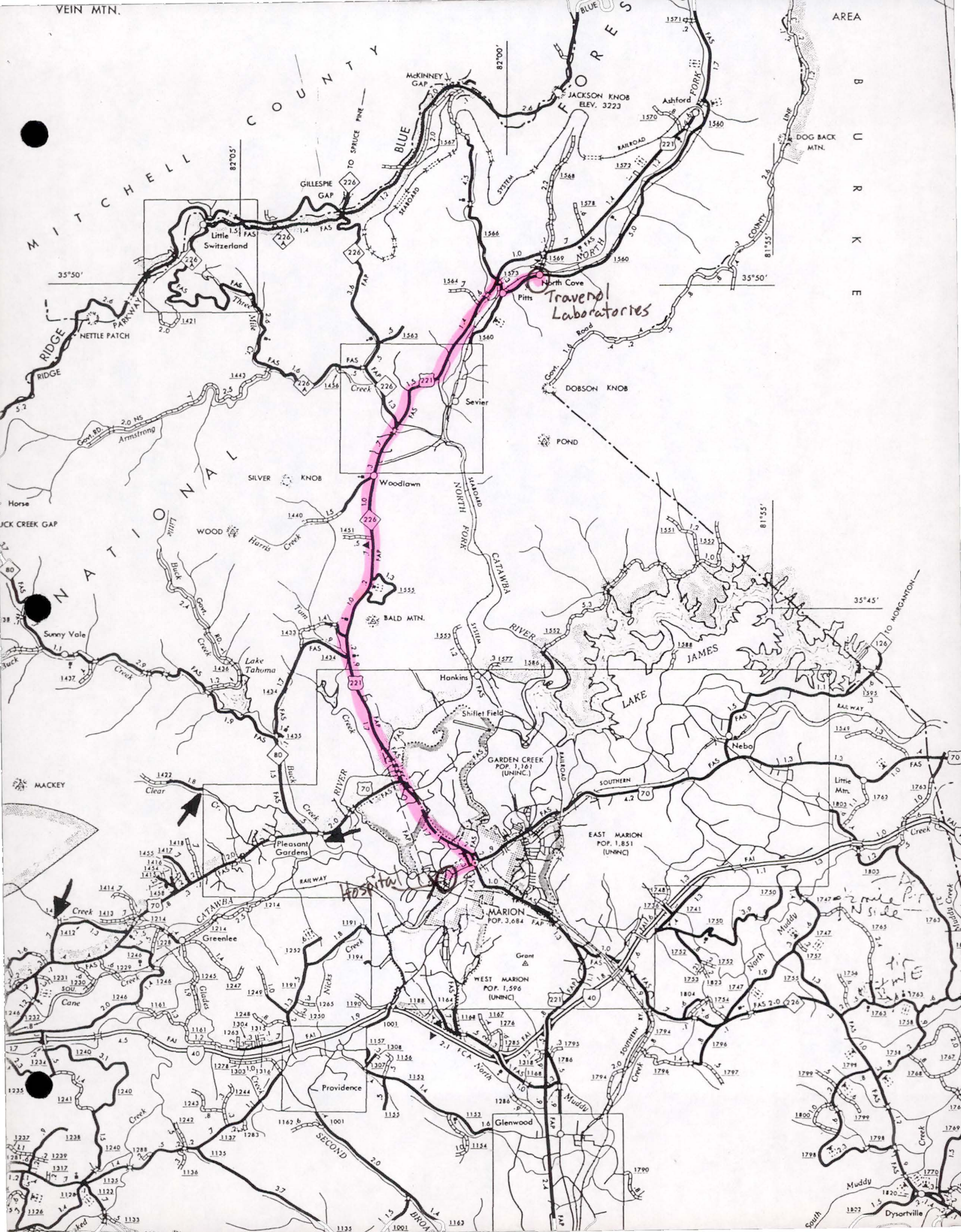
EQUIPMENT CHECKLIST

____	Air purifying respirator	X	First Aid Kit
____	Cartridges for respirator	X	3 gal. Distilled H20
X	Rainsuit	X	Gloves (poly/nitrile/cloth)
____	02 Indicator	X	Boots/Boot Covers
X	Eye Wash Unit	X	Coveralls (tyvek/saranex)
X	H Nu	X	Eye Protection
____	pH Meter	X	Hard Hat
____	Explosimeter	X	Decontamination Materials.
____	Radioactive Monitor		
____	Detector Tubes and Pump		

<u>Poison Control Center - State Coordinator</u>
Duke University Medical Center
Telephone: 1-800-672-1697
Box 3024
Durham, NC 27710

ASHEVILLE 704-255-4490	Western NC Poison Control Center Memorial Mission Hosp. 509 Biltmore Ave. 28801	HENDERSONVILLE 704-693-6522 Ext. 555,556	Margaret R. Pardee Memorial Hospital Fleming St., 28739
CHARLOTTE 704-379-5827	Mercy Hospital 2001 Vail Ave, 28207	HICKORY 704-322-6649	Catawba Mem. Hosp. Fairgrove Chur. Rd 28601
DURHAM 1-800-672-1697	Duke Univ. Med. Center Box 3007, 27710	JACKSONVILLE 919-577-2555	Onslow Mem. Hospital Western Blvd. 28540
GREENSBORO 919-379-4105	Moses Cone Hospital 1200 N. Elm St. 27420	WILMINGTON 919-343-7046	New Hanover Mem. Hospital 2131 S. 17th St. 28401

1-800-722-2222



VEIN MTN.
AREA
MITCHELL COUNTY
BLUE RIDGE PARKWAY
NATIONAL
FOREST
BURKE
McKINNEY GAP
JACKSON KNOB ELEV. 3223
Ashford
DOG BACK MTN.
GILLESPIE GAP
TO SPRUCE PINE
Little Switzerland
NETTLE PATCH
North Cove
Pitts
Travenol Laboratories
DOBSON KNOB
Sevier
POND
SILVER KNOB
Woodlawn
WOOD
Harris Creek
BALD MTN.
Sunny Vale
Lake Tahoma
Hankins
Shiflet Field
LAKE JAMES
CATAWBA RIVER
TO MORGANTON
Nebo
GARDEN CREEK POP. 1,161 (UNINC.)
EAST MARION POP. 1,851 (UNINC)
Little Mtn.
MACKEY
Pleasant Gardens
Hospital
MARION POP. 3,684
Greenlee
Grant
WEST MARION POP. 1,596 (UNINC)
Providence
Glenwood
Dysartville
SECOND BROAD
Muddy Creek
North Muddy
Buck Creek
Clear Cr.
Cane Creek
Glades
Nicks Creek
Three Mile Cr.
Armstrong
SEABOARD
SOUTHERN
NORTH FORK
82°05'
82°00'
81°55'
35°50'
35°45'

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Stoddard Solvent

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula C_9H_{20}	1
Natural Physical State at 25°C liquid	1
Vapor Pressure ~2 mm Hg at 20°C	1
Melting Point ? °F/°C Boiling Point 320-329 °F/°C	1
Flash Point (open or closed cup) 102-140 °C/°F	1
Solubility - H_2O insoluble	1
Other miscible with alcohol, benzene, ether, chloroform, carbontetrachloride, carbon disulfide, and oils, except caster oil.	1

Physical Features: (odor, color, etc.) colorless liquid with a kerosene like odor(1).

II. TOXICOLOGICAL DATA

Standards: 100 ppm(3) TLV 500 ppm(1) PEL 5000 ppm(1) IDLH

Routes of Exposure: Inhalation, ingestion, skin and/or eye contact(1)

Acute/Chronic Symptoms: irritation of eyes, nose, and throat, dizziness; skin problems(1)

First Aid: Eyes: irrigate immediately; Skin: Wash with soap and water immediately; Inhalation: artificial respiration; Ingestion: get medical attention immediately.

Chemical Name: Stoddard solvent

III. HAZARDOUS CHARACTERISTICS

Reference

A. Combustibility Yes X No ____ — 1

Toxic by-products ____________ — ______

____________ — ______

B. Flammability LEL 0.8% UEL ? — 1

C. Reactivity Hazard incompatible with strong oxidizers — 1

D. Corrosivity Hazard yes/no pH: ______ — ______

Neutralizing agent: ______________________ — ______

E. Radioactive Hazard

		Exposure Rate	
Background	yes/no	______	______
Alpha particles	yes/no	______	______
Beta particles	yes/no	______	______
Gamma radiation	yes/no	______	______

IV. REFERENCES

(1) Pocket Guide to Chemical Hazards-NIOSH, 1985

(2) The Merck Index, 10th Edition, 1983

(3) Threshold Limit Values and Biological/Exposure Indices for 1987-88, ACGIH

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Turpentine

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula $C_{10}H_{16}$	1
Natural Physical State at 25°C liquid	2
Vapor Pressure 5 mm Hg at 20°C	2
Melting Point -58 to -76°F/°C Boiling Point 302-356 °F/°C	2
Flash Point (open or closed cup) 95 °C/°F	2
Solubility - H_2O insoluble	2
Other soluble in alcohol, ether, chloroform, and glacial acetic acid	1

Physical Features: (odor, color, etc.) colorless liquid with a characteristic paint odor (2)

II. TOXICOLOGICAL DATA

Standards: 100 ppm(3) TLV 100 ppm(2) PEL 1900 ppm IDLH 2

Routes of Exposure: Inhalation, skin absorption, ingestion, eye contact (2)

Acute/Chronic Symptoms: Irritation of the eyes, nose, and throat; headache, vertigo; skin irritation; sensitization; blood in the urine(2)

First Aid: Inhalation: artificial respiration; Skin contact: soap and water wash promptly; Ingestion: get medical attention immediately; Eye contact: irrigate immediately (2).

Chemical Name: Turpentine

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 1

Toxic by-products ____________ — ______

____________ — ______

B. Flammability LEL 0.8% UEL ? — 2

C. Reactivity Hazard incompatible with strong oxidizers, chlorine — 2

D. Corrosivity Hazard yes/no pH: ______ — ______

Neutralizing agent: ____________ — ______

E. Radioactive Hazard

		Exposure Rate	
Background	yes/no	______	______
Alpha particles	yes/no	______	______
Beta particles	yes/no	______	______
Gamma radiation	yes/no	______	______

IV. REFERENCES

(1) The Condensed Chemical Dictionary, 10th Edition

(2) Pocket Guide to Chemical Hazards, NIOSH, 1987

(3) Threshold Limit Values and Biological Exposure Indices for 1988-89, ACGIH

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Xylene, O, M, & P (Dimethyl benzene)

I. PHYSICAL/CHEMICAL PROPERTIES

Reference

Chemical Formula C8 H10

Natural Physical State at 25°C liquid

Vapor Pressure 7-9 mm Hg at 20°C

Melting Point 13-14 °F/°C Boiling Point 137-140 °F/°C

Flash Point (open or closed cup) 90/84/81 °C/°F

Solubility - H_2O insoluble

Other soluble in alcohol, ether and most other organic solvents.

Physical Features: (odor, color, etc.) colorless liquid with aromatic/ benzene odor. Common solvent for paints and coatings, especially alkyd resin type. IP = 8.5 eV

II. TOXICOLOGICAL DATA

Standards: 100 ppm TLV 100 ppm PEL 10,000 ppm IDLH 4

Routes of Exposure: inhalation

Acute/Chronic Symptoms: headache, fatigue, dizziness, lassitude, narcotic effects in high concentrations (2,3). Chronic effects not well defined (1).

First Aid: eyes: irrigate immed.; Skin: soap and water wash immed.; Inhalation: fresh air and artificial resp.; Ingestion: medical attention.

Chemical Name: Xylene, O, M, & P

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 1,2,3,4

Toxic by-products ____________ — ________

B. Flammability LEL 1.4% UEL 6.7% — 2

C. Reactivity Hazard strong oxidizers — 4

D. Corrosivity Hazard yes/no pH: ________ — ________

Neutralizing agent: ____________________ — ________

E. Radioactive Hazard — Exposure Rate

		Exposure Rate	Reference
Background	yes/no		
Alpha particles	yes/no		
Beta particles	yes/no		
Gamma radiation	yes/no		

IV. REFERENCES

The Merck Index, 10th Edition, 1983.

NFPA, Fire Protection Guide on Hazardous Materials, 8th Edition, 1984.

Documentation of the TLV, 4th Edition, 1980.

NIOSH Pocket Guide to Chemical Hazards, 1985.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Methanol

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula CH3 OH	1
Natural Physical State at 25°C liquid	1
Vapor Pressure 97 mm Hg at 20°C	1
Melting Point -144 $^{\circ}$F/$^{\circ}$C Boiling Point 148 $^{\circ}$F/$^{\circ}$C	1
Flash Point (open or closed cup) 52 $^{\circ}$C/$^{\circ}$F	1
Solubility - H_2O miscible	1
Other	

Physical Features: (odor, color, etc.) colorless liquid with a pungent odor. I.P. = 10.84 eV. Relative response on the HNU = 1

II. TOXICOLOGICAL DATA

Standards: 200 ppm TLV 200 ppm PEL 25000 IDLH 1

Routes of Exposure: Inhalation and skin.

Acute/Chronic Symptoms: Acute: eye irritation, headache, drowsy, vomit, visual disturbances.

First Aid: Skin: soap and water wash; Eyes: irrigation: fresh air and artificial respiration; Ingestion: medical attention.

Chemical Name: Methanol

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ ________

Toxic by-products ____________ ________

____________ ________

B. Flammability LEL ________ UEL __________ ________

C. Reactivity Hazard ______________________________ ________

____

D. Corrosivity Hazard yes/no pH: ______ ________

Neutralizing agent: ______________________________ ________

E. Radioactive Hazard — Exposure Rate

		Exposure Rate	Reference
Background	yes/no	________	________
Alpha particles	yes/no	________	________
Beta particles	yes/no	________	________
Gamma radiation	yes/no	________	________

IV. REFERENCES

Documentation of the TLV, 4th Edition, 1980.

NIOSH Pocket Guide to Chemical Hazards, 1985.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Ethyl alcohol

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula C_2H_5OH	1
Natural Physical State at 25°C liquid	1
Vapor Pressure 43 mm Hg at 20°C	1
Melting Point ____ °F/°C Boiling Point 78 °F/°C	1
Flash Point (open or closed cup) 55 °C/°F	1
Solubility - H_2O miscible	1
Other Methyl alcohol, ether, chloroform, acetone	1

Physical Features: (odor, color, etc.) Colorless liquid, wine like odor, pungent taste IP = 10.48 eV Relative Response on HNU = 3

II. TOXICOLOGICAL DATA

Standards: 1000 ppm(2) TLV ____ PEL ____ IDLH ____

Routes of Exposure: Ingestion, Inhalation, Skin and/or eye contact(3)

Acute/Chronic Symptoms: Lowering of inhibitions, dizziness, headache, nausea, loss of motor nerve control, shallow respiration, unconsciousness, death(1).

First Aid: Inhalation: artificial respiration; Skin: soap and water wash; Eyes: irrigate immediately; Ingestion: get medical attention immediately.

Chemical Name: Ethyl Alcohol

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — Reference: 1

Toxic by-products ____________ — ________

____________ — ________

B. Flammability LEL 3.3% UEL 19% — Reference: 1

C. Reactivity Hazard ______________________________ — ________

____

D. Corrosivity Hazard yes/no pH: ______ — ________

Neutralizing agent: ______________________________ — ________

E. Radioactive Hazard		Exposure Rate	Reference
Background	yes/no		
Alpha particles	yes/no		
Beta particles	yes/no		
Gamma radiation	yes/no		

IV. REFERENCES

(1) The Condensed Chemical Dictionary, 10th Edition

(2) Threshold Limit Values and Biological Exposure Indicies for 1987-88, ACGIH

(3) Enclyclopedia of Occupational Safety and Health, 3rd Edition, 1983.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Methylene Chloride

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula CH_2Cl_2	1
Natural Physical State at 25°C liquid	2
Vapor Pressure 350 mm Hg at 20°C	2
Melting Point -141 °F/°C Boiling Point 104 °F/°C	2
Flash Point (open or closed cup) none °C/°F	1
Solubility - H_2O soluble in 50 parts water	1
Other misible with alcohols, ether, DMF	1

Physical Features: (odor, color, etc.) Colorless liquid with a chloroform-like odor (2) 1P = 11.35 eV. Relative response on HNU = 9.4.

II. TOXICOLOGICAL DATA

Standards: 50 ppm(3) TLV 500 ppm(2) PEL suspect human carcinogen IDLH 3

Routes of Exposure: Inhalation, ingestion, eye contact, skin contact

Acute/Chronic Symptoms: Fatigue, weakness, sleepiness, light headedness, numb and tingling limbs, nausea, eye and skin irritation, vertigo, choking (2)

First Aid: Eye contact: Irrigate immediately; Skin contact: water flush; Inhalation: artificial respiration; Ingestion: get medical attention immed.

Chemical Name: Methylene Chloride

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes ___ No X — 1

Toxic by-products ________ — ________

B. Flammability LEL ________ UEL ________ — ________

C. Reactivity Hazard incompatible with strong oxidizers and caustics, chemically active metals such as Al or Mg powders, sodium, potassium. — 2

D. Corrosivity Hazard yes/no pH: ________ — ________

Neutralizing agent: ________ — ________

E. Radioactive Hazard

		Exposure Rate	Reference
Background	yes/no	________	________
Alpha particles	yes/no	________	________
Beta particles	yes/no	________	________
Gamma radiation	yes/no	________	________

IV. REFERENCES

(1) The Merck Index, 10th Edition

(2) Pocket Guide to Chemical Hazards, NIOSH, 1987

(3) Threshold Limit Values and Biological Exposure Indices for 1988-89, ACGIH

MG/10-86/Form 2

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Toluene (Methyl benzene, toluol)

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula C7H8	1,2,3,4
Natural Physical State at 25°C liquid	1,2,3,4
Vapor Pressure 2 mm Hg at 20°C	4
Melting Point -95 °F/°C Boiling Point 110.6 °F/°C	1,3,4
Flash Point (open or closed cup) 40 °C/°F	1,2,3,4
Solubility - H_2O slightly soluble	1,3,4
Other miscible with alcohol, chloroform, ether, acetone, glacial acetic acid, carbon disulfide	1,3,4

Physical Features: (odor, color, etc.) colorless liquid with an aromatic odor, IP 8.82 eV, derived from coal tar oil or petroleum
Relative response on HNU = 10

II. TOXICOLOGICAL DATA

Standards: 100 ppm TLV 200 ppm PEL 2000 ppm IDLH 4

Routes of Exposure: inhalation

Acute/Chronic Symptoms: Narcotic in high concentrations, headache, lassitude, and nausea. Chronic: anemia and dermatitis.

First Aid: Skin: soap and water wash immediately; eye: irrigate immediately; inhalation: fresh air and artificial respiration; ingestion: medical attention (4).

Chemical Name: Toluene

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 4

Toxic by-products ____________

B. Flammability LEL 1.0% UEL 7.0% — 4

C. Reactivity Hazard strong oxidizers — 3

D. Corrosivity Hazard yes/no pH: ______

Neutralizing agent: ____________

E. Radioactive Hazard

		Exposure Rate	Reference
Background	yes/no		
Alpha particles	yes/no		
Beta particles	yes/no		
Gamma radiation	yes/no		

IV. REFERENCES

The Merck Index, 10th Edition, 1983

Documentation of the TLV, 4th Edition, 1980

NIOSH Pocket Guide for Chemical Hazards, 1985

NEPA, Protection Guide on Hazardous Materials, 8th Edition, 1984

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Benzene

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula C6 H6	1,2
Natural Physical State at 25°C liquid	1,2
Vapor Pressure 75 mm Hg at 20°C	1,2
Melting Point ____ °F/°C Boiling Point 80 °F/°C	1
Flash Point (open or closed cup) 12 °C/°F	1,2
Solubility - H_2O 18%	2
Other in alcohol, Acetone Ether	1

Physical Features: (odor, color, etc.) colorless liquid with odor of aromatic hydrocarbons IP = 9.24 eV. Relative response on HNU = 10

II. TOXICOLOGICAL DATA

Standards: 10 ppm TLV 10 ppm PEL 2000 ppm IDLH 2

Routes of Exposure: inhalation

Acute/Chronic Symptoms: Upper respiratory irritation, muscle spasms, slow pulse, irritated eyes and skin burns. *Suspect human carcinogen.

First Aid: Eyes: irrigate immediately; Skin: water flush immediately, Inhalation: fresh air and artificial respiration; Ingestion: medical attention immediately.

Chemical Name: Benzene

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products ____________ — ______

____________ — ______

B. Flammability LEL 1.3% UEL 7.1% — 2

C. Reactivity Hazard Strong oxidizer, chlorine — 2

D. Corrosivity Hazard yes/no pH: ______ — ______

Neutralizing agent: ____________ — ______

E. Radioactive Hazard

		Exposure Rate	
Background	yes/no	______	______
Alpha particles	yes/no	______	______
Beta particles	yes/no	______	______
Gamma radiation	yes/no	______	______

IV. REFERENCES

Documentation of the TLV's, 4th Edition, 1980

Pocket Guide to Chemical Hazards, NIOSH, 1985

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Ethyl Acetate

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula $CH_3\ COOC_2\ H_5$	1
Natural Physical State at 25°C liquid	2
Vapor Pressure 76 mm Hg at 20°C	2
Melting Point -117 $^{\circ}$F/$^{\circ}$C Boiling Point 171 $^{\circ}$F/$^{\circ}$C	2
Flash Point (open or closed cup) 24 $^{\circ}$C/$^{\circ}$F	2
Solubility - H_2O 8.7% soluble in water	2
Other soluble in alcohol and ether	1

Physical Features: (odor, color, etc.) colorless liquid with a pleasant, fruity odor (2) IP = 10.11 eV

II. TOXICOLOGICAL DATA

Standards: 400 ppm (3) TLV 40 ppm(2) PEL 10,000 ppm IDLH 2

Routes of Exposure: Inhalation, Ingestion, Skin Contact, Eye Contact

Acute/Chronic Symptoms: Irritation of the eyes, nose, and throat; narcosis, dermititis

First Aid: Eye contact: irrigate immediately; Skin contact: water flush promptly; Inhalation: artificial respiration; Ingestion: get medical attention immediately (2).

Chemical Name: Ethyl Acetate

III. HAZARDOUS CHARACTERISTICS

Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products ____________ ________

____________ ________

B. Flammability LEL 2.2% UEL 11% — 2

C. Reactivity Hazard incompatible with nitrates, strong oxidizers, alkalis, and acids — 2

D. Corrosivity Hazard yes/no pH: ________ ________

Neutralizing agent: ____________________ ________

E. Radioactive Hazard

		Exposure Rate	
Background	yes/no	________	________
Alpha particles	yes/no	________	________
Beta particles	yes/no	________	________
Gamma radiation	yes/no	________	________

IV. REFERENCES

(1) The Condensed Chemical Dictionary, 10th Edition

(2) The Pocket Guide to Chemical Hazards, NIOSH, 1987

(3) Threshold Limit Values and Biological Exposure Indices for 1988-89, ACGIH

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Lead, inorganic dusts

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula Pb	1
Natural Physical State at 25°C solid	1
Vapor Pressure N/A mm Hg at 20°C	
Melting Point 600 °F/°C Boiling Point 900 °F/°C	
Flash Point (open or closed cup) N/A °C/°F	
Solubility - H_2O N/A	
Other N/A	

Physical Features: (odor, color, etc.) appearance and odor vary depending upon specific compound.

II. TOXICOLOGICAL DATA

Standards: .15 mg/m TLV 0.05 mg/m PEL N/A IDLH

Routes of Exposure: inhalation and ingestion

Acute/Chronic Symptoms: Acute: lassitude, pallor, constipation, abdominal pain, gingival gum line, tremors. Target organs: GI tract, CNS, kidneys, blood.

First Aid: Eyes: irrigate immediately; Skin: soap and water wash promptly; Inhalation: fresh air and artificial respiration; Ingestion: medical attention immediately.

Chemical Name: Lead, inorganic dusts

III. HAZARDOUS CHARACTERISTICS

Reference

A. Combustibility Yes ___ No X ___

Toxic by-products ___

B. Flammability LEL N/A UEL ___

C. Reactivity Hazard None

D. Corrosivity Hazard yes/no pH: ___

Neutralizing agent: ___

E. Radioactive Hazard

		Exposure Rate	
Background	yes/no		
Alpha particles	yes/no		
Beta particles	yes/no		
Gamma radiation	yes/no		

IV. REFERENCES

The Merck Index, 10th Edition, 1985

Pocket Guide to Chemical Hazards, NIOSH, 1985