POOR LEGIBILITY

PORTIONS OF THIS DOCUMENT MAY BE UNREADABLE, DUE TO THE QUALITY OF THE ORIGINAL

07/11/91

2652

SITE NAME	CONE MILLS CORPS./PRINT WORKS PLANT
EPA ID #	NCD980559157
REF ID	3053
EVENT	SSI2
APPROVAL DATE	02/20/91
LEVEL	STATE
PREPARER	MCCONNEY/CAIN
RECOMMENDED DISPOSITION	ESIE
APPROVED DISPOSITION	NFRAP
HRS CONSIDERATIONS (Y/N)	

COMMENTS SECTION

NO GW DATA TAKEN. SW CONTAMINATED BUT UNKNOWN SOURCE. DUE TO THE LOW TARGET POPULATION AND NEAR EST WELL BEING 1.8 MILES AWAY THE SITE IS GIVEN A NFRAP.

Rec'd
AUG 1990

State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

August 14, 1990

NFRAP
2/20/91
K. Cain

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

Subject: Screening Site Investigation Report
Cone Mills Corp./Print Works Plant
NCD980559157
Greensboro, Guilford County, North Carolina

Dear Ms. Cain:

Please find attached the site investigation report for the subject site. Based on data collection and evaluation, on a visit to the site and on analyses of samples taken from the site, we have concluded the following:

Cone Mills Corp./Print Works Plant (CMC/PWP) is located in the city of Greensboro, Guilford County, North Carolina. CMC/PWP is situated in an urban area with other industrial facilities and residential areas located adjacent to or near the facility. The Print Works Plant is now referred to as Plant 9 and is immediately adjacent to North Buffalo Creek.

CMC/PWP was constructed in the 1930's and was used as a textile printing and finishing operation. Fabric was manufactured at another Cone Mill facility, and was shipped to CMC/PWP as unfinished gray fabric. The fabric was prepared for dyeing, printed or dyed, and then finished at the CMC/PWP facility. The printing process was done by applying dye with rollers. Some dyeing of solid colors was also done at the facility. CMC/PWP was closed in 1977 and converted into a warehouse for fabric manufactured at another Cone Mill facility.

Prior to 1960, waste disposal practices at CMC/PWP are unclear. Reportedly, all waste water was disposed of to the city sewer. In 1960, a dye waste disposal facility for Cone Mill Corp. operations was built near the site. This facility

has a discharge point located well downstream of the site. The waste water from CMC/PWP was filtered for lint and piped to the dye waste disposal facility through an underground pipe. Cone Mills Corp. filed a CERCLA 103 (c) notification in 1981 indicating that unknown wastes from the production of textiles were buried onsite and that these wastes were later removed. According to company management, this listing was filed in error due to uncertainty of past waste management practices, not due to documented onsite waste disposal.

During the site investigation visit, no evidence of the on site treatment, storage, or disposal of hazardous waste was found. During this visit, sediment samples were taken from North Buffalo Creek. Laboratory analysis of these samples showed the presence of a number of polynuclear aromatic hydrocarbons (PAHs) in all of the samples, including the background upstream sample. The levels of these PAHs were for the most part higher in the upstream sample than the downstream samples, with the farthest downstream sample having the lowest PAHs levels. The upstream sample was taken well upstream of the site property and it is unlikely that any outfall from the site was located upstream of the sampling point. Therefore, the contamination found can not be attributed to the site. Considering that the PAHs levels decrease along the length of the creek, it is likely that the source of the contamination is located upstream of the site. North Buffalo Creek is an urban creek and any number of industries could be located along this creek.

The great majority of the residents in the 4-mile radius surrounding CMC/PWP are provided drinking water by the city of Greensboro. The city of Greensboro obtains its water from surface water intakes situated on Lake Townsend, Lake Higgins, and Lake Brandt, all of which are located north of the city. These intakes are all upstream of the site and are not threatened by the site. Ground water is the sole source of drinking water available to only a small number of the residents within four miles of the site. The population utilizing groundwater obtained from wells located within three miles of the site as drinking water is estimated at 1877 individuals. The population utilizing groundwater obtained from wells within a three to four mile radius of the site as drinking water is estimated at 2477 individuals. The nearest well is believed to be located approximately 1.8 miles northeast of the site.

The CMC/PWP area is drained by North Buffalo Creek, which enters Buffalo Creek. The end of the three path-length mile segment is reached on North Buffalo Creek and the end of the

fifteen path-length mile segment is reached on Buffalo Creek. North Buffalo Creek and Buffalo Creek are classified as Class C water bodies and are not suitable for drinking water. The nearest drinking water intake is located over 50 miles from the point the site drainage enters North Buffalo Creek. There is very little fishing and recreational boating on North Buffalo Creek and Buffalo Creek. North Buffalo Creek is a small creek and a City of Greensboro sewage discharge point is located downstream within the three path-length mile segment. Buffalo Creek is also of no fishing significance. There is no commercial fishing on these creeks. Boating on these creeks is limited due to poor access. North Buffalo and Buffalo creeks are not used for residential or commercial irrigation.

During the site investigation visit, no ground water samples could be obtained. For this reason, further remedial investigation of the site is recommended. In addition, due to the fact that the contamination found in North Buffalo Creek can not be attributed to the site, further investigation of this Creek to determine the source of this contamination is recommended.

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

Sincerely,

John P. McConney
Environmental Chemist
NC Superfund Section

JM/cone.sil

Attachment

NORTH
CAROLINA

DEHNR/DSWM

Cone Mills Corp./Print Works Plant
NCD980559157
Screening Site Investigation
August 1990

By: John McConney
Environmental Chemist
Superfund Section
Division of Solid Waste Management

SCREENING SITE INVESTIGATION

Cone Mills Corp./Print Works Plant
NCD980559157
Greensboro, Guilford County, NC

Rec'd
AUG 7 1990

August 1990

Superfund Section
Solid Waste Management Division
NC Department of Environment, Health, and Natural Resources

Prepared by:

John McConney
Environmental Chemist

Reviewed by:

Jack Butler
Environmental Engineer

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1.0 Executive Summary

Cone Mills Corp./Print Works Plant (CMC/PWP) is located in the city of Greensboro, Guilford County, North Carolina. CMC/PWP is situated in an urban area with other industrial facilities and residential areas located adjacent to or near the facility. The Print Works Plant is now referred to as Plant 9 and is immediately adjacent to North Buffalo Creek.

CMC/PWP was constructed in the 1930's and was used as a textile printing and finishing operation. Fabric was manufactured at another Cone Mill facility, and was shipped to CMC/PWP as unfinished gray fabric. The fabric was prepared for dyeing, printed or dyed, and then finished at the CMC/PWP facility. The printing process was done by applying dye with rollers. Some dyeing of solid colors was also done at the facility. CMC/PWP was closed in 1977 and converted into a warehouse for fabric manufactured at another Cone Mill facility.

Prior to 1960, waste disposal practices at CMC/PWP are unclear. Reportedly, all waste water was disposed of to the city sewer. In 1960, a dye waste disposal facility for Cone Mill Corp. operations was built near the site. This facility has a discharge point located well downstream of the site. The waste water from CMC/PWP was filtered for lint and piped to the dye waste disposal facility through an underground pipe. Cone Mills Corp. filed a CERCLA 103 (c) notification in 1981 indicating that unknown wastes from the production of textiles were buried onsite and that these wastes were later removed. According to company management, this listing was filed in error due to uncertainty of past waste management practices, not due to documented onsite waste disposal.

During the site investigation visit, no evidence of the on site treatment, storage, or disposal of hazardous waste was found. During this visit, sediment samples were taken from North Buffalo Creek. Laboratory analysis of these samples showed the presence of a number of polynuclear aromatic hydrocarbons (PAHs) in all of the samples, including the background upstream sample. The levels of these PAHs were for the most part higher in the upstream sample than the downstream samples, with the farthest downstream sample having the lowest PAHs levels. The upstream sample was taken well upstream of the site property and it is unlikely that any outfall from the site was located upstream of the sampling point. Therefore, the contamination found can not be attributed to the site. Considering that the PAHs levels decrease along the length of the creek, it is likely that the source of the contamination is located upstream of the site. North Buffalo Creek is an urban creek and any number of industries could be located along this creek.

The great majority of the residents in the 4-mile radius surrounding CMC/PWP are provided drinking water by the city of Greensboro. The city of Greensboro obtains its water from surface water intakes situated on Lake Townsend, Lake Higgins, and Lake Brandt, all of which are located north of the city. These intakes are all upstream of the site and are not threatened by the site. Ground water is the sole source of drinking water available to only a small number of the residents within four miles of the site. The population utilizing groundwater obtained from wells located within three miles of the site as drinking water is estimated at 1877 individuals. The population utilizing groundwater obtained from wells within a three to four mile radius of the site as drinking water is estimated at 2477 individuals. The nearest well is believed to be located approximately 1.8 miles northeast of the site.

The CMC/PWP area is drained by North Buffalo Creek, which enters Buffalo Creek. The end of the three path-length mile segment is reached on North Buffalo Creek and the end of the fifteen path-length mile segment is reached on Buffalo Creek. North Buffalo Creek and Buffalo Creek are classified as Class C water bodies and are not suitable for drinking water. The nearest drinking water intake is located over 50 miles from the point the site drainage enters North Buffalo Creek. There is very little fishing and recreational boating on North Buffalo Creek and Buffalo Creek. North Buffalo Creek is a small creek and a City of Greensboro sewage discharge point is located downstream within the three path-length mile segment. Buffalo Creek is also of no fishing significance. There is no commercial fishing on these creeks. Boating on these creeks is limited due to poor access. North Buffalo and Buffalo creeks are not used for residential or commercial irrigation.

During the site investigation visit, no ground water samples could be obtained. For this reason, further remedial investigation of the site is recommended. In addition, due to the fact that the contamination found in North Buffalo Creek can not be attributed to the site, further investigation of this Creek to determine the source of this contamination is recommended.

Background

2.1 Location

Cone Mills Corp./Print Works Plant (CMC/PWP) is located in the city of Greensboro, Guilford County, North Carolina. The county code is 41 and this is in the Sixth Congressional District. The coordinates are 36° 06′ 05" North latitude and 79° 46′18" West longitude (4).

2.2 Site Layout

CMC/PWP is located in an urban area with other industrial facilities and residential areas located adjacent to or near the facility. The Print Works Plant is now referred to as Plant 9 and is immediately adjacent to North Buffalo Creek. The site is surrounded by a fence (4,8).

2.3 Ownership and Site Use History

CMC/PWP was constructed in the 1930's and was used as a textile printing and finishing operation. The facility is and has been wholly owned and operated by Cone Mills Corporation (9).

Fabric was manufactured at another Cone Mill facility, and was shipped to CMC/PWP as unfinished gray fabric. The fabric was prepared for dyeing, printed or dyed, and then finished at the CMC/PWP facility. The preparation process consisted of desizing, scouring, and bleaching. The scouring was done with soap at a high pH and the bleaching was done with peroxide and silica. The printing process was done by applying dye with rollers. Some dyeing of solid colors was also done at the facility. The finishing was done by applying a finishing agent such as permanent press or a water resistant finish. CMC/PWP was closed in 1977 and converted into a warehouse for fabric manufactured at another Cone Mill facility (8,9).

Prior to 1960, waste disposal practices at CMC/PWP are unclear. Cone Mills Corp. filed a CERCLA 103 (c) notification in 1981 indicating that unknown wastes from the production of textiles were buried onsite and that these wastes were later removed. According to company management, this listing was filed in error due to uncertainty of past waste management practices, not due to documented onsite waste disposal (7,9).

2.4 Permit and Regulatory History

CMC/PWP was closed in 1977 and has never had status under RCRA (9).

2.5 Remedial Actions to Date

Reportedly, no remedial actions have ever taken place at the site.

2.6 Summary Trip Report

On May 16, 1990, the team of John McConney and Jack Butler, both of the NC Superfund Section, conducted a site investigation of the subject site. The team was met by Arthur J. Toompas, Manager, Water and Air Resources, and John Summers, Plant Engineer for Plant 9. Terry Cole, of the Guilford County Department of Public Health, accompanied the team during the site investigation. Background information on the site and a site map were provided to the team. Mr. Toompas reported that EPA had investigated a nearby Cone Mill facility, the White Oak Plant, in 1988; the report on this investigation was dated May 2, 1989. During this EPA investigation, North Buffalo Creek had been sampled. The area sampled was well downstream of CMC/PWP and this earlier sampling was not applicable for the CMC/PWP investigation (8,9).

During the site investigation visit, the company management reported that waste water was disposed of in the city sewer system. Reportedly, no sludge or other waste generated during waste water treatment was disposed of onsite. The city of Greensboro has a waste water treatment facility located downstream of CMC/PWP, the North Buffalo Treatment Plant, and this plant would have treated the waste water from Cone Mills. In 1960, Cone Mills Corp. constructed a dye waste disposal facility roughly 500 to 600 feet from the site. This waste water treatment facility was used by a number of Cone Mill facilities in the immediate area, including the Print Works Plant. The waste water from CMC/PWP was filtered for lint and piped to the dye waste disposal facility through an underground pipe. The discharge point for this dye waste disposal facility is located well downstream of the site (8,9).

Following the site briefing, the team and the company representatives conducted a pre-sampling reconnaissance of the site. The site is bounded by a fence, monitored by closed circuit cameras, and a security guard was present. The team toured parts of the interior of the facility and verified the reported information that the site is being used only for the warehousing of raw material and finished products. No evidence of the storage of process chemicals was seen in the toured areas (8,9).

The waste water treatment system was then examined. This system used pumps to move the waste stream to a holding tank and then through a filter to remove lint. The waste stream was then moved by gravity to the dye waste disposal facility that was located offsite. The pipe to the dye waste

disposal facility was underground; however, the portion that passed over North Buffalo Creek was exposed (8,9).

The company management reported that there had never been any underground storage tanks on site. In addition, no monitoring wells were on site. The depth to ground water, roughly 20 feet, made the installation of a hand dug temporary well point infeasible. There was a concrete pad and tank supports remaining of an above ground tank farm that had contained five tanks; these tanks had been removed when the facility was closed. There was no evidence of stressed vegetation in the area immediately around the tank farm. During the reconnaissance, the grounds and the entire perimeter of the site were toured. There was no evidence of underground burial of waste on site (8,9).

Following the reconnaissance, the team proceeded to conduct sampling of the surface water pathway, North Buffalo Creek. A background sediment sample was taken from roughly 150 feet upstream of the Fairview Rd. bridge that crosses the creek. A second sediment sample was taken from the creek along the frontage of the facility. This was slightly upstream from a railroad trestle crossing the Creek near the northern end of the facility. A third sediment sample was taken from downstream of the facility, but upstream of the discharge point of the present waste water treatment system. This sampling point was slightly upstream of a pipe from the present waste water treatment that crosses the creek well downstream of the facility. These sampling points are marked on a site map included in Appendix A. The company management declined to split samples (8,9).

3.0 Environmental Setting

3.1 Topography

CMC/PWP is located in the upland section of the Piedmont physiographic province. The Piedmont physiographic province is a submaturely to maturely dissected peneplane, a relatively flat land surface representing an advanced stage of erosion. The land surface near the streams is gently rolling and the interstream areas are relatively flat (10). CMC/PWP drains to North Buffalo Creek. The overland flow to this creek is 200 feet, with a drop of 10 feet (4). This yields a slope of 5.0%.

3.2 Surface Water

The area surrounding CMC/PWP is drained by the Haw River and its tributaries, including North Buffalo Creek (4,10). The site area itself is drained by North Buffalo Creek, which enters Buffalo Creek. Buffalo Creek enters Reedy Creek, which in turn enters the Haw River. The end of the three path-length mile segment is reached on North Buffalo Creek and the end of the fifteen path-length mile segment is reached on Buffalo Creek (4,12).

North Buffalo Creek, Buffalo Creek and Reedy Creek are all classified as Class C water bodies. Class C water bodies are suitable for fish and wildlife propagation, secondary recreation, and agriculture (12). North Buffalo Creek and Buffalo Creek, as well as Reedy Creek, are not suitable for drinking water. The nearest drinking water intake is located on the Haw River and is approximately 35 miles downstream from the point Buffalo Creek enters Reedy Creek, over 50 miles from the point the site drainage enters North Buffalo Creek. This intake is for the town of Bynum (15).

There is very little fishing and recreational boating on North Buffalo Creek and Buffalo Creek. North Buffalo Creek is a small creek and a sewage discharge point is located downstream within the three path-length mile segment. Buffalo Creek is also of no fishing significance. There is no commercial fishing on these creeks. Boating on these creeks is limited due to poor access (13). North Buffalo and Buffalo creeks are not used for residential or commercial irrigation (17).

3.3 Geology, Soils, and Ground Water

The soil underlying CMC/PWP is classified as Urban Land. This is an area where more than 75 percent of the surface has been covered with streets, buildings, parking lots, and railroad yards. The natural soils have been altered by cutting, filling, grading, and shaping during the process of urbanization. The immediate area consists of soils from the

Enon series which consists of well drained, slowly permeable soils including sandy loams, clay loams, and clays (14).

The site itself is underlain by a sheared granite rock unit. The surrounding 4 mile radius is underlain by a number of rock units including sheared granite, greenstone schist, and sericite schist. The sheared granite unit is very distinctive and is composed of a sheared, schistose or gneissic, biotite granite cut by innumerable greenish-colored mafic dikes which have been metamorphosed to a slate or schist. This granite is a light pink coarse-grained rock consisting chiefly of orthoclase, plagioclase, biotite, and quartz. The greenstone schist crops out in a very irregular belt across the southeastern part of Guilford County, occurring in elongated areas and irregular patches. This greenstone schist is typically a very fine-grained light to medium olive-green hornblende-plagioclase schist. Quartz veins are present in many places. The sericite schist is fine-grained, with fine, smooth planes of schistosity, and consists of green quartz-sericite-chlorite schist. This unit is usually deeply weathered (10).

Ground water in the area is contained in the interstices of the soils and in the secondary interstices of the underlying formations (11). These secondary interstices consist of joints, fractures, planes of schistosity, and fractured quartz veins (10). There is one aquifer-of-concern that begins in the surficial deposits and continues in the underlying formation. Yields in the rock formations in the area are adequate for domestic purposes and moderate to large supplies are available for industrial use. Wells in the area range in depth from 100 feet to 400+ feet and have an average yield of 75 gpm. The depth to ground water is approximately 20 feet (10).

3.4 Climate and Meteorology (1,2)

Seasonal Temperatures:

(^{o}F)	January	July
Mean Max.	48	89
Mean Min.	34	66
Mean	38	77

Precipitation: (inches)

Mean Annual Precipitation:	44
Mean Annual Evaporation:	41
Net Annual precipitation:	3
Mean Annual snowfall:	9
One year 24-hr. rainfall:	3.0

Storm Events: Mean days/year with thunderstorms: 50
Prevailing winds and wind speeds: SW at 9

In 1979, the annual emissions inventory summary for this area was: particulates at 36,195 tons, sulfur dioxide at 6,099 tons, carbon monoxide at 139,693 tons, volatile organic

compounds and hydrocarbons at 45,120 tons, and nitrogen oxides at 21,131 tons (16).

3.5 Land Use and Population Distribution

CMC/PWP is located in the city of Greensboro, in an industrialized area near the northeastern part of town. There are several other textile manufacturing facilities owned by Cone Mills Corp. located near the facility, with several of these located upstream of the site. Residential areas are also located adjacent to and near the site (4). The majority of the city of Greensboro is located within a four mile radius of the site. Greensboro currently has a population of 196,000 individuals and a population density of 2447 individuals per square mile (19).

3.6 Water Supply

The great majority of the residents in the 4-mile radius surrounding CMC/PWP are provided drinking water by the city of Greensboro. The city of Greensboro obtains its water from surface water intakes situated on Lake Townsend, Lake Higgins, and Lake Brandt, all of which are located north of the city (14). These intakes are all upstream of the site and are not threatened by the site (4). The water distribution system of the city of Greensboro covers all of the territory inside of the city limits, as well as some territory outside of the city limits. Reportedly, 98% of the streets inside of the city limits are on the city distribution system and the residents can access the water lines, if they have not already done so (18).

The majority of the 3-mile radius surrounding the site is inside of the city limits and these residents are served by the Greensboro distribution system. All of the 0 to 1 mile radius is within the city limits, roughly 95% of the 1 to 2 mile radius is within the city limits, roughly 70% of the 2 to 3 mile radius is within the city limits, and roughly 40% of the 3 to 4 mile radius is within the city limits. The residents in the areas outside of the city limits are believed to be accessing ground water as drinking water (4,21). There is only one community water system utilizing ground water obtained from a well located within four miles of the site as drinking water; this water system is located within the 3 to 4 mile radius (20).

Ground water is the sole source of drinking water available to only a small number of the residents within three miles of the site. The population utilizing groundwater obtained from wells within three miles of the site as drinking water is estimated at 1877 individuals (21). This figure represents 2% of the estimated population living within the city limits in the three mile radius surrounding the site and all of the population outside of the city limits within the three mile radius. The population utilizing groundwater

obtained from wells within a three to four mile radius of the site as drinking water is estimated at 2477 individuals (21). This figure is based on 2% of the estimated population living in the city limits within the three to four mile radius surrounding the site, as well as the population living outside of the city limits in the three to four mile radius. The nearest well is believed to be located approximately 1.8 miles northeast of the site (4,21).

3.7 Critical Environments

There are no five-acre wetlands located within a two mile radius of the site (4). There are no critical habitats of an endangered or threatened species within one mile of the site. There are four critical habitats within North Carolina; the nearest is located roughly 32 straight-line miles from the site and is for the Cape Fear Shiner (3).

4.0 Waste Types and Quantities

4.1 Waste Quantities

The amount of waste on site could not be determined or estimated. The site has never had status under RCRA and Cone Mill Corp. management could not provide any information on the amount of waste generated at the site. This lack of information has prevented any estimation of the possible waste quantities at the site.

4.2 Waste Disposal Methods and Locations

Prior to 1960, waste disposal practices at CMC/PWP are unclear. The facility was constructed in the 1930's and operated until 1977, when operations ceased and the facility was converted to a warehouse. Operations ceased at the facility before RCRA regulations were implemented and this facility has never had status under RCRA. All file information regarding waste disposal on site was provided by Cone Mills Corp. management (8,9).

Reportedly, prior to 1960 all waste water was disposed of to the city sewer. The city of Greensboro has a sewage treatment plant located downstream of the site on North Buffalo Creek and this plant may have been responsible for treatment of this waste. In 1960, a dye waste disposal facility for Cone Mill Corp. operations was built near the site, roughly 600 feet northeast and downstream of the site. The discharge point for this facility is well downstream of the site. This facility served a number of Cone Mill Corp. plants, including CMC/PWP. The waste water from CMC/PWP was filtered for lint and piped to the dye waste disposal facility through an underground pipe (8,9).

Cone Mills Corp. filed a CERCLA 103 (c) notification in 1981 indicating that unknown wastes from the production of textiles were buried on site and that these wastes were later removed. According to company management, this listing was filed in error due to uncertainty of past waste management practices, not due to documented on site waste disposal (7,9). During the site investigation visit, no evidence of the on site treatment, storage, or disposal of hazardous waste was found (8).

4.3 Waste Types

During the site investigation visit, sediment samples were taken from North Buffalo Creek. Laboratory analysis of these samples showed the presence of a number of polynuclear aromatic hydrocarbons (PAHs) in all of the samples, including the background upstream sample. The levels of these PAHs were for the most part higher in the upstream sample than the

downstream samples, with the farthest downstream sample having the lowest PAHs levels (App. B). The background upstream sample was taken well upstream of the site property and it is unlikely that any outfall from the site was located upstream of the sampling point (8,9). Therefore, the contamination found can not be attributed to the site.

Considering that the PAHs levels decrease along the length of the creek, it is likely that the source of the contamination is located upstream of the site. North Buffalo Creek is an urban creek and any number of industries could be located along this creek. No specific information could be found stating that PAHs are or are not a constituent of textile or dye waste (26,27).

5.0 Laboratory Data

5.1 Laboratory Data Summary

Sample Type and location	Sample Number Field/Lab	Results
	Background Samples	
North Buffalo Creek upstream sediment (CMC-SD1)	15790/010999 12114/905334	Inorganics - background levels Organics - background levels
	Source Samples	
North Buffalo Creek -downstream sediment (CMC-SD2)	15791/011000 12115/905335	Inorganics - no significant levels Organics - no significant levels
North Buffalo Creek - downstream sediment (CMC-SD3)	15792/011001 12116/905336	Inorganics - no significant levels Organics - no significant levels
	Quality Control Samples	
Trip Blank (VOC only)	12117/905337	Organics - all compounds BDL

5.2 Quality Assurance Review

During the sampling visit to the site, a Trip blank was transported to the field and was handled and treated in the same manner as the background and source samples. This blank were prepared as per the Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, April 1, 1986. Laboratory analysis of the Trip blank indicates that no contamination of this blank occurred during the sampling visit.

6.0 Toxicological/Chemical Characteristics

(taken from Reference No. 23)

CHROMIUM

CAS RN: 7440473 NIOSH #: GB 4200000
Af: Cr; Aw: 52.0

SYN: CHROME

TOXICITY DATA:	CODEN:
ivn-rat TDLo:2160 ug/kg/6W-I TFX:ETA	JNCIAM 16,447,55
imp-rat TDLo:1200 ug/kg/6W-I TFX:ETA	JNCIAM 16,447,55
imp-rbt TDLo:75 mg/kg:ETA	ZEKBAI 52,425,42

Carcinogenic Determination: Animal Suspected IARC** 2,100,73; Animal Indefinite IARC** 23,205,80. TLV-TWA 500 ug/m3 DTLVS* 4,98,80. *Toxicology Review:* 85CVA2 5,63,70; KOTTAM 11(11),1300,75; FOREAE 7,313,42; MIBUBI 9(4),321,75; FCTXAV 9,105,71; PEXTAR 12,102,69; 85DHAX Cr,22,74; BNYMAM 54,413,78; NTIS** Conf-691001. OSHA Standard: Air: TWA 1 mg/m3 (SCP-0) FEREAC 39,23540,74. "NIOSH Manual of Analytical Methods" VOL 1 152,182, VOL 3; S323,352, VOL 5 173#. NIOSH Current Intelligence Bulletin 4, 1975. Reported in EPA TSCA Inventory, 1980. Proposed OSHA Medical Records Rules FEREAC 47,30420,82.

THR: An exper ETA, CARC.

Disaster Hazard: Powder will explode spont in air.

Incomp: Oxidants.

For further information see Vol. 3, No. 3 of *DPIM Report.*

CHROMIUM COMPOUNDS

Chromic acid and its salts have a corrosive action on the skin and mu mem. The lesions are confined to the exposed parts, affecting chiefly the skin of the hands and forearms and the mu mem of the nasal septum. The characteristic lesion is a deep, penetrating ulcer, which, for the most part, does not tend to suppurate, and which is slow in healing.

Small ulcers, about the size of a matchhead or end of a lead pencil may be found, chiefly around the base of the nails, on the knuckles, dorsum of the hands and forearms. These ulcers tend to be clean, and progress slowly. They are frequently painless, even though quite deep. They heal slowly, and leave scars. On the mu mem of the nasal septum the ulcers are usually accompanied by purulent discharge and crusting. If exposure continues, perforation of the nasal septum may result, but produces no deformity of the nose. Chromate salts are exper and hmn CARC of the lungs, nasal cavity and paranasal sinus, also exper CARC of the stomach and larynx. Hexavalent compounds are said to be more toxic than the trivalent. Eczematous dermatitis due to trivalent chromium compounds has been reported.

Reference List
Cone Mills Corp./Print Works Plant
NCD980559157

1. NC Atlas. The University of NC Press. Chapel Hill, NC.

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

3. Parker W.T. US Department of Interior, Fish and Wildlife Service, letter to Pat DeRosa, dated 21 June 1985 with attachments and DeRosa, Pat, NC Superfund Section, memo to Superfund Branch staff "Critical Habitats of Federally Listed Endangered Species in NC", dated May 18, 1989.

4. USGS 7-1/2' Topographic Quadrangles: Browns Summit, N.C., 1951 (photorevised 1968); Greensboro, N.C., 1951 (photorevised 1968); Mcleansville, N.C., 1952 (photorevised 1968); Lake Brandt, N.C., 1951 (photorevised 1968).

5. DeRosa, Pat. NC Superfund Section. Letter to Bland, Denise, US EPA, dated 16 September 1985, and EPA Form 2070-12 (7-81) completed September 11, 1985.

6. DeRosa, Pat. NC Superfund Section. Memo to file "Cone Mills Corporation/Print Works Plant NCD980559157", dated September 10, 1985.

7. Site Notification Form for Cone Mills Corp/Print Works Plant. Dated January 25, 1982.

8. McConney, John P. NC Superfund Section. Logbook notes taken during site investigation visit, dated May 16, 1990.

9. McConney, John P. NC Superfund Section. Letter to Cain, Kelly, US EPA, dated June 1, 1990.

10. Mundorff, M.J. Geology and Ground Water in the Greensboro Area, North Carolina. Bulletin No. 55. NC Department of Conservation and Development. Raleigh, 1948.

11. Heath, R.C. Basic Elements of Ground-Water Hydrology With Reference to Conditions in North Carolina. USGS Water-Resources Investgation Report 80-44, 1980.

12. Classifications and Water Quality Standards Assigned to the Waters of the Cape Fear River Basin. NC Department of Natural Resources and Community Development, Division of Environmental Management. Raleigh, NC. June 30, 1989.

13. McConney, John P. NC Superfund Section. Memo to file "Fishing and boating on North Buffalo Creek and Buffalo Creek", dated July 10, 1990.

14. Soil Survey of Guilford County, North Carolina. US Department of Agriculture, Soil Conservation Service. December 1977.

15. McConney, John P. NC Superfund Section. Memo to file "Drinking water intakes along Buffalo and Reedy Creeks, and Haw River", dated July 11, 1990.

16. North Carolina State Government Statistical Abstract. Office of State Budget and Management. Fifth Edition, 1984.

17. McConney, John P. NC Superfund Section. Memo to file "Irrigation from North Buffalo and Buffalo Creeks", dated July 11, 1990.

18. McConney, John P. NC Superfund Section. Memo to file "Water lines inside of the Greensboro city limits", dated July 18, 1990.

19. McConney, John P. NC Superfund Section. Memo to file "Population distribution of Greensboro", dated July 19, 1990.

20. McConney, John P. NC Superfund Section. Memo to file "Community water systems in the Cone Mills Corp/Print Works Plant (CMC/PWP) 4-mile radius", dated July 25, 1990 and NC Public Water Supply Branch. Listing of community and non-community water systems using ground water. Dated 7/11/90.

21. McConney, John P. NC Superfund Section. Memo to file "Ground water users in the Cone Mill Corp/Print Works Plant (CMC/PWP) 4-mile radius", dated July 26, 1990.

22. Laboratory Data Summary

23. Sax N.I. Dangerous Properties of Industrial Matericals. Sixth Edition. Van Nostrand Reinhold Company. New York, NY.

24. Environmental Pollution Control Textile Processing Industry. EPA Document No. 625/7-78-002. USEPA. October 1978.

25. Data Collection and Documentation Techniques for HRS Scoring of Hazardous Waste Sites. NUS Corporation. March 1987.

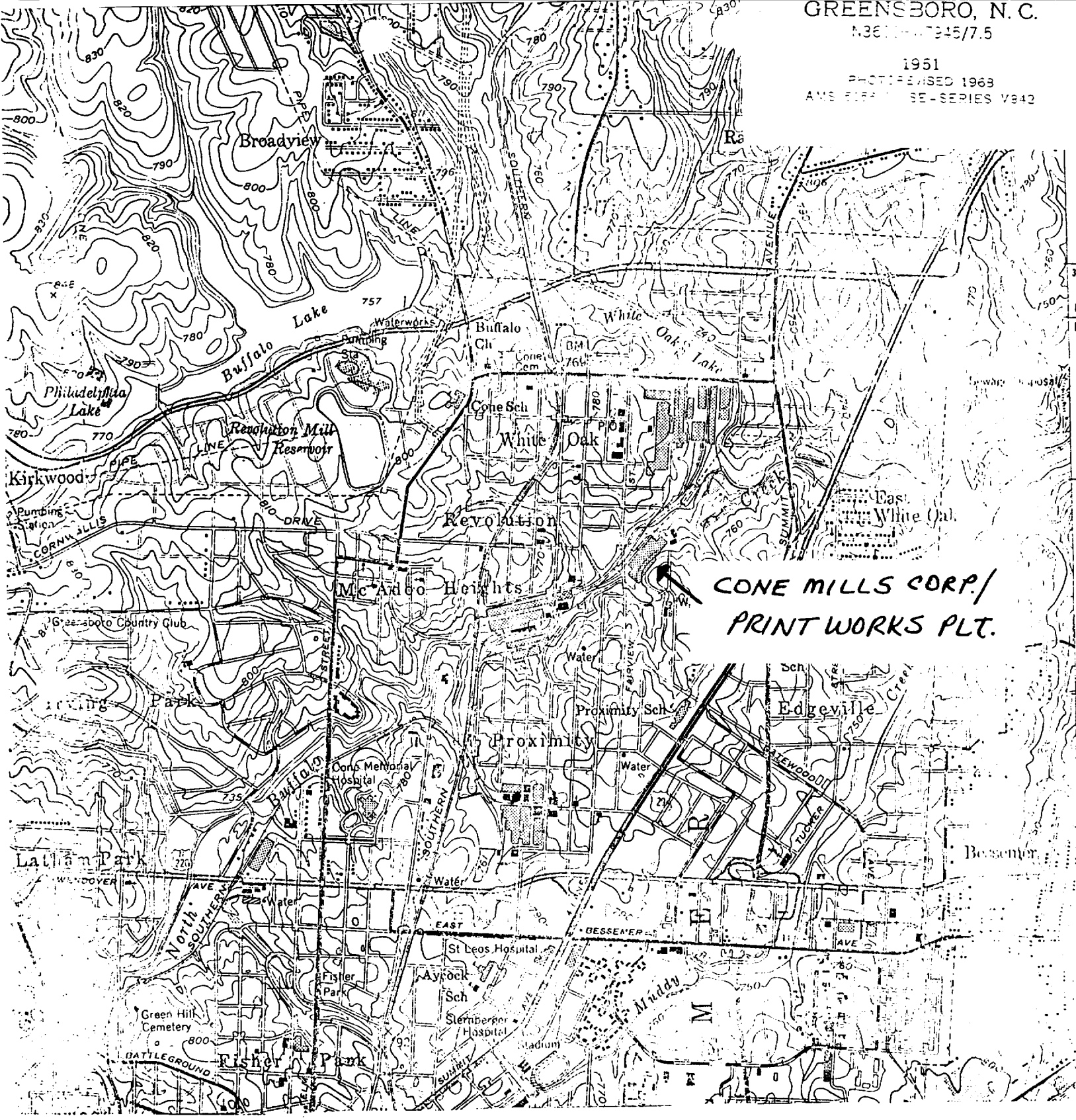
26. Encyclopedia of Occupational Health and Safety. Third (Revised) Edition. International Labor Office. Geneva.

27. Wastewater-Treatment Systems - Upgrading Textile Operation to Reduce Pollution. EPA Document No. 625/3-74-004. USEPA. October 1974.

Appendix A

GREENSBORO, N. C.
N36[illegible]7945/7.5

1951
PHOTOREVISED 1968
AMS [illegible] SE-SERIES V842



SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

MN GN
3½° 62 MILS
0°42' 12 MILS

UTM GRID AND 1968 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Cone Mills Corporation
Print Works Plant
NORTH BUFFALO CREEK
12 TH ST
GORDON ST
WATER ST
FAIRVIEW
9 TH ST
PARKING LOT
PARKING AREA
BASEBALL FIELD
SUB STA
STORAGE AREA
WATER TANKS
OVERHEAD PIPE
TANKS
WATER
Sheet 30
858,000N
857,000
31,000N
30,000
Sampling Points

UNSCANNABLE

MEDIA

(PHOTOGRAPHS)

OVERSIZED

DOCUMENT

MAP

Appendix B

SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH

Receipt for Samples

The samples described below were collected in connection with the administration, enforcement, and documentation of the:

(orth Carolina Hazardous Waste Management Rules, 10 NCAC 10F

( ) North Carolina Solid Waste Management Rules, 10 NCAC 10G

(X) Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

( ) Toxic Substances Control Act (TSCA). 15 U.S.C. §2601, et seq., specifically Section 11 of TSCA, 15 U.S.C. § 2610.

John P. McConney — Inspector's Name

P.O. Box 27687, Raleigh NC 27611-7687 — Inspector's Address

Cone Mills Corp. — Name of Firm

1201 Maple St., Greensboro NC — Firm Address

Arthur J. Toompas — Firm Owner, Operator, or Agent

Manager, Water and Air Resources — Title

SAMPLE NUMBER	COLLECTED		SAMPLE TYPE			DUPLICATE SAMPLES			SAMPLE LOCATION	
	DATE	TIME	WATER	SOIL	OTHER	OFFERED	ACCEPTED	REJECTED	ON-SITE	OFF-SITE
S-1	5/16/90	1046			✓	✓		✓		✓
SD 2	5/16/90	1112			✓	✓		✓	✓	
SD 3	5/16/90	1135			✓	✓		✓	✓	

Receipt for the sample(s) described above is hereby acknowledged:

John P. McConney
Signature of Inspector

Environmental Chemist
Ti

Receipt/rejection of duplicate or split samples is hereby acknowledged:

Arthur J. Toompas
Signature of Firm Owner, Operator, or Agent

MANAGER Water & Air Resources
Title

COMMENTS

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

SAMPLE ANALYSES REQUEST

State Laboratory of Public Hea
P. O. Box 280
306 N. Wilmington Str
Raleigh, 276

Site Number 41D 980559 157 Field Sample Number 15790

Name of Site Cone Mills Corp/PrintWorks Plant Site Location Greensboro, Guilford County

Collected By John P. McConney ID# 45 Date Collected 5/16/90 Time 1046

Type of Sample:

Environmental	Concentrate	Comments
____ Groundwater (1)	____ Solid (5)	CMC - SD 1
____ Surface Water (2)	____ Liquid (6)	
____ Soil (3)	____ Sludge (7)	
✓ Other (4)	____ Other (8)	

RECEIVED
JUN 26 1990
SUPERFUND SECTION

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
✓ Arsenic	<0.025	✓ Arsenic	<10	✓ Silver	<37
✓ Barium	<0.04	✓ Barium	19	____ Sulfates	
✓ Cadmium	<0.08	✓ Cadmium	15	____ Zinc	
✓ Chromium	<0.20	____ Chloride		____ Ph	
✓ Lead	<1.00	✓ Chromium	<37	____ Conductivity	
✓ Mercury	<0.02	____ Copper		____ TDS	
✓ Selenium	<0.025	____ Fluoride		____ TOC	
✓ Silver	<0.20	____ Iron			
		✓ Lead	22		
		____ Manganese			
		✓ Mercury	<0.07		
		____ Nitrate			
		✓ Selenium	<5		

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/
____ 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 ____

Date Extracted ____ Date Analyzed ____

Reported By ____ Lab Number 10999 (A) 1790

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

SAMPLE ANALYSES REQUEST

State Laboratory of Public H
P. O. Box 2
306 N. Wilmington S
Raleigh, 2

Site Number 41D 980559 157 Field Sample Number 15791

Name of Site Cone Mills Corp/Print Works Plant Site Location Greensboro, Guilford County

Collected By John P. McConney ID# 45 Date Collected 5/16/90 Time 1112

Type of Sample:

Environmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	CMC - SD2
___ 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/
✓ Arsenic	<0.025	✓ Arsenic	<10	✓ Silver	<38
✓ Barium	<0.04	✓ Barium	17	Sulfate	
✓ Cadmium	<0.08	✓ Cadmium	<15	Zinc	
✓ Chromium	<0.20	Chloride		Ph	
✓ Lead	<1.00	✓ Chromium	<38	Conductiv	
✓ Mercury	<0.02	Copper		TDS	
✓ Selenium	<0.025	Fluoride		TOC	
✓ Silver	<0.20	Iron			
		✓ Lead	23		
		Manganese			
		✓ Mercury	<0.07		
		Nitrate			
		✓ Selenium	<5		

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg
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/
Gross Alpha	
Gross Beta	

Date Received ___ Date Reported ___

Date Extracted ___ Date Analyzed 1100 (A) 1790

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

SAMPLE ANALYSES REQUEST

State Laboratory of Public H
P. O. Box 2
306 N. Wilmington S
Raleigh, 2

Site Number 41D 980559 157 Field Sample Number 15792

Name of Site Cone Mills Corp/PrintWorks Plant Site Location Greensboro, Guilford County

Collected By John P. McConney ID# 45 Date Collected 5/16/90 Time 1135

Type of Sample:

Environmental	Concentrate	Comments
____ Groundwater (1)	____ Solid (5)	CM6 - SD3
____ 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
✓ Arsenic	<0.025	✓ Arsenic	<10	✓ Silver	<40
✓ Barium	<0.04	✓ Barium	16	Sulfates	
✓ Cadmium	<0.08	✓ Cadmium	<16	Zinc	
✓ Chromium	<0.20	Chloride		Ph	
✓ Lead	<1.00	✓ Chromium	<40	Conductivity	
✓ Mercury	<0.02	Copper		TDS	
✓ Selenium	<0.025	Fluoride		TOC	
✓ Silver	<0.20	Iron			
		✓ Lead	20		
		Manganese			
		✓ Mercury	<0.08		
		Nitrate			
		✓ Selenium	<5		

ORGANIC CHEMISTRY

Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results m
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/l
Gross Alpha	
Gross Beta	

Date Received ____ Date Reported ____

Date Extracted ____ Date Analyzed 11/01 (M) 1790

Lab Number ____

DIVISION OF HEALTH SERVICES
SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH

Chain of Custody Record

Hazardous Waste Materials

Location of Sampling: ____ Generator ____ Transporter ____ Treatment Facili
____ Storage Facility ____ Disposal Facility ____ Landfill
X Other: _____

Company's Name Cone Mills Corp. Telephone (919) 379-6579

Address 1201 Maple St., Greensboro

Collector's Name John P. McLaurin (signature) Telephone (919) 733-2801

Date Sampled May 16, 1990 Time Sampled 1046 - 1135

Type of Process Generating Waste Textile

Field Information

Field Sample No. 15790 15791 15792

Chain of Possession:

	signature	title	inclusive dates
1.	John P. McLaurin	Env. Chemist	6/16/90 - 6/17/90
2.	Joyce Dunn	Chem Analyst	16 May 90
3.			

Results reported

signature	title	date
M C Walker	Chemist	25 June 90

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 H
P. O. Box 2
306 N. Wilmington
Raleigh, 2

Site Number 4ID 980559157 Field Sample Number 012114

Name of Site Cone Mills Corp/PrintWorks Plant Site Location Greensboro, Guilford County

Collected By John P. McConney ID# 45 Date Collected 5/16/90 Time 1046

Type of Sample:

Environmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	CMC-SD 1
___ Surface Water (2)	___ Liquid (6)	
___ Soil (3)	___ Sludge (7)	
✓ Other (4)	___ Other (8)	

RECEIVED
JUL 11 1990
SUPERFUND SECTION

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg
___ 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 m
✓ 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/l
___ Gross Alpha	
___ Gross Beta	

Date Received 5-17-90 VP Date Reported 7-9-90

Date Extracted 5-24-90 AA Date Analyzed BNA 6-1-90 BD PT 6-21-90 mw

905334

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

SAMPLE ANALYSES REQUEST

State Laboratory of Public H
P. O. Box 2
306 N. Wilmington
Raleigh, 2

Site Number 41D 980559 157 Field Sample Number 012115

Name of Site Cone Mills Corp/PrintWorks Plant Site Location Greensboro, Guilford County

Collected By John P. McConney ID# 45 Date Collected 5/16/90 Time 1112

Type of Sample:

Environmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	CMC- SD2
___ 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
___ 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 r
✓ 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 5-17-90 VP Date Reported

Date Extracted 5-24-90 AA Date Analyzed BNA 6-1-90 BD OT 6-21-90 MW

Lab Number 905335

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

SAMPLE ANALYSES REQUEST

State Laboratory of Public H
P. O. Box 2
306 N. Wilmington
Raleigh, 2

Site Number 41D 980559 157 Field Sample Number 012116

Name of Site Cone Mills Corp/PrintWorks Plant Site Location Greensboro, Guilford County

Collected By John P. McConney ID# 45 Date Collected 5/16/90 Time 1135

Type of Sample:

Environmental	Concentrate	Comments
____ Groundwater (1)	____ Solid (5)	CMC - SD3
____ 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
____ 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 m
✓ 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/l
____ Gross Alpha	
____ Gross Beta	

Date Received 5-17-90 VP Date Reported

Date Extracted 5-24-90 AA Date Analyzed BNA 6-1-90 BD PT 6-21-90 mw

905336

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

SAMPLE ANALYSES REQUEST

State Laboratory of Public Hea
P. O. Box 280
306 N. Wilmington St
Raleigh, 27

S Number 41D 980 559 157 Field Sample Number 12117

Name of Site Cone Mills Corp/Print Works Plat Site Location Greensboro, Guilford County

Collected By John P. McConney ID# 45 Date Collected 5/16/90 Time -

Type of Sample:

Environmental	Concentrate	Comments
____ Groundwater (1)	____ Solid (5)	Trip 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/
____ 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.
X 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 5-17-90 VP Date Reported

Date Extracted Date Analyzed PT 6-21-90 nw

Reported By Lab Number 905337

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

SAMPLE ANALYSES REQUEST

State Laboratory of Public Hea
P. O. Box 280
306 N. Wilmington Str
Raleigh, 276

Number 41D 980 559157 Field Sample Number 12118

Name of Site Cone Mills Corp / Print Works Plant Site Location Greensboro, Guilford County

Collected By John P. McLoney ID# 45 Date Collected 5/16/90 Time –

Type of Sample:

Environmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	Trip 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	
X 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 5-17-90 VP Date Reported

Date Extracted 5-22-90 AA, BD Date Analyzed BNA 5-31-90 BD

Reported By Lab Number 905338

DIVISION OF HEALTH SERVICES
SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH

Chain of Custody Record

Hazardous Waste Materials

Location of Sampling: ___ Generator ___ Transporter ___ Treatment Facilit
___ Storage Facility ___ Disposal Facility ___ Landfill
X Other: _____

Company's Name Cone Mills Corp. Telephone (919) 379-6579

Address 1201 Maple St., Greensboro

Collector's Name John P. McLaurin (signature) Telephone (919) 733-2801

Date Sampled May 16, 1990 Time Sampled 1046 - 1135

Type of Process Generating Waste Textile

Field Information

Field Sample No. 12114 12115 12116 12117 12118

Chain of Possession:

	signature	title	inclusive dates
1.	John P. McLaurin	Env. Chemist	5/16/90 - 5/17/90
2.	Vicki S. Painter	Chem. Analyst II	5-17-90
3.			

Results reported

signature	title	date
John L. Real	Chemist	7-9-90

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

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

ASE/NEUTRAL AND ACID EXTRACTABLES	LAB NO	905334	905335	905336	905338		
	FIELD #	12114	12115	12116	12118		
COMPOUND	TYPE	(4)	(4)	(4)	(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
N-nitrosodimethylamine	10/330	u	u	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		400	330K				
hexachlorobutadiene		u	u				
4-chloro-m-cresol							
hexachlorocyclopentadiene							
,6-trichlorophenol							
2-chloronaphthalene							
acenaphthylene							
dimethyl phthalate							
2,6-dinitrotoluene		↓	↓				
acenaphthene	↓	330K	330K				
2,4-dinitrophenol	50/1650	u	u				
2,4-dinitrotoluene	10/330						
4-nitrophenol	50/1650	↓	↓				
fluorene	10/330	567	330K				
4-chlorophenylphenylether	↓	u	u				
diethyl phthalate	↓						
4,6-dinitro-o-cresol	50/1650						
diphenylamine	↓						
azobenzene	↓						
4-bromophenylphenylether	10/330						
hexachlorobenzene	10/330						
pentachlorophenol	50/1650	↓	↓	↓			
phenanthrene	10/330	7,900	4,333	330K			
anthracene	↓	3,233	1,233	u			
dibutyl phthalate	↓	u	u	u			
fluoranthene	↓	8,267	7,633	330K	↓		

MDL
H_2O/SOIL

J - Estimated value.
< - Actual value is known to be less than value given.
> - 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	905334	905335	905336	905338		
	FIELD #	12114	12115	12116	12118		
COMPOUND	TYPE	(4)	(4)	(4)	(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
pyrene	10/330	5,983	7,200	330K	U		
benzidine	50/1650	U	U	U			
butyl benzyl phthalate	10/330	U	U				
benz(a)anthracene		2,017	1,800				
chrysene		1,800	2,133	330K			
3,3-dichlorobenzidine	50/1650	U	U	U			
bis(2-ethylhexyl)phthalate	10/330						
di-n-octyl phthalate	10/330						
benzo(b)fluoranthene	50/1650						
benzo(k)fluoranthene		1650K	1,667	1650K			
benzo(a)pyrene		1650K	1,800	U			
indeno(1,2,3-cd)pyrene		1650K	2,100				
dibenzo(a,h)anthracene		1650K	1650K				
benzo(g,h,i)perylene		1650K	1650K				
aniline	50/1650	U	U	U	U		
benzoic acid							
benzyl alcohol							
4-chloroaniline							
dibenzofuran	10/330	330K	330K				
2-methylnaphthalene		330K	330K				
2-methylphenol		U	U				
4-methylphenol							
2-nitroaniline	50/1650						
3-nitroaniline							
4-nitroaniline							
2,4,5-trichlorophenol							

MDL
H_2O/501L

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
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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

TRIP BLANK

PURGEABLE COMPOUNDS	LAB NO	905334	905335	905336	905337		
	FIELD #	12114	12115	12116	12117		
COMPOUND	TYPE	(4)	(4)	(4)	(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	10ppb	u	u	u	u		
bromomethane	10						
dichlorodifluoromethane	5						
vinyl chloride	10						
chloroethane	10						
methylene chloride	5						
trichlorofluoromethane							
ethene, 1,1-dichloro							
ethane, 1,1-dichloro-							
1,2-trans-dichloroethene							
chloroform							
ethane, 1,2-dichloro-							
ethane, 1,1,1-trichloro-							
carbontetrachloride							
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	10						
bromoform	10						
ethane, 1,1,2,2-tetrachloro-	5						
ethene, tetrachloro-							
toluene							
chlorobenzene							
ethylbenzene							
acetone	10	u	u	u	u		
2-butanone	10						
carbondisulfide	5						
2-hexanone	10						
4-methyl-2-pentanone	10						
styrene	5						
vinyl acetate	10						
xylenes (total)	5						
	↑MDL↑						

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-O (4/86 Laboratory)

Appendix C

Reference List
Cone Mills Corp./Print Works Plant
NCD980559157

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2. 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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4. USGS 7-1/2' Topographic Quadrangles: Browns Summit, N.C., 1951 (photorevised 1968); Greensboro, N.C., 1951 (photorevised 1968); Mcleansville, N.C., 1952 (photorevised 1968); Lake Brandt, N.C., 1951 (photorevised 1968).

5. DeRosa, Pat. NC Superfund Section. Letter to Bland, Denise, US EPA, dated 16 September 1985, and EPA Form 2070-12 (7-81) completed September 11, 1985.

6. DeRosa, Pat. NC Superfund Section. Memo to file "Cone Mills Corporation/Print Works Plant NCD980559157", dated September 10, 1985.

7. Site Notification Form for Cone Mills Corp/Print Works Plant. Dated January 25, 1982.

8. McConney, John P. NC Superfund Section. Logbook notes taken during site investigation visit, dated May 16, 1990.

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16. North Carolina State Government Statistical Abstract. Office of State Budget and Management. Fifth Edition, 1984.

17. McConney, John P. NC Superfund Section. Memo to file "Irrigation from North Buffalo and Buffalo Creeks", dated July 11, 1990.

18. McConney, John P. NC Superfund Section. Memo to file "Water lines inside of the Greensboro city limits", dated July 18, 1990.

19. McConney, John P. NC Superfund Section. Memo to file "Population distribution of Greensboro", dated July 19, 1990.

20. McConney, John P. NC Superfund Section. Memo to file "Community water systems in the Cone Mills Corp/Print Works Plant (CMC/PWP) 4-mile radius", dated July 25, 1990 and NC Public Water Supply Branch. Listing of community and non-community water systems using ground water. Dated 7/11/90.

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NORTH CAROLINA ATLAS

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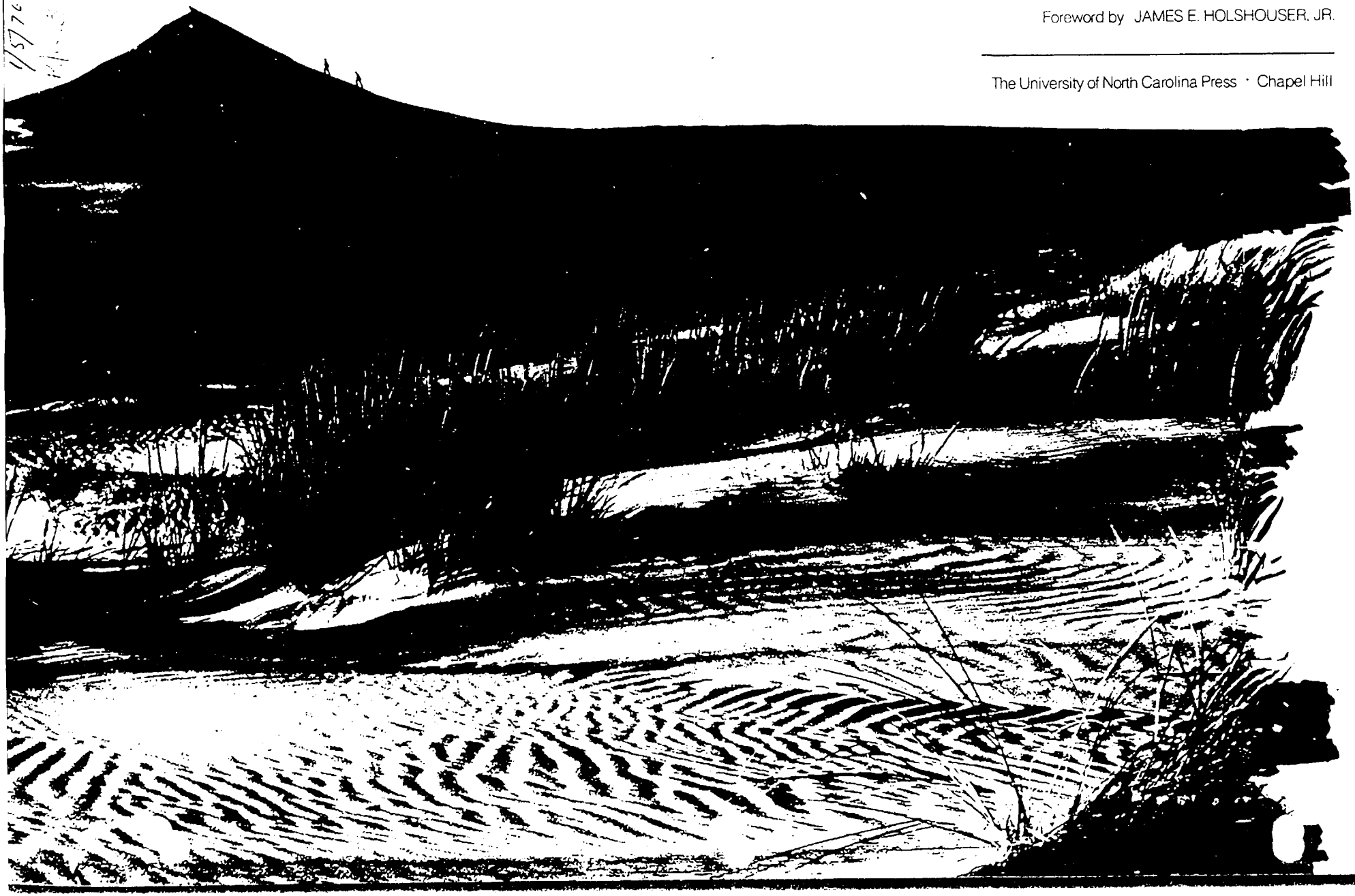
ALFRED W. STUART

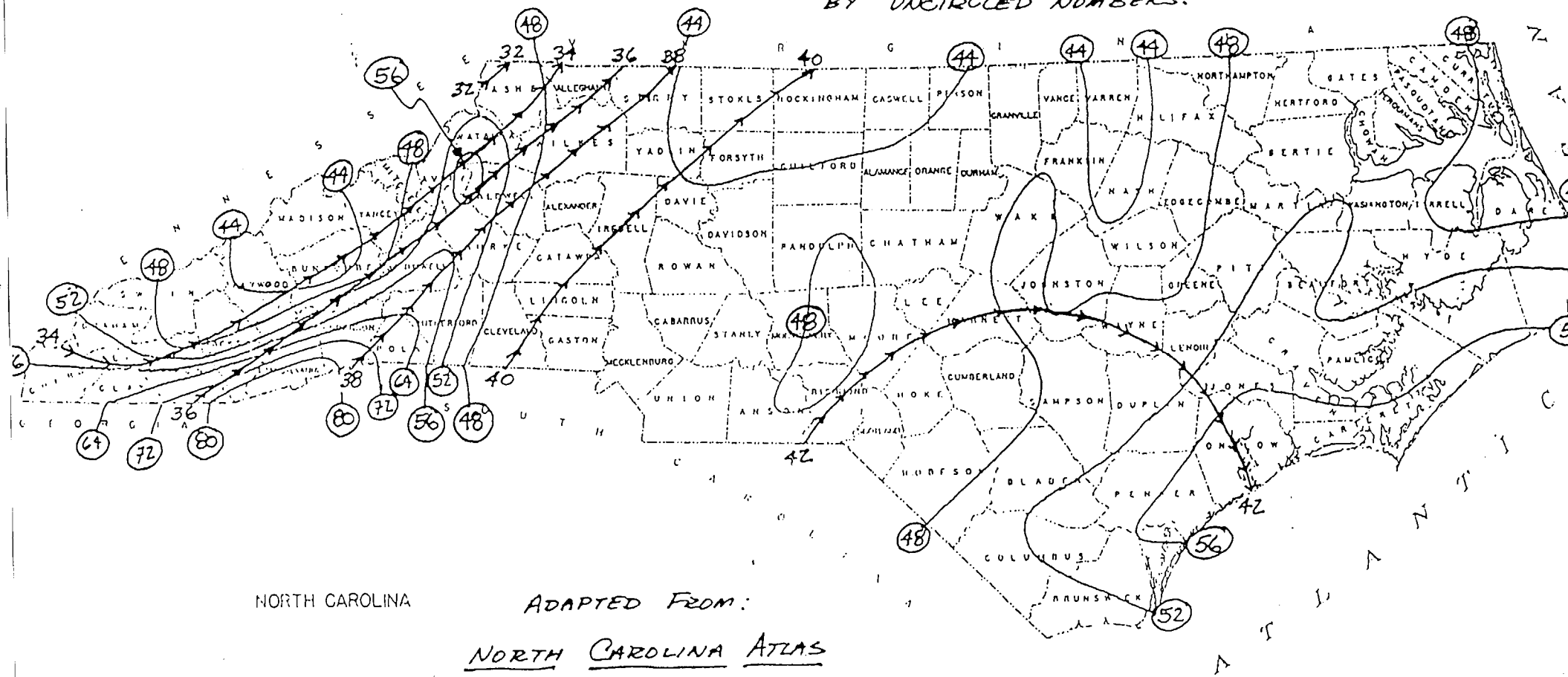
Foreword by JAMES E. HOLSHOUSER, JR.

The University of North Carolina Press · Chapel Hill



MEAN ANNUAL PRECIPITATION AND MEAN ANNUAL EVAPORATION

NOTE: PRECIPITATION ISOGRAMS ARE SOLID LINES (——) WITH INCHES OF RAINFALL GIVEN BY CIRCLED NUMBERS. EVAPORATION ISOGRAMS ARE NOTCHED LINES (→→→) WITH INCHES OF EVAPORATION GIVEN BY UNCIRCLED NUMBERS.



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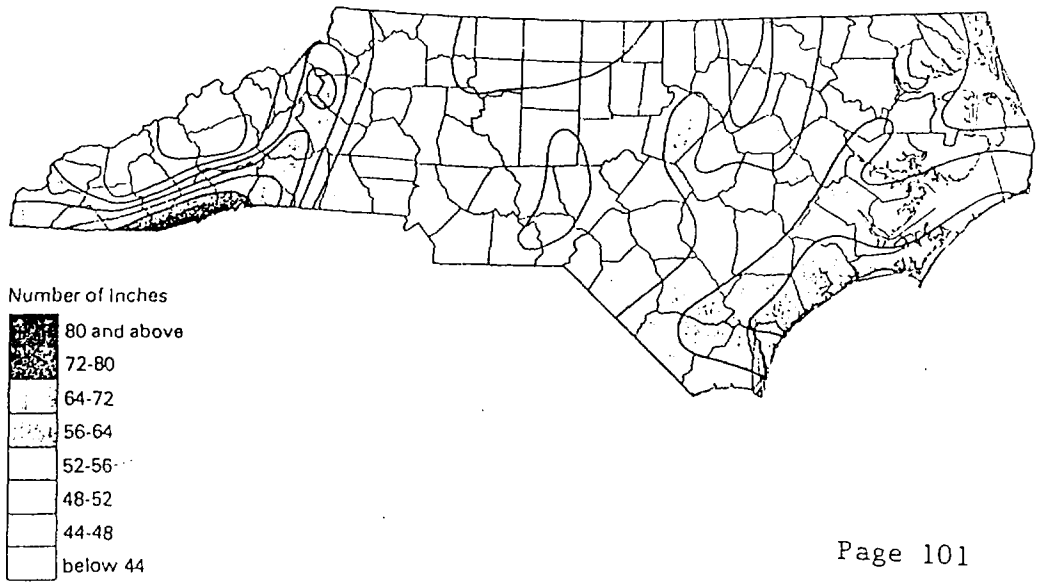
NORTH CAROLINA ATLAS
THE UNIVERSITY OF NC PRESS,
CHAPEL HILL, NC, FIGURE
5.15 PAGE 101 AND FIGURE
5.20 PAGE 103.

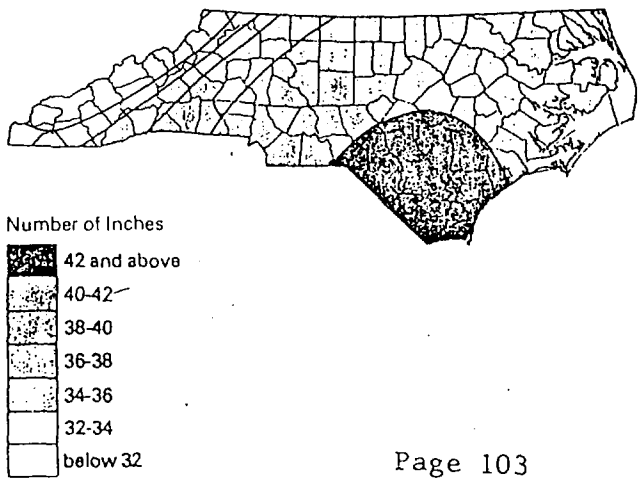
Figure 5.15. Average Annual Precipitation in N.C.



Page 101

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

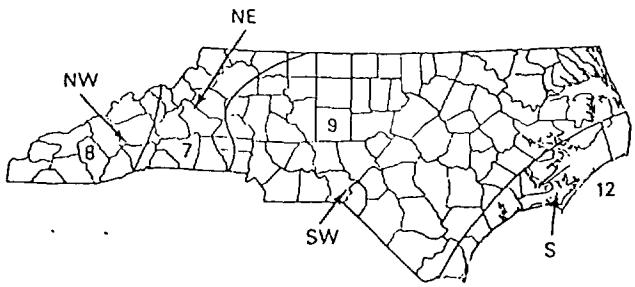
Figure 5.20. Mean Annual Evaporation in N.C.



Page 103

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

Figure 5.21. Prevailing Winds and Mean Annual Wind Speed in N.C.



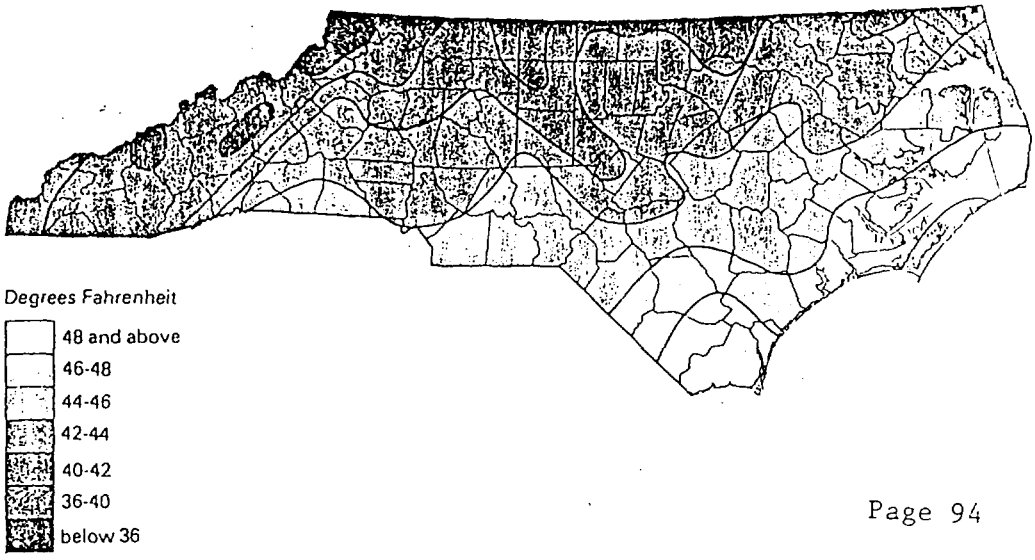
Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

Note: Wind speeds are noted in miles per hour.

Page 104

From: North Carolina Atlas, The University of North Carolina Press, Chapel Hill, N.C.

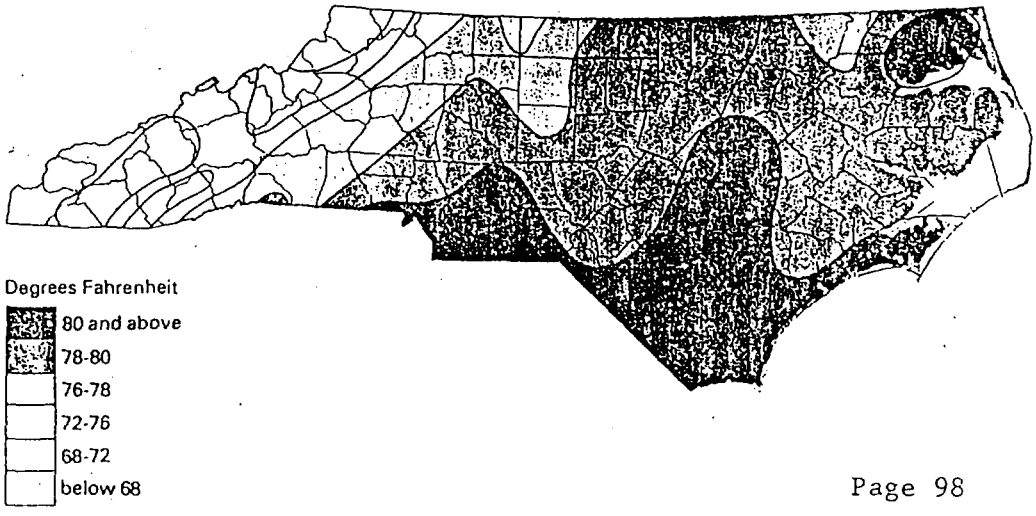
Figure 5.2. Average January Temperatures in N.C.



Page 94

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

Figure 5.9. Average July Temperature in N.C.

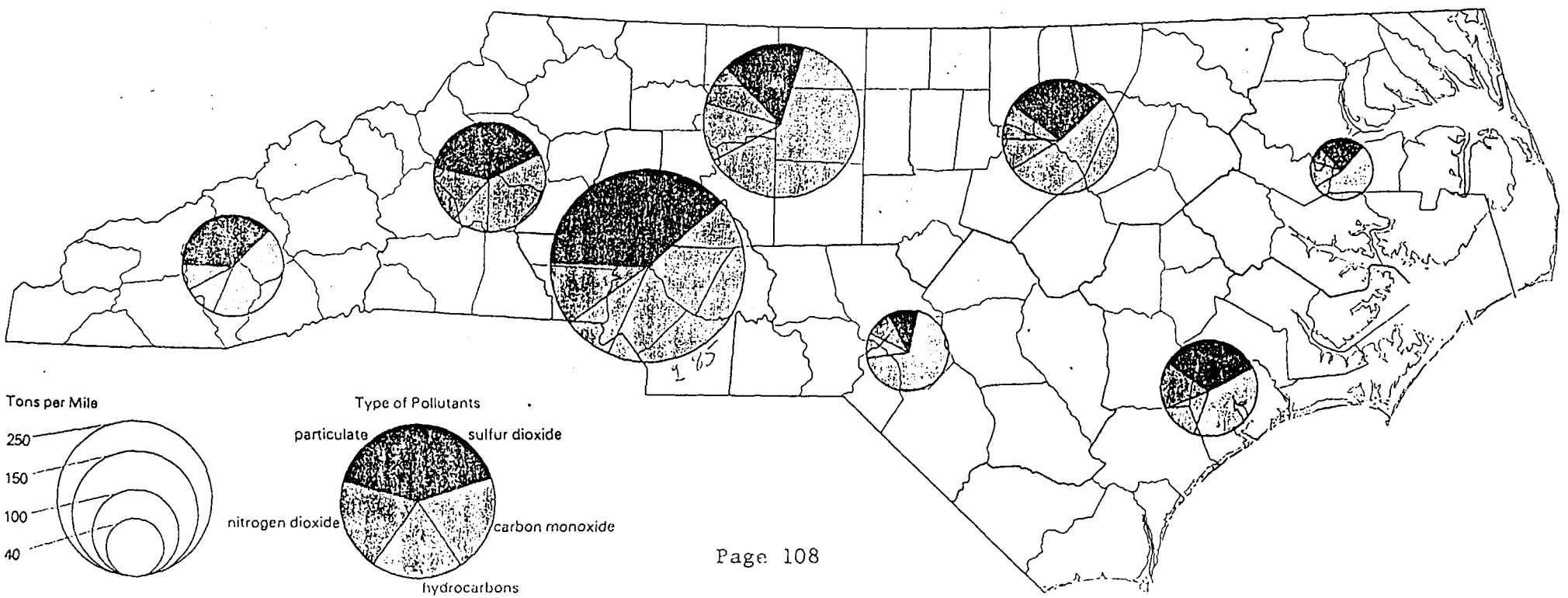


Page 98

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

From: North Carolina Atlas, The University of North Carolina Press, Chapel Hill, N.C.

Figure 5.26. Emissions of Pollutants per Square Mile by N.C. Air Quality Control Regions, 1970



Source: N.C. Department of Natural and Economic Resources, *The North Carolina Plan for Implementing National Air Quality Standards*, 1970.

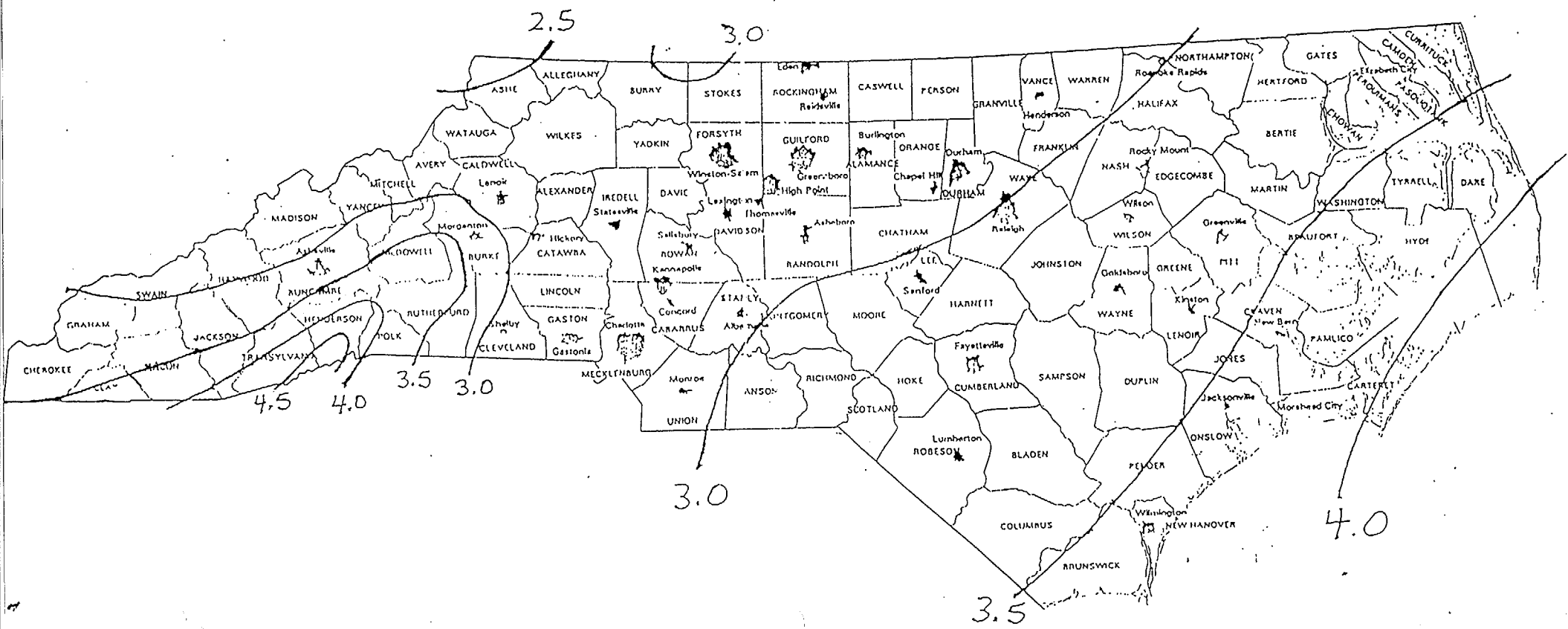
From: North Carolir Atlas, The University of North Carolina Pr Chapel Hill, N.C.

Ref. 2

ONE-YEAR 24-HOUR RAINFALL IN INCHES

SOURCE: RAINFALL FREQUENCY ATLAS OF THE UNITED STATES, TECH. PAPER NO. 40, U.S. DEPT. OF COMMERCE, U.S. GOV'T PRINTING OFFICE, WASHINGTON DC, 1963.

TAKEN FROM: UNCONTROLLED HAZARDOUS WASTE SITE RANKING SYSTEM A USERS MANUAL (HW-10) PAGE 33 FIG. 8



May 18, 1989

TO: Superfund Branch Staff

FROM: Pat DeRosa PD

RE: Critical Habitats of Federally Listed Endangered Species in North Carolina

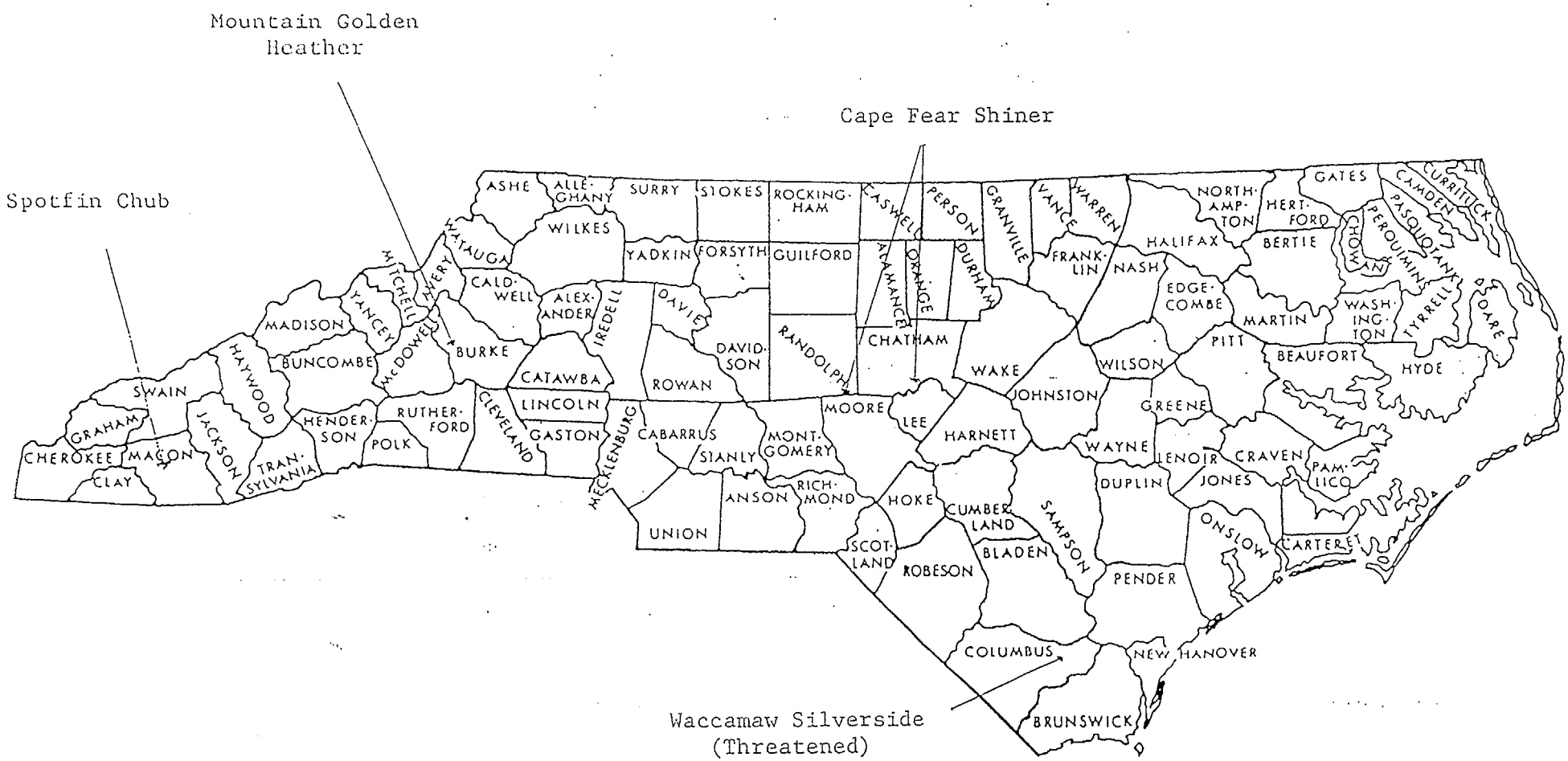
On May 18, 1989, I spoke by telephone with John Fridell, US Fish and Wildlife Service, Asheville, NC (704) 259-0321 to request an update on critical habitats in North Carolina. Mr. Fridell said the Fish and Wildlife Service has been reorganized into a western and eastern office in North Carolina. His office now handles only western North Carolina. He said there have been no changes in the designated critical habitats identified in western North Carolina.

I then spoke by telephone with Debby Mignogno, US Fish and Wildlife Service, Raleigh, NC (919) 856-4520 regarding critical habitats in eastern North Carolina. Ms. Mignogno sent the attached maps of the 2 critical habitats designated in eastern North Carolina. Please note that the Waccamaw Silverside is listed as threatened, not endangered.

PD/pb/critical.hab

CRITICAL HABITATS OF FEDERALLY LISTED

ENDANGERED SPECIES IN NC



1 inch = approx. 53 miles

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MAY 19 1989
6/88
SUPERFUND BRANCH

CAPE FEAR SHINER

Notropis mekistocholas

Order: Cypriniformes

Family: Cyprinidae

Status: Endangered (Federal Register 9/25/87)

Range: The Cape Fear shiner is known from four small populations in the Cape Fear River drainage in Randolph, Moore, Lee, Harnett, and Chatham Counties, North Carolina.

The strongest population 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 have been 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 is located above the Rocky River Hydroelectric Dam. This population was historically the best, but the area yielded only one specimen after extensive surveys by Pottern and Huish (1985). The third population is found in the Deep River system in Randolph and Moore Counties. This population is believed to be small (Pottern and Huish 1985, 1986). In a 1985 survey, 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 fourth population is found in Neal Creek, which flows into the Cape Fear River near Lillington in Harnett County.

Three historic populations have apparently been extirpated: one in Robeson Creek, Chatham County, believed lost when Jordan Lake flooded part of the creek; and one each in Parkers Creek and Kenneth Creek in Harnett County, which disappeared for unknown reasons. Other undiscovered populations or population segments have likely been lost due to reservoir construction in the Deep, Haw, and Cape Fear Rivers.

Chatham and Lee Counties. Approximately 0.5 river mile of Bear Creek, from Chatham County Road 2156 Bridge downstream to the Rocky River, then downstream in the Rocky River (approximately 4.2 river miles) to the Deep River, then downstream in the Deep River (approximately 2.6 river miles) to a point 0.3 river mile below the Moncure, North Carolina, U.S. Geological Survey Gaging Station; and (3) North Carolina. Randolph and Moore Counties. Approximately 1.5 miles of Fork Creek, from a point 0.1 river mile upstream of Randolph County Road 2873 Bridge downstream to the Deep River then downstream approximately 4.1 river miles of the Deep River in Randolph and Moore Counties, North Carolina, to a point 2.5 river miles below Moore County Road 1456 Bridge.

Constituent elements include clean streams with gravel, cobble, and boulder substrates with pools, riffles, shallow runs and slackwater areas with large rock outcrops and side channels and pools with water of good quality with relatively low silt loads.

Feeding Habits: Plant material forms the primary part of the diet.

Reproduction and Development: No information is presently available on breeding behavior, fecundity, or longevity.

Population Level: Total numbers are unknown, but all populations appear to be small. Surveys conducted in 1984 and 1985 yielded 101 individuals from the population located around the junction of the Rocky River and Deep River in Chatham and Lee Counties, 1 specimen from the Rocky River near State Highway Bridge 902 in Chatham County, and 6 specimens from the Deep River system in Randolph and Moore Counties.

Management and Protection: Assuring survival of the Cape Fear shiner will require, at a minimum, maintaining good water quality and the natural conditions of the remaining habitat. Providing for a higher level of security will necessitate determining limiting factors and reestablishing additional populations into suitable waters within the historic range.

References:

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.

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CAPE FEAR SHINER - N. mekistocholas 6/88

Description: The Cape 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 on plant material, and its digestive tract is modified for this diet by having an elongated, convoluted intestine.

Reasons for Current Status: 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; and changes in flow regulation at existing hydroelectric 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.

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 implemented with the survival of the species and the protection of its habitat in mind.

Habitat: 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 midstream, and in flooded side channels and pools (Pottern and Huish 1985).

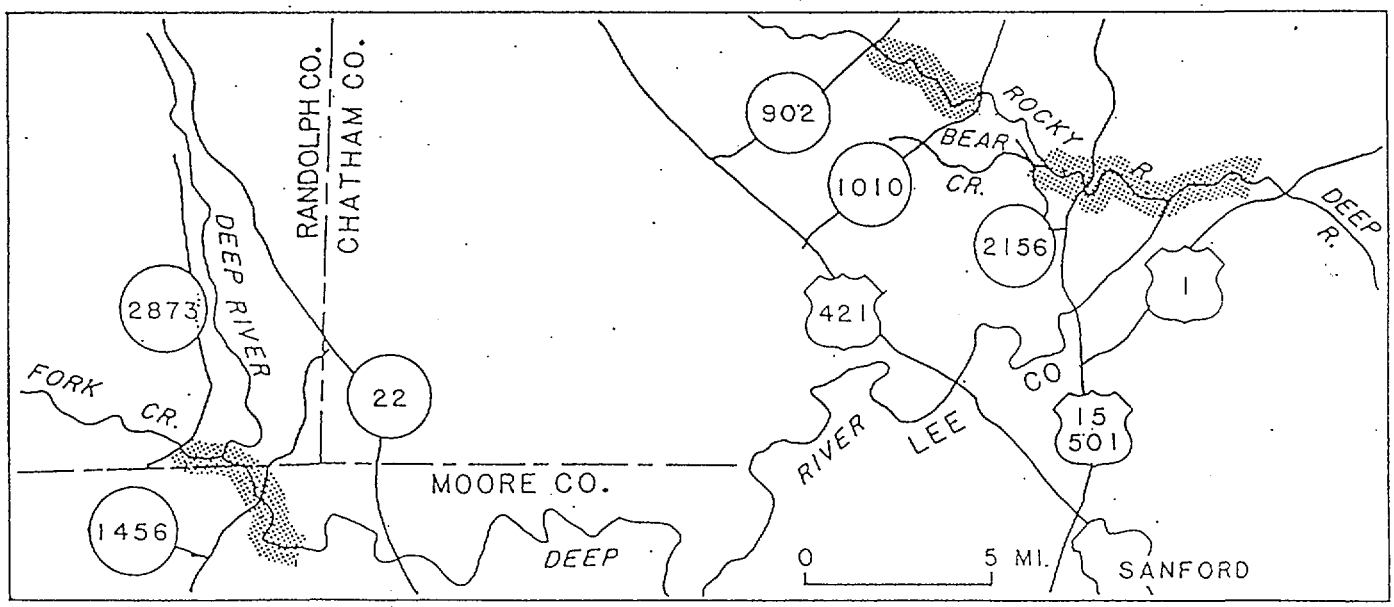
Critical Habitat: (1) North Carolina, Chatham County. Approximately 4.1 miles of the Rocky River from North Carolina State Highway 902 Bridge downstream to Chatham County Road 1010 Bridge; (2) North Carolina,

NORTH CAROLINA - Critical Habitat

Notropis mekistocholas, "Cape Fear shiner"

(1) Chatham County. Approximately 4.1 miles of the Rocky River from North Carolina State Highway 902 Bridge downstream to Chatham County Road 1010 Bridge;
(2) Chatham and Lee Counties. Approximately 0.5 river mile of Bear Creek, from Chatham County Road 2156 Bridge downstream to the Rocky River, then downstream in the Rocky River (approximately 4.2 river miles) to the Deep River, then downstream in the Deep River (approximately 2.6 river miles) to a point 0.3 river mile below the Moncure, North Carolina, U.S. Geological Survey Gaging Station; and
(3) Randolph and Moore Counties. Approximately 1.5 miles of Fork Creek, from a point 0.1 river mile upstream of Randolph County Road 2873 Bridge downstream to the Deep River then downstream approximately 4.1 river miles of the Deep River in Randolph and Moore Counties, North Carolina, to a point 2.5 river miles below Moore County Road 1456 Bridge.

Constituent elements include clean streams with gravel, cobble, and boulder substrates with pools, riffles, shallow runs and slackwater areas with large rock outcrops and side channels and pools with water of good quality with relatively low silt loads.



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7/87

WACCAMAW SILVERSIDE

Menidia extensa

Order: Mugiliformes

Family: Atherinidae

Status: Threatened (Federal Register 4/8/87)

Range: Known only from Lake Waccamaw and the upper Waccamaw River in Columbus County, North Carolina. The silverside is found in the upper Waccamaw River only during periods of high water and is not a permanent resident. Lake Waccamaw (not to be confused with the town of Lake Waccamaw) is the property of the State of North Carolina and is administered by the North Carolina Department of Natural Resources and Community Development's Division of Parks and Recreation.

Description: The Waccamaw silverside, also known as "skipjack" or "glass minnow," is a small (growing to about 2.5 inches), slim, almost transparent fish with a silvery stripe along each side. Its body is laterally compressed, the eyes are large, and the jaw is sharply angled upward.

Reasons for Current Status: The primary threat is the deterioration of water quality in Lake Waccamaw resulting from nutrient buildup. Although specific sources are currently unidentified, runoff and leachate from surrounding development may be contributing to the buildup. Nutrients in the lake increased since 1973, and it now appears that any further increase could tip the scales toward water quality conditions that would threaten the species. The existing data, as interpreted by Casterlin et al. (1986), indicate that phosphate concentrations and loading rates in the lake more than tripled in the years between 1973 and 1981. They further state that "continued high rates of phosphorus input (organic pollution) will likely bring the lake to a hyper-eutrophic state . . . by the end of the century." Water quality could also be affected by habitat alteration from development and other changes in land use, both around the lake and in its watershed (especially Big Creek), if these activities are not planned and implemented with the protection of the Lake Waccamaw ecosystem in mind.

A permit to propagate hybrid bass at several sites in the Lake Waccamaw watershed has been granted by the North Carolina Wildlife Resources Commission. Although the permit stipulates certain precautionary measures, escape of non-native predators from such a project into the system could upset the existing predator-prey relationships in the lake to the detriment of the Waccamaw silverside and other fishes now present in the lake.

A final factor that could threaten the Waccamaw silverside relates to its very short life cycle. The fish spawn when one-year-old and most die shortly thereafter. Failure to spawn in any one year could jeopardize the species. Water quality problems related to nutrient loading, even on a short-term basis, could cause the extinction of this fish.

WACCAMAW SILVERSIDE - M. extensa

Habitat: Lake Waccamaw is a natural lake with an approximate surface area of 8,934 acres and an average depth of 7.5 feet. Although it is fed by acidic swamp streams, the lake has a virtually neutral pH. This neutral condition, unusual among North Carolina's coastal plain lakes, is believed to be caused by the buffering effect of the calcareous Waccamaw Limestone formation, which underlies the lake and is exposed on the north shore. The Waccamaw silverside inhabits open water throughout the lake, where schools are commonly found near the surface over shallow, dark-bottomed areas.

Critical habitat: North Carolina, Columbus County. Lake Waccamaw in its entirety to mean high water level, and Big Creek from its mouth at Lake Waccamaw upstream approximately 0.6 kilometers (0.4 miles) to where the creek is crossed by County Road 1947.

Constituent elements include high quality clear open water, with a neutral pH and clean sand substrate.

Reproduction and Development: Spawning occurs from April through June, but reaches to peak when water temperatures are between 68 and 72F. Fully developed larvae form small isolated schools by early May. No parental care of the young has been noted. The silversides reach sexual maturity by the following spring, spawn, and then shortly thereafter most of the adults die off. A few may survive a second winter.

Population level: Estimated to be in the millions.

Management (Activities, Recommendations, Implications): The taking of silversides for fish bait or for scientific purposes is not considered a threat to the species. These activities may continue in accordance with State regulations. Activities which could affect water and substrate quality by increasing siltation and/or nutrient loading, or by altering temperature or pH, will require monitoring and control as necessary and feasible. Some of the activities that could prove detrimental include indiscriminate logging, land use changes, stream alteration such as channelization or impoundment, bridge and road construction, improper pesticide/herbicide application, and point and nonpoint pollution discharge.

References:

Casterlin, M.E., W.W. Reynolds, D.G. Lindquist, and C.G. Yarbrough. 1986. Algal and Physicochemical Indicators of Eutrophication in a Lake Harboring Endemic Species: Lake Waccamaw, North Carolina. Journal of the Elisha Mitchell Scientific Society 100(3):83-103.

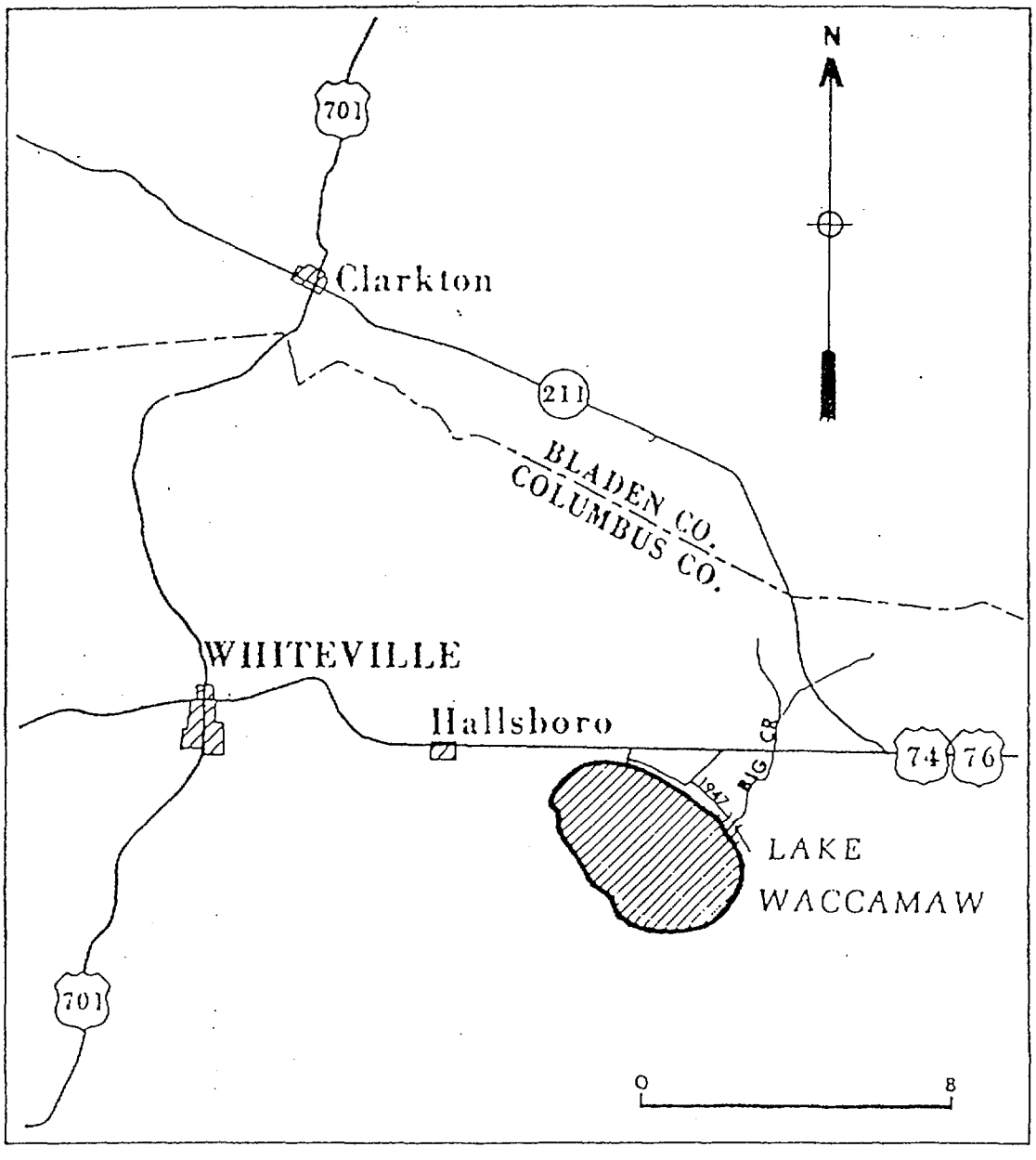
Davis, J.R. and D.E. Louder. 1969. Life History of Menidia extensa. Transactions of the American Fisheries Society 98(3):466-472.

NORTH CAROLINA - Critical Habitat

Menidia extensa, "Waccamaw silverside"

Columbus County. Lake Waccamaw in its entirety to mean high water level, and Big Creek from its mouth at Lake Waccamaw upstream approximately 0.6 kilometer (0.4 mile) to where the creek is crossed by County Road 1947.

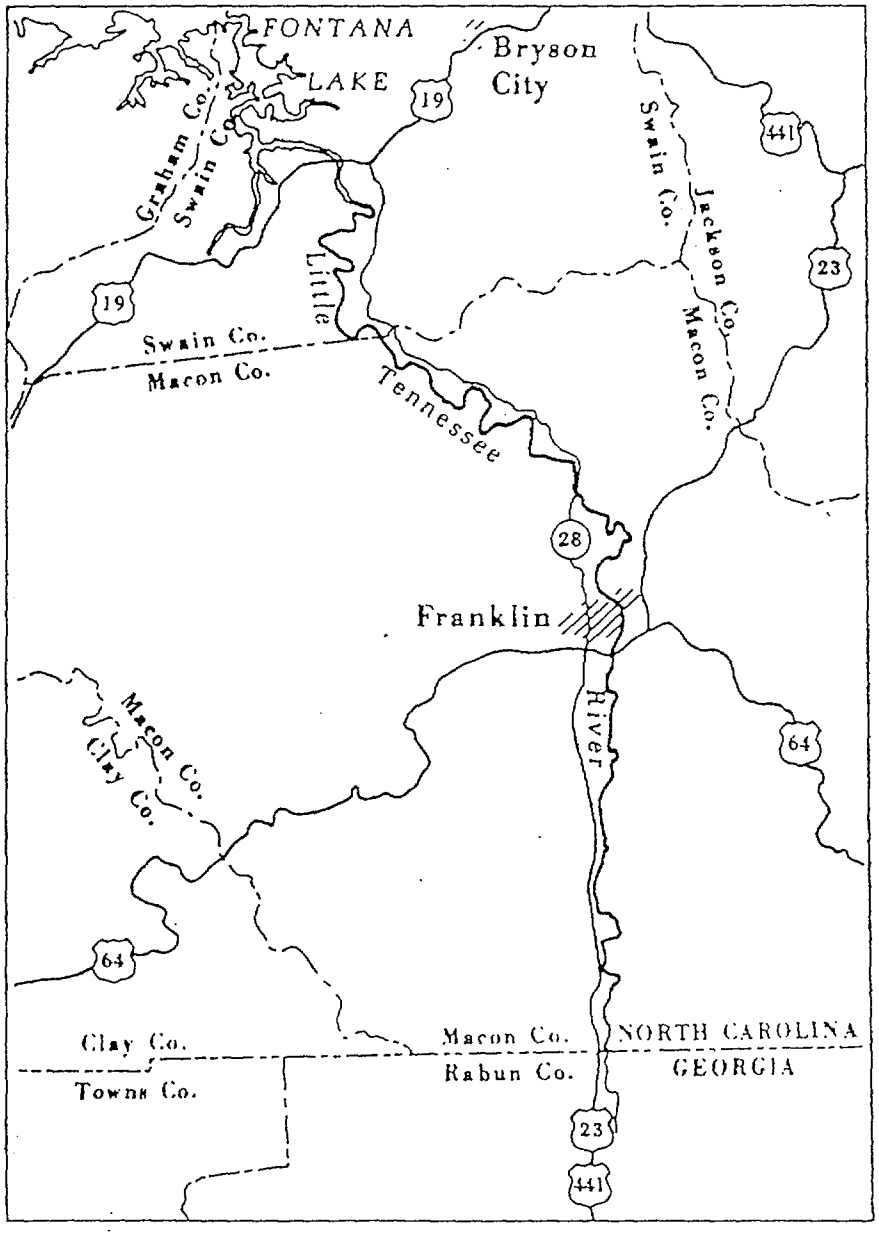
Constituent elements include high quality clear open water, with a neutral pH and clean sand substrate.



NORTH CAROLINA - Critical Habitat

Hybopsis monacha, "spotfin chub"

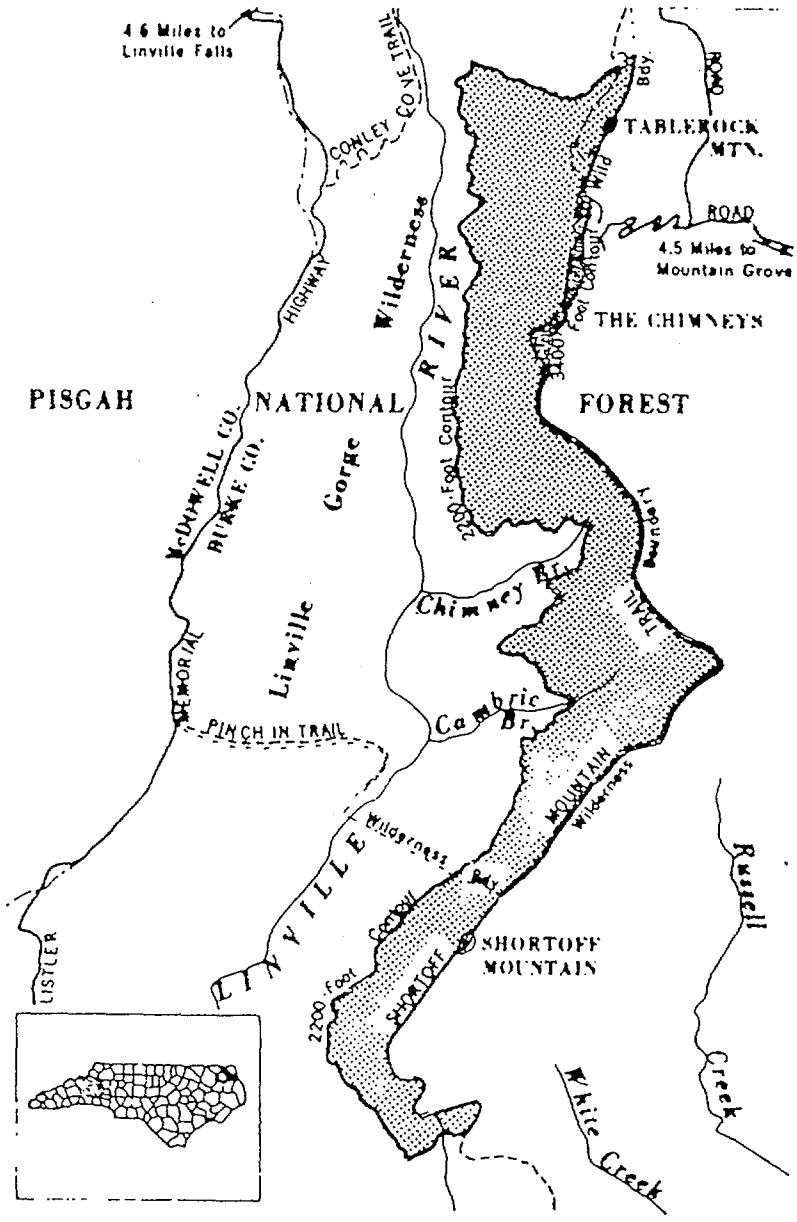
Macon and Swain Counties. Little Tennessee River, main channel from the backwaters of Fontana Lake upstream to the North Carolina-Georgia state line.



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.



Reference No. 4
(see Appendix A)

USGS 7-1/2' Topographic Quadrangles: Browns Summit, N.C., 1951 (photorevised 1968); Greensboro, N.C., 1951 (photorevised 1968); Mcleansville, N.C., 1952 (photorevised 1968); Lake Brandt, N.C., 1951 (photorevised 1968).

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

16 September 1985

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

SUBJECT: Final Preliminary Assessment Report
Cone Mills Corp./Print Works Plant NCD 980559157
Fairview Street
Greensboro, NC

Dear Ms. Bland:

Enclosed please find the Preliminary Assessment report for the subject site. This priority is based on our review of available data, and, sometimes, on conversations and correspondence with the site owner and operator. We have concluded that:

Cone Mills Corp./Print Works Plant is located on Fairview Street in Greensboro, NC. The plant was used to manufacture and finish cotton and cotton/synthetic blend fabrics. Operations began at least as far back as 1936 and continued until the plant closed in 1977. Cone Mills still owns the site and it is reportedly used for storage.

In 1981, the company manager of water and air resources filed a CERCLA 103 (C) notification indicating that textile waste had been buried on site. However, the specific constituents of the waste were not reported. There is also some indication that the waste may have been removed. Although written requests have been made, no additional information has been made available by the company regarding disposal of waste on this site.

Due to the nature of manufacturing at the site, a variety of organics and metals may be present in the buried waste. Contamination of soil, groundwater and surface water is possible. Additional information is needed to determine whether hazardous materials were indeed buried at the site and whether these materials threaten public health or the environment. A medium priority is therefore recommended for inspection of this site.

On 13 September 1985, this Preliminary Assessment was reviewed by CERCLA Unit personnel and by Faye Sweat from the North Carolina Department of Natural Resources and Community Development, Division of Environmental Management.

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

Sincerely,

Pat DeRosa
Waste Management Specialist
Solid and Hazardous Waste Management Branch
Environmental Health Section

PD/tb/0175b

EPA

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

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D980559157

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Cone Mills Corp./Print Works Plant	1800 Fairview Street

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Greensboro	NC	27405	Guilford	41	6

09 COORDINATES LATITUDE	LONGITUDE
~~36 06 05~~	~~079 46 18~~

10 DIRECTIONS TO SITE (Starting from nearest public road)

Take US 70 West to Wendover Ave. in Greensboro. Continue west on Wendover and turn right on Summit Ave. going north. Take a left on 16th Street (west) to Fairview St. Turn left on Fairview (south). Site just beyond RR tracks on left.

III. RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)
Cone Mills Corporation	1201 Maple Street

03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER
Greensboro	NC	27405	( )

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

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

13 TYPE OF OWNERSHIP (Check one)

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

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

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

☐ A. RCRA 3001 DATE RECEIVED: ___/___/___ (MONTH DAY YEAR) ☒ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: 06 09 81 (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION

☐ YES DATE ___/___/___ (MONTH DAY YEAR)
☒ NO

BY (Check all that apply)

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

CONTRACTOR NAME(S): _____

02 SITE STATUS (Check one)

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

03 YEARS OF OPERATION

1936 (?) (BEGINNING YEAR) | 1977 (ENDING YEAR) plant closed ☒ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED

Notified for on-site burial of unknown textile wastes. Plant was closed in 1977 but is still owned by Cone Mills. Plant was used to manufacture and finish cotton and cotton/synthetic blends. Materials buried on site were reportedly removed at a later

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

date. No information on the volume, or type of waste buried, nor the dates and methods of burial and removal. Waste may include organic dyes and heavy metals. Potential for contamination of soil, groundwater and surface water.

V. PRIORITY ASSESSMENT

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

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

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NUMBER
T.A. Allspaugh	Cone Mills	(919) 379-6579

04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
Pat DeRosa	NC DHR/DHS	SHW Mgmt. Br.	(919) 733-2178	09 11 85 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D980559157

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			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			Potential contaminants of buried
IOC	INORGANIC CHEMICALS			waste may include organic dye
ACD	ACIDS			waste and heavy metals.
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

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. CERCLA Files, NC Solid & Haz. Waste Management Branch, Raleigh, NC.
2. Central files, NC Division of Environmental Management, Dept. of Natural Resources and Community Development, Raleigh, NC.

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D980559157

II. HAZARDOUS CONDITIONS AND INCIDENTS

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

Unknown.

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

Unknown.

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

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

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

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

Unknown.

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

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

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

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

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)*

DATE: September 10, 1985

TO: File

FROM: Pat DeRosa

SUBJECT: Cone Mills Corporation/Print Works Plant
NCD 980559157

A review of the NPDES permit application filed with NC Dept. of NRCD by Cone Mills provided the following information:

Print Works Plant:	outfall 002
Date Discharge Began:	1936
Process:	Manufacture and finishing of cotton and cotton/synthetic blends generally falling under SIC 2211,2261,2262.

PD/tb/0175b

Date: January 25, 1982

County: Guilford

Notifier's name and address: (b) (6) [redacted]

(b) (6) [redacted]

Contact's name: (b) (6) [redacted]

Site name and address: Cone Mills Corp./Print Works Plant

1800 Fairview St., Greensboro, N. C. 27405

Site location: 1800 Fairview St., Greensboro, N. C. 27405

Type of waste: Not known

What process generated the waste? Production of Textiles

Volume of waste: Not Known

Method of storage or disposal: buried on site

Dates of waste activity: Not known

Site history:

T. A. Alspaugh notified of waste disposal activity that occurred on property owned by Cone Mills Corp./Print Works Plant in Greensboro. He said waste was buried on site and later removed. More detailed information was not made available by the contact person.

NCD 000776914 ?

GEN, TSD

CHECK

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

Cone Mills Corp./Print Works
Plant - NCD 980559157
Greensboro - Guilford Cnty. 5/16/90
- 0900 - sunny cool
- met by Arthur Toompas
Manager, Water and Air Resources
- plant closed in 1977 - printing & finishing operations - started at turn of the century - early 1930's
- receives grey fabric - prepared for dyeing - by desizing, scour bleach - scour w/ soap at high ph, bleach w/ peroxide & silica
- then dyeing
- mostly printing operations - applied dye w/ rollers
- finishing - applied finish - permat press, water resistant etc
- then sanforized - removes shrinkage before cutting

- the design of the plant was such that it could not be modernized was shut down in 1977.
the plant was not sold and was converted to warehouse
- John Summer - Plant Engineer for the facility joined the group
- usual Cone waste treatment pit offsite 500-600 feet
- "dye waste disposal" facility built in 1960
- NUS ~~went~~ investigated Water Oak in 1988 - report dated May 2, 1989
- waste may have been disposed of to the city - possibly to the creek - city uses North Buffalo sewage plant - this is downstream of this plant

Ref. 8

- denim fabric is warehoused this is finished fabric held for customer - no process chemicals
- Plant 9 - this is the name for the facility by Cone Mills/Print Work

- the team then go left to tour the facility

- the inside of the facility contained shelving for denim and rooms for cotton bales

- pumped to holding tank - pumped through filter (for lint) then gravity drained to wwtreatment facility
- pipe was underground to stream then exposed over stream then underground to plant

- exposed pipe was removed
- present wwtreatment discharged to stream the NPDES permit # 0000876
- no UST's onsite
- no monitoring wells
- old tank farm w/ concrete bases for 5 tanks is on the eastern side
- entire perimeter was toured
- the team then proceeded to sample the sanitary sewer path way - sediment samples only

- upgradient sediment sample taken 50 m upstream of bridge across from facility - new discharge pt CMC-SD 1
- sample taken from 2 to 3 ft. from side of bank near sand bar at 10 46

- midpoint of facility frontage on creek was sampled near RR trestle - upgradient of this
- was sampled at 11:12
  labeled CMC-SD2

- team sampled downstream of facility - above wwtreatment outflow
  labeled CMC-SD3
- sampled at 11:35
- facility refused to split samples
- exited site at 1200

Cone

Arthur J. Toompas
Manager, Water and Air Resources

CONE MILLS CORPORATION
1201 Maple Street
Greensboro, N.C. 27405

Phone
(919) 379-6226

State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

June 1, 1990

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

Subject: Screening Site Investigation Start
Cone Mills Corp./Print Works Plant
NCD980559157
Greensboro, Guilford County, North Carolina

Dear Ms. Cain:

Cone Mills Corp./Print Works Plant (CMC/PWP) is located in the city of Greensboro, Guilford County, North Carolina. The county code is 41 and this is in the Sixth Congressional District. The coordinates are 36° 06′ 05" and 79° 46′18".

CMC/PWP is located in an urban area with other industrial facilities and residential areas located adjacent to or near the facility. The Print Works Plant is now referred to as Plant 9 and is immediately adjacent to North Buffalo Creek. The site is surrounded by a fence.

CMC/PWP was constructed in the 1930's and was used as a textile printing and finishing operation. The facility is and has been wholly owned and operated by Cone Mill Corp. Fabric was manufactured at another Cone Mill facility, and was shipped to CMC/PWP as unfinished gray fabric. The fabric was prepared for dyeing, printed or dyed, and then finished at the CMC/PWP facility. The preparation process consisted of desizing, scouring, and bleaching. The scouring was done with soap at a high pH and the bleaching was done with peroxide and silica. The printing process was done by applying dye with rollers. Some dyeing of solid colors was also done at the facility. The finishing was done by applying a finishing agent such as permanent press or a water resistant finish. CMC/PWP was closed in 1977 and converted into a warehouse for fabric manufactured at another Cone Mill facility.

Prior to 1960, waste disposal practices at CMC/PWP are unclear. Cone Mills Corp. filed a CERCLA 103 (c) notification in 1981 indicating that unknown wastes from the production of textiles were buried onsite and that these wastes were later removed. According to company management, this listing was filed due to uncertainty of past waste management practices, not due to documented onsite waste disposal. CMC/PWP was closed in 1977 and has never had status under RCRA.

During the site investigation visit, the company management reported that waste water was disposed of in the city sewer system. Reportedly, no sludge or other waste from waste water treatment was disposed of onsite. The city of Greensboro has a waste water treatment facility located downstream of CMC/PWP, the North Buffalo Treatment Plant, and this plant would have treated the waste water from Cone Mills. In 1960, Cone Mills Corp. constructed a dye waste disposal facility roughly 500 to 600 feet from the site. This waste water treatment facility was used by a number of Cone Mill facilities in the immediate area, including the Print Works Plant. The waste water from CMC/PWP was filtered for lint and piped to the dye waste disposal facility through an underground pipe.

On May 16, 1990, the team of John McConney and Jack Butler, both of the NC Superfund Section, conducted a site investigation of the subject site. The team was met by Arthur J. Toompas, Manager, Water and Air Resources, and John Summers, Plant Engineer for Plant 9. Terry Cole, of the Guilford County Department of Public Health, accompanied the team during the site investigation. Background information on the site and a site map were provided to the team. Mr. Toompas reported that EPA had investigated a nearby Cone Mill facility, the White Oak Plant, in 1988; the report on this investigation was dated May 2, 1989. During this EPA investigation, North Buffalo Creek had been sampled. The area sampled was well downstream of CMC/PWP and this earlier sampling was not applicable for the CMC/PWP investigation.

Following the site briefing, the team and the company representatives conducted a pre-sampling reconnaissance of the site. The site is bounded by a fence, monitored by closed circuit cameras, and a security guard was present. The team toured parts of the interior of the facility and verified the reported information that the site is being used only for the warehousing of raw material and finished products. No evidence of the storage of process chemicals was seen in the toured areas.

The waste water treatment system was then examined. This system used pumps to move the waste stream to a holding tank and then through a filter to remove lint. The waste stream was then moved by gravity to the dye waste disposal facility that was located offsite. The pipe to the dye waste disposal facility was underground; however, the portion that passed over North Buffalo Creek was exposed.

The company management reported that there had never been any underground storage tanks on site. In addition, no monitoring wells were on site. There was a concrete pad and tank supports remaining of an above ground tank farm that had contained five tanks; these tanks had been removed when the facility was closed. There was no evidence of stressed vegetation in the area immediately around the tank farm. During the reconnaissance, the grounds and the entire perimeter of the site were toured. There was no evidence of underground burial of waste on site.

Following the reconnaissance, the team proceeded to conduct sampling of the surface water pathway, North Buffalo Creek. A background sediment sample was taken from roughly 150 feet upstream of the Fairview Rd. bridge that crosses the creek. A second sediment sample was taken from the creek along the frontage of the facility. This was slightly upstream from a railroad trestle crossing the Creek near the northern end of the facility. A third sediment sample was taken from downstream of the facility, but upstream of the discharge point of the present waste water treatment system. This sampling point was slightly upstream of a pipe from the present waste water treatment that crosses the creek well downstream of the facility. These sampling points are marked on a site map included with this letter. The company management declined to split samples.

The investigation team adhered to the safety procedures in the site safety plan. All samples were obtained during the site investigation visit in accordance with standard sampling methodology and were delivered to the NC Laboratory of Public Health for organic and inorganic analysis.

Sincerely,

John P. McConney
Environmental Chemist
NC Superfund Section

Enclosure
JM/cone.svl

Ref. 10

NORTH CAROLINA
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

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Geology and Ground Water

IN THE

Greensboro Area, North Carolina

BY

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Rising above the general upland surface formed by the peneplane remnants are a number of monadnocks. A small monadnock range in central and western Stokes County is the highest of these. This range includes Sauratown Mountain, Moores Knob, Hanging Rock, Cooks Wall, and several lower peaks. This group is capped by beds of highly resistant quartzite. Pilot Mountain, to the southwest in Surry County, belongs to this group. The altitude of Moores Knob is 2,572 feet and that of Pilot Mountain is 2,415 feet. A number of other peaks rise well above 2,000 feet, 1,000 feet or more above the general upland surface.

Although the entire area is included in the Piedmont upland section, the Triassic rocks have been eroded more easily than the other rocks so that a partial lowland has developed on them. Along the southeastern edge of the Triassic belt this lowland is separated from the upland by a very prominent scarp, the surface of the Triassic being 200 to 300 feet lower than the surface of the crystalline rocks to the southeast. Northwestward the Triassic gradually rises 300 to 400 feet and the surface on the Triassic merges into the surface on the crystalline gneisses and schists without any pronounced break in the topography.

The relation of the physiography and topography to the geology of the Triassic basin is shown in the generalized cross-section of figure 2.

GEOLOGY

INTRODUCTION

Most of the time in the field was spent in obtaining hydrologic data, but some attention was also given to the geology. Before completion of the field work it became apparent that existing geologic maps were entirely inadequate for use in arriving at any conclusions regarding the quantity and quality of water available from the different rock units. Therefore, 5 additional weeks were spent in making a reconnaissance of the geology of the area; and the reconnaissance data, together with the notes made during the collection of the data on the wells, were used in making a geologic map of the area. Considering the large size of the area and the short time spent in mapping, it is readily apparent that the geology was necessarily greatly generalized and that the map can be considered only a reconnaissance map. The rock units chosen are rather broad and often include several kinds of rock. For example, the Triassic includes sandstone, arkose, conglomerate, shale, and mudstone. The Triassic could easily have been divided into three or four formations if time had permitted and the mapping had been done on large-scale base maps. Similarly, the gneiss and schist unit includes several types of gneisses and schists which probably could be separated into individual formations. The units chosen for the mapping were the broadest possible that would include rocks of similar ages, petrology, and water-bearing properties.

Because of the complexity of the geology, the time available did not permit the complete separation of even these broad units, so that some areas shown as one rock unit on the map may actually include some mall areas of rocks belonging to another unit. Furthermore, the small scale of the map does not permit the owing of very small areas.

AREAL DISTRIBUTION AND CHARACTER OF THE ROCKS

neiss.—This unit includes several types of interbedded gneisses and schists, most of which appear to edimentary origin. Most of these rocks are identical with rocks in other sections of the State which pped by Arthur Keith as Carolina gneiss[1], although small areas of hornblende schist and gneiss are with this unit in the Greensboro area that are similar to Keith's Roan gneiss. The unit forms a trending northeast-southwest. It underlies nearly one-half of the Greensboro area, occupying rsyth, Rockingham, and Caswell Counties and occurring in large areas in Stokes and Guilford

ost abundant rock is quartz-mica-feldspar gneiss with the proportion of quartz differing greatly to place. The feldspar usually is predominantly plagioclase although nearly always some potash also present. At a few places the potash feldspar, either orthoclase or microcline, or both, predomi- some places the proportion of quartz increases greatly so that the rock is actually a quartzite gneiss. has a medium to coarse texture and is usually light gray in color. However, at many places a larger rtion of biotite gives the rock a darker color. In some areas the gneiss is very fine-textured and finely

, Arthur, U. S. Geol. Survey Geol. Atlas, Cranberry folio, (no. 90), 1903; also Asheville folio (no. 116), 1904; Mount Mitchell folio (no. 124), 1905; dio (no. 135), 1906; Pisgah folio (no. 147), 1907; and Gaffney-Kings Mountain folio (no. 222), 1931.

SUMMARY OF ROCK UNITS AND THEIR WATER-BEARING PROPERTIES

The following table lists the rock units shown on the map, plate 1, and gives a brief geologic and hydrologic description of them.

ROCK UNITS IN THE GREENSBORO AREA

Unit	*Description*	*Water-bearing Properties*
Triassic (Newark group)	Consolidated sedimentary rocks consisting of arkose, arkosic sandstone, sandy shale, shale, mudstone, and conglomerate. Mostly red, brown, and yellow in color. Lenticular in many places.	Water occurs in fractures, joints, and along bedding planes. Entirely adequate supplies for domestic use nearly everywhere. Moderate to moderately large supplies for municipal and industrial use at many places, but yields decrease with continuous pumping. Average yield of 5[illegible] wells is 17 gallons a minute. Water at many places is moderately hard to hard.
Porphyritic granite	Commonly gray, very coarse porphyritic granite, generally massive, but gneissic at places owing to only partial assimilation of intruded gneisses and schists. At a few places medium-textured, equigranular.	Water occurs in joints and fractures. Adequate supplies for domestic use obtained at most places. Limited quantities for industrial and municipal supplies at most places, larger supplies at a few places. Average yield of 47 wells is 8 gallons a minute.
Diorite	Usually fine- to medium-grained, gray to dark greenish gray; consists chiefly of plagioclase and hornblende. Massive at many places but schistose or gneissic at a few places.	Water occurs in joints and fractures. About 30 percent of wells yield supplies inadequate or only partially adequate for domestic use. Supplies are inadequate for municipal and industrial use at many places. Average yield of 26 wells is 6 gallons a minute. Water generally moderately hard to hard, low in iron.
Sheared granite	Light pink to gray, mostly coarse-grained biotite granite. Greatly sheared, at places schistose or gneissic. Cut by innumerable green mafic schistose or slaty dikes which resemble the greenstone schist.	Water occurs in fractures and joints. Adequate yields for domestic supplies at most places. Moderate to moderately large supplies for municipal and industrial users at some places, but inadequate supplies at a number of places. Average yield of 116 wells is 14 gallons a minute. Water moderately hard at many places, soft at other places; usually low in iron content.
Slate	Chiefly gneissic, schistose, or slaty tuffs consisting of mineral grains and fragments in a fine-grained matrix of volcanic ash and some land waste. Usually tough, hard, light-colored. Include some clay slates.	Water occurs in joints, fractures, slaty cleavages, and in quartz veins. Adequate yields for domestic use nearly everywhere. Moderate yields for municipal and industrial use at most places. Average yield of [illegible] wells is 16 gallons a minute. Water generally soft to moderately hard but at a few places is hard or very hard.
Sericite schist	Chiefly sericite, quartz-sericite, and chlorite-sericite schist. Usually fine-grained and finely foliated. Schistosity strikes northeast, dip is vertical. Very deeply weathered.	Water occurs in joints, fractures, and planes of schistosity. Yields are adequate for domestic supplies at most places and moderate supplies can be obtained for municipal and industrial use at most places. Average yield of 14 wells is 10.5 gallons a minute. Water usually soft, in some places contains objectionable amounts of iron.
Greenstone schist	Green, slightly to highly schistose mafic rocks chiefly of volcanic origin. Consist of lava flows, tuffs, breccias, and some intrusives. Usually greatly sheared and fractured. Quartz veins at many places.	Water occurs in joints, fractures, along planes of schistosity, and in fractured quartz veins. Yields adequate domestic supplies nearly everywhere and moderate to moderately large supplies for municipalities and industries. Average yield of 135 wells is 28 gallons a minute, the highest of all units. Water generally moderately soft and in some places contains objectionable iron.
Quartzite and schist	Fine- to medium-grained quartzite, gneissic appearance at places because of muscovite contained; also mica schist, quartz-mica schist, quartz-chlorite-mica schist, moderately coarse and greatly crenulated.	Water occurs in fractures, joints, along bedding planes and planes of schistosity. Yields small supplies of water at most places. Average yield of 27 wells is 5 gallons [illegible] minute. Water usually soft and low in iron.
Gneiss	Quartz-mica-feldspar gneiss, quartz-mica schist, hornblende plagioclase gneiss, hornblende schist, and marble. Mostly of sedimentary origin. Bedding usually distinct, striking northeast. Dip generally moderate.	Water occurs in joints, fractures, bedding planes, a[illegible] planes of schistosity. Yields adequate domestic supp[illegible] practically everywhere. Moderate to moderately la[illegible] supplies for municipal and industrial use at most pl[illegible] Average yield of 350 wells in area is 11.5 gallons a [illegible]ute. Water ranges from soft to extremely hard. [illegible] content usually low.

laminated. This phase usually is light-colored and consists chiefly of muscovite and plagioclase. Where muscovite is prominent, the rock has some of the characteristics of a schist. Where it contains considerable amounts of potash feldspar, the gneiss has a pinkish cast. Banding is generally prominent caused either by differences in color due to the different proportions of the minerals, or by variation in texture.

A second important rock type included in this unit is quartz-mica schist. Biotite and muscovite usually occur in nearly equal amounts. Quartz generally is subordinate to the mica, although at a few places it is the chief mineral. Plagioclase is a characteristic accessory and by increase in amount of this mineral the schist grades into feldspar gneiss. In places garnet is an important accessory, the grains usually ranging in size from about 1 to 5 millimeters. The schist is usually rather coarse with irregular, wavy schistosity. The color is commonly bronze to brown, the darker colored varieties having a higher proportion of biotite. Other, lighter-colored phases consist chiefly of muscovite and quartz.

Other types of gneisses and schists mapped with this unit include hornblende-plagioclase gneiss, hornblende schist, quartzite and, at a few places, marble.

Most of the gneisses are distinctly banded, and the different types alternate in layers that at many places appear to be beds of sedimentary origin. Dips and strikes of the bedding planes were recorded at many

Plate 5—Interbedded gneiss and schist in northwestern Forsyth County, three quarters of a mile east of Yadkin River on State Highway 67. Strike about N. 50° E., dip 24° SE.

ces and have been plotted on the map. Only dips and strikes were recorded that appeared to be repre- tive of a considerable area, usually where the same dip and strike persisted for at least several hun- feet. The small folds, both synclinal and anticlinal, many of which were observed, were not recorded. f the larger folds are shown by the plotting of the dip and strike arrows. Several relationships are d by the dip and strike arrows. First, the strike is quite uniformly to the northeast. Second, the ly, if ever, vertical and dips of less than 45 degrees are commoner than dips of more than 45 de- d, the dip southeast of the quartzite and schist unit, is uniformly to the southeast with relatively s. In a small area in northwestern Rockingham County, the dip appears to be uniformly to Northwest of the quartzite and schist unit, in northwestern Stokes County, the dip appar-

ently is reversed and is generally to the northwest. The structure of the gneiss and schist unit apparently is that of an anticlinorium whose axis extends from southwestern Stokes County to northeastern Rockingham County. The general dips of the limbs of this structure are interrupted by many minor folds.

The southeastern limb of the anticlinorium is generally about 20 miles wide. Assuming an average dip of 30 degrees, a conservative figure, the total thickness of the strata would be 10 miles, a figure which appears to be much too large. It seems probable that normal strike faults have caused a repetition of the strata. One such fault, along the northwestern side of the Triassic, has a throw of more than 7,000 feet. Similar faults are also suggested by the parallelism of some of the streams and by the apparent repetition of strata, features which are particularly noticeable in Forsyth County, northwest of Bethania.

Most of the gneisses and schists of this unit appear to have been derived from sedimentary rocks, mostly sandy clays or arkoses, with some beds of clean sand and some of clay. In many places the bedding is distinct and the large proportion of quartz rules out any possibility of an igneous origin, either intrusive or extrusive. The hornblende-feldspar gneisses and the hornblende schists may originally have been igneous rock. Some may have been ferromagnesian intrusives and probably others were lava flows. The rocks of this unit appear to be identical with the Carolina gneiss in other sections of North Carolina, which according to Keith[1] is mainly of sedimentary origin. The age of these rocks is indefinite. They apparently are older than Cambrian because in western North Carolina they are overlain by rocks of Cambrian age[2].

Quartzite and schist.—The rocks of this unit crop out in a belt extending northeast across southwestern and central Stokes County, forming Sauratown Mountain, Moores Knob, Hanging Rock, Cooks Wall, and other large and small mountains of that area. The rocks are chiefly quartzite and quartz-muscovite or quartz-chlorite-muscovite schist. The quartzite is usually fine- to medium-grained, light-colored, and usually contains some silvery-white muscovite. At some places it also has a small amount of green chlorite, and at places brownish-green or green biotite. The mica and chlorite are usually fine-grained and at most places enough of the micaceous minerals are contained in the rock to give it a gneiss appearance. With larger amounts of mica the gneissic appearance is quite prominent. At some places magnetite and plagioclase are present as accessory minerals.

The schist is most commonly a moderately coarse muscovite schist with considerable quartz. At some places the quartz predominates. In many places the schist contains brown to greenish colored biotite, and at some places green chlorite. Where biotite and chlorite are absent the schist is silvery gray, but where these minerals are present the schist usually has a greenish tinge. At some places the schist is slightly graphitic and at many places it contains considerable garnet. The schist is greatly crenulated and corrugated, especially at the base of the mountains.

Other types of rocks found include quartz-mica-feldspar gneiss. It seems that every gradation between a pure quartzite and a feldspar (mostly plagioclase) gneiss can be found. It is not known whether these rocks grade from one to another in the same bed or whether different beds are represented. An interesting rock found at a few places in the Sauratown Mountain group is flexible sandstone, a fine-grained sandstone consisting of fine interlocking quartz grains and mica flakes.

The mountains are capped by massive white to light-gray quartzite beds, with a few relatively thin layers of greenish-colored mica, quartz schist, and quartz-mica schist, forming a nearly vertical wall at many places several hundred feet high. The slopes below the caps at most places are covered with debris, but the underlying rock apparently is alternating quartzite and schist layers, the schist becoming predominant near the base.

The dips in the quartzites are usually lower than in the gneisses of the first unit, usually being 15 to 20 degrees. In general the strike is northeast, but considerable variation was noted.

The great crenulation and corrugation of the schist at the base of the mountains suggests that most of the stress which produced the deformation of the rocks was absorbed by the schists beneath the more competent quartzites. The quartzite, as it were, rode up on the more plastic schist.

In the short time available only a generalized idea of the structure could be obtained. However, the structures of a few of the mountains were observed. Sauratown Mountain proper, between Gap and Pinnacle, is a hogback ridge. The south end of the ridge trends nearly due north, the quartzite dipping to the

[1] Keith, Arthur, U. S. Geol. Survey Geol. Atlas, Gaffney-Kings Mountain folio (no. 222), p. 3, 1931.
[2] Keith, Arthur, U. S. Geol. Survey Geol. Atlas, Asheville folio (no. 146), p. 4, 1904.

west, and the northeast end of the ridge trends about N. 25° E., the quartzite dipping to the northwest. The trend of this, the main part of Sauratown Mountain, is not parallel to the strike of the quartzite because the quartzite cliff becomes lower to the northeast along the ridge. The mountains between Gap and Danbury appear to be formed by the upturned edges of the quartzite which has been folded into an eastward-plunging syncline. Moores Knob and Ruben Mountain form the northwestern limb and Huckleberry Mountain, Cook's Wall, and Cole Gap Mountain form the southeastern limb. The quartzite forming Hanging Rock dips to the north and appears to be the southern limb of another eastward-plunging syncline or the same syncline faulted up.

The quartzites and schists of this unit originated as sedimentary sands and clays, presumably deposited in marine water. The rocks appear to be similar to those mapped as Cambrian in the Gaffney-Kings Mountain area[1]. These rocks in that area and in the Greensboro area are shown on the geologic map of the

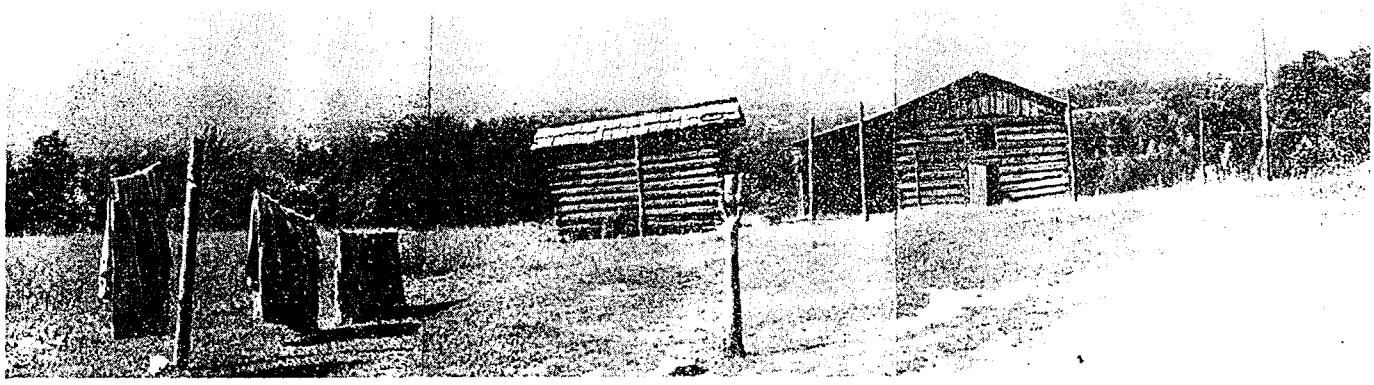


Plate 6—Sauratown Mountain from the south. These mountains are capped by massively bedded quartzite which is very resistant to erosion. The dips are low, generally 10° to 15°.

United States[2] as Wissakickon schist and are regarded as Pre-Cambrian. No information was obtained re-arding their age in the Greensboro area. It is believed that they are younger than the gneiss unit.

Greenstone schist.—The greenstone schist crops out in a very irregular belt extending across the south-ern half of Guilford County, the northwestern half of Alamance County, and the south-central part of ell County. The greenstone schist does not crop out continuously across this belt but occurs in elong-reas and irregular patches separated by areas of granite.

e greenstone schist includes an assemblage of rocks that were mapped together because it is difficult, npossible, to separate them in the field; because they are thought to be of the same age and to have rigins; and because they have certain marked resemblances. All are some shade of green, are highly schistose, and are mafic rocks of igneous origin. The typical greenstone schist is a very d light to medium olive-green hornblende-plagioclase schist, generally containing some chlorite. nde is green, decidedly pleochroic, and has an extinction angle of 18° to 20°. The plagioclase ples was also green, apparently from partial alteration to epidote. The plagioclase generally nction angle and is probably oligoclase and sodic andesine. The chlorite is green and fibrous have formed by alteration of the hornblende. This rock probably was originally an andesitic exposures the greenstone schist is coarser, is less schistose, and has a darker color. In these ar is relatively unaltered and little chlorite has developed, possibly because the more massive dered the circulation of the hydrothermal solutions. The hornblende is green, but because chlorite and because the feldspar is not altered to epidote the rock has a dark greenish-The grain is usually sufficiently coarse that close examination discloses the interlocking

[1] ed. Survey Geol. Atlas, Gaffney-Kings Mountain folio (no. 222), 1931.
[2] ologic map of the United States, 1932.

grains of white plagioclase and greenish-black hornblende. This rock quite possibly is an altered diorite. At a few places the greenstone schist is apparently a very much altered ferromagnesian tuff or breccia. In the bed of Haw River, near Swepsonville, some of the greenstone is fine-grained and slightly gneissic. On the south side of the river a very coarse greenish-colored rock is exposed that consists chiefly of hornblende and plagioclase. In some layers the plagioclase appears to have been completely altered to epidote. This rock overlies the rock exposed in the river and apparently is flat-lying. Both rocks may have been lava flows, but the relatively coarse grain of the higher one suggests that it was a sill.

At a number of other places the greenstone has a gneissic appearance, particularly in the coarser phases.

The schistosity strikes northeast, parallel to the general regional strike, and is nearly everywhere vertical. Where the rocks are gneissic, the banding is usually greatly contorted. The present attitude of the original flows, beds and other individual members is obscure, and no attempt was made to decipher the structure.

The greenstone schists probably all originated as ferromagnesian igneous rocks, most of them probably as lava flows. Their age is uncertain.

Sericite schist.—This unit extends northeastward from a point near Guilford College through the southeastern corner of Rockingham County and halfway across Caswell County, to a point a few miles south of Yanceyville. It forms a belt from 1 to 4 miles wide northwest of and for almost the entire distance in contact with the greenstone schist.

The sericite schist is generally so deeply weathered that only rarely can fresh, unaltered material be obtained, and even then one cannot be certain that the fresh rock is the same as the rock from which the weathered material was derived. The schist is usually fine-grained, with fine, smooth planes of schistosity. Generally the only recognizable minerals are sericite, quartz, chlorite, and limonite. The sericite occurs in small silvery-white scales. Some specimens of the schist consist almost entirely of sericite and have a silvery-white color; others contain much iron oxide that has evidently been derived from a mineral such as biotite, chlorite, or hornblende. At other places the rock is a quartz-sericite schist or a quartz-biotite schist. In the latter rock quartz generally predominates. Near Cherry Grove, in Caswell County, unweathered rock from a dug well was a fine-grained, finely foliated green quartz-sericite-chlorite schist. The weathered material at the surface was the usual deeply weathered red clayey soil with sericite flakes. It is possible that this specimen represents most of the rock in the unit.

The sericite schist lies along the northwestern edge of the greenstone schist and appears to be in contact with it for nearly the entire distance. At several places near the contact, exposures were noted in which greenstone schist and sericite schist alternated as though interbedded. It may be that the sericite schist was formed as a sedimentary product of land waste deposited at intervals of quiescence between the periods of volcanism that produced the greenstone schists. The main body of chlorite-sericite schist would thus have been deposited during a long period of quiescence; most of the greenstone schist being formed when volcanism was active. According to this hypothesis the rocks near the contact were formed during a transition period, when short intervals of volcanic activity alternated with short periods of quiescence.

The two rock units were evidently formed in the same period, but it is not known whether the period began with the deposition of the sediments from which the sericite schist was derived and ended with the volcanism that produced the rocks from which the greenstone schists were derived, or vice versa.

Slates.—Included in this unit are rocks of sedimentary and igneous origin that have been metamorphose into slates, and phyllites or low rank schist.

The largest area of slate covers approximately the southeastern third of Alamance County. A narro very irregular belt of slate extends from Climax in Guilford County, northeastward nearly to Burlingto and a small area crops out just south of High Point.

Probably the commonest rocks of this unit are gneissic, schistose and slaty tuffs. These usually tough, hard grayish-white to bluish-gray rocks consisting of mineral fragments or grains in a fine-gra matrix of volcanic ash. At places the tuff contains both feldspar and quartz fragments and grains. At c aces the tuff consist largely of quartz grains and pebbles with just enough ash to fill the space bet the grains. At some places the rock is dense and fine-grained and was derived entirely from volcanic

This phase resembles chert. All these rocks are tough and hard when unweathered but in some places upon weathering they disintegrate into their component minerals. Thus a weathered tuff containing quartz grains and pebbles resembles a friable silty sandstone.

Most of the tuff has a slaty or schistose cleavage; in many exposures the cleavage is prominent, but at some places it may be obscure or entirely absent. At many exposures of the coarser phases the tuff has a gneissic appearance caused by crude banding of the coarse feldspar or quartz grains and fragments. Clay slate, a very fine-grained buff-colored rock with smooth cleavage planes, occurs in Guilford County south of Big Alamance Creek and at a few other places.

The cleavage planes of the slates usually are vertical and strike northeast. At only a few places can the bedding be observed. These rocks were formed mostly by the commingling of volcanic ash and other ejecta with some land waste. Some of the beds are believed to have been deposited in water but many may have been deposited directly on the land. The clay slates probably were formed by the deposition of clay and silt in bodies of water.

The age of the slates has usually been considered to be pre-Cambrian. There is little or no direct evidence either supporting or disproving this correlation. Probably the arguments most commonly advanced for a pre-Cambrian age are the degree of metamorphism and the absence of any fossils. The argument based on degree of metamorphism appears to be very weak because at many places in the United States rocks much younger than pre-Cambrian have undergone as much or more metamorphism than these slates. Detailed studies of the slates have been made in only a few places. The most important of these, made by Laney[1], Pogue[2], and Stuckey[3], all state that no evidence was found regarding the age but place the slates in the pre-Cambrian because that has been the accepted age.

Sheared granite.—This unit is very distinctive and can generally be readily distinguished in the field. It is a sheared, in many places schistose or gneissic, biotite granite cut by innumerable greenish-colored mafic dikes which have been metamorphosed to a slate or schist. The dikes have a close resemblance to the greenstone schists, and in general appear in much greater numbers near the southeastern margin of the granite belt, near the contacts with the greenstone schists.

The granite crops out in an irregular and interrupted belt across southeastern Guilford County, most of Alamance County, and the southeastern corner of Caswell County. In this belt it is very closely associated with the greenstone schist and, in southeastern Alamance County, with the tuffaceous slates.

The granite is most commonly a light-pink coarse-grained rock consisting chiefly of orthoclase, plagioclase, biotite, and quartz. At a few places the granite is light gray and medium-grained, the feldspar being chiefly plagioclase. Nearly everywhere the granite has been greatly sheared, with the development of a schistose or gneissic structure. The biotite occurs in large smears which wrap around the surfaces of the feldspar and quartz crystals.

Microscopic examination of a thin-section cut from a specimen obtained 5 miles east of High Point indicated that the granite has undergone a considerable amount of metamorphism. Orthoclase occurred in a few large-zoned crystals, with some microcline which showed strain shadow. The feldspar is chiefly albite which showed both albite and pericline twinning. The crystals are large and many of them are curved as much as 5°. Some form an S-curve. Quartz occurs only in very small grains, as though granulated or mylotinized, and occurs in stringers threading between the feldspar crystals. Nearly all the quartz grains show prominent strain shadows. There is considerable green, very pleochroic hornblende which occurs in large curved crystals. There are also a few scattered augite crystals. Biotite is quite plentiful and threads in between the other minerals, curving around their margins. The small amount of chlorite is similar to the biotite in its occurrence.

Probably more than 90 percent of the dikes, which cut the granite in such great numbers, are of one general type. They are generally several inches to several feet wide, a few being up to about 25 feet in width. Some of them can be traced for hundreds of feet. The dikes occur nearly everywhere in the granite in great numbers. Rarely does an outcrop of 200 or 300 feet of granite fail to expose at least one dike, and at many places 10 or 12 dikes cut the granite in an outcrop of that size. The dikes appear to be more num-

[1] Laney, F. B., The Gold Hill mining district of North Carolina: North Carolina Geol. and Econ. Survey Bull. 21, p. 74, 1910.
[2] Pogue, J. E., Jr., Cid mining district of Davidson County: North Carolina Geol. and Economic Survey Bull. 22, p. 95, 1910.
[3] Stuckey, J. L., The pyrophyllite deposits of North Carolina: North Carolina Dept. Cons. and Devel. Bull. 37, p. 25, 1928.

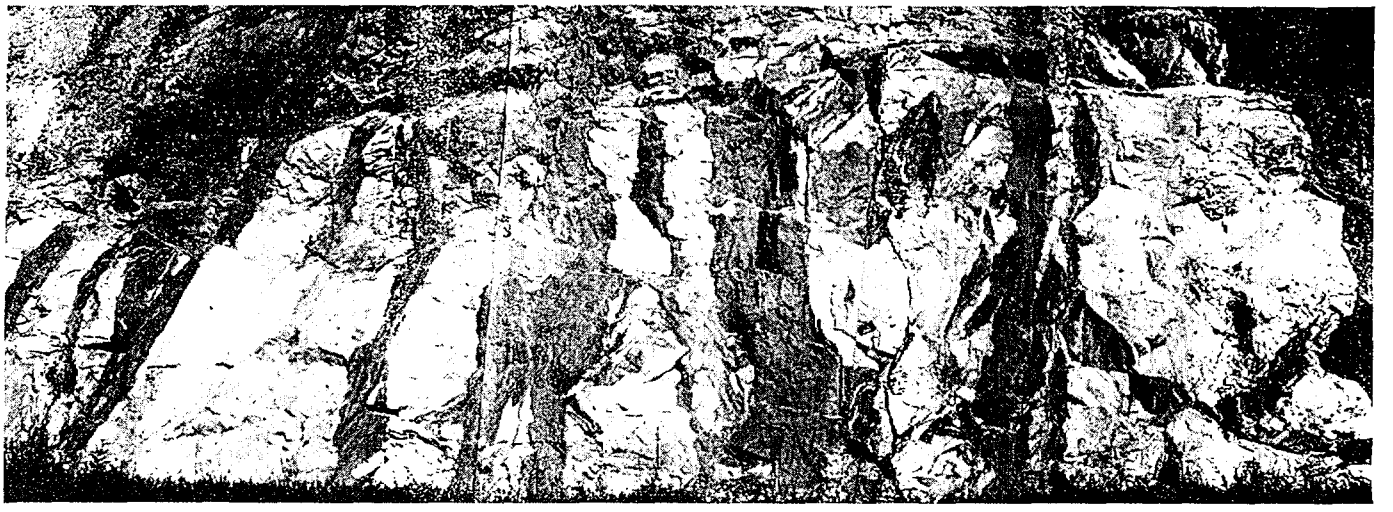
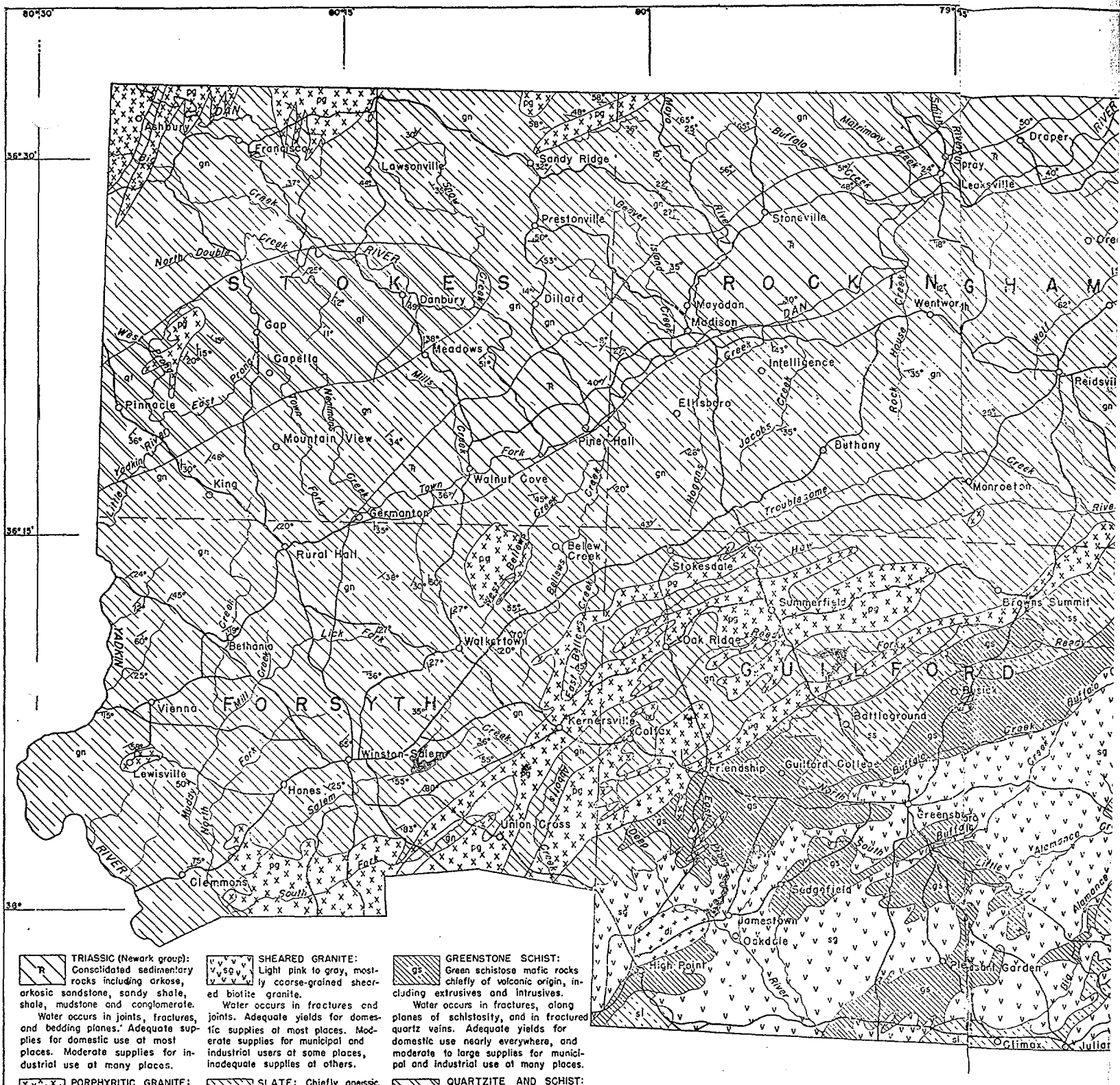


Plate 7—Sheared granite with inclusions of gneiss, both cut by mafic dikes. Metamorphism has produced a gneissic structure in the granite and has altered the dikes to schist.

Plate 8—Close-up of sheared granite.

erous and more closely spaced along the margins of the granite, where it is in contact with the greenstone schist. In fact, in some exposures near the margin of the granite the dikes occupy more area than the granite into which they are intruded.

The typical dike is a very fine-grained greenish-colored schist. Brownish-colored dikes are noted at a few places and, except for the color, they are similar to the green dikes. Microscopic study shows that the rock consists chiefly of chlorite, biotite, plagioclase, and augite. Present in minor amounts are muscovite, apatite, and garnet. The chlorite occurs as a matrix of felted shards from which the biotite and augite developed. Both the biotite and augite occur in idimorphic crystals ranging in size from the smallest that can



TRIASSIC (Newark group): Consolidated sedimentary rocks including arkose, arkosic sandstone, sandy shale, shale, mudstone and conglomerate.

Water occurs in joints, fractures, and bedding planes. Adequate supplies for domestic use at most places. Moderate supplies for industrial use at many places.

PORPHYRITIC GRANITE: Chiefly coarse gray porphyritic granite. Generally massive, occasionally gneissic.

Water occurs in joints and fractures. Adequate supplies for domestic use at most places. Supplies for municipal and industrial use limited at most places.

DIORITE: Fine- to medium-grained, gray rock consisting chiefly of hornblende and plagioclase.

Water occurs in joints and fractures. About 30 percent of wells yield supplies inadequate or only partially adequate for domestic use. Supplies are inadequate for industrial use at many places.

SHEARED GRANITE: Light pink to gray, mostly coarse-grained sheared biotite granite.

Water occurs in fractures and joints. Adequate yields for domestic supplies at most places. Moderate supplies for municipal and industrial users at some places, inadequate supplies at others.

SLATE: Chiefly gneissic, schistose, or slaty tuffs, some clay slate and slaty lava flows.

Water occurs in fractures, cleavages, and in quartz veins. Adequate yields for domestic use and moderate yields for industrial and municipal use at most places.

SERICITE SCHIST: Chiefly sericite, quartz-sericite, and chlorite-sericite schist. Fine grained and finely foliated.

Water occurs in fractures, joints and planes of schistosity. Adequate yields for domestic use, moderate yields for municipal and industrial use at most places.

GREENSTONE SCHIST: Green schistose mafic rocks chiefly of volcanic origin, including extrusives and intrusives.

Water occurs in fractures, along planes of schistosity, and in fractured quartz veins. Adequate yields for domestic use nearly everywhere, and moderate to large supplies for municipal and industrial use at many places.

QUARTZITE AND SCHIST: Fine- to medium-grained quartzite, also some mica and quartz-mica schist.

Water occurs in fractures, joints, and along bedding planes and planes of schistosity. Yields small supplies of water at most places.

GNEISS: Chiefly quartz-mica-feldspar gneiss and quartz-mica schist of sedimentary origin.

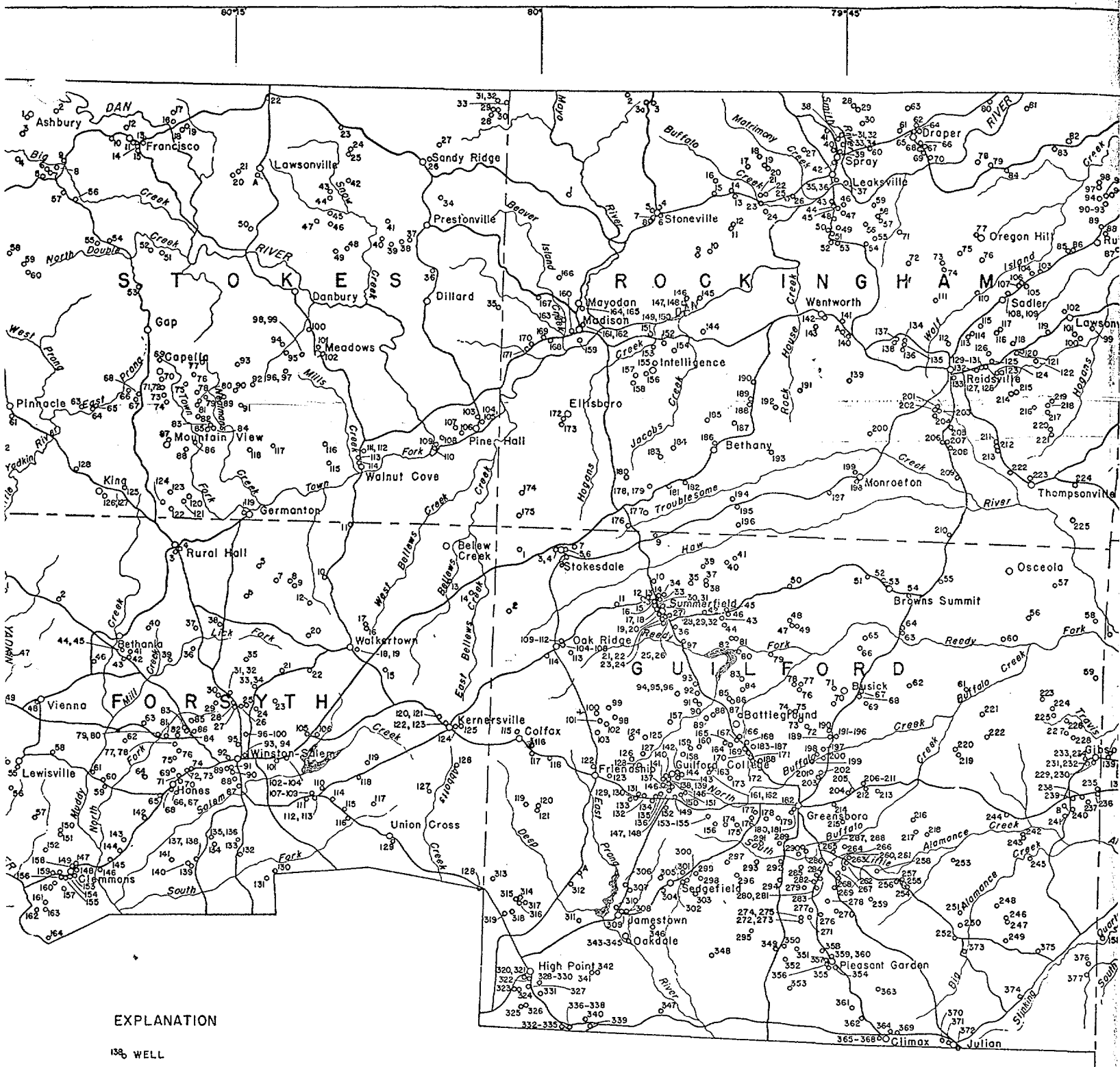
Water occurs in joints, fractures, bedding planes, and planes of schistosity. Adequate domestic supplies nearly everywhere. Moderate supplies for municipal and industrial use at most places.

GEOLOGIC MAP of the GREENSBORO AREA, NORTH CAROLINA

SCALE

0 5 10 15

Base compiled from County maps of the State Highway Department



MAP OF THE

GREENSBORO AREA, NORTH CAROLINA

showing

LOCATION OF WELLS AND SPRINGS LISTED IN THE REPORT

Base compiled from County maps of the State Highway Department

ANALYSES OF GROUND WATER FROM FORSYTH COUNTY, NORTH CAROLINA

(Analysts: E. W. Lohr and M. S. Berry, U. S. Geological Survey. Numbers at heads of columns correspond to numbers in table of well data)

(parts per million)

	2	3	93	124	164
Silica (SiO_2)	31	28	22	31	29
Iron (Fe)	.02	.02	.03	.03	.03
Calcium (Ca)	5.7	22	64	23	6.7
Magnesium (Mg)	3.1	8.0	24	7.4	3.0
Sodium and Potassium (Na+K)	14	7.2	67	7.0	1.3
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	63	112	46	92	30
Sulfate (SO_4)	3.2	9.1	10	17	3.7
Chloride (Cl)	1.2	1.5	225	5	1.2
Fluoride (F)			.0	.5	
Nitrate (NO_3)	.0	.0	47	2.0	2.2
Dissolved solids	89	130	603	143	71
Total hardness as $CaCO_3$	27	88	258	88	29
Date of collection	May 21, 1943	May 20, 1943	Oct. 16, 1942	Oct. 15, 1942	May 19, 1943
Depth, feet	130	350	714	308	110
Chief aquifer	Gneiss	Gneiss	Gneiss	Granite	Granite

GUILFORD COUNTY

(Area, 651 square miles; population, 153,916)

Geography, physiography, and drainage.—Guilford County, in the south-central part of the Greensboro area, is the largest of the six counties and has the largest population. It has four incorporated cities and towns and about 14 unincorporated towns and villages. Greensboro, located in the center of the county, is the largest city and county seat. High Point, the only other city, is in the extreme southwestern corner of the county. Greensboro is an important center of textile manufacturing and High Point also has a number of textile factories, although it is better known as a center of furniture manufacturing. There are a few factories in the smaller towns and villages, but the remainder of the county is dominantly agricultural. Guilford County has a good system of paved roads and railroads, most of which radiate from Greensboro.

Guilford County is in the Piedmont physiographic province. Its surface is formed by the uplifted and partially dissected peneplane of that province. The land surface near the larger streams is gently rolling, with a relief of 100 to 150 feet. The interstream areas are broad and generally quite flat. No large trunk streams flow through or near Guilford County and therefore there are no deep valleys. Because the base-level is higher, dissection has generally been less extensive than in other counties of the Greensboro area. Guilford County is underlain by rocks of several different types. Because some of these differ considerably in resistance to erosion, both the topography and the drainage pattern are greatly influenced by the geology. However, topographic maps have not been made of any part of the county, and the geology is complex and at many places obscure, so that the exact relation of the topography and drainage to the geology cannot always be ascertained. The outstanding feature is the northeastward trend of the ridges and streams. Apparently some of the streams flow along or near the contact between different kinds of rocks, whereas others flow in weaker rocks, the more resistant rocks forming interstream divides. The major exception to the northeastward trend of the streams is Deep River, which flows southeastward chiefly across diorite and granite, which are uniformly resistant.

Practically all of Guilford County is drained by the two main branches of the Cape Fear River system, Haw River and Deep River. About 75 percent of the county is drained by Haw River and its tributaries, the most important of which are Reedy Fork, Buffalo Creek, and Alamance Creek. Practically all of the remaining 25 percent is drained by Deep River, only a few square miles of the southwest corner of the county draining southward into Yadkin River.

Geology.—The geology of Guilford County apparently is more complex than that of any other county of the Greensboro area. Seven of the nine geologic units crop out in Guilford County and the areal distribution of most of them is quite irregular.

The gneiss unit crops out in several irregular belts extending northeastward across the northwestern corner of the county. These belts are separated by areas of porphyritic granite, which was intruded into the gneiss. The principal rocks of the gneiss unit are banded quartz-mica-feldspar gneiss and quartz-mica schist. They are chiefly of sedimentary origin, and although the rocks have been greatly changed by metamorphism at many places the bedding planes can still be distinguished. The granite has intimately intruded the gneiss so that the boundaries between the two units necessarily are greatly generalized.

The greenstone schist crops out in large, irregularly shaped areas in the southeastern two-thirds of the county. These areas are separated by areas of sheared granite. The greenstone schist consists of a green fine- to medium-grained basic schistose rocks, chiefly of volcanic origin. At most places the rock is highly schistose but at a few places it is coarser and fairly massive.

The sericite schist crops out in a belt extending northeastward across the county from a point near Guilford College. It is closely associated with the greenstone schist and may be a metamorphosed tuff or possibly a metamorphosed clay. The rock is greatly weathered, and usually the only recognizable minerals are quartz, sericite and iron oxide, the latter apparently an oxidation product of chlorite and hornblende.

The slate unit is limited to a narrow, highly irregular belt extending across the southeastern corner of the county and to a small patch in the south edge of High Point. The rocks are mostly tuffaceous slates but include some clay slates.

The sheared granite is exposed over about 50 percent of the southeastern half of the county, where it forms a fairly continuous area interrupted by large patches of greenstone and slate. The granite is generally a moderately coarse pink schistose and gneissic rock consisting chiefly of quartz, biotite, and feldspar. The granite has been considerably metamorphosed and intensely sheared. The outstanding feature of the granite is the schistose and slaty dikes, which are green in color and greatly resemble the greenstone schists.

Diorite crops out at a number of places but was mapped separately at only two places. The outcrops otherwise are too small or not well enough exposed to map separately. Places where diorite crops out but is not shown on the map include the vicinity of Sedgefield, Pleasant Garden, along State highway 62 between Climax and High Point, and an area about 6 miles north of High Point. The diorite is a medium- to coarse-grained, dark-gray to greenish-gray rock consisting chiefly of plagioclase and hornblende. It generally is massive but at a few places is somewhat schistose.

The porphyritic granite outcrops in irregular, elongated patches across the northwestern corner of the county, where it is closely associated with the gneiss. In places the gneiss has been completely assimilated by the granite but in other places the gneiss has only been impregnated by emenations from the granitic magma. Because the granite has so intimately intruded the gneiss and because every gradation between true granite and true gneiss can be found, the map is necessarily greatly generalized.

The porphyritic granite is generally coarse-grained and medium gray, with large phenocrysts of feldspar. The ground mass consists of quartz, biotite, and feldspar. At most places the granite is entirely massive, but at some places the granite has some of the schistosity of the gneiss.

Ground water.—Nearly all domestic water supplies, many industrial supplies, and one of the three municipal water supplies are obtained from wells.

Dug wells are extensively used for domestic supplies in rural districts. Generally they are from about 15 to 50 feet deep and 2½ to 4 feet in diameter. Wells can generally be dug deep enough in gneiss and schist that they will not go dry even during a drought. However, at some places in granite, diorite, greenstone schist, and slate, the rock is so close to the surface that dug wells frequently go dry.

Bored wells are used considerably in suburban areas and are cheaply and easily constructed. They are bored by power-driven earth augers and cannot go below the completely weathered zone. For this reason, they are not always successful in rocks such as granite and diorite, where the water table at times declines below the weathered zone. Most bored wells are cased, and where they are properly constructed and of sufficient depth that they will not go dry, they are a satisfactory source of supply. Dug and bored wells

obtain their water from the weathered rock material at and just below the water table. For this reason, extra precautions must be observed to prevent contamination.

There are a large number of drilled wells in Guilford County. Records of more than 350 drilled wells are given in the tables of well data. Many of these were core-drilled with chilled shot and are 2 or 3 inches in diameter. There are many other core-drilled wells in Guilford County which do not appear in the table. Core-drilled wells have the advantages of all drilled wells and are cheaper than the larger percussion-drilled wells. However, although they are satisfactory for domestic wells, their small size makes them unsatisfactory for most industrial plants. About 7 or 8 gallons a minute is the maximum rate at which water can be removed from a 2-inch well by a deep-well pump. The average yield of 157 wells 2 inches in diameter in Guilford County is 6 gallons a minute and the average yield of 20 wells 3 inches in diameter is 10½ gallons a minute. These quantities are near the maximum amount that can be pumped from wells of that diameter and suggest that many of the wells would yield more than can be withdrawn from the well.

Most industrial, and public-supply wells are drilled with a percussion drill and are from 4 to 8 inches in diameter. The 6-inch well is by far the commonest. The larger-diameter wells encounter more fractures and cracks than small-diameter wells. Also, because a larger pump can be used, more water can be pumped from a large-diameter well than from a small-diameter well.

Drilled wells, both core-drilled and churn-drilled, have certain advantages over dug or bored wells. Because they are generally tightly cased and the water is obtained from crevices in the rock, they are much less liable to contamination. The depth of water in the well is generally large in comparison with the fluctuation of the water level, so that the yield decreases only slightly during a drought.

A summary of data on drilled wells 3 inches or more in diameter is given below:

TABLE 16—SUMMARY OF DATA ON WELLS IN GUILFORD COUNTY
(Drilled wells 3 inches or more in diameter)

ACCORDING TO ROCK TYPE

Type of Rock	Number of Wells	Average Depth (feet)	Yield (gallons a minute)			Percent of wells yielding less than 1 gallon a minute
			Range	Average	Per foot of Well	
Gneiss	20	123	1—50	15.6	0.126	5.0
Greenstone schist	67	163	1—200	36.5	.223	3.0
Sericite schist	8	116	5—20	11.1	.105	0
Slate	4	273	5—15	10.5	.039	0
Sheared granite	54	175	0—70	14.4	.093	13.0
Porphyritic granite	26	137	[illegible]—30	10.9	.079	3.8
All wells	179	158	0—200	22.0	.139	6.1

ACCORDING TO TOPOGRAPHIC LOCATION

Topographic Location	Number of Wells	Average Depth (feet)	Yield (gallons a minute)			Percent of wells yielding less than 1 gallon a minute
			Range	Average	Per foot of Well	
Hill	41	203	0—100	15.5	0.076	24.4
Flat	44	170	0—200	22.2	.131	2.3
Slope	55	130	2—120	21.8	.168	0
Draw	16	125	[illegible]—75	22.8	.182	0
Valley	22	158	10—100	34.4	.218	0

According to this table, wells in greenstone schist have by far the greatest average yield and average yield per foot of well. Wells in the gneiss unit rank second both in average yield and average yield per foot of well. Wells in sheared granite rank third in average yield but are fourth in average yield per foot of well, being exceeded in that respect by wells in sericite schist. Wells in the porphyritic granite rank fifth in both respects and wells in slate are sixth and lowest. However, data on only four wells in slate are included, one of which was very deep and had a low yield. If this one well were omitted, the record for the slate would be more than twice as good. It is obvious that not much importance can be given the position of the slates in table 16. The relative rank of wells in slate is given more accurately in table 1.

Although the greenstone schist is generally an excellent aquifer, at some places it is not. In the vicinity of Whitset and southwestward it apparently yields rather meagerly. Wells in the greenstone schist between Greensboro and Browns Summit and in the vicinity of Sedgefield have not been uniformly successful. Fortunately, at most places where water is needed for industrial purposes, excellent wells have usually been obtained.

More wells are drilled in granite (including together the sheared granite and porphyritic granite) than in any other rock. Results have generally been quite uncertain. No particular area can be designated as unusually poor, except possibly the vicinity of the County Home just east of Greensboro, and no areas can be designated as exceptionally good. At a number of places where a well several hundred feet deep was drilled and only a few gallons a minute was obtained, a second well drilled a few hundred feet away obtained several times as much water. It is apparent that the success or failure of a well depends on encountering fractures and joints in the rock. The second part of table 16, showing the average yields of wells in different topographic location, is significant in that connection. Wells drilled on hills have by far the lowest average yield and average yield per foot of well. Wells in valleys have much the highest average yield and average yield per foot of well. Wells in draws are second, on slopes third, and in flat areas fourth. Wells on hills have an average yield 30 percent less and an average yield per foot of well 42 percent less than wells drilled on flat areas. A hill is a poor location for a well because it is quite commonly underlain by rock which is more resistant to erosion. In many places the rock in hills is resistant to erosion because it has few fractures, joints, and similar openings facilitating the movement of ground water, which promote weathering and thus make the rock easily susceptible to erosion. Naturally if the avenues of movement of ground water are limited, the amount of water yielded by a well drilled there will be small.

In some of the other counties it was observed that wells drilled in draws had a greater average yield and average yield per foot of well than wells drilled in valleys. This was attributed to the relative large width of the valley in comparison with the width of the fracture or joint zone which originally determined the location of the valley. Draws, on the other hand, may be either wider or narrower than the zone of weakness which localized them. That wells in the valleys of Guilford County have a higher average yield and average yield per foot of well than wells in draws may be partly attributed to the small size of the Guilford County valleys.

Analyses of eight samples of water from wells in Guilford County are given in the table of analyses. Seven of the samples are from wells in granite and one is from a well in greenstone schist.

The seven samples from the granite ranged from soft to very hard and from 0.0 to 0.04 part per million in iron content. There is evidence of considerable contamination in some of the samples and in these there is little correlation between depth and hardness. However, in the samples from wells 22, 43, and 111, which appear to be free from contamination, increasing hardness correlates with increasing well depth.

The water from the well in greenstone, well 328, which has a relatively large amount of chloride, sulfate, and nitrate and therefore appears to be somewhat contaminated, is moderately hard.

Temperatures range from 59 to 63° F. and average 61° F.

Municipal supplies.—Gibsonville, population 1,753, has had a public supply since 1822, obtaining its water from two deep wells, one in Guilford County and the other in Alamance County. Well 234, Guilford County, is 201 feet deep and yields 100 gallons a minute. Well 139, Alamance County, is 335½ feet deep and was tested at 112 gallons a minute but is now being pumped at about 45 gallons per minute. Well 233, Guilford County, is only a short distance from well 234. The pumping of the one causes a large drawdown in the other, so well 233 was abandoned. Logs of wells 233 and 234 are given following the table of well data.

The turbine pump on well 234 discharges into a 154,000-gallon concrete reservoir. Centrifugal pumps force the water into the mains. A 75,000-gallon elevated tank gives additional storage. Well 139 in Alamance County pumps directly into the mains. The water from neither well is treated. Consumption of water averages about 55,000 gallons a day.

Greensboro, population 59,319, obtains its water from an impounded lake on Reedy Fork and Horsepen Creek, about 7 miles north of the city. The lake covers an area of 450 acres and has a capacity of 1,000,000,000 gallons. An auxiliary reservoir a mile south of the lake and 120 feet higher gives additional raw-water storage of 20,000,000 gallons. The water is pumped to the treatment plant in the city through a 24-inch line by three steam-driven centrifugal pumps and one water wheel. Water treatment consists of coagulation with alum, filtration, chlorination, and final adjustment of pH with lime. There are two concrete clear-water reservoirs with capacities of 3,000,000 and 18,000,000 gallons, respectively, and two elevated tanks with capacities of 250,000 and 500,000 gallons, respectively. The capacity of the treatment plant is 12,000,000 gallons a day. The maximum consumption is about 7,000,000 gallons a day and the average is about 5,500,000 gallons a day. About 25 percent of the water is used by industries.

In addition to the municipal water plant in Greensboro is the Buffalo Water Works, owned by the Proximity Manufacturing Company. Water is obtained from Buffalo and Richland Creeks. The total capacity of the storage lakes on these creeks is about 1,000,000,000 gallons. The water is treated by coagulation with alum and lime, filtration, final adjustment of pH with lime, and chlorination. The filter plant has a capacity of about 4,500,000 gallons a day but filter plants at some of the mills increase the capacity to about 8,500,000 gallons a day. The total consumption is about 8,000,000 gallons a day, most of which is used by the mills. Nearly 7,000 people in the mill villages are also supplied with water.

High Point, population 38,495, obtains its supply from an impounded lake on Deep River 5 miles northeast of the city. The dam is 45 feet high and the lake has an area of 350 acres. The water flows by gravity 4,000 feet through a 30-inch pipe to the raw-water pumping station. Four electrically driven centrifugal pumps with a total capacity of 8,000,000 gallons a day and one gasoline-driven pump with a capacity of 3,500,000 gallons a day pump the water to the treatment plant through parallel 24-inch and 12-inch lines. Treatment consists of coagulation with alum, the addition of ammonia and chlorine, filtration, secondary chlorination, and final adjustment of pH with lime. The clear-water reservoir has a capacity of 3,200,000 gallons and a 1,000,000-gallon elevated tank furnishes additional storage. The pumps on the distribution system exactly duplicate the raw-water pumping system. The capacity of the source is reported to be 15,000,000 gallons a day and the capacity of the treatment plant is 6,000,000 gallons a day. The maximum consumption is about 4,000,000 gallons a day and the average is about 3,500,000 gallons a day.

RECORDS OF WELLS IN GUILFORD COUNTY

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water (feet)[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
1	1½ miles W of Stokesdale	W. R. Hutchins	Well Drillers Inc.	Dr	222		6	60R	1±	Gneiss	Hill	Soft water.
2	3½ miles SW of Stokesdale	C. S. Linville	do.	Dr	100+		6		5	Granite	Slope	Hard water.
3	Stokesdale	Geo B. Jones	Z. V. Jones	Cr-Dr	99	50	2		4	Gneiss	Flat	Soft water, no iron.
4	Do.	Jim Knight	do.	Cr-Dr	112		3		5	do	do	Used by 3 families. Water slightly hard.
5	Do.	Dr. V. E. Edwards	do	Cr-Dr	95		2		6	do	do	
6	Do.	Carl Lemon	Well Drillers Inc.	Dr	188	57	6	20R	15	do	Valley	Soft water. Drawdown reported 65 feet.
7	Do.	Paul Knight	Z. V. Jones	Cr-Dr	110		2		4	do	Flat	Soft water.
8	Do.	Stokesdale School		Dr	140		6		15	do	do	
9	3 miles N of Summerfield	Mrs. Blanche Robinson	J. Stafford	Cr-Dr	125		2		5	do	do	No water in a 300-foot well at same location
10	2 miles N of Summerfield	C. C. Winfree	Frank Gardner	Cr-Dr	117		3		3-4	Granite	do	Water slightly hard.
11	2 miles NW of Summerfield	Miss Elizabeth Ogburn	F. L. Smith	Dr	131½	120	6		15-20	do	do	

[1] Vir. Mach. Co.=Virginia Machinery & Well Co.; Dan. Well Co. Danville Well Drilling Co.; Sydnor Well Co.=Sydnor Pump & Well Co.
[2] Dr=Drilled, Br=Bored, Cr-Dr=Core Drilled, B-Dr=Bored and Drilled, D-Dr=Dug and Drilled.
[3] Depth to water from land surface; R=Reported, M=Measured.

RECORDS OF WELLS IN GUILFORD COUNTY—*Continued*

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water (feet)[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
12	1 mile NW of Summerfield	J. W. Winfree	Frank Gardner	Cr-Dr	90	80	2		5+	Granite	Flat	
13	Do.	Miss Elizabeth Ogburn	F. L. Smith	Dr	53½	36	6		18-20	do	do	Soft water.
14	1 mile N of Summerfield	M. V. Winfree	Frank Gardner	Cr-Dr	90		2		4	do	do	
15	1 mile NW of Summerfield	S. J. Ellington	do	Cr-Dr	102	67	2	40R	6+	do	do	
16	¾ mile N of Summerfield	C. L. Scarlett	do	Cr-Dr	60		2		4	do	do	
17	Summerfield	L. W. Tilley	do	Cr-Dr	118½		2		6	do	Slope	Soft water, no iron.
18	Do.	Summerfield School	J. R. Cummings	Dr	225		6		12-15	do	Flat	
19	Do.	S. S. Blackburn	Frank Gardner	Cr-Dr	102		2	25R	5	do	do	Soft water, no iron.
20	Do.	J. B. Thorp	W. B. Mayhew	Cr-Dr	100±		2	25R	5±	do	do	
21	Do.	L. A. Stafford	J. R. Cummings	Dr	90?		6	35R	15	do	do	
22	Do.	G. S. Miles (T. E. Case)	Walter Stafford	Cr-Dr	271½	40	2	40R	16	do	do	Analysis in table.
23	Do.	R. O. Gamble	W. B. Mayhew	Cr-Dr	94		2		5	do	do	
24	Do.	do.	Z. V. Jones	Cr-Dr	76		2		1±	do	Hill	
25	Do.	W. Parrish	W. B. Mayhew	Cr-Dr	97		2		5	do	Flat	Soft water, no iron.
26	Do.	Mrs. O. E. Shields	W. B. Mayhew	Cr-Dr	110		2		5-6	do	Flat	
27	Do.	L. A. Stafford (Hammer Mill)	do.	Cr-Dr	100±		3		10	do	Draw	
28	Do.	W. B. Stafford	J. Stafford	Cr-Dr	168	69	4	21R	7	do	Flat	Soft water, no iron.
29	Do.	Methodist Parsonage	W. B. Mayhew	Cr-Dr	90		3		5-6	do	do	Soft water.
30	¾ mile N of Summerfield	A. C. Metz	Frank Gardner	Cr-Dr	198		2	28R	15	do	do	Soft water, no iron.
31	Do.	Mrs. L. H. Taylor	W. B. Mayhew	Cr-Dr	96		2		4-5	do	do	
32	Summerfield	B. H. Hoskins	do.	Cr-Dr	93		2		6-7	do	do	
33	¾ mile N of Summerfield	Mrs. D. T. Todd	do.	Cr-Dr	86		2		5-6	do	do	Water slightly hard.
34	1 mile N of Summerfield	J. H. Barhan	J. Stafford	Cr-Dr	297		2		3	do	do	Hardness about 7. parts per million.
35	2 miles NE of Summerfield	R. L. Stigall	Fank Gardner	Cr-Dr	93		3			do	do	Soft water.
36	1 mile SE of Summerfield	C. O. Martin	J. Stafford	Cr-Dr	126		2		7?	do	Draw	Not used.
37	3 miles NE of Summerfield	G. T. Wilson	Frank Gardner	Cr-Dr	140		2		5	Gneiss		Water moderately soft.
38	Do.	J. W. Dixon	do.	Cr-Dr	100		2		10	do	Slope	
39	3¼ miles NE of Summerfield	Mrs. J. Alice Wilson	do.	Cr-Dr	100		2		4-5	Granite		Water contains some iron.
40	4 miles NE of Summerfield	W. T. Clayton	W. B. Mayhew	Cr-Dr	82⅓		2		4-5	do		Soft water.
41	4½ miles NE of Summerfield	R. J. Clayton	Frank Gardner	Cr-Dr	97		2		4-5?	do		
42	2 miles E of Summerfield	Hubert Walker	W. B. Mayhew	Cr-Dr	114		2		5-6	do	Draw	Water moderately soft, no iron.
43	3 miles E of Summerfield	J. F. Mathews	do.	Cr-Dr	130	90	2	35R	5	do	Flat	Analysis in table.
44	Do.	R. F. Shaw	Z. V. Jones	Cr-Dr	100		2		2	do		
45	Do.	J. F. Mathews	W. B. Mayhew	Cr-Dr	100		2		6	do	Flat	
46	Do.	W. L. Moton	do.	Cr-Dr	157	100	2		5	do	do	Soft water, no iron.
47	4½ miles SW of Browns Summit	Dr. Wesley Taylor	Well Drillers Inc.	D-Dr	186		6		3	do	Hill	Dug 50 feet.
48	Do.	do.	J. R. Cummings	Dr	80		6		3	do	Slope	
49	Do.	do.	do.	Dr	144		6		5	do	do	
50	4½ miles W of Browns Summit	Joe D. Whitt (W. D. Sharp)	J. Stafford	Cr-Dr	259	40	2		3¾	do	Draw	
51	1½ miles NW of Browns Summit	E. A. Spencer	J. L. Hopkins	Dr	163⅓		6	35R	8	Gneiss		Moderately soft water.
52	Browns Summit	Mrs Salley E. Troxler	W. P. Phillippi	Cr-Dr	96	88	2		8	do		Hard water.
53	Do.	C. R. Hopkins	do.	Cr-Dr	66½	33	2		8	do	Hill	Moderately hard water.
54	¾ mile SE of Browns Summit	Browns Summit Negro School	F. L. Smith	Dr	68		6		30	do	Flat	
55	2 miles E of Browns Summit	Monticello School		Dr	90		6		30	Granite	do	
56	2½ miles SE of Osceola	Willie Andrews	W. B. Mayhew	Cr-Dr	70	40	2		½±	do	Hill	Not used; insufficient water.
57	2 miles SE of Osceola	Busick School		Dr	80		6		15	Greenstone		Water contains some iron.

[1], [2], [3] Footnotes given at beginning of table.

RECORDS OF WELLS IN GUILFORD COUNTY—*Continued*

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water (feet)[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
58	4½ miles SE of Osceola	Avery Brown	W. B. Mayhew	Cr-Dr	90		2		6-7	Granite	Slope	Soft water
59	3 miles N of Gibsonville	County Farm	F. L. Smith	Dr	48		6		7	Greenstone		
60	3¼ miles S of Osceola	P. L. Michael	W. P. Phillippi	Dr	131		2		2-3	do	Slope	Soft water.
61	6 miles SW of Osceola	D. R. Huffine, Dairy	J. R. Cummings	Dr	119	25±	6	40R	10+	do		Soft water, no iron.
62	3¼ miles E of Busick	Madison School	--	Dr	80		6		12-15	do	Hill	
63	2 miles SE of Browns Summit	Proximity Mfg. Co. Farm	W. B. Mayhew	Cr-Dr	250		2		0	Granite	do	
64	Do	do	do	Cr-Dr	60		2		3	do	do	
65	2½ miles S of Browns Summit	U. S. Army Rifle Range	Vir. Mach. Co.	Dr	300		8		15	Greenstone	Slope	
66	3 miles S of Browns Summit	do	do	Dr	236		8	30R	25	do	do	Reported drawdown 50 feet.
67	¾ mile E of Busick	H. H. Horner	W. B. Mayhew	Cr-Dr	60		2		6-7	Granite		
68	Do	Carl Gregory	do	Cr-Dr	97		2		7	do	Ridge	
69	1¼ miles E of Busick	W. W. Parish	do	Cr-Dr	97		2		7	Greenstone	Slope	Soft water.
70	½ mile S of Busick	Southern Webbing Mills	Heater Well Co.	Dr	185	40?	8		40	do	Valley	
71	¼ mile W of Busick	R. A. Hawkins	Frank Gardner	Cr-Dr	140	90	2		5	do	Ridge	Water contains some iron.
72	1½ miles SW of Busick	A. C. Hillard	Paul Greggerson	Cr-Dr	242	60	2		4	do		
73	Do	R. B. Carroll	Carter	Cr-Dr	100	58	2		5	Schist	Valley	Water contains much iron.
74	2½ miles SW of Busick	Charlie Pulliam	W. B. Mayhew	Cr-Dr	90		2		7-8	do	Flat	
75	Do	Jesse Wharton School		Dr	80		6		15	do	Draw	
76	2 miles W of Busick	W. M. Moore	W. B. Mayhew	Cr-Dr	112½	85	2		5	Schist	Slope	
77	Do	Mrs. W. S. Moore, Dairy	do	Cr-Dr	150	100	2		5-6	do	Valley	
78	Do	Mrs. W. S. Moore	do	Cr-Dr	112		2		5-6	do	do	Water contains some iron.
79	3 miles NE of Battleground	Negro Scout Camp	do	Cr-Dr	230		2		4	Granite?		
80	3 miles N of Battleground	Greensboro Pumping Station	Z. V. Jones	Cr-Dr	125		2		4	Gneiss	Valley	
81	3½ miles N of Battleground	L. Richardson	W. B. Mayhew	Cr-Dr	200	200	3		7	do	Hill	
82	Do	do		Cr-Dr	130	80	3		8	do	Slope	Water moderately hard.
83	2 miles NE of Battleground	R. G. Trosper	Heater Well Co.	Dr	105		6⅝		10	Granite	Valley	Soft water.
84	1½ miles NE of Battleground	City of Greensboro	W. B. Mayhew	Cr-Dr	125 [4]	25	2		5	Gneiss	Flat	
85	1 mile N of Battleground	Robert Woodward	Heater Well Co.	Dr	104	40	8		25	do	Valley	
86	Do	C. W. Causey, Jr.	do	Dr	80	58	6		10	do	Slope	
87	Battleground	Greensboro Park		Cr-Dr	110		2		5	Schist	Valley	
88	¾ mile W of Battleground	L. F. Barnard	J. Stafford	Cr-Dr	126		2		7	do	Slope	
89	1 mile W of Battleground	Dr. R. B. Davis	Heater Well Co.	Dr	90		6		½	Granite	Hill	
90	1½ miles NW of Battleground	Harry Hoffman	Danville Well Co.	Dr	109	20	6	8R	15+	Gneiss	Valley	Drawdown 40 feet at 10 gallons a minute. Hardness 210 parts per million.
91	Do	J. G. Crutchfield	do	Dr	74		6		10	do	do	
92	2 miles NW of Battleground	M. W. Lewis	Frank Gardner	Cr-Dr	53		2		5	Granite		
93	2½ miles NW of Battleground	J. P. Huskins	Danville Well Co.	Dr	65	35	6	30R	5	do	Hill	Water slightly hard.
94	Do	Shady Oak Dairy	W. B. Mayhew	Cr-Dr	160		2		5	Gneiss	do	Not in use.
95	Do	do		Cr-Dr	88		2½		8	do	Slope	
96	Do	do	Heater Well Co.	Dr	94	44	8		33	do	do	
97	1½ miles SE of Summerfield	Oscar Peedon	Mackintyre	Dr	105	95	4	50R	7½	Granite	do	
98	2½ miles N of Friendship	R. B. Miller	W. B. Mayhew	Cr-Dr	102		2		5-10	Gneiss	Draw	Soft water.
99	3 miles N of Friendship	D. C. Dettor	do	Cr-Dr	143	122+	2		6	do	Flat	Water slightly hard.
100	Do	R. L. Edwards	J. R. Cummings	Dr	85		6	30R	10+			
101	2½ miles N of Friendship	W. R. Beeson	W. B. Mayhew	Cr-Dr	141	51	2		4½	Granite	Hill	Water slightly hard, no iron.
102	Do	W. D. Warren	Well Drillers Inc.	Dr	156	61	6	48M	5-6	do	do	Water moderately soft.
103	2 miles N of Friendship	Robert H Cain	W. B. Mayhew	Cr-Dr	204		2		5	do		Soft water.
104	Oak Ridge	Maj. Z. L. Whitaker & Maj. E. A. Green	J. R. Cummings	Dr	45		6		15	Gneiss		
105	Do	Maj. Z. L. Whitaker	do	Dr	62		6	30R	6	do	Slope	

[1], [2], [3] Footnotes given at beginning of table.

RECORDS OF WELLS IN GUILFORD COUNTY—*Continued*

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water (feet)[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
106	Oak Ridge	Oak Ridge Military Ins.	J. R. Cummings	Dr	78	35-40	6	30R	50	Gneiss	Draw	
107	Do.	do.	do.	Dr	66	35-40	6	30R	16	do	Slope	Yield diminishes if pumped continuously.
108	Do.	do.	do.	Dr	65		6		20	do	do	Do
109	Do.	Maj. Z. L. Whitaker	do.	Dr	42		6		15	Granite	do	
110	Do.	Oak Ridge Military Ins.	do.	Dr	200		6		10	do	do	Not used because of fine sand with water.
111	Do.	do.	do.	Dr	63		6	30R		do	Hill	Analysis in table. Temperature 59½° F.
112	Do.	do.	do.	Dr	700		6		7	do	do	Not used. Entire yield obtained at 60 feet.
113	½ mile SE of Oak Ridge	T. J. Pegram, Estate	do.	Dr	200		6		1½	Gneiss	do	Water hard, contains considerable iron.
114	Oak Ridge	Oak Ridge School		Dr	110?		6		15	do		
115	Colfax	Methodist Church	Well Drillers Inc.	Dr	163		6		10	Granite	Flat	
116	¾ mile SE of Colfax	Colfax School	J. R. Cummings	Dr	225		6		20	Gneiss	do	
117	1 mile SE of Colfax	J. E. Gray	do.	D-Dr	70		6			do	Ridge	Dug 37 feet. Soft water, no iron.
118	1½ miles SE of Cofax	O. G Brown	do.	D-Dr	43		6	27R	2½	Granite	Draw	Dug 30 feet.
119	3 miles S. of Colfax	Z. P. Campbell	Well Drillers Inc.	Dr	67	60	6		14	do	Hill	Soft water, no iron.
120	Do.	Prison Camp 505	Vir. Mach. Co.	Dr	80		6		16	do	Slope	Soft water.
121	Do.	do.	Heater Well Co.	Dr	141	99	6		20	do	Flat	
122	¼ mile N of Friendship	Methodist Parsonage	W. B. Mayhew	Cr-Dr	80		2		8	Greenstone	do	
123	½ mile E of Friendship	Greensboro-High Point Airport	Danville Well Co.	Dr	123		6	21R	52+	do	Hill	Pumped 24 hours with 44 feet of drawdown at 52 gallons a minute.
124	2 miles NE of Friendship	Motsinger Bros. Dairy	Well Drillers Inc.	Dr	136		6		20	Granite?	do	
125	2 miles NW of Guilford College	Clarence Knight Dairy	J. R. Cummings	Dr	75		6			do	Slope	Water slightly hard, no iron.
126	2 miles NW of Guilford College	W. A. Coble	W. B. Mayhew	Cr-Dr	32	28	3		12	Greenstone	Slope	At 28 feet entered 4 feet of quartz veins.
127	Do.	State Dairy Farm	J. R. Cummings	Dr	88		6		40	do	Hill	
128	1½ miles W of Guilford College	C. C. Cummings	W. B. Mayhew	Cr-Dr	135	100	2		6	do	Slope	
129	2 miles SE of Friendship	Standard Oil Co.	Heater Well Co.	Dr	143	60	8		20	do	Draw	
130	Do.	Shell Oil Co.	do.	Dr	200		6		12	do	Slope	
131	Do.	The Maples	J. Stafford	Cr-Dr	199¾		2		5	do	Flat	
132	Do.	Miller Motor Co.	Well Drillers Inc.	Dr	300		6		0	Greenstone?		No water.
133	Do.	Plantation Pipeline	Vir. Mach. Co.	Dr	204		8	20R	71	Greenstone	Slope	Drawdown 147 feet after 24 hours at 71 gallons a minute. Log in table.
134	2 miles SW of Guilford College	D. E. Petty		Cr-Dr	114		3	16R	16	do	Flat	
135	1½ miles SW of Guilford College	W. H. Blaylock	W. B. Mayhew	Cr-Dr	125		2		4	do	Slope	Water slightly hard, no iron.
136	Do.	Wesley Ferrell	do.	Cr-Dr	70+		2		5	do		
137	½ mile SW of Guilford College	J. O. Lindley	do.	Cr-Dr	120		2		5	do	Hill	
138	½ mile W of Guilford College	Lindley Dairy	do.	Cr-Dr	65	50	2		4½	do	Slope	Water slightly hard, no iron.
139	Do.	do.	do.	Cr-Dr	90		3		10	do	Valley	
140	Do.	S. E. Coble	do.	Cr-Dr	87		2		5-6	do	Hill	
141	Do.	A. J Hollowell	do	Cr-Dr	110	75	2		5	do		
142	Guilford College	Guilford College	Sydnor Well Co.	Dr	364		8		20	do	Flat	Not used.
143	Do.	Jule Coltrane	W. B. Mayhew	Cr-Dr	167		2		4	do	do	
144	Do.	A. J. Marshburn	do	Cr-Dr	112½	100	2		8	do	do	Water slightly hard, no iron.
145	½ mile W of Guilford College	J. H. Henshaw	do.	Cr-Dr	95		2	20M	5-6	do	Hill	Soft water, no iron.
146	½ mile S of Guilford College	School	J. R. Cummings	Dr	110		6		30	do	Slope	

[1], [2], [3] Footnotes given at beginning of table.

RECORDS OF WELLS IN GUILFORD COUNTY—*Continued*

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water feet[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
147	¾ mile S of Guilford College	Dr. John D. Williams	W. B. Mayhew	Cr-Dr	63	60	2		7+	Greenstone		
148	Do.	H. M. Crutchfield	do	Cr-Dr	75		2		7	do		
149	Do.	O. R. Stout	do	Cr-Dr	87		2		7	do		Soft water, no iron.
150	Do.	A. S. Long	do	Cr-Dr	65		2	16R	6	do	Slope	Water contains a little iron
151	Do.	J. W. Simpson & R. G. Simmons	Danville Well Co.	Dr	99	68	6	40R	39	Greenstone	Valley	Drawdown 20 feet.
152	1½ mile S of Guilford College	R. C. Smith		Cr-Dr	70		2		5-6	do	Hill	Water contains some iron.
153	4 miles W of Greensboro	Pomona Terra Cotta Co., No. 2 plant	W. B. Mayhew	Cr-Dr	120	80	3		18	do	Slope	
154	Do.	Pomona Terra Cotta Co., No. 3 plant	do	Cr-Dr	65-70		3		15	do	do	
155	Do.	Pomona Terra Cotta Co., No. 4 plant	do	Cr-Dr	120	100	3	12R	20	do	do	
156	Do.	Pomona Mills Co.	Vir. Mach. Co.	Dr	302½		8		60	do	Flat	Temperature 60° F.
157	2½ miles N of Guilford College	E. R. Bond	Heater Well Co.	Dr	150	105	6		3	Granite	Hill	Water obtained at 127 feet.
158	1 mile N of Guilford College	Miss Ada Field	J. Stafford	Cr-Dr	224	70	2		6+	Schist	Slope	Moderately soft water.
159	1½ miles N of Guilford College	Dave Hodgins	Frank Gardner	Cr-Dr	97		2		7	do	Hill	Do
160	Do.	Jefferson Std. Life Ins. Co., farm	Heater Well Co.	Dr	78		6		20	do	Slope	
161	1 mile E of Guilford College	J. M. Crutchfield	do	Dr	162		6			Greenstone	Hill	Hard water.
162	Do.	S. P. Bryant	do	Dr	110	105	6		20	do	do	
163	1¼ miles E of Guilford College	J. P. Dillard	W. B. Mayhew	Cr-Dr	115	95	2		6-7	do	do	Water slightly hard.
164	1 mile SW of Battleground	H. G. Armfield	Heater Well Co.	Dr	95		6		15	do	Valley	Log in table.
165	1 mile S of Battleground	C. W. Holshouser	G. G. Clayton	Br	50		24	40R		Schist	Flat	Water somewhat hard.
166	½ mile S of Battleground	Hobbs Store	W. B. Mayhew	Cr-Dr	98		2		5	do	do	
167	Do.	Mrs. Mary Lou Woods	J. Stafford	Cr-Dr	70	47	2	40R	8	do	do	
168	1 mile S of Battleground	State Prison Camp	W. B. Mayhew	Cr-Dr	185		2		6-7	do	Valley	
169	1½ miles SE of Battleground	WBTG Radio Station		Dr	118		6	15R	5?	do	Draw	Water slightly hard.
170	1¾ miles SE of Battleground	Miss Annie Stratford	W. B. Mayhew	Cr-Dr	93		2		5-6	do	Slope	
171	2 miles SE of Battleground	J. C. Jones	Heater Well Co.	Dr	102		6			do	Ridge	Water fairly soft.
172	Do.	G. P. Rose	W. B. Mayhew	Cr-Dr	104		2		5	do	do	Water fairly soft, no iron.
173	2 miles E of Guilford College	W. T. Dowd	Heater Well Co.	Dr	85	81	6		7	Greenstone	Slope	
174	Greensboro	Southern R. R. Co. Roundhouse	?	Dr	300		6			do	Flat	Very large yield reported.
175	Greensboro?	Southern R. R., Section foreman's house	Southern R. R. Co.	Dr	120±		6		10+	do	do	
176	Greensboro	Mock, Judson, Voehringer Co.	Sydnor Well Co.	Dr	438		8	50R	200	Greenstone	Slope	Drawdown 200 feet. Temperature 60° F.
177	Do.	Vick Chemical Co.	do	Dr	203		8	28R		do	do	
178	Do.	Geo. C. Brown & Co.	Well Drillers Inc.	Dr	120		6		15	do	Draw	Two other wells 20 and 40 feet deep, 6 inches in diameter, yield 8-10 gallons a minute each Soft water.
179	Do.	Buffalo Rock Inc.	F. L. Smith?	Dr	126½		6	17R		do	Flat	Satisfactory yield. Soft water.
180	Do.	Piedmont Ice & Coal Co.	Heater Well Co.	Dr	125		8		40	Granite	do	Well abandoned.
181	Do.	do.	do.	Dr	187		8		4	do	do	Do
182	Do.	Colonial Stores Inc.	L. R. Hartsell	Cr-Dr	55		4		10	do	Hill	
183	3 miles NW of Greensboro	Floyd H. Craft	Heater Well Co.	Dr	101	83	6⅝ s		4	Schist	Slope	Log in table.
184	Do.	Lewis A Raulston	do	D-Dr	58	54	6⅝ s	8R	20	do	do	Dug 24 feet. Soft water
185	Do.	A. Stern	do	Dr	110	68	6⅝ s		5	do	Flat	
186	Do.	G. R. Cates	Carl Greggerson	Cr-Dr	165		2		3-5	do		

[1], [2], [3] Footnotes given at beginning of table.

RECORDS OF WELLS IN GUILFORD COUNTY—*Continued*

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water (feet)[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
187	3 miles NW of Greensboro.	E. G. Rawlins	?	Cr-Dr	95		2		5-6	Schist	Slope	
188	2 miles NW of Greensboro	R. G. Hardin	F. L. Smith	Dr	290±?		6		14	do	Flat	Soft water, no iron.
189	3½ miles NE of Greensboro	Rankin School	?	Dr	120		6		15	Greenstone		
190	4 miles NE of Greensboro.	Mrs. C. A. McNealy	W. B. Mayhew	Cr-Dr	132		2	23R	5	do	Flat	Hard water.
191	Do.	H. B. Powell	do	Cr-Dr	80		2	25R	7½	Granite?	Slope	Water is not hard.
192	Do.	G. D. Wyrick	Carl Greggerson	Cr-Dr	215		2		3½	Greenstone	Flat	Moderately soft water.
193	Do.	O. H. Graham	do	Cr-Dr	170		2		6½	do	do	Do
194	Do.	R. E. Fittchett	W. B. Mayhew	Cr-Dr	80		2		7¾	do	Slope	Soft water.
195	Do.	Joe Walters	do	Cr-Dr	120		2		7	do	do	
196	Do.	do	do	Cr-Dr	70		2		6	do		
197	Greensboro	Proximity Mfg. Co., White Oak Mill		Dr	322		8?		55	do	Valley	
198	Do.	Proximity Mfg. Co., (Revolution Mill)	Sydnor Well Co.	Dr	437		8		100	do	do	Not in use at present.
199	Do.	do	do	Dr	402	60±	8		100	do	do	
200	Do.	Proximity Mfg. Co., Print Works	do	Dr	100		8		100	do	do	
201	Do.	Proximity Mfg. Co., Hubbard St.	Sydnor Well Co.	Dr	282		8	17R	180	do	Slope	Log in table. Analysis in table. Temperature 61° F.
202	Do.	Proximity Mfg. Co., at Standpipe	do	Dr	487		8		70	Granite?	do	Not in use.
203	Do.	Proximity Mfg. Co., Revolution Mill	do	Dr	858		8		5	Granite	Flat	Do
204	East edge of Greensboro	Mrs. George Smith	J. Stafford	Cr-Dr	126		2		8	do		Soft water, no iron.
205	Do.	Bessemer School	J. R. Cummings	Dr	110		6		10-12	do		
206	3 miles E of Greensboro	County Home	W. B. Mayhew	Cr-Dr	78	60	3		6	do		Analysis in table.
207	Do.	do	do	Cr-Dr	78	60	3		6	do		
208	Do.	do	Heater Well Co.	Dr	250	35	8		4	do		
209	Do.	do	do	Dr	100		8		6	do	Slope	
210	Do.	County Dairy	J. R. Cummings	Dr	700		6		2	do	do	
211	Do.	do	do	Dr	700		6	165R	7	do	Hill	Hard water.
212	Do.	Prison Camp	W. B. Mayhew	Cr-Dr	120		2	30R	7	do	Slope	Soft water, no iron.
213	3½ miles E of Greensboro	Tabor Hudson	Heater well Co.	Dr[4]	72		6	20R	5	do	Flat	Soft water.
214	Greensboro	D. D. Stout, Home Ice Plant	do	Dr	200	74	6	10R	24	do	do	Soft water, pH 6.5; chloride [illegible] parts per million. Log in table.
215	2 miles SE of Greensboro	J. V. Hunt, Woodland Dairy Farm	Danville Well Co.	Dr	256		6	20R	30	Greenstone	Valley	Drawdown 100 feet.
216	5½ miles E of Greensboro.	P. C. Clapp	Well Drillers Inc.	Dr	123½		6	21R	20±	Granite	Flat	Soft water.
217	6 miles E of Greensboro	Miss Hazel Teague	do	Dr	104		6		10-15	do	do	Soft water, no iron.
218	Do.	A. W. Higgins	do	Dr	160		6		26	do	do	Soft water.
219	6 miles W of Gibsonville	McLeansville School	J. R. Cummings	Dr	120		6		12	do		Water contains some iron.
220	Do.	A. B. Holt	?	Br	27	27	24	16M		do	Flat	
221	5 miles NW of Gibsonville.	Robah C. LaMarr	Heater Well Co.	Dr	49	42	6	20R	1	do	Hill	
222	5 miles W of Gibsonville	L. L. Bolick	do	Dr	42		6	8R	20	do	Draw	Soft water, no iron.
223	3 miles NW of Gibsonville.	P. E. Lowe	W. P. Phillippi	Cr-Dr	50⅓	45	2	25R	9½	Greenstone	Slope	Water from quartz vein at 45 to 50 feet.
224	2½ miles NW of Gibsonville	L. G. Loy	do	Cr-Dr	53	30	2		5	do	do	Hardness 35 to 40 parts per million.
225	2 miles NW of Gibsonville.	Friedens Lutheran Church	do	Cr-Dr	148		2		4	do	Flat	
226	1½ miles NW of Gibsonville	Mrs. Eric Summers	W. P. Phillippi	Cr-Dr	48		2			Greenstone	Slope	Water moderately hard, some iron.
227	1¼ miles NW of Gibsonville	W. J. Sockwell	F. L. Smith	Dr	67		6	25R	9	do		Water slightly hard, some iron.
228	1 mile NW of Gibsonville.	R. C. Apple	W. P. Phillippi	Dr	137	18	2		5	do	Hill	
229	Gibsonville	Minnesota Mfg. Co.	Sydnor Well Co.	Dr	557	207	8	70R	65	do	Draw	Pumping level reported to be [illegible] feet below surface.
230	Do	do	do	Dr	436	80	10	50R	50	do	Flat	Water reported to be coming from above 2[illegible] feet. Temperature 6[illegible] F.

[1], [2], [3] Footnotes given at beginning of table.

RECORDS OF WELLS IN GUILFORD COUNTY—*Continued*

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water (feet)[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
231	Gibsonville	Minneola Mfg. Co.	F. L. Smith	Dr	204	41	6		30	Greenstone	Flat	Most of water from above 125 feet.
232	Do.	do.	do.	Dr	300	65	6		40	do	Draw	
233	Do.	City	Sydnor Well Co.	Dr	201	201	8			do	Hill	Tested at 110 gallons a minute, failed in service. Log in table.
234	Do.	do.	do.	Dr	201	201	8	37R	100	do	do	Log similar to log of well 133.
235	1¾ miles S of Gibsonville	A. M. Shepard, estate	F. L. Smith	D-Dr	80		6		1	do	do	Dug 45 feet.
236	Do.	Mrs. Hattie Shepard	do.	Dr	65		6			do	Flat	Very small yield.
237	2¼ miles SW of Gibsonville	J. L. Dick	do.	Dr	121	11	6	30R	1±	do	Hill	Water comes in at 46 feet.
238	Do.	Lee H Ingle	Heater Well Co.	Dr	36		6	9R	10	do	Draw	
239	Do.	J. C. Cowan, Sinclair Station	F. L. Smith	Dr	56		6		16-18	do	Valley	
240	3 miles SW of Gibsonville	Whitsett School	do.	Dr	165		6		5±	do	Flat	
241	Do.	C. E. Edgerton	do.	D-Dr	65		6		3	do	Slope	Dug 40 feet.
242	5 miles SW of Gibsonville	Rock Creek Dairy	J. R. Cummings	Dr	120		6		5	do	do	
243	Do.	do.	F. L. Smith	Dr	160	50	6		25	do	do	Hard water.
243a	5½ miles SW of Gibsonville	do.	do.	Dr	54	44	6		20	do	Hill	
244	5 miles SW of Gibsonville	Palmer Memorial Institute	Vir. Mach. Co.	Dr	380		8	37R	90+	do	do	Drawdown 90 feet.
245	6 miles SW of Gibsonville	Girl Scout Camp	J. Stafford	Cr-Dr	80		2		3-4	do		
246	6 miles NE of Julian	J. L. Neese	W. P. Phillippi	Cr-Dr	74		2		5	Slate		Moderately soft water.
247	Do.	O. G. Priddle	do.	Cr-Dr	103	40	2		¼	do		
248	7 miles NE of Julian	J. B. Apple	do.	Cr-Dr	100+		2			do	Hill	Small yield.
249	5½ miles NE of Julian	J. B. Corsbie	do.	Cr-Dr	65		2		2½	Granite	do	Moderately soft water, some iron.
250	6 miles N of Julian	C. P. Phillips	F. L. Smith	Dr	159	9	6	12R	20	do	Valley	
251	6½ miles N of Julian	Geo. H. Lynch	W. P. Phillippi	Cr-Dr	138		2		1±	Granite		
252	5½ miles N of Julian	G. W. Shoffner	F. L. Smith	Dr	57	48	6		2½	do	Hill	
253	7½ miles SE of Greensboro	R. V. Andrews	Carl Greggerson	Cr-Dr	178		3	20R	3	do	Slope	Drawdown 25 feet.
254	6 miles SE of Greensboro	Charles Wade	F. L. Smith	Dr	87		6		25	do	do	
255	Do.	Alamance School	J. R. Cummings	Dr	140±		6		10	do	do	
256	Do.	W. F. Brower	Well Drillers Inc.	Dr	80		6		15	do		
257	Do.	Alamance Presbyterian Church	Carl Greggerson	Cr-Dr	190	46	2	28R	10	do	Hill	Hard water.
258	4½ miles SE of Greensboro	Frank Allred	Well Drillers Inc.	Dr	87		6		6	Greenstone	do	Soft water.
259	5½ miles SE of Greensboro	Robert Forsyth	Frank Gardner	Cr-Dr	69	17	2		5-6	do	Valley	
260	4 miles SE of Greensboro	Neese Country Sausage Co.	T. A. Leadbetter	Dr	48		6	18R	12	do	Slope	
261	Do.	do.	W. B. Mayhew	Cr-Dr	54	20	2	18R	9	do	do	Not used.
262	Do.	do.	do.	Cr-Dr	185		3		2½	do	Hill	Never used, insufficient water.
263	Do.	Charles T. Sharpe	do.	Cr-Dr	108	68	2		6	do	Flat	
264	3 miles SE of Greensboro	Robert Sharp	do.	Cr-Dr	70		2		6	do		
265	2½ miles SE of Greensboro	Tom Pemberton	Auman	Dr	42		6	22R	25	do	Draw	Soft water.
266	3 miles SE of Greensboro	A. Hoyle Hinkle	F. L. Smith	Dr	132	36	6	28R	25-30	do	Hill	Moderately soft water.
267	3½ miles SE of Greensboro	C. F. Swain	W. B. Mayhew	Cr-Dr	158	52	2		5-6	do		
268	Do.	Henry Sharpe	do.	Cr-Dr	38	30	2		6	do	Valley	
269	4 miles SE of Greensboro	C. A. Scott	do.	Cr-Dr	72	60	2		7+	do	do	
270	2 miles N of Pleasant Garden	Mr. Kemp	do.	Cr-Dr	75±	10+	2		4+	Granite		
271	2 miles NW of Pleasant Garden	J. Nickols	do.	Cr-Dr	108		2		6	do		
272	Do.	T. W. Ritter Ritter's Lake	do.	Cr-Dr	52		2		1½	do	Valley	Well flows 1½ gallons a minute
273	Do.	T. W. Ritter	Heater Well Co.	Dr	142		6	10R	20	do	do	
274	Do.	do.	W. B. Mayhew	Cr-Dr	46		3		20	do	do	Not in use.
275	Do.	do.	do.	Cr-Dr	100		2		4	do	do	Do
276	2 miles NW of Pleasant Garden	H. L. Clodfelter	W. B. Mayhew	Cr-Dr	134		2		9	do	Draw	Soft water.

[1], [2], [3] Footnotes given at beginning of table.

RECORDS OF WELLS IN GUILFORD COUNTY—*Continued*

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water (feet)[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
277	2¼ miles NW of Pleasant Garden	Alvin T. Haley	W. B. Mayhew?	Cr-Dr	72	68	2	35R	5-6	Granite	Hill	Water too hard, no iron.
278	3 miles N of Pleasant Garden	D. F. Engle	Carl Greggerson	Cr-Dr	117	32	2	35R	5-6	Greenstone	Slope	
279	4 miles S of Greensboro	C. E. Mosier	W. B. Mayhew	Cr-Dr	114	46	2	30R	4½	do		
280	Do	N. L. Biggs	do	Cr-Dr	110	85±	2	30R	5-6	Granite		
281	Do	Kirby Kirtman	do	Cr-Dr	90	70	2		5-6	Greenstone		
282	3½ miles S of Greensboro	Mrs. Sherril	do	Cr-Dr	60	50	2		8+	do	Slope	
283	Do	H. A. Lane	do	Cr-Dr	55±		2		4	do	Hill	
284	Do	Mrs. D. W. Romsuer	do	Cr-Dr	98	80	2		5	do	Flat	
285	3 miles S of Greensboro	Charles B. Routh	Heater Well Co.	D-Dr	62	26	6	25R	3	do	Slope	Water somewhat hard.
286	2 miles S of Greensboro	American Agriculture Chemical Co.	Sydnor Well Co.	Dr	433	90	8	30R	35	do	Hill	Quartz vein at 400 feet.
287	Do	Carolina By-Products Co.	do	Dr	521		8		100+	do		
288	Do	do	do	Dr	299	50	8		13	do	Draw	Temperature 61° F. Water comes in at 176 feet.
289	1½ miles S of Greensboro	G. S. Miles, Stables	J. Stafford	Cr-Dr	198		2		5	do		
290	2 miles S of Greensboro	Armour Fertilizer Plant	Danville Well Co.	Dr	271	75	6	10R	60	do	Valley	Drawdown 35 feet. Temperature 61° F.
291	2½ miles SW of Greensboro	G. W. Crouse	W. B. Mayhew	Cr-Dr	80		2		7	Granite	do	
292	2¼ miles S of Greensboro	WGBG Radio Station	Heater Well Co.	Dr	58	43	6		20	Greenstone	do	Water from quartz veins.
293	3 miles SW of Greensboro	J. C. Inmon	W. B. Mayhew	Cr-Dr	90	60	2		5	Granite	Hill	Soft water, no iron.
294	3 miles S of Greensboro	O. D. Park	Danville Well Co.	Dr	85		6		15	Granite?		
295	4 miles SE of Sedgefield	Summer School		Dr	80		6		8-10	Granite	Flat	Water contains much iron.
296	2½ miles E of Sedgefield	W. R. Johnson	W. B. Mayhew	Cr-Dr	105	80	2		6-7	do	Hill	
297	2 miles NE of Sedgefield	R. H. Swiggart	Well Drillers Inc.	Dr	123		6		0	do	Flat	
298	1¼ miles NE of Sedgefield	H. A. McNary	W. B. Mayhew	Cr-Dr	60		2		6	Greenstone	Valley	
299	Do	Mrs. Jewel Smith	Heater Well Co.	Dr	87	76	6	30 R	20	do	Flat	Drawdown 12 feet. Log in table.
300	½ mile E of Sedgefield	Mrs. J. H. Adams	Sydnor Well Co.	Dr	900		6		0	Granite	Hill	
301	Sedgefield	Pilot Life Insurance Co.	Sydnor Well Co.	Dr	308		8		65	Greenstone	Slope	Water slightly hard
302	Do	Dr. A. T. Smith	J. Stafford	Cr-Dr	80		2		5-6	Granite	Hill	Soft water.
303	Do	R. E. Bowman, Dairy	J. R. Cummings	Dr	375		4		30-40	Greenstone		
304	½ mile SW of Sedgefield	Dr. R. F. Wakefield	J. Stafford	Cr-Dr	102		2		16	Granite	Flat	
305	1 mile W of Sedgefield	Mrs. J. H. Adams, Farm	Heater Well Co.	Dr	110		6		20	Greenstone?	Valley	Water somewhat hard. Temperature 59° F.
306	1½ miles N of Jamestown	Edward Armstrong John Aldred	do	Dr	51		6		8-10	Granite	Slope	
307	1¼ miles N of Jamestown	Edward Armstrong	F. L. Smith	Dr	146½		6		15-20	do	do	Water moderately hard.
308	Jamestown	Mrs. Lucie C. Ragsdale	Courson	Dr	150		4			do	Hill	Water slightly hard.
309	Do	R. E. Bundy	W. B. Mayhew	Cr-Dr	45		2		6	do	Slope	
310	Do	O. M. Bundy	do	Cr-Dr	90		2		6-7	do		
311	3 miles NE of High Point	Lindale Dairy Farm	F. L. Smith	Dr	240	32	6	10R	30±	Granite?	Valley	
312	4½ miles NE of High Point	Hortence White	Heater Well Co.	D-Dr	76		6		½	Granite	Hill	Dug 39 feet.
313	4½ miles NW of High Point	F. L. Warford	do	Dr	125	46	6		20	Gneiss	do	
314	3 miles N of High Point	Sherwood Forrest	Well Drillers Inc.	Dr	276	100+	6			Granite	Flat	Large yield.
315	Do	Mrs. Lena Thacker	L. R. Hartsell	Cr-Dr	80	40	4		15	do	Hill	
316	Do	O. W. Butner	M. A. Holder	Dr	164		5⅝		20	Granite?	Slope	Hardness 56 parts per million, some iron.
317	Do	Oak View School		Dr	90		6		20	Granite	do	
318	2¾ miles NW of High Point	J. C. Currie	L. C. Hartsell	Cr-Dr	57	50	4		30	do	do	Soft water.
319	Do	J. M. Young	do	Cr-Dr	58	54	4			do	Draw	Large yield. Hard water.
320	High Point	Adams Mills		Dr	120		4	40R	50	Greenstone	do	Hard water. Temperature 61° F.
321	Do	Adams Mills Corp. (Hosiery Mills)		Dr	124		6	35R	75	do	do	Temperature 62½° F.

[1], [2], [3] Footnotes given at beginning of table.

RECORDS OF WELLS IN GUILFORD COUNTY—*Continued*

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water (feet)[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
322	High Point	J. N. Wright	L. R. Hartsell	Dr	113	100	6	36½M	7	Greenstone	Flat	Used for air conditioning.
323	Do.	Cloverbrand Creamery	J. R. Cummings	Dr	96		6		13	do	do	
324	Do.	Powell & Headen		Dr	175		4			do	do	Large yield, hard water. Not used.
325	Do.	*Highlands Cotton* Mills, Inc.		Dr	190	100	6		12	Slate?	Slope	Hard water.
326	Do.	Cloverdale Dye Plant	Sydnor Well Co.	Dr	750		6		5	Slate	Hill	Insufficient water, never used.
327	Do.	Colonial Stores, Inc.	L. R. Hartsell	Cr-Dr	68		4		15+	Greenstone	Flat	Drawdown reported negligible.
328	Do.	Logan Porter Mirror Co.	do.	Cr-Dr	75		6	25R	100	do	do	Analysis in table. Temperature 62° F.
329	Do.	Slane Hosiery Mill	Heater Well Co.	Dr	160		6		120	do	Slope	Water from quartz veins at 90 and 120 feet. Drawdown 3 feet at 120 gallons a minute.
330	Do.	Crown Hosiery Mill		Dr	240		8	20R	200	do	Flat	Water moderately hard: owner uses a softener.
331	Do.	*High Point* Weaving Co.		Dr	900		8			Slate		Not used.
332	3 miles SE of High Point	S. O. Peebles	L. R. Hartsell	Cr-Dr	64		6		10+	Granite	Slope	
333	Do.	N. J. McCuiston		Cr-Dr	92	80	4		10+	do	do	
334	Do.	Mrs. L. J. Marshall	L. R. Hartsell	Cr-Dr	68		4	16R	10±	do		
335	Do.	S. W. Horn	do.	Cr-Dr	84	65	4		10±	do	Slope	Large yield, soft water.
336	Do.	Lonnie Dickens	do.	Cr-Dr	54	45	4		10+	do		
337	Do.	D. W. Beck	do.	Cr-Dr	62		4			do	Slope	*Adequate yield.*
338	Do.	S. W. Horn	do.	Cr-Dr	52	45	4		10+	do	do	
339	3¾ miles SE of High Point	J. A. Pope	do.	Cr-Dr	49	47	4		5	do		Soft water.
340	4 miles SE of High Point	Allen Jay School	F. L. Smith	Dr	60		6		5±	do	Flat	Owner also has a second well, same depth and yield.
340a	Do.	do.	Well Drillers Inc.	Dr	?		6		9?	do	do	
341	3 miles E of High Point	P. W. Helms	M. A. Holder	Dr	90		5⅝		12	do		
342	Do.	Union Hill School		Dr	90		6		20	do	Slope	
343	Oakdale	Oakdale Cotton Mills	W. B. Mayhew	Cr-Dr	45		2		10	do	Valley	Analysis in table.
344	Do.	do.	do.	Cr-Dr	45		2		10±	do	Slope	Three wells in village with this depth and yield.
344a	Do.	do.	Courson	Cr-Dr	100		2		10±	do	do	Four wells in village with this depth and yield.
345	Do.	do.		Dug	30		24	25¼M		do	do	Analysis in table.
346	1½ *miles SE of Jamestown*	Dr. H. L. Brockman	Heater Well Co.	D-Dr	74	68	6		15	*Greenstone*	do	*Dug 44 feet. Soft water.*
347	6 miles SE of High Point	J. E. Millis	?	Dr	380		8		25-30	Granite	Hill	Hard water.
348	8 miles E of High Point	R. Morgan	J. R. Cummings	Dr	117	16	6	46R	1/6	do	do	
349	2½ miles NW of Pleasant Garden	S. B. Tye	W. B. Mayhew	Cr-Dr	106		2		5-6	Granite	Hill	
350	Do.	S. J. Lasley	do.	Cr-Dr	112		2		6	do	do	Soft water.
351	2 miles NW of Pleasant Garden	Cone Country Club	do.	Cr-Dr	65	6	3		15	do	Valley	Water contains iron
352	2 miles W of Pleasant Garden	J. A. Vaughn	Heater Well Co.	Dr	125	25	6		1	do	Hill	Soft water, contains iron.
353	2 miles SE of Pleasant Garden	W. B. Ross, Dairy	W. B. Mayhew	Cr-Dr	110	80	3		12	Greenstone		
354	Pleasant Garden	Pleasant Garden School	do.	Dr	120	80	2		5-6	do		
355	Do.	Robbins Mill Works	do.	Cr-Dr	85±		2½		10	do	Valley	
356	Do.	P. F. Reddick	do.	Cr-Dr	80		2		7-8	Granite		
357	Do.	S. Reddick	do.	Cr-Dr	80	70	2		8	do		
358	¾ mile NW of Pleasant Garden	Walter Wright	C. R. Overman	Cr-Dr	190		2		5-6	do		
359	Pleasant Garden	W. B. Kerns	E. C. Younts	Cr-Dr	82		2		7	do		
360	Do.	E. L. Rummage	W. B. Mayhew	Cr-Dr	109		2	38R	7-8	Greenstone?		Hard water.
361	2½ miles NW of Climax	W. B. Kerns	C. R. Overman	Cr-Dr	312		2			Granite	Hill	Very small yield
362	1¾ miles NW of Climax	E. B. Hockett	Carl Greggerson	Cr-Dr	150	39	2	22R	2	do	do	Log in table.
363	2½ *miles N of Climax*	A. T. *Jones*	do	Cr-Dr	123½	44	2		4	*Greenstone*	do	*Hard water contains much* iron.
364	Climax	W. T. Parrish		Cr-Dr	70	63	2		12-15	Slate	Flat	

[1], [2], [3] Footnotes given at beginning of table.

RECORDS OF WELLS IN GUILFORD COUNTY—*Continued*

Well Number	Location	Owner	Driller[1]	Type of Well[2]	Depth of Well (feet)	Depth of Casing (feet)	Diameter of Well (inches)	Depth to Water (feet)[3]	Yield Gallons a Minute	Chief Aquifer	Topographic Location	Remarks
365	Climax	J. W. Moore	Carl Greggerson	Cr-Dr	42	6?	2		6	Slate	Valley	Soft water.
366	Do.	R. S. Donnell	do	Cr-Dr	100		2		9	do	Flat	Do
367	Do.	M. L. Allred	do	Cr-Dr	85½	80?	2		12	do	do	
368	Do.	Climax Corp.	W. B. Mayhew	Cr-Dr	120	100	3		15	do		
369	¾ mile E of Climax	M. T. Parish	Parish & Younts	Cr-Dr	97	57	2		15	do		
370	½ mile NW of Julian	D. F. McClintock	W. B. Mayhew	Cr-Dr	118		2		5-6	do		Soft water with a little iron.
371	Julian	T. B. Reynolds	do	Cr-Dr	170		2	20R	6	do		Soft water.
372	Do.	S. R. Stafford	Z. V. Jones	Cr-Dr	99?		2			Granite		Moderately soft water with a little iron.
373	4½ miles N of Julian	Lutheran Church	T. A. Leadbetter	Dr	90	30+	6		3½	Greenstone	Hill	Moderately soft water.
374	4 miles NE of Julian	Nathanael Greene School	?	Dr	140		6		10+	Slate?	Hill	Water contains some iron.
375	6 miles NE of Julian	Mrs. Pearl Bailey	W. B. Mayhew	Cr-Dr	95		2		5	Slate	Flat	
376	7½ miles NE of Julian	Dan Bowman	F. L. Smith	D-Dr	63½		6	30½M		Granite	Hill	Dug 49 feet.
377	7 miles NE of Julian	L. G. Clapp	do	Dr	41		6	21R	1½	do	do	

RECORDS OF SPRINGS IN GUILFORD COUNTY

Location	Name	Yield gallons a minute	Chief aquifer	Topographic location	Remarks
A—5 miles NE of High Point	C. M. Borum	½	Granite	Valley	Spring issues from contact of overburden and solid rock. Has never failed.
B—2½ miles S of Gibsonville	J. H. Joyner and others	5-10	Greenstone	Flat	Water issues from fractures or cleavages in the greenstone schist. Supplies 7 homes. Water slightly hard.

[1], [2], [3] Footnotes given at beginning of table.

ANALYSES OF GROUND WATER FROM GUILFORD COUNTY, NORTH CAROLINA

(Analysts: E. W. Lohr, M. D. Foster, and M. S. Berry, U. S. Geological Survey. Numbers at heads of columns correspond to numbers in table of well data)

(parts per million)

	22	43	111	201	266	328	343	345
Silica (SiO_2)	32		22	32			38	48
Iron (Fe)	.02		.01	.0			.02	.04
Calcium (Ca)	23		4.0	59			21	53
Magnesium (Mg)	4.1		1.6	13			6.7	29
Sodium and Potassium (Na+K)	12		6.6	21			18	25
Carbonate (CO_3)	0		0	0			0	0
Bicarbonate (HCO_3)	116	23	22	181	48	48	50	148
Sulfate (SO_4)	2	a2	2	48	a8	a18	21	55
Chloride (Cl)	2	2	6	30	29	30	35	64
Fluoride (F)		.0		.3	.0	.0		
Nitrate (NO_3)	.5	3.2	2.9	5.1	19	31	7.6	45
Dissolved solids	138		63	311			188	422
Total hardness as $CaCO_3$	74	21	17	201	86	111	80	252
Date of collection, 1942	Aug. 14	Aug. 14	Sept. 17	June 5	Aug. 12	Nov. 12	Sept. 18	Sept. 18
Depth (feet)	271	130	63	274	78	75	45	30
Chief aquifer	Granite	Granite	Granite	Granite (?)	Granite	Greenstone schist	Granite	Granite

a By turbidity

LOG OF WELL 133, 2 MILES SE OF FRIENDSHIP
(Driller's log)

	Thickness (feet)	Depth (feet)
Greenstone schist (?):		
Clay, red	65	65
Sand	5	70
Shale	6	76
Granite, gray	28	104
Granite, bluish	52	156
Granite, very fine-grained, blue	48	204

LOG OF WELL 164, 1 MILE SW OF BATTLEGROUND
(Driller's log, with comments by the writer)

	Thickness (feet)	Depth (feet)
Greenstone schist (?):		
Shale, yellow	51	51
Flint, blue (silicified schist?)	9	62
Flint, dark gray (silicified schist?)	8	70
Granite, gray	8	78
Varied blue stone and quartz	12	90
Rock, green, blue, yellow	5	95

LOG OF WELL 183, 3 MILES NW OF GREENSBORO
(Driller's log)

	Thickness (feet)	Depth (feet)
Sericite schist (?):		
(Old well)	28	28
Clay	30	58
Mud	15	73
Shale, blue	28	101

LOG OF WELL 201 AT GREENSBORO
(Driller's log)

	Thickness (feet)	Depth (feet)
Greenstone schist:		
Soil	3	3
Sandstone, becoming harder	17	20
Blue granite	30	50
Hard gray granite	78	128
Black granite (crevice struck at 144 feet and had to fill in 2 or 3 times to turn tools)	18	146
Dark blue granite, hard	128	274
Blue granite	7	281
Gray granite	1	282

Completion test: Static level 17 feet. Pump setting 218 feet. Pumped 2¼ hours at 225 gallons a minute, 19 hours at 180 gallons a minute. (Well originally 274 feet deep. Deepened to 282 feet in 1944. Samples examined from the last 8 feet of drilling were greenstone schist.)

LOG OF WELL 214, AT EAST EDGE OF GREENSBORO
(Driller's log, with comments by the writer)

	Thickness (feet)	Depth (feet)
Granite:		
Granite, weathered	42	42
Granite, weathered, yellow	29	71
Granite, gray	19	90
Granite, light gray	12	102
Rock, hard, blue (salty dike?)	51	153
Granite, gray	29	182
Granite, light gray	18	200

LOG OF WELL 233, GIBSONVILLE
(Driller's log)

	Thickness (feet)	Depth (feet)
Greenstone schist:		
Clay, red and gray	133	133
Rock, soft, rotten	18	151
Rock, white flint	9	160
Rock, white flint, and blue-green rock	20	180
Rock, soft blue, caving	21	201

LOG OF WELL 299, 1¼ MILES NE OF SEEGEFIELD
(Driller's log)

	Thickness (feet)	Depth (feet)
Greenstone schist:		
Clay, red	22	22
Clay, yellow and sand	23	45
Sand, yellow and blue	7	52
Sand, white	16	68
Sand, white and white flint rock	5	73
Shale, blue	14	87

LOG OF WELL 362, 1¾ MILES NW OF CLIMAX
(Driller's log)

	Thickness (feet)	Depth (feet)
Granite:		
Clay	22	22
Quicksand	5	27
Sandrock	12	39
Granite, gray, hard	111	150

ROCKINGHAM COUNTY

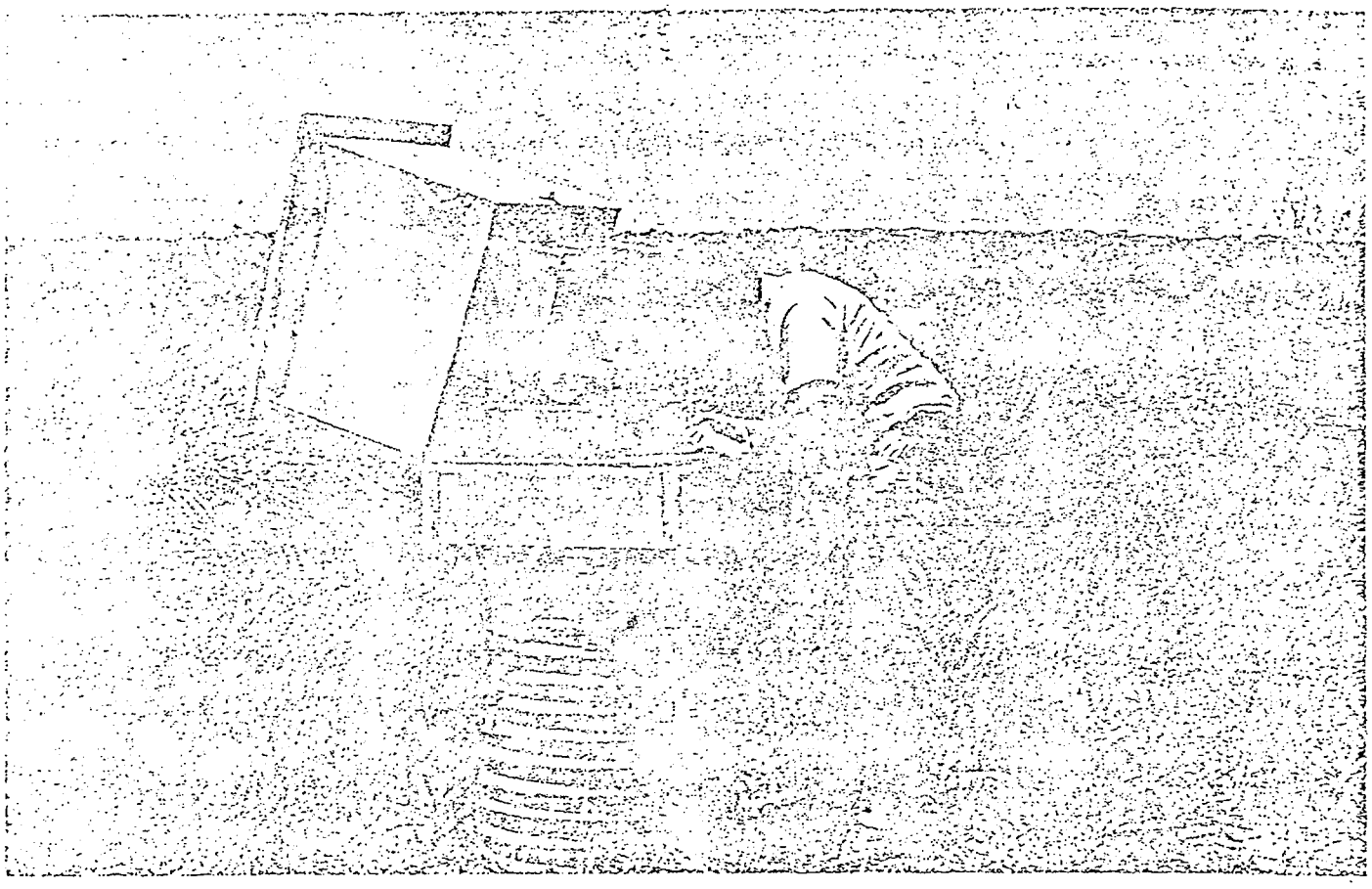
(Area, 572 square miles; population, 57,898)

Geography, physiography, and drainage.—Rockingham County, in the north-central part of the Greensboro area, is the second largest county in the area. There are five incorporated cities and towns in the county and four unincorporated towns and villages. Reidsville is the largest incorporated city, but the combined population of Leaksville-Spray is considerably more, although most of the area is not incorporated. Reidsville has an important cigarette manufacturing industry and Leaksville-Spray has a number of large textile mills. Textile mills and furniture factories are located in the other, smaller towns. Agriculture is the chief occupation outside these towns. Rockingham County has an excellent system of improved highways and is served by three railroad systems.

Rockingham County is in the Piedmont physiographic province, which is characterized by a dissected upland plateau-like surface formed by uplift and partial dissection of a peneplane. Large areas between the larger streams are relatively flat, but near these streams the upland has been dissected and the topography has reached approximate maturity, most of the surface consisting of slopes with little flat upland or lowland. The surface is particularly rugged in a strip several miles wide along the southeast side of the Dan River basin. In this area even the smaller streams tributary to the Dan have cut down several hundred feet below the upland surface. The basin of Dan River, formed in Triassic rocks, possibly should be considered as a separate division of the Piedmont province, because it is much lower and has had a different physi-

Ref. 11

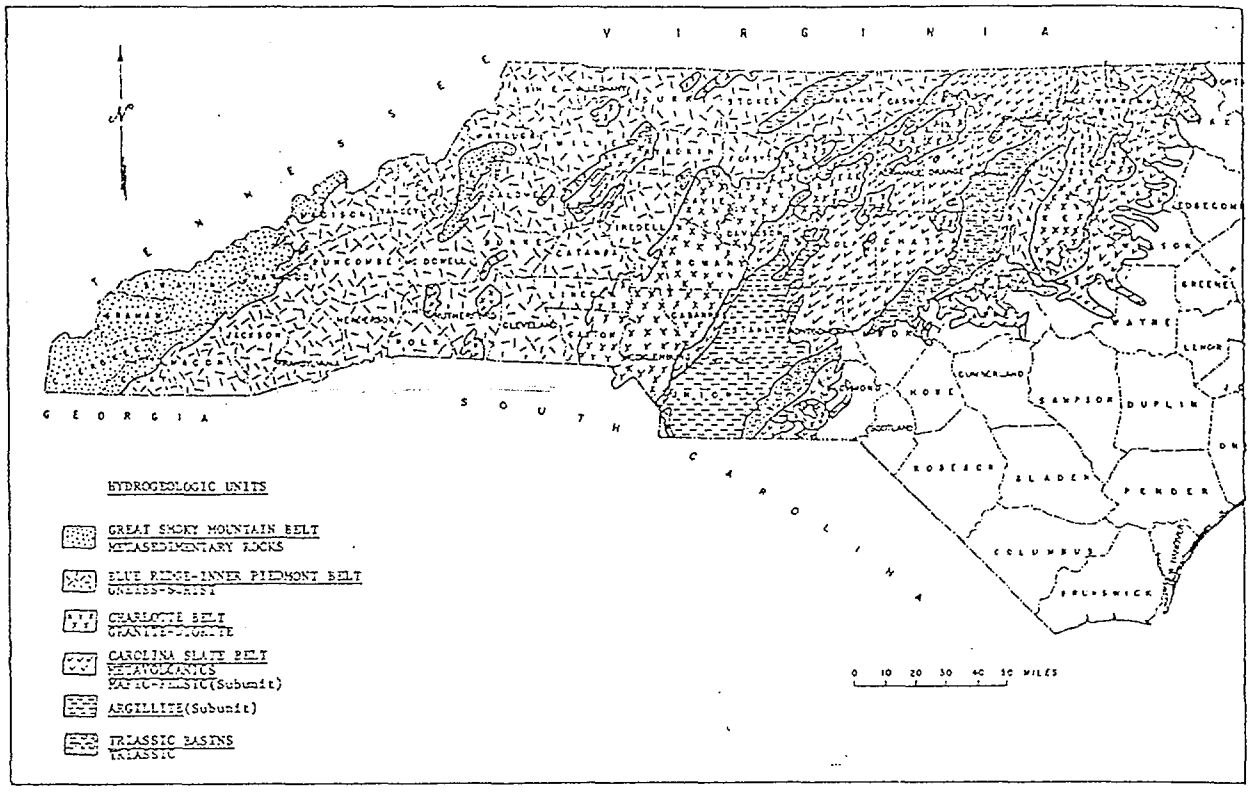
Basic Elements of Ground-Water Hydrology with Reference to Conditions in North Carolina



U.S. GEOLOGICAL SURVEY
WATER RESOURCES INVESTIGATIONS
OPEN-FILE REPORT 80-44

Prepared in cooperation with the
North Carolina Department of Natural
Resources and Community Development

Rock Units and Aquifers in the Piedmont and Mountains



The rocks underlying the Piedmont and mountains can be divided into two groups: (1) bedrock, and (2) saprolite (or residuum). The saprolite underlies the land surface and ranges in thickness from a foot or two near bedrock outcrops to more than 100 ft. Bedrock underlies the saprolite and is the parent rock from which the saprolite was derived in the process referred to as weathering.

Many stream valleys, especially those of larger streams, are underlain by a layer of material similar in composition to saprolite. This material, which has been deposited by the streams during floods, is correctly referred to as *alluvium*. However, to avoid unnecessary complications, we will lump the alluvium in with the saprolite for the purpose of this discussion.

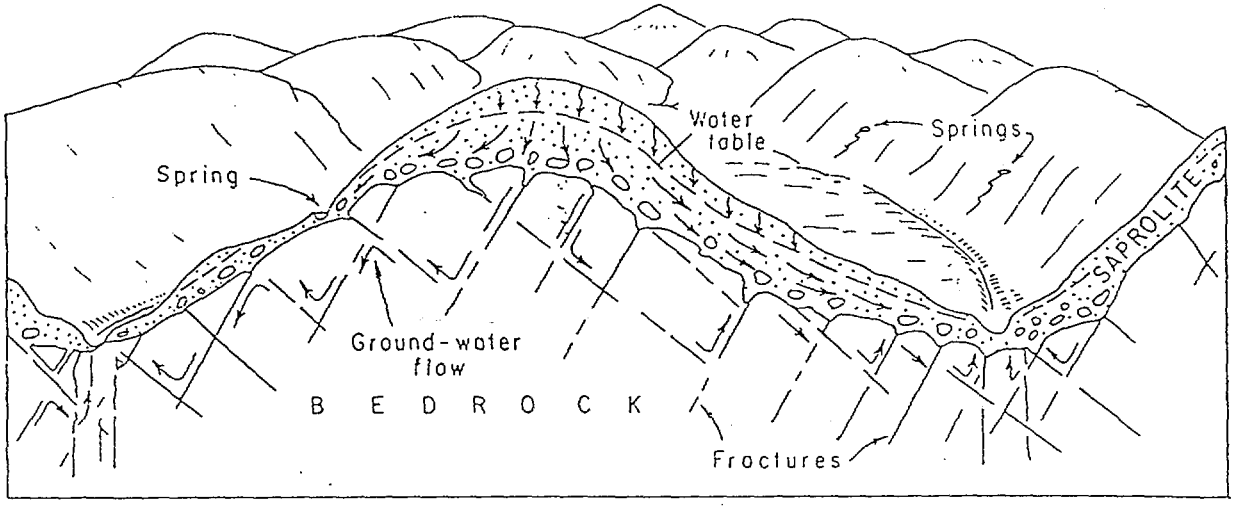
The bedrock underlying the Piedmont and mountains consists of many different types of igneous and metamorphosed igneous and sedimentary rocks. The Generalized Geological Map of North Carolina accompanying the discussion of WATER-BEARING ROCKS divides the bedrock in the Piedmont and mountains into six units. The 1:500,000 scale Geologic Map of North Carolina, published in 1958, divides the bedrock in the same area into 48 different units. But, a much larger number of units have been identified and are shown on large scale geologic maps.

The bedrock units differ from each other in mineral composition and other geologic characteristics. Fortunately, these differences do not result in large differences in hydraulic characteristics so that it is possible to combine the bedrock units into a relatively small number of hydrogeologic units.

The accompanying map shows the hydrogeologic units into which the bedrock in the Piedmont and mountains has been divided by the U.S. Geological Survey and the North Carolina Groundwater Section.

The most productive hydrogeologic units are the Great Smoky Mountain belt and the Blue Ridge-Inner Piedmont belt. The least productive units are the Carolina Slate Belt and the Triassic Basins. The Charlotte Belt is intermediate in productivity.

Ground-Water Situation in the Piedmont and Mountains



The *saprolite* (weathered rock) that forms the land surface in the Piedmont and mountains consists of unconsolidated granular material. It thus contains water in the pore spaces between rock particles.

The *bedrock*, on the other hand, does not have any significant intergranular (primary) porosity. It contains water, instead, in sheet-like openings formed along fractures (that is, breaks in the otherwise "solid" rock). Fractures in bedrock are of two types: (1) *joints*, which are breaks along which there has been no differential movement; and (2) *faults*, which are breaks along which the adjacent rocks have undergone differential movement.

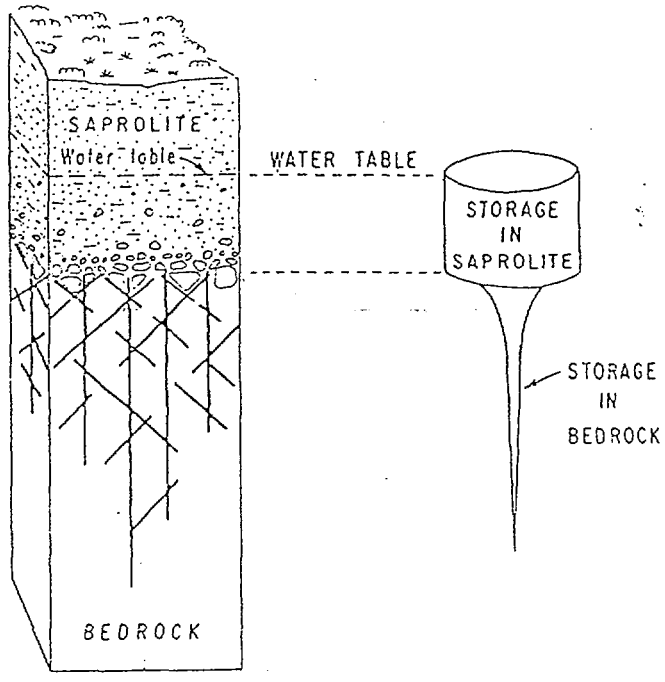
Faults are formed during earthquakes and generally contain larger and more extensive openings than those developed along joints. Joints, however, are far more numerous than faults.

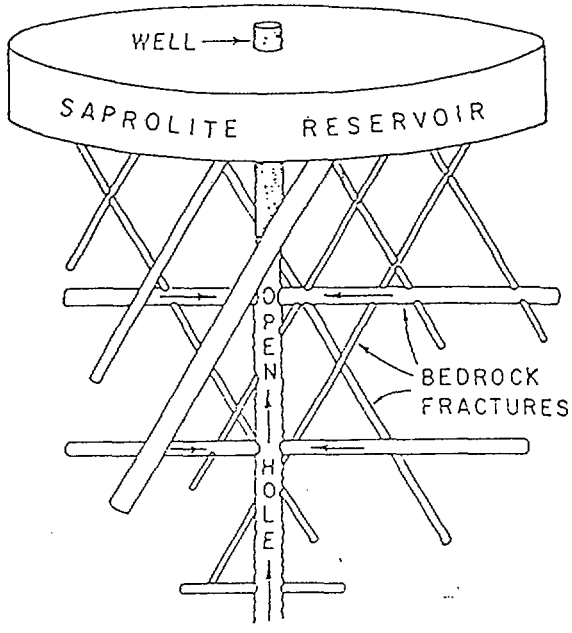
Fractures (joints and faults) are more abundant under valleys, draws, and other surface depressions than under hills. In fact, geologists assume that it is the presence of fractures that determined the position of valleys in the first place. Fractures tend to be more closely-spaced and the openings developed along them tend to be larger near the surface of the bedrock. Most fractures appear to be non water-bearing below a depth of 300 to 400 ft. Large water-bearing openings, penetrated below this depth are probably associated with faults.

The ground-water system in the Piedmont and mountains is recharged by precipitation on the interstream areas. A part of the precipitation infiltrates through the unsaturated zone to the water table, which normally occurs in the saprolite.

Ground water moves laterally and downward through the saprolite to points of ground-water seepage (springs) on the hillsides and to the streams in the adjacent valleys. Some of the water in the saprolite also moves downward into the bedrock and, thereafter, through the fractures to the adjacent valleys.

Hydraulic Characteristics of the Piedmont and Mountain Ground-Water System





One of the most basic concepts of ground-water hydrology is that aquifers function both as reservoirs, in which water is in storage, and as pipelines, which transmit water from one point to another. This is referred to as the *reservoir-pipeline concept.* This concept forms a useful basis on which to discuss the hydraulic characteristics of the Piedmont and mountain ground-water system.

The reservoir (storage) function of aquifers depends on the porosity. The pipeline function depends on the hydraulic conductivity and the thickness of the aquifer. The approximate range in porosity and hydraulic conductivity for the saprolite and bedrock is shown in the following table.

Rock type	Porosity in percent	Hydraulic conductivity in feet per day
Saprolite	20-30	1-20
Bedrock	0.1-1	1-20

The above values suggest that the principal difference between saprolite and bedrock is in water-storage capacity. In other words, the saprolite has the capacity to store a much larger quantity of water than does the bedrock. This is not the entire story, however.

As we noted above, the capacity of an aquifer to transmit water depends both on hydraulic conductivity and on aquifer thickness. The part of the bedrock containing water-bearing fractures is several times thicker than the saprolite.

We can then, without great error, view the ground-water system in the Piedmont and mountains as consisting of a saprolite reservoir overlying a bedrock pipeline consisting of numerous small, interconnected pipes. In the vicinity of a pumping well the bedrock fractures ("pipes") convey water from the saprolite reservoir to the well.

The yield of a well drawing from fractured bedrock depends on several factors. The most important of these are believed to be:

1. The number, size, areal extent, and degree of interconnection of the fractures penetrated by the well,
2. The thickness of saturated saprolite in the vicinity of the well and the specific yield of the saprolite, and
3. The hydraulic conductivity of the saprolite and the nature of the hydraulic connection between the saprolite and the bedrock.

The number and the size of the fractures control the rate at which water can enter the well. The areal extent and degree of interconnection of the fractures control the size of the area that supplies water to the well.

The thickness and the specific yield of the saprolite determines the volume of water available from storage in the saprolite. The hydraulic conductivity of the saprolite and the nature of the hydraulic connection between the saprolite and the bedrock determines the rate at which water can drain from the saprolite into the bedrock fractures.

HYDRAULIC CONDUCTIVITY AND TRANSMISSIVITY VALUES FOR TYPICAL NORTH CAROLINA ROCKS AND AQUIFERS

Hydraulic Conductivity of Selected Rocks

Material	Hydraulic conductivity (rounded values) (ft/day)	[(gal/day)/ft²]	(meters/day)	CM/SEC
Coarse sand	200	1500	60	7.06×10^{-2}
Medium sand	130	1000	40	4.59×10^{-2}
Silt	1	5	0.2	3.53×10^{-4}
Clay	0.001	0.01	0.0004	3.53×10^{-7}
Limestone (Castle Hayne)	300	2000	80	1.06×10^{-1}
Saprolite	5	50	2	1.77×10^{-3}
Granite and gneiss	5	50	2	1.77×10^{-3}
Slate	3	25	1	1.06×10^{-3}

Hydraulic conductivity replaces the term "field coefficient of permeability" and should be used when referring to the water-transmitting characteristic of material in quantitative terms. It is still permissible to refer in qualitative terms to "permeable" and "impermeable" material.

Average Values of Hydraulic Conductivity, Thickness, and Transmissivity for Selected Aquifers in North Carolina

Aquifer	CM/SEC	Hydraulic Conductivity (ft./day)	Thickness (ft.)	Transmissivity (ft²./day)
Post-Yorktown deposits	1.77×10^{-2}	50	20	1000
Yorktown Formation	1.77×10^{-2}	50	40	2000
Castle Hayne Limestone	1.06×10^{-1}	300	100	30000
Cretaceous deposits	7.06×10^{-3}	20	200	4000
Saprolite	1.77×10^{-3}	5	50	250
Granite and gneiss	1.77×10^{-3}	5	200	1000

Transmissivity replaces the term "coefficient of transmissibility" because, by convention, an aquifer is transmissive and the water in it is transmissible.

(from Heath, R. C., 1980, Basic elements of ground-water hydrology with reference to conditions in North Carolina; U.S. Geological Survey Water-Resources Investigations Report 80-44)

HYDRAULIC CONDUCTIVITY CONVERSION FACTORS:

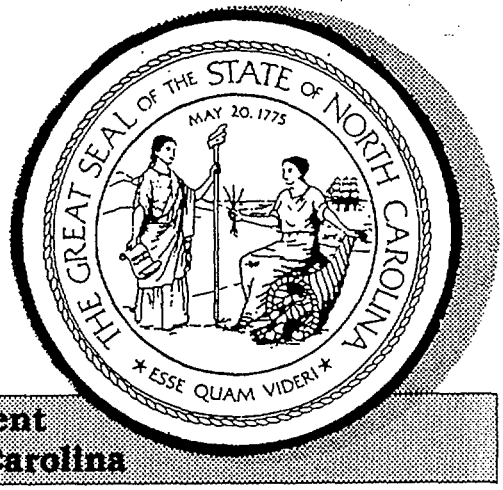
$$\frac{FT}{DAY} \times \frac{30.5\ CM/FT}{86400\ SEC/DAY} = \frac{CM}{SEC}$$

OR

$$N\ \frac{FT}{DAY} = 3.53 \times 10^{-4}\ N\ \frac{CM}{SEC}$$

STATE OF NORTH CAROLINA
DEPARTMENT OF
NATURAL RESOURCES AND
COMMUNITY DEVELOPMENT

Classifications and Water Quality Standards Assigned to The Waters of The Cape Fear River Basin



Division of Environmental Management
Raleigh, North Carolina

Reprint from North Carolina Administrative Code: 15 NCAC 2B .0311
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

.0311 CAPE FEAR RIVER BASIN

Name of Stream	Description	Class	Classification Date	Classification Index No.
	HAW RIVER DRAINAGE AREA			
HAW RIVER	From source to supplemental water intake for City of Burlington	WS-III NSW	2/1/86	16-(1)
Rock Branch (Rocky Branch)	From source to Haw River	WS-III NSW	2/1/86	16-2
Mears Fork Creek	From source to Haw River	WS-III NSW	2/1/86	16-3
Benaja Creek	From source to Haw River	WS-III NSW	2/1/86	16-4
Unnamed Tributary at Brooks Lake (Brooks Lake)	From source to dam at Brooks Lake	B NSW	12/1/83	16-4-1-(1)
Unnamed Tributary at Brooks Lake	From dam at Brooks Lake to Benaja Creek	WS-III NSW	2/1/86	16-4-1-(2)
Candy Creek	From source to Haw River	WS-III NSW	2/1/86	16-5
Troublesome Creek	From source to Haw River	WS-III NSW	2/1/86	16-6
Glady Creek	From source to Troublesome Creek	B NSW	12/1/83	16-6-1
Unnamed Tributary to Troublesome Cr (Lake Hunt)	From source to dam at Lake Hunt	B NSW	12/1/83	16-6-2-(1)
Unnamed Tributary to Troublesome Creek	From dam at Lake Hunt to Troublesome Creek	WS-III NSW	2/1/86	16-6-2-(2)
Hester Lake	Entire lake and connecting stream to Unnamed Tributary to Troublesome Creek	WS-III NSW	2/1/86	16-6-2-3
Little Troublesome Creek	From source to Haw River	C NSW	12/1/83	16-7
Rose Creek (Apple Pond)	From source to Haw River	WS-III NSW	2/1/86	16-8
Giles Creek	From source to Haw River	WS-III NSW	2/1/86	16-9
HAW RIVER	From supplemental water intake for City of Burlington to Dry Creek (near Bynum)	C NSW	12/1/83	16-(10)
Reedy Fork (including Lake Brandt and Lake Townsend below normal operating levels)	From source to Lake Townsend Dam	WS-III NSW	2/1/86	16-11-(1)
Beaver Creek	From source to Reedy Fork	WS-III NSW	2/1/86	16-11-2
Moores Creek	From source to Reedy Fork	WS-III NSW	2/1/86	16-11-3
Brush Creek	From source to paved Guilford College Road (SR 2137)	C NSW	12/1/83	16-11-4-(1)
Brush Creek (Lake Higgins)	From paved Guilford College Road (SR 2137) to Lake Brandt, Reedy Fork	WS-III NSW	2/1/86	16-11-4-(2)
Horsepen Creek	From source to Lake Brandt, Reedy Fork	WS-III NSW	2/1/86	16-11-5
Unnamed Tributary at Guilford College	From source to dam at Guilford College bathing lake	B NSW	12/1/83	16-11-5-1-(1)
Unnamed Tributary at Guilford College	From dam at Guilford College bathing lake to Horsepen Creek	C NSW	12/1/83	16-11-5-1-(2)
Long Branch	From source to Lake Townsend, Reedy Fork	WS-III NSW	2/1/86	16-11-6
Richland Creek (Richland Lake)	From source to Lake Townsend, Reedy Fork	WS-III NSW	2/1/86	16-11-7
Squirrel Creek	From source to Lake Townsend, Reedy Fork	WS-III NSW	2/1/86	16-11-8
Reedy Fork (Hardys Mill Pond)	From Lake Townsend Dam to Haw River	C NSW	12/1/83	16-11-(9)
Unnamed Tributary at Camp Herman (Lake Herman)	From source to dam at Lake Herman	B NSW	12/1/83	16-11-10-(1)

.0311 CAPE FEAR RIVER BASIN

Name of Stream	Description	Class	Classification Date	Classification Index No.
Unnamed Tributary at Camp Herman	From dam at Lake Herman to Reedy Fork	C NSW	12/1/83	16-11-10-(2)
Smith Branch	From source to Reedy Fork	C NSW	12/1/83	16-11-11
Rocky Branch	From source to Reedy Fork	C NSW	12/1/83	16-11-12
Katie Branch	From source to Reedy Fork	C NSW	12/1/83	16-11-13
Buffalo Creek	From junction of North Buffalo Creek and South Buffalo Creek to Reedy Fork	C NSW	12/1/83	16-11-14
North Buffalo Creek	From source to Buffalo Creek	C NSW	8/1/85	16-11-14-1
Lake Hamilton, Lake Euphemia	Entire lakes and connecting streams to North Buffalo Creek	C NSW	12/1/83	16-11-14-1-1
Unnamed Tributary at Cone Mills (Philadephia Lake, Buffalo Lake)	From source to dam at Buffalo Lake	WS-III NSW	2/1/86	16-11-14-1-2-(1)
Unnamed Tributary at Cone Mills (White Oak Lake)	From dam at Buffalo Lake to North Buffalo Creek	C NSW	12/1/83	16-11-14-1-2-(2)
Muddy Creek	From source to North Buffalo Creek	C NSW	8/1/85	16-11-14-1-3
Jorden Branch	From source to North Buffalo Creek	C NSW	12/1/83	16-11-14-1-4
South Buffalo Creek	From source to Buffalo Creek	C NSW	8/1/85	16-11-14-2
Piedmont Creek	From source to South Buffalo Creek	C NSW	12/1/83	16-11-14-2-1
Glenwood Creek	From source to South Buffalo Creek	C NSW	12/1/83	16-11-14-2-2
Ryan Creek	From source to South Buffalo Creek	C NSW	12/1/83	16-11-14-2-3
Mile Run Creek	From source to South Buffalo Creek	C NSW	12/1/83	16-11-14-2-4
Blackwood Creek	From source to Buffalo Creek	C NSW	12/1/83	16-11-14-3
Parks Creek	From source to Reedy Fork	C NSW	12/1/83	16-11-15
Travis Creek	From source to Haw River	C NSW	1/1/85	16-12
Tickle Creek (Trickle Creek)	From source to Travis Creek	C NSW	12/1/83	16-12-1
Dry Creek	From source to Haw River	C NSW	12/1/83	16-13
Stony Creek (Lake Burlington, Stony Creek Reservoir)	From source to dam at Copland Fabrics, Inc., water supply	WS-III NSW	2/1/86	16-14-(1)
Grays Branch	From source to Stony Creek	WS-III NSW	2/1/86	16-14-2
Benton Branch	From source to Stony Creek	WS-III NSW	2/1/86	16-14-3
Toms Creek	From source to Lake Burlington, Stony Creek	WS-III NSW	2/1/86	16-14-4
Buttermilk Creek	From source to Stony Creek	WS-III NSW	2/1/86	16-14-5
Jones Creek	From source to Buttermilk Creek	WS-III NSW	2/1/86	16-14-5-1
Laughin Creek	From source to Buttermilk Creek	WS-III NSW	2/1/86	16-14-5-2
Whittie Creek	From source to Buttermilk Creek	WS-III NSW	2/1/86	16-14-5-3
Jordan Creek	From source to Stony Creek	WS-III NSW	2/1/86	16-14-6
Hughes Mill Creek	From source to Jordan Creek	WS-III NSW	2/1/86	16-14-6-1
Owens Creek	From source to Jordan Creek	WS-III NSW	2/1/86	16-14-6-2
Mine Creek	From source to Stony Creek	WS-III NSW	2/1/86	16-14-7
Deep Creek	From source to Stony Creek	WS-III NSW	2/1/86	16-14-8
Stony Creek	From dam at Copland Fabrics, Inc., water supply to Haw River	C NSW	12/1/83	16-14-(9)
Service Creek (Servis	From source to Haw River	C NSW	12/1/83	16-15

Memorandum

Date: July 10, 1990

To: File

From: John P. McConney JPM

Subject: Fishing and boating on North Buffalo Creek and Buffalo Creek

On this date, Mr. Roger Jones, Fisheries Biologist for Guilford County, was contacted at (919) 228-1257. He provided the following information on fishing on the referenced water bodies.

- There is very little fishing on these water bodies. These creeks are not very clean and there is a sewage outfall located on North Buffalo Creek. There may be more fishing on the part of the creek located north of the city but fishing there is still very limited.

- There is no commercial fishing at all on these creeks.

- There is little or no boating on these creeks. There is little or no access. These creeks are only large enough for canoeing.

jm/desoto.rjl

Ref. 14

SOIL SURVEY OF

Guilford County, North Carolina

United States Department of Agriculture
Soil Conservation Service

In cooperation with
Board of Commissioners, Guilford County, North Carolina, and
North Carolina Agricultural Experiment Station

Greensboro has 35,985 workers in manufacturing enterprises. The 5-year increase was more than 11,000. With 13,900 workers, textile plants are the largest single source of employment. Other major types of industry, in order of total employment, are machinery, apparel, tobacco, food, newspaper printing and publishing, and metal working. Machinery manufacturing has had the greatest growth in employment, both in total number and in percentage of increase. In this field, employment in 1970 was 6,960, an increase of 259 percent since 1965.

High Point has 22,900 manufacturing workers. The 5-year increase was 1,600. Furniture manufacturing is the largest industry, with 8,100 employees, closely followed by textiles, with 7,000 employees. Other major types of industry are apparel, printing and publishing, and transportation equipment. Many of the nation's leading furniture and hosiery manufacturers have their headquarters in High Point.

Guilford County is also a major transportation center, with nearly 5,000 persons employed in various transportation enterprises. Rail service is provided by several lines. The airport serving both Greensboro and High Point has scheduled passenger and freight service. More than 100 trucking and warehousing firms have installations in the county and employ more than 3,000 workers.

Water Supply

Guilford County has an abundant supply of water from both surface streams and ground water (*3*).

There are three types of wells in Guilford County: dug, bored, and drilled.

Dug wells range from a few feet to nearly 100 feet in depth. The inside diameter usually is 24 to 30 inches. Dug wells have the advantage of larger storage capacity than other types, but digging below the water table and through bedrock is difficult. Contamination is another problem associated with the shallower dug wells.

Bored wells are very similar to dug wells, but the earth is removed by a large machine operated auger. Bored wells usually range from 30 to 40 feet in depth and from 18 to 24 inches in diameter. Because wells can easily be bored for a considerable depth below the water table, this type of well is not so apt to go dry during periods of drought. Bored wells, however, cannot be used where the water table is below the zone of completely decayed and disintegrated rock.

Drilled wells are safer and more reliable than dug and bored wells. Because they are tightly cased and water is obtained from crevices in the bedrock, the danger of contamination is much less. Because the well generally extends far below the fluctuating water table, drilled wells rarely go dry.

A drilled well, 3 inches or more in diameter, gives the greatest yield in the greenstone schist. Greenstone schist has an average yield of 28 gallons per minute and 0.17 gallon per minute per foot of well. Wells in sheared granite rank second, with an average yield of 14 gallons per foot of well. Next in order of greatest average yield are gneiss serioite schist, porphyritic granite, and diorite.

Topographic location is important when locating a well. The highest yields are from wells in valleys, the average being 28 gallons per minute from a drilled well 3 inches or more in diameter. The next greatest average yield is from wells in draws; they yield 27 gallons per minute. Next in order are flats, slopes, and hills.

Yield per minute generally increases with depth, but yield per foot of well depth generally decreases as depth increases.

Cities and industries in Guilford County cannot rely on wells for their water supply. Greensboro obtains its water from Lake Higgins, which has a capacity of 800,000,000 gallons; Lake Brandt, which has a capacity of 2,200,000,000 gallons; and Lake Townsend, which has a capacity of 6,500,000,000 gallons.

The City of High Point obtains its water from City Lake, which has a capacity of 1,250,000,000 gallons, and New City Lake, which has a capacity of 3,000,000,000 gallons. Jamestown obtains its water supply from Oakdale Mill Pond, capacity unknown. Other municipalities in Guilford County obtain their water supply from wells.

The approximately 2,500 artificial lakes are used chiefly for irrigation, livestock water supply, recreation, fire protection, and flood prevention.

Land Use

According to the 1971 North Carolina Conservation Needs Inventory, the land use in Guilford County is approximately as follows: cropland, 101,666 acres; pasture, 30,235 acres; urban and built-up areas, 70,744 acres; forest, 192,300 acres; and other land, 20,995 acres.

Guilford Battleground National Park is maintained by the U.S. Park Service. The Greensboro-High Point-Winston Salem Regional Airport is maintained by the Greensboro-High Point Airport Authority. The City of High Point maintains two lakes for water supply and recreation and several other recreational parks. The City of Greensboro maintains a park and zoo and three lakes, which are used for water supply and recreation.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are located, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes, the size of streams and the general pattern of drainage, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has been changed very little by leaching or by the action of plant roots.

Borrow pits are areas where the soil has been excavated to a depth of more than 20 feet. The more recently excavated areas are bare and are subject to accelerated erosion. The older areas are eroded, but many of them have stabilized under pine and other vegetation. Some of the areas are smooth, and others have a highly irregular surface.

Quarries are areas where the regolith has been removed and the underlying rock has been quarried for use mainly as construction aggregate. These areas are open excavations as deep as 100 feet or more. Water fills er cavities all year in most of the abandoned These cavaties are almost entirely devoid of ı. Some pine and cedar trees are around the top ırries, where the soil is exposed.

tary landfill areas the original soil has been and solid waste material placed in alternating h the original soils and other soil materials. A have been used as dumps for industrial and tes. Soil material was mixed in some of these low areas, and the land was then leveled. Some er sanitary landfills that are closed have stands ı pine and shortleaf pine.

reas are so diverse that onsite investigation of each unit should be made before proceeding with any land use practice.

Ur—Urban land. This land type consists of areas where more than 75 percent of the surface is covered with streets, buildings of all types, parking lots, railroad yards, and airports. The soils between these facilities are sed for parks, lawns, playgrounds, cemeteries, and drainageways. The natural soils have been greatly altered by cutting, filling, grading, and shaping during the processes of urbanization. The original landscape, or topography, and the drainage pattern has been changed.

Most of the acreage of this land type is in the business districts of Greensboro and High Point or around the perimeter of the cities. Isolated areas are as small as 5 acres. Slopes are 2 to 10 percent.

The major concern is the excessive runoff from roofs, roads, and parking lots, which increases the flooding hazard in lower lying areas. There is a very severe hazard of waterway and reservoir siltation from areas that are graded and not immediately stabilized.

Determination of use and treatment requires onsite investigation.

VaB—Vance sandy loam, 2 to 6 percent slopes. This well drained soil is on narrow ridges on uplands. The mapped areas are 3 to 15 acres or more in size.

Typically, the surface layer is brown sandy loam about 6 inches thick. The subsoil is 34 inches thick; the upper part is mottled strong brown clay, and the lower part is mottled brownish yellow clay loam. The underlying material, to a depth of 72 inches, is mottled brownish yellow, white, and red clay loam.

Included with this soil in mapping are a few small areas of soils that have a clay loam surface layer. Also included e small areas of Appling, Enon, and Helena soils.

The organic-matter content of the surface layer is low. Permeability is slow, available water capacity is low, and the shrink-swell potential is moderate. Reaction of the subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The seasonal high water table is at a depth of more than 6 feet.

Most areas of this soil are used for cultivated crops or pasture. The rest are forested. Slope, runoff, erosion, and slow permeability are the main limitations in the use and management of this soil.

This soil has moderately high potential for tobacco, corn, milo, and small grain. It has high potential for horticultural crops, such as tomatoes, sweet corn, green beans, and peas. Minimum tillage and crop residue management help to control runoff and erosion. Conservation practices such as maintaining sod in drainageways, constructing terraces and diversions, stripcropping, establishing field borders, contour farming, and using crop rotations that include close-growing crops also help conserve soil and water. The potential for hay and pasture plants such as ladino clover, red clover, fescue, and sericea lespedeza. Proper pasture management helps to ensure adequate protective cover, which reduces runoff and controls erosion.

The potential for urban uses, such as houses and streets, is low because of slow permeability and low strength. Potential is moderate for recreation areas because of slow permeability.

This soil has moderately high potential for broadleaf and needleleaf trees. The dominant trees are white oak, black oak, post oak, northern red oak, southern red oak, blackjack oak, cedar, maple, hickory, loblolly pine, shortleaf pine, and Virginia pine. The main understory species are dogwood, holly, and sassafras. There are no major limitations in the use and management of this soil for woodland. Capability unit IIIe-3; woodland group 3o.

VaC—Vance sandy loam, 6 to 10 percent slopes. This well drained soil is on long, narrow side slopes. The mapped areas are 3 to 15 acres in size.

Typically, the surface layer is brown sandy loam about 6 inches thick. The subsoil is 34 inches thick; the upper part is mottled strong brown clay, and the lower part is mottled brownish yellow clay loam. The underlying material, to a depth of 72 inches, is mottled brownish yellow, white, and red clay loam.

Included with this soil in mapping are a few small areas of soils that have a clay loam surface layer and a few small areas of soils that have gravel or small cobbles in the surface layer. Also included are a few small areas of Appling, Cecil, Enon, and Helena soils.

The organic-matter content of the surface layer is low. Permeability is slow, available water capacity is low, and the shink-swell potential is moderate. Reaction of the subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The seasonal high water table is at a depth of more than 6 feet.

Most areas of this soil are forested. The rest are used for cultivated crops, for pasture, or for urban and indus-

—49 to 70 inches; light brownish gray (10YR 6/2) loam; few pockets of sandy clay; common medium prominent brownish yellow (10YR 6/6) mottles; massive; friable, sticky and slightly plastic; common fine flakes of mica; few fine black mineral fragments; slightly acid.

Depth to bedrock is more than 60 inches. Few to common fine flakes of mica occur throughout.

The A horizon is brown and dark brown loam, silt loam, or fine sandy loam.

The C horizon is dark brown, yellowish brown, dark yellowish brown, brown, light brownish gray, or strong brown loam, sandy loam, sandy clay loam, or loamy sand. The C horizon is slightly acid to strongly acid.

Coronaca Series

The Coronaca series consists of well drained, moderately permeable soils that formed in material weathered from hornblende gneiss, gabbro, and diorite. These soils are on broad, smooth interstream divides. Slopes are 2 to 10 percent.

Typical pedon of Coronaca clay loam, 2 to 6 percent slopes, 4.5 miles south of Whitsett on North Carolina Highway 61 to junction of North Carolina Highway 61 and State Route 3108, 1 mile northeast on State Route 3108 to State Route 3110; 0.5 mile south on State Route 3110, and 200 yards west of road in cultivated field:

Ap—0 to 8 inches; dark reddish brown (2.5YR 3/4) clay loam; moderate medium granular structure; friable; common fine roots; few medium pores; neutral; abrupt smooth boundary.

B21t—8 to 30 inches; dark red (2.5YR 3/6) clay; moderate medium subangular blocky structure; firm, sticky and plastic; few fine roots; common fine pores; common thin distinct discontinuous clay films on faces of peds; few dark mineral stains; slightly acid; gradual wavy boundary.

B22t—30 to 52 inches; dark red (2.5YR 3/6) clay; few fine prominent reddish yellow mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few medium roots; few fine pores; common thin distinct discontinuous clay films on faces of peds; few dark mineral stains; slightly acid; gradual wavy boundary.

B23t—52 to 71 inches; dark red (2.5YR 3/6) clay; common fine prominent reddish yellow mottles; weak medium subangular blocky structure; firm, sticky and plastic; few medium roots; few thin faint patchy clay films on faces of peds; few dark mineral stains; slightly acid; gradual wavy boundary.

B3—71 to 80 inches; red (2.5YR 4/6) clay loam; common medium prominent reddish yellow (7.5YR 6/8) mottles; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; few thin distinct discontinuous clay films on faces of peds; medium acid; gradual wavy boundary.

C—80 to 95 inches; red (2.5YR 5/8) silty clay loam; many medium prominent reddish yellow (7.5YR 6/8) mottles; massive; friable; 85 percent saprolite; medium acid.

The solum ranges from 60 to 100 inches or more in thickness. Depth to bedrock is more than 60 inches.

The Ap horizon is dark red or dark reddish brown clay loam or sandy clay loam.

The B2t horizon is dark red or red. The B3 horizon is red or dark red clay loam, clay, or silty clay loam. The B horizon is medium acid to neutral.

The C horizon is loam, sandy clay loam, or silty clay loam.

Enon Series

ıe Enon series consists of well drained, slowly permeable soils that formed in residuum weathered from dark colored rocks such as diorite, gabbro, hornblende schist, or mixed acidic and basic rocks. These soils are on broad, smooth interstream divides and long, narrow side slopes. Slopes are 2 to 15 percent.

Typical pedon of Enon fine sandy loam, 2 to 6 percent slopes, 1 mile southwest of Greensboro on U.S. Highway 29-70 to State Road 1662, 25 feet north of State Road 1662, and 450 feet east of State Road 1387:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; very friable; many fine and medium roots; few medium fragments of quartz and black concretions; strongly acid; clear smooth boundary.

A2—3 to 8 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium granular structure; very friable; many fine and medium roots and root channels; few medium black concretions; medium acid; clear wavy boundary.

B1—8 to 11 inches; light olive brown (2.5Y 5/4) sandy clay loam; weak medium subangular blocky structure; friable, sticky and plastic; few fine roots and root channels; few thin faint patchy clay films on faces of peds; slightly acid; gradual wavy boundary.

B21t—11 to 21 inches; yellowish brown (10YR 5/8) clay; moderate medium prismatic structure that parts to moderate medium angular blocky structure; firm, sticky and plastic; few fine and medium roots between peds; few fine pores and root channels; common thick distinct discontinuous clay films on faces of peds; common fine and medium black concretions; slightly acid; gradual wavy boundary.

B22t—21 to 33 inches; yellowish brown (10YR 5/8) clay; moderate medium angular blocky structure; firm, very sticky and plastic; few fine roots and pores; common thick distinct discontinuous clay films on faces of peds; many medium black concretions; few medium gravel; neutral; gradual wavy boundary.

C—33 to 75 inches; mottled brownish yellow (10YR 6/8), black (10YR 2/1), and dark greenish gray (5GY 4/1) loam; massive; friable; 90 percent saprolite; neutral.

The solum ranges from 20 to 44 inches in thickness. Depth to bedrock is more than 60 inches.

The Ap or A1 horizon is dark brown, grayish brown, dark grayish brown, yellowish brown, brown, and light olive brown fine sandy loam, loam, and clay loam.

The B1 horizon, is light olive brown or yellowish brown. The B2t horizon is light olive brown, light yellowish brown, yellowish brown, or strong brown clay or clay loam. The B3 horizon, if present, is brownish yellow, strong brown, reddish yellow, yellowish brown, or light olive brown sandy clay loam, silty clay loam, or clay loam. The B horizon is medium acid to neutral.

The C horizon is loam, sandy loam, or clay loam.

Helena Series

The Helena series consists of moderately well drained, slowly permeable soils that formed in a mixture of material weathered from acidic and basic crystalline rocks such as aplitic granite or granite gneiss that is cut by dikes of gabbro and diorite. These soils are on long, narrow side slopes. Slopes are 0 to 10 percent.

Typical pedon of Helena sandy loam, 0 to 6 percent slopes, in an area of Helena-Sedgefield sandy loams, 0 to 6 percent slopes, 2 miles south of Kimesville on State Road 3349, 80 feet west of State Road 3349, 40 feet southwest of power pole:

Ap—0 to 7 inches; dark brown (10YR 4/3) sandy loam; weak medium granular structure; very friable; many fine roots; slightly acid; clear smooth boundary.

B21t—7 to 16 inches; brownish yellow (10YR 6/6) clay; few medium distinct yellowish red (5YR 5/8) mottles; moderate medium angular blocky structure; very firm, sticky and plastic; few fine and medium

roots and few medium root channels; common thin distinct discontinuous clay films on faces of peds; very strongly acid; gradual wavy boundary.

B22t—16 to 32 inches; reddish yellow (7.5YR 6/6) clay; common fine distinct light gray mottles, few medium distinct very pale brown (10YR 8/4) mottles, and few fine distinct reddish yellow mottles; moderate medium angular blocky structure; very firm, sticky and plastic; few medium roots and root channels; common thin distinct discontinuous clay films on faces of peds; very strongly acid; gradual wavy boundary.

B3—32 to 38 inches; mottled brownish yellow (10YR 6/8), strong brown (7.5YR 5/8), and light gray (10YR 7/2) clay loam; weak medium angular blocky structure; firm, sticky and plastic; few medium root channels; few thin faint patchy clay films on faces of peds; few fine uncoated sand grains; very strongly acid; gradual wavy boundary.

C—38 to 80 inches; mottled strong brown (7.5YR 5/8) and white (10YR 8/1) clay loam; massive; firm; 90 percent saprolite; very strongly acid.

The solum ranges from is 20 to 60 inches in thickness. Depth to bedrock is greater than 48 inches.

The A horizon is pale brown, dark brown, light brownish gray, or grayish brown sandy loam or loamy sand.

The B1 horizon, if present, is yellowish brown sandy clay loam. The B2t horizon is strong brown, reddish yellow, yellowish brown, or brownish yellow sandy clay loam or clay loam. The B horizon is strongly acid to very strongly acid.

The C horizon is commonly variegated yellowish red, strong brown, yellow, white, or gray sandy clay loam or clay loam.

Iredell Series

The Iredell series consists of moderately well drained, slowly permeable soils that formed in residuum weathered from diorite, gabbro schist, and other rocks high in content of ferromagnesian minerals. These soils are on flats, in concave areas, and around the heads of intermittent drainageways. Slopes are 0 to 4 percent.

Typical pedon of Iredell fine sandy loam, 0 to 4 percent slopes, about 1 mile east of Pleasant Garden on State Road 3418 to junction with State Road 3412, about 3/4 mile southeast on State Road 3412 to farm road, and 500 yards south of highway in pasture:

Ap—0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam; weak medium subangular blocky structure parting to moderate medium granular structure; very friable; many fine and medium roots; few small fragments of quartz; few small concretions; neutral; clear wavy boundary.

B1—7 to 9 inches; yellowish brown (10YR 5/8) sandy clay loam; small pockets of light brownish gray (10YR 6/2) fine sandy loam mixed throughout; weak medium subangular blocky structure; friable; common medium roots; few medium concretions; few small fragments of quartz; medium acid; clear smooth boundary.

B2t—9 to 27 inches; light olive brown (2.5YR 5/4) clay; moderate medium and coarse angular blocky structure; very firm, very sticky and very plastic; common thin distinct discontinuous clay films on faces of peds; common fine and medium roots; few very fine pale yellow fragments; slightly acid; gradual wavy boundary.

B3—27 to 32 inches; mottled olive brown (2.5YR 4/4), olive (5Y 4/3), and olive gray (5Y 4/2) clay loam; moderate medium angular blocky structure grading to massive; firm, sticky and plastic; few medium roots; common thin distinct discontinuous clay films on faces of peds; common very fine pale yellow fragments; neutral; gradual wavy boundary.

C1—32 to 41 inches; mottled yellow (2.5Y 7/6), olive brown (2.5Y 4/4), and olive gray (5Y 4/2) sandy clay loam; few pockets of gray clay loam; massive; friable; 85 percent saprolite; mildly alkaline; gradual wavy boundary.

C2—41 to 60 inches; mottled black, olive, olive gray, and yellow clay loam; massive; friable; 90 percent saprolite; mildly alkaline.

R—60 inches; hard dark colored diorite.

The solum ranges from 20 to 36 inches in thickness. Depth to bedrock is 40 to 72 inches.

The Ap horizon is dark brown, grayish brown, or dark grayish brown fine sandy loam or sandy loam.

The B1 horizon is yellowish brown or light olive brown. The B2t horizon is light olive brown, olive brown, or yellowish brown. The B3 horizon is pale olive, olive brown, light olive brown, or brownish yellow clay loam or sandy clay loam. The B horizon is medium acid to neutral.

The C horizon is sandy loam, sandy clay loam, or clay loam.

Madison Series

The Madison series consists of well drained, moderately permeable soils that formed in residuum weathered from acid micaceous metamorphic rock. These soils are on fairly narrow ridges and long, fairly narrow side slopes. Slopes are 2 to 35 percent.

Typical pedon of Madison sandy loam, 6 to 10 percent slopes, 3 miles north of Regional Airport on North Carolina Highway 68, 3/4 mile west on State Road 2016, 0.5 mile north on State Road 2070, and 25 feet north of State Road 2016 in pine forest:

Ap—0 to 5 inches; reddish brown (5YR 4/4) sandy loam; weak medium granular structure; very friable; many fine roots; few fine flakes of mica; medium acid; abrupt smooth boundary.

B2t—5 to 29 inches; red (2.5YR 4/6) clay; weak medium subangular blocky structure; firm, sticky and slightly plastic; few fine and medium roots and root channels; few thin faint patchy clay films on faces of peds; many fine flakes of mica; when dry the mica appears as reddish yellow (7.5YR 7/6) streaks; strongly acid; gradual irregular boundary.

B3—29 to 34 inches; red (2.5YR 4/8) clay loam; few fine distinct reddish yellow mottles; weak fine subangular blocky structure; friable; slightly sticky and slightly plastic; few fine and medium roots; few thin faint patchy clay films on faces of peds; many fine and medium flakes of mica; few fine fragments of weathered mica gneiss; strongly acid; gradual irregular boundary.

C1—34 to 58 inches; reddish yellow (5YR 6/8) sandy clay loam; few fine prominent dark gray mottles; massive; friable; many fine and medium flakes of mica; 85 percent mica gneiss saprolite; strongly acid; gradual irregular boundary.

C2—58 to 80 inches; reddish yellow (5YR 6/8) sandy loam; common fine prominent black mottles; massive; very friable; 90 percent mica gneiss saprolite; strongly acid.

The solum ranges from 20 to 40 inches in thickness. Depth to bedrock is more than 60 inches. Few to many flakes of mica occur in the upper part of the profile, and many occur in the lower parts. Mica schist and mica gneiss fragments are on the surface and throughout the profile in places.

The A horizon is reddish brown, dark brown, brown, yellowish red, or yellowish brown sandy loam, fine sandy loam, or clay loam.

The B1 horizon, if present, is yellowish red sandy clay loam. The B2t horizon is red or light red clay or clay loam. The B3 horizon is red or yellowish red clay loam or sandy clay loam. The B horizon is strongly acid to very strongly acid.

The C horizon is red, yellowish red, or reddish yellow sandy clay loam, sandy loam, or loam.

Mecklenburg Series

The Mecklenburg series consists of well drained, slowly permeable soils that formed in material weathered from dark colored basic rocks such as diorite, gabbro, and horn-

blende schist. These soils are on broad, smooth interstream divides and long, narrow side slopes. Slopes are 0 to 10 percent.

Typical pedon of Mecklenburg sandy clay loam, 2 to 6 percent slopes, eroded, 1 mile southwest of Greensboro in the Sedgefield area, 0.5 mile east of High Point Road (U.S. Highways 29A and 70A), 360 feet east of woodland:

Ap—0 to 7 inches; reddish brown (5YR 4/4) sandy clay loam; weak medium granular structure; very friable; many fine roots; material from the B21t horizon; common small black concretions; few small pebbles; medium acid; clear smooth boundary.

B21t—7 to 16 inches; yellowish red (5YR 4/6) clay; few fine distinct reddish yellow mottles; moderate medium angular blocky structure; firm, sticky and plastic; few fine and medium roots and root channels; common thick distinct discontinuous clay films on faces of peds; common small black concretions; slightly acid; gradual wavy boundary.

B22t—16 to 33 inches; red (2.5YR 4/6) clay; common medium distinct brownish yellow (10YR 6/8) mottles; moderate medium angular blocky structure; firm, sticky and plastic; few medium roots; common thick distinct discontinuous clay films on faces of peds; few fine black concretions; slightly acid; gradual wavy boundary.

B3—33 to 38 inches; yellowish red (5YR 4/6) clay loam; many medium distinct brownish yellow (10YR 6/8) mottles; weak medium angular blocky structure; friable, slightly sticky and slightly plastic; few fine root channels; few thin faint patchy clay films on faces of peds; few fine black concretions; medium acid; gradual wavy boundary.

C—38 to 70 inches; mottled red (2.5YR 4/6) and brownish yellow (10YR 6/8) silty clay loam; massive; friable, slightly sticky and slightly plastic; few black concretions; medium acid.

The solum ranges from 20 to 40 inches in thickness. Depth to bedrock is 48 to 60 inches.

The Ap horizon is reddish brown, yellowish red, or brown.

The B2t horizon is red or yellowish red. The B3 horizon is yellowish red or reddish yellow clay loam or sandy clay loam. The B horizon is medium acid or slightly acid.

The C horizon is loam, silty clay loam, or sandy clay loam.

Sedgefield Series

The Sedgefield series consists of moderately well drained and somewhat poorly drained, slowly permeable soils that formed in residuum weathered from mixed acidic and basic rocks. These soils are on the lower parts of the slopes and on broad, flat areas. Slopes are 0 to 6 percent.

Typical pedon of Sedgefield sandy loam, 0 to 6 percent slopes, 11 miles south of Greensboro to Sumner School, 1 mile south of Sumner School on State Road 1137, 25 feet west of highway, and 25 feet north of farm road in field:

Ap—0 to 8 inches; grayish brown (10YR 5/2) sandy loam; weak medium granular structure; very friable; many fine roots; slightly acid; clear smooth boundary.

A2—8 to 12 inches; pale yellow (2.5Y 7/4) loamy sand; weak medium granular structure; very friable; few fine roots; medium acid; clear wavy boundary.

B1—12 to 16 inches; light yellowish brown (2.5Y 6/4) sandy loam; weak medium subangular blocky structure; very friable; few fine roots; common fine and medium pores; common pale yellow (2.5Y 7/4) tongues of material from the A2 horizon extend through this horizon and make up about 15 percent of the horizon; slightly acid; clear wavy boundary.

B2t—16 to 28 inches; yellowish brown (10YR 5/6) clay; common coarse prominent light gray (2.5Y 7/2) mottles and few medium distinct strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure that parts to moderate medium angular blocky structure; few pale yellow (2.5Y 7/4) tongues of material from the A2 horizon extend 1 to 5 centimeters into this horizon; few to common fingers of material from the A2 horizon 1 to 2 millimeters wide extend to about 10 centimeters into this horizon, fingers and tongues of material from the A2 horizon make up about 1 to 4 percent of this horizon; very firm, sticky and plastic; common fine roots mostly between primary structural aggregates; common fine and medium pores; common thin distinct discontinuous clay films on faces of primary and secondary peds; medium acid; clear wavy boundary.

B3—28 to 33 inches; mottled strong brown (7.5YR 5/8), light gray (2.5Y 7/2), and light yellowish brown (2.5Y 6/4) sandy loam and sandy clay loam; weak medium angular blocky structure; friable, sticky; few fine roots; few thin faint patchy clay films on faces of peds; few medium quartz gravel; slightly acid; gradual wavy boundary.

C1—33 to 38 inches; yellowish brown (10YR 5/6), light yellowish brown (10YR 6/4), and very pale brown (10YR 7/3) coarse sandy loam; massive; friable; 85 percent saprolite; neutral.

C2—38 to 48 inches; light olive brown (2.5Y 5/4) and grayish brown (2.5Y 5/2) loam; massive; friable; 85 percent saprolite; neutral.

Cr—48 to 60 inches; moderately hard greenish gray saprolite that is streaked with black and yellow.

The solum ranges from 20 to 40 inches in thickness. Depth to bedrock is more than 48 inches.

The Ap horizon is grayish brown, dark grayish brown, or brown. The A2 horizon, if present, is pale yellow, light yellowish brown, or pale brown. The A horizon is sandy loam, fine sandy loam, or loamy sand. It is 0 to 15 percent coarse fragments. Reaction is strongly acid to slightly acid.

The B1 horizon, if present, is light yellowish brown or yellowish brown sandy loam or sandy clay loam. The B2t horizon is light yellowish brown, brownish yellow, yellowish brown, or light olive brown clay loam, sandy clay, or clay. The B3 horizon is sandy loam, sandy clay loam, or clay loam. The Bt horizon is strongly acid to slightly acid, and the B2 horizon is medium acid to neutral.

The C horizon is yellowish brown, light yellowish brown, very pale brown, light olive brown, or grayish brown coarse sandy loam or loam. Reaction is medium acid to neutral.

Vance Series

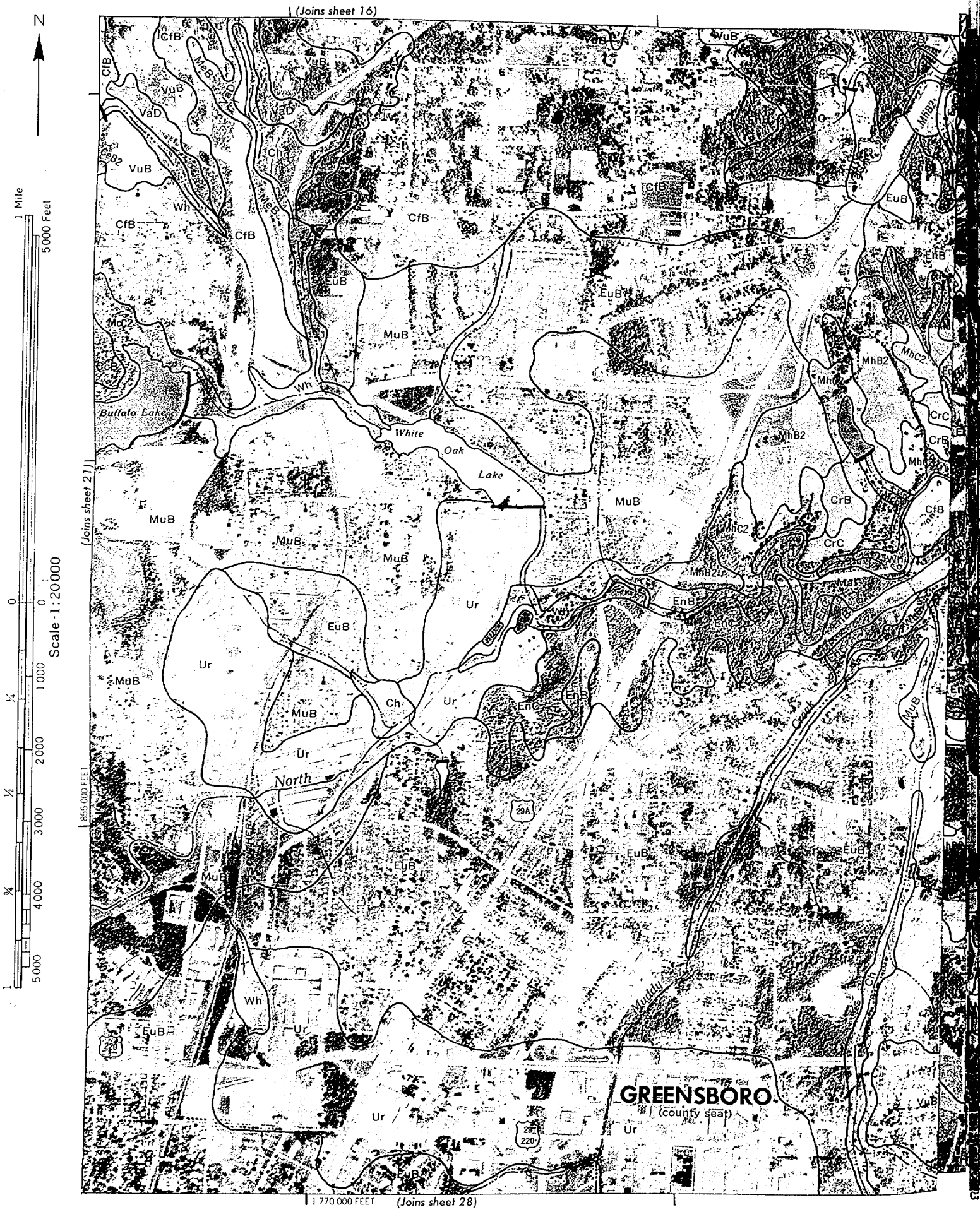
The Vance series consists of well drained, slowly permeable soils that formed in residuum weathered from acid crystalline rocks, primarily aplitic granite. These soils are on narrow ridges and long narrow side slopes. Slopes are 2 to 15 percent.

Typical pedon of Vance sandy loam, 2 to 6 percent slopes, 1 1/4 miles east of McLeansville on State Road 2755, 100 feet southeast of junction of State Road 2755 and State Road 2814, and 50 feet southeast of telephone pole:

Ap—0 to 6 inches; brown (10YR 5/3) sandy loam; weak medium granular structure; very friable; many fine roots; many fine pores; neutral; abrupt smooth boundary.

B21t—6 to 18 inches; strong brown (7.5YR 5/8) clay; few fine distinct red mottles; moderate medium angular blocky structure; very firm, sticky and plastic; few medium roots and root channels; few fine pores; many fine and medium white (10YR 8/1) weathered fragments of rock; common thick discontinuous clay films on faces of peds; very strongly acid; gradual wavy boundary.

B22t—18 to 35 inches; strong brown (7.5YR 5/8) clay; few fine distinct red and light yellowish brown mottles; moderate medium angular blocky structure; very firm, sticky and plastic; few fine roots and root channels; few fine pores; many fine and medium white (10YR 8/1) weathered fragments of rock; common thick discontinuous clay films on faces of peds; very strongly acid; gradual wavy boundary.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(county seat)
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Memorandum

Date: July 11, 1990

To: File

From: John P. McConney JPM

Subject: Drinking water intakes along Buffalo and Reedy Creeks, and Haw River

On this date Mr. E.P. Cain, Water Supply Engineer for Guilford County, was contacted at (919) 761-2390. He provided the following information regarding drinking water intakes along the referenced pathway.

-- North Buffalo Creek, Buffalo Creek, and Reedy Creek are not suitable for drinking water intakes and are classified as Class C water bodies. There are no drinking water intakes on these water bodies.

-- Reedy Creek enters into the Haw River; several sections of the Haw River are suitable for drinking water. However, there are no drinking water intakes on the downstream portion of the Haw River in Guilford or Alamance Counties. The nearest drinking water intake on the Haw is in Chatham County and is for the town of Bynum. This is located an estimated 35 path-length miles from the point where Buffalo Creek enters Reedy Creek.

JM/desoto.dil

Ref. 16

Fifth Edition, 1984

North Carolina State Government

Statistical Abstract

Table 178

EMISSIONS INVENTORY SUMMARY (IN TONS)
FROM POINT AND AREA SOURCES, BY COUNTY
1979

County	Particulates		Sulfur Dioxide		Nitrogen Oxides		Volatile Organic Compounds and Hydrocarbons		Carbon Monoxide	
	Area Sources	Point Sources	Area Sources	Point Sources	Area Sources	Point Sources	Area Sources	Point Sources	Area Sources	Point Sources
State Total	553,662	222,263	43,247	731,157	334,896	290,035	560,734	114,695	2,416,683	130,670
Alamance	7,718	868	818	1,428	5,890	266	11,748	3	45,688	21
Alexander	2,150	633	173	128	1,150	32	1,634	535	6,880	2
Alleghany	2,168	-	63	-	611	-	924	-	3,931	-
Anson	2,537	201	183	2	1,618	16	2,700	92	10,909	4
Ashe	5,022	422	127	9	1,127	74	1,713	231	7,535	12
Avery	1,785	78	89	83	799	50	797	8	4,116	7
Beaufort	5,334	1,079	307	21,236	2,731	1,145	4,277	23	19,654	51
Bertie	2,927	1,688	144	316	1,598	312	2,107	63	11,434	101
Bladen	3,565	135	191	551	1,935	99	2,731	184	12,777	8
Brunswick	3,293	913	284	16,616	2,818	3,418	3,285	29,359	16,967	10,845
Buncombe	15,826	4,523	1,036	101,654	8,073	34,108	17,219	536	66,409	2,245
Burke	5,906	568	485	1,528	4,066	671	6,335	1,486	27,446	109
Cabarrus	6,136	765	581	2,638	4,775	1,126	8,704	998	45,995	94
Caldwell	6,070	3,850	581	383	3,408	435	4,897	5,680	19,740	69
Camden	707	3	47	-	517	-	825	-	4,021	-
Carteret	1,949	8	270	81	2,269	16	5,080	-	20,446	2
Caswell	2,438	899	124	-	1,160	-	1,516	-	8,438	-
Catawba	7,537	19,814	1,345	75,338	7,829	33,880	13,934	3,016	40,662	1,932
Chatham	4,994	9,679	349	12,208	2,464	5,352	3,999	756	15,675	889
Cherokee	3,332	50	104	1	1,050	6	1,750	1	7,010	1
Chowan	747	54	93	326	795	54	1,405	227	6,347	4
Clay	2,096	-	71	-	1,200	-	2,076	-	17,224	-
Cleveland	6,160	365	945	406	4,030	929	6,461	-	15,717	46
Columbus	5,840	1,406	351	7,735	3,216	2,082	4,170	412	20,162	12,427
Craven	6,501	3,358	399	6,706	3,677	2,614	6,682	1,048	32,514	7,085
Cumberland	17,810	586	1,120	2,927	9,493	681	17,624	834	90,631	74
Currituck	1,100	159	700	-	1,200	2	1,400	-	4,900	-
Dare	605	5	104	240	932	71	3,926	2	14,035	12
Davidson	10,207	355	756	998	6,301	629	10,328	2,470	44,355	144
Davie	2,233	428	149	66	1,259	31	5,206	181	8,938	5
Duplin	4,789	105	273	763	2,949	154	3,668	41	18,942	13
Durham	10,624	836	778	880	6,398	194	12,903	703	58,610	15
Edgecombe	3,302	3,041	491	407	4,010	81	4,720	1,367	21,017	17
Forsyth	17,838	528	2,173	5,837	16,754	2,152	24,192	21,488	95,712	186
Franklin	2,850	-	181	-	1,771	-	3,165	83	13,286	-
Gaston	10,171	7,566	1,145	62,730	8,842	29,610	15,598	687	61,159	1,789
Gates	1,298	-	69	-	729	-	740	-	4,277	-
Graham	842	44	35	60	364	19	479	3	2,231	4
Granville	5,457	78	206	720	2,277	1,028	4,013	515	19,515	188
Greene	1,329	11	87	-	998	-	1,330	-	7,063	-
Guilford	33,493	2,702	2,769	3,330	20,142	989	31,063	14,057	139,198	495
Halifax	5,044	1,306	315	9,556	2,903	2,485	5,316	329	25,552	10,410
Harnett	5,575	143	306	765	3,268	169	4,489	5	24,530	14
Haywood	4,414	682	285	9,768	2,528	4,703	5,531	49	17,166	43,964
Henderson	6,842	308	370	2	3,040	28	5,703	3	21,248	7
Hertford	2,085	885	152	276	1,410	2,615	2,278	54	11,197	111
Hoke	897	31	122	193	979	54	1,834	-	6,977	3
Hyde	828	148	95	-	814	-	3,074	-	11,064	-
Iredell	10,157	2,169	729	916	4,958	665	9,541	1,025	37,946	114
Jackson	4,694	99	153	5	2,[illegible]07	30	3,203	6	18,948	6

Memorandum

Date: July 11, 1990

To: File

From: John P. McConney JPM

Subject: Irrigation from North Buffalo and Buffalo Creeks

On this date, Mr. L. Phillips, Agricultural Extension Agent for Guilford County, was contacted at (919) 375-5876. He reported that, to the best of his knowledge, North Buffalo Creek and Buffalo Creek were not used for either residential or commercial irrigation.

JM/desoto.irl

Memorandum

Date: July 18, 1990

To: File

From: John P. McConney JPM

Subject: Water lines inside of the Greensboro city limits

On this date, the Water and Sewer Department of the city of Greensboro was contacted at (919) 373-2896. Ms. Kim Smith reported that the city has water lines that serve all of the territory inside the city limits, as well as some areas outside the city limits. Mr. William Finger, the Assistant Public Works Director, reported that 98% of the streets inside the city limits are served by the city's distribution system and that there are water lines on these streets that the residents could access.

JM/desoto.gw1

Memorandum

Date: July 19, 1990

To: File

From: John P. McConney JPM

Subject: Population distribution of Greensboro

On this date, the Planning Department of the City of Greensboro was contacted at (919) 373-2144. Ms. Melanie Poloff reported that the city currently has a population of 196,000 individuals and that the current size is 80.1 square miles. This yields a population density of 2447 individuals per square mile.

JM/desoto.gpl

Memorandum

Date: July 25, 1990

To: File

From: John P. McConney JPM

Subject: Community water systems in the Cone Mills Corp/Print Works Plant (CMC/PWP) 4-mile radius

On this date, the community water systems in the 4-mile radius surrounding CMC/PWP were determined. A listing of all of the community and non-community water systems providing ground water for drinking water in the Greensboro area was provided by the NC Public Water Supply Branch. This listing includes the longitude and latitude, the number of customers, and the phone number of the system. Using the coordinates, the location of these systems were plotted. Only two of these were within the 4-mile radius: Shady Lane Mobile Court and Guilford County Subsidiary II. Both of these systems were contacted. The Shady Lane Mobile Court was contacted at (919) 621-0859, is near the listed location in the 3 to 4 mile radius, and is still in operation. Ms. Mildred was unable to confirm the file information of 109 customers. The Guilford County Subsidiary II was contacted at (919) 375-5024. This listing is a state prison camp and the location on file is incorrect; this is actually located outside of the 4-mile radius. There is one non-community water system in the area, the Brightwood Christian School. This is located in the 3 to 4 mile radius and has 60 students. This information will be included in the population count and marked on the topographic quadrangles.

JM/cone.cw1

PWID	PWMANAME	PWMAARCO	PWMAPNUM	PWPLSOCI	PWPLPOPL	PWPLTYPE	PWPLACTV	PWPLLATI	PWPLLON
0241111	HICKORY RUN MHP	919	2995028	G	000000399	C	A	0360100	079540
0241113	HADLEY MHP	919	6978855	G	000000074	C	A	0360230	079434
0241117	HOLIDAY HILLS	919	6650817	G	000000182	C	A	0360030	079454
0241121	LAKEVIEW TP	919	6978976	G	000000096	C	A	0360210	079435
0241135	PMH RENTALS MHP	919	8558513	G	000000064	C	A	0360015	079531
0241150	WOOLARD'S TRAILER PARK	919	2713227	G	000000091	C	A	0360155	079450
0241151	SHADY LANE MOBILE COURT	919	6210859	G	000000109	C	A	0360815	079443
0241152	CEDAR VALLEY MHP	919	8543187	G	000000298	C	A	0360000	079450
0241185	SERENITY CARE REST HOME	919	2756932	G	000000050	C	A	0360148	079443
0241189	GUILFORD COUNTY SUBSIDARY II	919	3755024	G	000000346	C	A	0360630	079421
0241195	LIBERTY VALLEY WATER SYSTEM	919	3732181	G	000000025	C	A	0360120	079454
0241404	TRAVEL INN	919	2996131	G	000000050	N	A	0360045	079503
0241411	BRIGHTWOOD CHRISTIAN SCHOOL	919	6212633	G	000000060	N	A	0360830	079440
0241412	VANDALIA SCHOOL	919	3789105	G	000000350	N	A	0360100	079463
0241413	VANDALIA CHRISTIAN SCHOOL	919	3798380	G	000000320	N	A	0360030	079463
0241419	REEDY FORK BAPT CHURCH	919	6210456	G	000000500	N	A	0360945	079461
0241423	BRIGG'S MEMORIAL BAPTIST CH DC	919	3753798	G	000000400	N	A	0360700	079424
0241426	CROSS OF CHRIST LUTHERAN CH	919	2924770	G	000000125	N	A	0360650	079525
0241428	GUILFORD COLLEGE METH CH	919	2991832	G	000000600	N	A	0360611	079521
0241429	JESSUP GROVE BAPTIST CHURCH	919	6680615	G	000000175	N	A	0360830	079533
0241434	MT HOPE PENTECOSTAL HOLINESS C	919	6979667	G	000000050	N	A	0360115	07944C
0241436	NEWGARDENS FRIEND MEETING	919	2925407	G	000000500	N	A	0360509	079501
0241438	ANDREWS MEMORIAL BAPT CH	919	6216117	G	000000070	N	A	0360915	079451
0241444	CALVARY CHRISTIAN CHURCH	919	2724295	G	000000045	N	A	0360145	079441
0241445	CAMP HERMAN BAPTIST CHURCH	919	3754932	G	000000100	N	A	0361000	079434
0241446	FELLOWSHIP PRESBYTERIAN CHURCH	919	2885177	G	000000100	N	A	0360745	079513
0241448	SEDGEFIELD LAKE METHODIST CH		0000000	G	000000035	N	A	0360215	079533
0241452	CHARITY BAPTIST CHURCH	919	2884230	G	000000140	N	A	0360930	079527
0241457	MEMORIAL PRESBYTERIAN CH	919	6213220	G	000000075	N	A	0360715	079441
0241458	GARDEN OF PRAYER HOLINESS CH		0000000	G	000000030	N	A	0360930	07945(
0241459	FRIENDLY CHAPEL F W BAPTIST CH	919	6749703	G	000000030	N	A	0360935	07945
0241463	SHARPE RD BAPTIST DAYCARE	919	2722618	G	000000085	N	A	0360250	07944
0241464	SEDGEFIELD PRESBYTERIAN CHURCH	919	2994061	G	000000100	N	A	0360100	07952
0241471	BOREN CLAY PRODUCTS	919	6742255	G	000000080	N	A	0360500	07946(
0241479	WYSONG MILES CO	919	6213960	G	000000096	N	A	0360950	07942
0241485	NEESES SAUSAGE CO	919	2759543	G	000000075	N	A	0360200	07945
0241488	DANIEL R HOBBS M D	919	3781400	G	000000050	N	A	0360130	07945
0241496	PINEY LAKE	919	3795197	G	000000045	N	A	0360015	07945
0241500	GREENSBORO CAMPGROUND INC	919	2754047	G	000000252	C	A	0360250	07944
0241501	GUILFORD WILDLIFE CLUB	919	2883856	G	000000050	N	A	0360800	07950
0241511	LONGVIEW GOLF COURSE	919	2944018	G	000000075	N	A	0360600	07954
0241517	MORIAH METHODIST CHURCH	919	2727988	G	000000150	N	A	0360130	07945
0241520	LEBANNON BAPT CHURCH	919	6210597	G	000000025	N	A	0360515	07942
0241541	ALAMANCE ELEM SCHOOL	919	3791660	G	000000900	N	A	0360100	07942
0241544	CARLSON FARMS COUNTRY CLUB	919	2883415	G	000000700	N	A	0360900	07953
0241560	BUR MILL COUNTRY CLUB	919	2882818	G	000001400	N	A	0360945	07952
0241563	GREENS SUPPER CLUB	919	6219950	G	000000100	N	A	0360930	07943
0241564	GREGORYS DRIVE-IN	919	6211031	G	000000080	N	A	0360845	07944
0241569	LEES TRUCK STOP	919	3756444	G	000000100	N	A	0360830	07944
0241571	SMITH RICHARDSON FOUNDATION	919	2887230	G	000000070	N	A	0360945	07952
0241572	MOOSE LODGE #685	919	2994200	G	000000100	N	A	0360030	07950
0241586	FELLOWSHIP HALL	919	6213381	G	000000080	N	A	0360900	07943
0241587	LONG'S REST HOME FOR THE AGED	919	8550487	G	000000025	N	A	0360000	07950
0241592	FRIENDSHIP GULF	919	0000000	G	000000150	N	A	0360350	07954

7. /90 GRID--0360000/0361 -0794200/0795430 PAGE 0002

PWID	PWMANAME	PWMAARCO	PWMAPNUM	PWPLSOC1	PWPLPOPL	PWPLTYPE	PWPLACTV	PWPLLAT1	PWPLLON
0241600	I-85 TEXACO	919	2996292	G	000000100	N	A	0360045	0795030
0241621	BRIGHTWOOD BAPTIST CHURCH DC	919	6210198	G	000000182	N	A	0360830	0794400
0241630	FRIENDLY RD INN	919	2925805	G	000000100	N	A	0360510	0795430
0241634	RAINES BI RITE	919	2996120	G	000000025	N	A	0360440	0795345
0241637	INDUSTRIAL TRUCK SALES	919	2759121	G	000000060	N	A	0360000	0794900
0241646	BRIGGS MEMORIAL KIDDIE KOLLEGE	919	3754160	G	000000070	N	A	0360700	0794230
0241650	ROSES CHILD DAYCARE CTR #1	919	2886535	G	000000030	N	A	0360950	0795210
0241653	CONE MILLS--OLYMPIC PRODUCTS	919	3789620	G	000000250	N	A	0360150	0794620

Memorandum

Date: July 26, 1990

To: File

From: John P. McConney JPM

Subject: Ground water users in the Cone Mill Corp/Print Works Plant (CMC/PWP) 4-mile radius

On this date the population using ground water obtained from wells located in the 4-mile radius surrounding CMC/PWP as drinking water was determined. Using information provided by the city of Greensboro and Guilford County, the city limits of Greensboro and the extraterritorial water lines were indicated on the USGS topographical quadrangles for the area. The NC Public Water Supply Branch supplied information regarding the community water systems in the area. A house count was performed using the topographic quadrangles and the results were as follows:

0 to 1 mile radius was entirely within the city limits.
1 to 2 mile radius had 42 houses x 3.8 = 160 individuals.
2 to 3 mile radius had 160 houses x 3.8 = 608 individuals.
3 to 4 mile radius had 510 houses x 3.8 = 1938 individuals.
Shady Lane Mobile Court is located in the 3 to 4 mile radius and serves a population of 109 individuals.

According to Greensboro city officials 98% of the streets within the city limits have water lines and the residents can access these water lines, if they have not already done so. The population density of Greensboro is 2447 individuals per square mile. The 0 to 1 mile radius is entirely within the city limits; 2% of the estimated Greensboro population of 7,684 individuals is 154 individuals drinking ground water. Roughly 90% of the 1 to 2 mile radius is within the city limits; 2% of the estimated Greensboro population of 23,050 individuals is 414 individuals drinking ground water. Roughly 70% of the 2 to 3 mile radius is within the city limits; 2% of the estimated Greensboro population of 38,663 is 541 individuals drinking ground water. Roughly 40% of the 3 to 4 mile radius is within the city limits; 2% of the estimated Greensboro population of 53,785 individuals is 430 individuals drinking ground water.

The total estimated population using ground water obtained from wells located within the 3-mile radius from CMC/PWP as drinking water is 1877 individuals. The total estimated population using ground water obtained from wells located within the 3 to 4 mile radius from CMC/PWP as drinking water is 2477 individuals.

JM/cone.gw1

Laboratory Data

Laboratory Data Summary

Sample Type and location	Sample Number Field/Lab	Results
Background Samples		
North Buffalo Creek upstream sediment (CMC-SD1)	15790/010999 12114/905334	Inorganics - background levels Organics - background levels
Source Samples		
North Buffalo Creek -downstream sediment (CMC-SD2)	15791/011000 12115/905335	Inorganics - no significant levels Organics - no significant levels
North Buffalo Creek - downstream sediment (CMC-SD3)	15792/011001 12116/905336	Inorganics - no significant levels Organics - no significant levels
Quality Control Samples		
Trip Blank (VOC only)	12117/905337	Organics - all compounds BDL

Ref. 23

Dangerous Properties of Industrial Materials

Sixth Edition

N. IRVING SAX

Assisted by:

Benjamin Feiner/Joseph J. Fitzgerald/Thomas J. Haley/Elizabeth K. Weisburger

4-9-85 $198.00 S/HW (Z.C.)

WA 440 S29 1984 c.2

VNR VAN NOSTRAND REINHOLD COMPANY

New York

CHROMIUM

CAS RN: 7440473 NIOSH #: GB 4200000
Af: Cr; Aw: 52.0

SYN: CHROME

TOXICITY DATA:	CODEN:
ivn-rat TDLo:2160 ug/kg/6W-I TFX:ETA	JNCIAM 16,447,55
imp-rat TDLo:1200 ug/kg/6W-I TFX:ETA	JNCIAM 16,447,55
imp-rbt TDLo:75 mg/kg:ETA	ZEKBAI 52,425,42

Carcinogenic Determination: Animal Suspected IARC** 2,100,73; Animal Indefinite IARC** 23,205,80. TLV-TWA 500 ug/m3 DTLVS* 4,98,80. *Toxicology Review:* 85CVA2 5,63,70; KOTTAM 11(11),1300,75; FOREAE 7,313,42; MIBUBI 9(4),321,75; FCTXAV 9,105,71; PEXTAR 12,102,69; 85DHAX Cr,22,74; BNYMAM 54,413,78; NTIS** Conf-691001. OSHA Standard: Air: TWA 1 mg/m3 (SCP-0) FEREAC 39,23540,74. "NIOSH Manual of Analytical Methods" VOL 1 152,182, VOL 3; S323,352, VOL 5 173#. NIOSH Current Intelligence Bulletin 4, 1975. Reported in EPA TSCA Inventory, 1980. Proposed OSHA Medical Records Rules FEREAC 47,30420,82.

THR: An exper ETA, CARC.

Disaster Hazard: Powder will explode spont in air.

Incomp: Oxidants.

For further information see Vol. 3, No. 3 of *DPIM Report.*

CHROMIUM COMPOUNDS

Chromic acid and its salts have a corrosive action on the skin and mu mem. The lesions are confined to the exposed parts, affecting chiefly the skin of the hands and forearms and the mu mem of the nasal septum. The characteristic lesion is a deep, penetrating ulcer, which, for the most part, does not tend to suppurate, and which is slow in healing.

Small ulcers, about the size of a matchhead or end of a lead pencil may be found, chiefly around the base of the nails, on the knuckles, dorsum of the hands and forearms. These ulcers tend to be clean, and progress slowly. They are frequently painless, even though quite deep. They heal slowly, and leave scars. On the mu mem of the nasal septum the ulcers are usually accompanied by purulent discharge and crusting. If exposure continues, perforation of the nasal septum may result, but produces no deformity of the nose. Chromate salts are exper and hmn CARC of the lungs, nasal cavity and paranasal sinus, also exper CARC of the stomach and larynx. Hexavalent compounds are said to be more toxic than the trivalent. Eczematous dermatitis due to trivalent chromium compounds has been reported.

EPA-625/7-78-002

ENVIRONMENTAL POLLUTION CONTROL
TEXTILE PROCESSING INDUSTRY

U.S. ENVIRONMENTAL PROTECTION AGENCY
ENVIRONMENTAL RESEARCH INFORMATION CENTER • Technology Transfer

October 1978

CHAPTER 4

SOURCES AND STRENGTHS OF TEXTILE WASTEWATER

4.1 Introduction

Textile mill operations include a number of wet and dry processes, each of which may require several mechanical manipulations. As a general rule, however, the majority of all aqueous waste from the textile industry can be described in four separate categories (1):

1. Scouring
2. Bleaching
3. Dyeing or Printing
4. Special Finishing

Special finishing is meant to include all wastes which cannot be included in the first three categories.

Textile wastes are generally gray in color, or the color of the predominant dye being used, high in BOD and total dissolved solids, highly alkaline and high in temperature. The wastes usually exhibit extreme variability in strength and flow and also may at times contain toxic compounds. The sources of pollution are the natural impurities extracted from the fiber and the chemicals used in processing the fiber. The basic factors which determine the characteristics of the wastewater quantity and quality are therefore: 1) the type of fiber being processed; 2) the unit operations comprising the overall textile process; 3) the chemicals used in the process; and 4) the degree of "in-house" conservation measures being practiced (2).

Cotton and synthetic fibers are generally woven into cloth before any finishing operations are applied. Wool is generally washed (scoured) and dyed before being woven into cloth. In either case, weaving contributes indirectly to the wasteload by the addition of sizes and anti-static lubricants.

4.1.1 Scouring

Desizing and scouring of natural fibers – cotton and wool – removes natural impurities such as dirt and grease as well as the chemical additives mentioned above. In the wool industry, scouring removes impurities approximately equal in weight to the residual fiber weight, creating one of the strongest liquid wastes, in terms of BOD, of any industry (1). Synthetic fiber scouring wastes, on the other hand, are relatively low in both pollution and volume due to the lack of natural impurities and the small amounts of additives used. The cotton finishing industry also commonly desizes woven cloth for starch removal followed by a thorough scouring, for the removal of impurities.

In both the cotton and wool industries, scouring and washing is the major source of pollution, contributing over half of the total plant BOD and solids (1). In the synthetic textile industry, scouring and washing are not major contributors to the wastestreams, generally producing less than half of the total plant pollution measured as BOD.

4.1.2 Bleaching

Bleaching is generally accomplished by soaking the cloth in a standing bath containing an oxidizing agent in solution, or in a continuous bleaching process. Nearly all of the cotton produced is bleached, regardless of its final color, using hypochlorite or hydrogen peroxide. Wool is commonly bleached with hydrogen peroxide and acid. Synthetics are bleached with hydrogen peroxide, sodium hypochlorite, peracetic acid, sodium chlorite, or other chemicals.

Only a small percentage of wool and synthetic cloth is bleached white. Natural wool is yellow in color and bleaching is required only when white of light colors are desired. Synthetic cloth is bleached for the removal of stains or when a translucent bluish-white color is desired.

Bleach wastes may be toxic and acidic but are not high in organic pollutant concentration and generally do not contribute more than 5% of the plant's organic wasteload (1).

4.1.3 Dyeing and Printing

The types of dyes commonly employed by the textile industry include direct, disperse, acid and pre-metalized, vat, basic, sulphur, fiber reactive, napthol and azoic. Of these, the first six account for approximately 85% of the total used. The quantity of dye used depends on the characteristics of the fiber, the color, and the desired finish. Some synthetic textiles require the use of special carriers to achieve satisfactory penetration of the dye into the fiber. These carriers are very strong and present a major source of pollution in the finishing of synthetic fibers. It has been estimated that greater than 90% of the dye processed is exhausted onto the fabric and the remaining 10% or less is rinsed to waste. In some cases, pressure dyeing at high temperatures is an alternative method to the use of carriers in dyeing. This method avoids both the cost and pollution of carrier dyeing while allowing satisfactory dye penetration in a shorter period of time.

Printing is most often done by roller application of various dye pastes. Chemical treatment follows printing to fix the color, and a final wash and rinse is employed to remove any residue. Printing process waste usually does not contribute significantly to the total waste load. The pollution load from the dyeing and printing sub-processes is approximately 3 to 10% of total plant BOD and solids in the wool industry. In cotton finishing the range is 15 to 35%, and for synthetics it is 5 to 80% (1).

4.1.4 Special Finishes

Special finishes include waterproofing, moth-proofing, fireproofing, pre-shrinking, brightening, durable press, etc. In addition, wool is fulled to achieve a felt-like appearance and cotton may be mercerized or causticized to smooth its surface. Most of these special finishing processes involve chemical treatment and removal of residue by washing and/or rinsing. The pollution contribution of special finishing sub-processes is in the range of 5 to 15% of the plant total (1).

4.1.5 Summary

The wasteloads from each individual process may vary over a wide range of values due to the large number of different fibers produced, each having its own distinctive characteristics. However, variations also exist between different plants processing the same fiber, due to technological differences in production procedures and many other variables which may exist. Additionally, many of the nation's textile mills are involved in the production of cloth composed of a combination of fibers requiring a variable process methodology dependent on cloth composition. Although quantities may vary, the wasteload characteristics are generally similar for all textile mills processing the same fiber.

Wool waste waters are characterized by high BOD, high solids concentration, and high grease content. Dye waste waters contain color which is extremely difficult to remove by common waste treatment methods. Wool grease presents an especially difficult problem because pretreatment for removal may be necessary before efficient biological treatment of the plant effluent is feasible. Cotton finishing wastes are not nearly as strong as those produced by the wool industry, having no grease and a relatively low solids content. Other characteristics are high BOD (although considerably lower than that found in wool wastes) and possible high color content. Synthetic finishing wastes are generally lower than cotton finishing wastes in pollutant quantities and characteristics. One significant difference can be the toxicity of synthetic dye wastes when metallic ion content dyes are used. Pollutant quantities per 1000 pounds of finished cloth vary over a wide range of values due to the many different types of fibers processed (1). Toxicity of synthetic fiber dye wastes can retard or prevent biological waste treatment when concentrations are significant. In such cases chemical pretreatment will be required prior to biological treatment or discharge to municipal sewers.

Water usage in the textile industries is relatively high due to the large amounts of water required in washing and rinsing operations. Cotton and wool finishing mills use 30,000 to 70,000 gallons of water per 1000 pounds of cloth. Synthetic finishing mills use considerably less water, ranging from 3000 to 29,000 gal/1000 pounds cloth (1). This lower water requirement reflects the lack of natural impurities on synthetic fibers, allowing less thorough washing as compared to cotton or wool. Water reuse has not been practiced to a great extent; however, it is expected that greater recirculation practices will be adopted in the future as water costs and pressures from regulatory agencies increase.

Wastewater characteristics have been tabulated by fiber processed for each pollutant parameter. Each table lists unit processes, waste generating sources, wastewater concentrations (in mg/l and lb/1000 lb product) and water use in gallons/1000 lb product. These tables can be found at the end of each processed fiber section as follows:

Section 4.2 – Cotton – Table 4-2 thru Table 4-9

Section 4.3 – Wool – Table 4-10 thru Table 4-14

Section 4.4 – Synthetic – Table 4-15 thru Table 4-29

Section 4.5 – Synthetic Blends – Table 4-30 and Table 4-31

4.2 Cotton Processing

The basic cotton fabric manufacturing processes which produce aqueous waste are:

- Slashing
- Desizing
- Scouring
- Mercerizing
- Bleaching
- Dyeing and Printing
- Finishing

4.2.1 Slashing

Slashing is the first process during weaving in which liquid treatment is involved. In slashing, the warp threads are coated with size (either starch or synthetic) to facilitate weaving by giving the threads tensile strength and smoothness. The compound is then dried on the threads and remains a part of the cloth until it is removed in subsequent processes. Although the slashing (sizing) compounds used most often are natural starches, other compounds such as polyvinyl alcohol (PVA), resins, alkali-soluble cellulose derivatives, gelatin glue, locust bean gum and gum tragacanth have been used. One of these, sodium carboxy-methyl-cellulose, or CMC, is finding some acceptance, mostly in the sizing of polyester blends. Other chemicals, such as lubricants, softeners, emulsifiers, humectants, preservatives ($ZnCl_2$, phenol, etc.), penetrants, anti-foam agents, and fillers, are often added to impart additional properties to a fabric. The grey goods thus prepared usually contain about 10 to 15% add-on, mostly sizing (1).

Liquid waste from slashing operations results from cleaning the slasher boxes, rolls and makeup kettles. Some spillage also occurs; however, the volume is usually low. Some textile greige mills produce a wide variety of woven goods, each requiring a specially formulated size. In mills of this type the size boxes may be dumped and cleaned several times a day depending upon the production schedule. In unusual cases such as this, slashing operations may produce a great volume of waste. Although the BOD of slashing waste can be quite high (to 810,000 mg/l for corn starch), slashing operations normally contribute only 5% BOD and 4.5% total solids to the total plant waste load.

Wastewaters from slashing operations are characterized by the following range of pollutants generated: BOD – 620 to 2500 mg/l, TS – 8500 to 22,600 mg/l, pH – 7 to 9.5 units, and water use – 60 to 940 gal/1000 lb. product.

Slashing wastewater is the first heavily contaminated liquid that is discharged during the fabric production process.

4.2.2 Desizing

The operation of desizing removes the sizing compound that was applied to the threads in the slashing operation, as well as mildewcides and fungicides and other impurities. The most common desizing operations are acid desizing and enzyme desizing (3).

The acid desizing process utilizes a solution of dilute sulfuric acid to hydrolyze the starch and render it water soluble, whereas the enzyme desizing process utilizes vegetable or animal enzymes to decompose starches to a water soluble form. In either case, the desizing mixture is normally applied to the fabric by means of a padder with a paper roll covering and pressure to insure that the fabric will be well saturated.

In acid desizing, the fabric soaks in a solution of sulfuric acid, at room temperature, for a period of 4 to 12 hours and is then washed (4). In enzyme desizing, the fabric and solution are maintained at a temperature of 130 to 180° F and a pH of 6 to 7.7 for a period of 4 to 8 hours (5). After the size has been solubilized, the fabric is rinsed clean. For desizing of polyvinyl alcohol (PVA) and carboxymethyl cellulose (CMC), materials which are directly soluble in water, no decomposition is required and the goods are merely washed with water for removal of sizing agents. This is usually done at 180° F or higher in washers without the use of steamers, J-boxes, or padders (6).

The waste from desizing operations contributes the largest BOD of all cotton finishing operations, approximately 45% (5). The waste from starch desizing is very strong with a BOD concentration as much as 5,000 ppm (7). This process also contributes the largest total suspended solids, approximately 86% of the total plant load. The rinse waters following desizing vary in strength depending on the rinsing method. Desizing of synthetic size (CMC, PVA) results in greatly reduced BOD load.

Depending upon size material to be removed in the desize operation, the waste characteristics will have the following range: BOD – 200 to 5200 mg/l, TS – 3800 to 3200 mg/l, pH – 6 to 8 units, and water use – 300 to 2500 gal/1000 lb. product.

4.2.3 Scouring

Scouring is a process in which the natural impurities (wax, pectins, alcohols, etc.), as well as the processing impurities (size, dirt, oil and grease, etc.) are removed from the fabric by hot alkaline detergents or soap solutions. Scouring is also used to make the fibers in the cloth whiter and more absorbent for subsequent bleaching and dyeing.

Scouring is accomplished by one of two methods, kier boiling or open width scouring, depending on the characteristics of the fabric. Kier boiling is often employed for scouring desized

cotton fabrics wherein the fabric (in rope form) is contained in a large vertical pressure vessel. In this process, the scouring chemicals are recirculated through the goods with heat supplied by an external heat exchanger. Open width scouring is used on certain heavy weight fabrics not normally processed in rope form.

Open width goods are processed in an open width boil-out machine, also known as the progressive jig. The jig is loaded with a scouring solution and the goods are fed continuously through by the use of eight or ten transfer rolls. The system is heated with steam coils and the temperature and residence time are maintained for proper scouring of the goods. The goods are wound onto rolls in the machine and maintained in contact with scouring liquids for the necessary period. Then they are unrolled through wash boxes and folded into a cloth truck or onto a roll.

Caustic soda (NaOH) and soda ash (Na_2CO_3) are used in most scouring operations, the former in concentrations of 1 to 8% of the cloth weight, the latter only 1 to 3% on weight of fibers. Sodium silicate (Na_2SiO_3) is generally used in smaller doses (0.25 to 1% on weight of fiber) (1). Pine oil soap to remove wax, and fatty alcohol sulfates to aid in melting, are also sometimes used in scouring. Although the fresh scour solution is clear, after scouring under pressure (5 to 15 psi) and at elevated temperature (200° F) for 2 to 12 hours, the scour liquid is an opaque brown (1). Methods of scouring and dumping of the scour waste vary from mill to mill; however, in all mills the cloth is rinsed completely until no brown color is left in the rinse water.

Scour liquor waste contributes approximately 16% of the total plant BOD. The grease and oil contribution is approximately 67% of the total. This is due to natural wax, oil and dirt present in cotton.

Wastewater characteristics for scour liquor are within the following range: BOD – 100 to 2900 mg/1, TS – 2200 to 17,400 mg/1, pH – 10 to 13 units, temperature – 250° F, and water use – 300 to 5100 gal/1000 lb. product.

4.2.4 Mercerizing

The process results in increased tensile strength, increased surface luster, increased abrasion resistance, reduction in potential shrinkage and increased affinity for dyestuffs.

Mercerization is accomplished by saturating the fabric with cold NaOH (15 to 30%). Physically, mercerization causes swelling of the cellulose fibers as alkali is absorbed into them, with higher concentrations, longer residence times, and lower temperatures favoring greater swelling. Mercerization may be conducted on greige goods (after desizing), on scoured goods (after kier boiling or caustic treatment) or on bleached goods. More complete mercerization results from treatment of bleached fabrics (in terms of fiber swelling), but mercerization of greige goods or scoured goods results in greater tensile strengths.

After the desired period of contact, the caustic is thoroughly washed off, sometimes with the aid of an intermediate acid wash. Generally, the caustic soda dragged out by the cloth is recovered and reused for scouring or mercerization. The mercerizing rinse wastes are alkaline, high in inorganic solids and caustic alkalinity, and low in BOD. With the increasing trend toward cotton-polyester blends, much less mercerizing is being done. It is estimated that less than 30% of cotton is now mercerized or causticized.

Mercerizing wastewater characteristics are dependent upon the degree of caustic recovery practiced in the mill and generally range as follows: BOD – 50 to 800 mg/l, TS – 320 to 18,000 mg/l, pH – 5.5 to 14 units, and water use – 2,000 to 37,000 gal/1,000 lb. product.

4.2.5 Bleaching

Bleaching of cotton cloth may be done with oxidizing agents, but sodium hypochlorite, sodium chlorite and hydrogen peroxide are the most common. Bleaching may be carried out immediately after scouring or after mercerizing, and may be done in bins, jigs or on a continuous basis.

In sodium hypochlorite bleaching, the cloth is first rinsed, scoured with a weak solution of sulfuric or hydrochloric acid and rinsed again. The cloth is then passed through a solution of sodium hypochlorite (about 0.25 to 0.50% available chlorine) and piled into large concrete bins or fed into a J-box if continuous operation is desired. The time required for hypochlorite bleaching varies with the type of cloth and may take from a few hours to as long as 24 hours at room temperature (1). The rinses following sodium hypochlorite bleaching are usually neutral in pH, vary in BOD depending upon the impurities in the fiber, and contain considerable amounts of free chlorine. A final rinse, which may contain an antichlor such as sodium bisulfite or sulfuric acid, is used to remove residual chlorine from the fabric. When bleaching with sodium chlorite, acetic acid is used in place of sulfuric or hydrochloric acid, the temperature of the bath is hot (108 to 185° F), and the pH is 3.5 to 5.5 (3).

Hydrogen peroxide is generally used for bleaching in the continuous process. Continuous bleaching ranges are employed for processing the majority of the cotton and cotton blended fabrics today. Fabric is fed in either rope or open width form and, in certain cases, the desizing, scouring and mercerizing operations are placed in tandem with the continuous bleaching range. The continuous bleaching process begins with a hot water (140 to 175° F) wash to insure removal of all contaminants. As the goods leave the washer excess water is removed and sodium hydroxide is added. The saturated material remains at 175 to 180° F for approximately 40 minutes to one hour resulting in the conversion of fats and waxes to soaps. The material is then rinsed, passed through a peroxide solution and allowed to bleach out at a temperature of 195° F for approximately 40 minutes to one hour (3).

The bleaching process contributes the lowest BOD to the total plant load. Wastewaters are characterized by the following ranges: BOD – 100 to 1,700 mg/l, TS – 840 to 14,400 mg/l, pH – 8.5 to 12 units, and water use – 300 to 14,900 gal/1,000 lb. product.

4.2.6 Dyeing and Printing

Dyeing is the process of applying color to the fiber stock, yarn or fabric. There are various methods of dyeing and many more types of dyes for each method. There are, however, six main classes of dyes for cotton fabric: vat, direct, developed, naphthol, sulfur and aniline black.

Vat dyes, known as fast dyes, are insoluble in water. They actually bond-in the colorant and are the most resistant of any types to light, dry cleaning, sunlight and washing. In the vat dyeing process, the insoluble dye is first made soluble in water by use of reducing chemicals and is then applied to the fibers. The absorbed dyestuff is then reoxidized to its insoluble highly colored form. An acid rinse (usually acetic acid) is used to neutralize the alkali present in the dye bath followed by detergent washing to produce brightness and wash resistance. Vat dyeing may be accomplished in individual batches or in continuous dye ranges.

Direct dyes are so named because they may be applied to the fibers without pre-application of chemicals required for retention. The advantages of direct dyes are their ease of application, low cost and variety of shades while the disadvantages are poor light and wash resistance, and poor resistance to acids and alkalis. Direct dyeing may be accomplished in dye becks, dyeing jigs, dye ranges and package dyeing units. Direct dyes may be applied with or without heat but with higher dye utilization at higher temperatures. Some direct dyes are subjected to post treatment with copper sulfate and acetic acid to increase light fastness and with potassium dichromate and acetic acid or formaldehyde to increase wash fastness.

Developed dyeing is a procedure wherein two different chemicals are employed. The first chemical (½ to 4% dye) is applied and absorbed into the fibers (1). The second chemical (developer) is then applied and a reaction with the first takes place directly on the fiber for stable color development. Dyeing is followed by rinsing to complete this process. The major advantage of developed dyeing is the production of a dyed fabric which possesses greater wash fastness. However, it may not have good light resistance.

Naphthol dyeing is developed dyeing in reverse. The cloth is first impregnated with the developer and then the dye is formed on the fiber by saturation in the dye bath. The advantages of naphthol dyes are good fastness and economy. Their major disadvantage is a limited range of colors.

In the actual process, the naphthol dye is dissolved by mixing with either sodium hydroxide under heat or ethyl alcohol and a cold solution of sodium hydroxide. The dissolved naphthol dyestuff is then added to the dye bath where the goods are dyed from 20 to 40 minutes at 80 to 100° F (6).

The naphthol is then ready for development in which it is coupled to the other portion of the final dye molecule. The so-called "fast color bases" are compounds with a free amino acid group which may be diazotized so that they will react with the naphthol. The base is placed in a solu-

tion to which sodium nitrite and hydrochloric acid have been added. Temperature is maintained at or below 40° F and the chemical reactions are similar to those employed in developed dyeing. Sodium acetate is employed to neutralize excess chemicals which would hinder the coupling reaction; acetic acid is used to neutralize excess alkali.

The naphtholated goods are then treated with a diazotized base for 20 to 30 minutes within the dye bath at room temperature. This coupling reaction can also be done in a dye box or on a continuous dyeing range (6).

Finally, the goods are detergent washed and rinsed, using a soap solution containing soda ash for 15 minutes at up to 200° F. The surface dye is removed, the shade is developed and fastness is improved.

Sulphur dyes are principally used to dye heavy cottons in shades of blacks, dark blues, browns, and other dark colors. The dyes are generally water insoluble and require dissolving in an alkaline solution before application. The dye is usually applied at high temperatures (140 to 212° F) using salt as an exhausting agent (6). Reoxidation is commonly done with sodium dichromate, acetic acid, sodium perborate or hydrogen peroxide. After dye reoxidation, surplus dyestuffs are removed by thorough washing with detergents.

Aniline black dye is an insoluble pigment produced by the oxidation of aniline. The cloth is passed through a dye bath typically consisting of 90 pounds of aniline hydrochloride, 35 pounds of sodium chlorate, and 13 pounds of $CuSO_4$ in 100 gallons of water (1). After impregnation, the cloth is given a steam treatment to develop the black pigment. Alkaline sodium dichromate treatment completes the process. Since the dye bath is not exhausted, it is seldom dumped.

Dyehouse wastewaters may contain quantities of chromium if aniline or sulfur dyeing methods are used. BOD generated from process chemicals used account for approximately 18% of the total plant load. Total dissolved solids contributed by dyeing account for approximately 34% of the total plant load. The high color values of the plant wastes are attributed to this operation. Table 4-1 presents a list of cotton and wool dyes, and chemicals used in the dyebaths.

Depending upon dye types and dyeing methods the wastewater characteristics are in the following ranges: BOD – 60 to 600 mg/l, TDS – 600 to 5,400 mg/l, Cr – 40 to 168 mg/l, pH – 6 to 12 units, and water use – 5,000 to 30,000 gal/1,000 lb. product.

TABLE 4-1

CHEMICALS PRESENT IN COTTON AND WOOL DYEBATHS

Dye Type	*Chemicals Present*
	Cotton
Aniline Black	Aniline hydrochloride, sodium ferrocyanide, sodium chlorate, pigment, soap, sodium di-chromate.
Developed	Dye, penetrant, sodium chloride, sodium nitrite, hydrochloric acid or sulfuric acid, developer (beta naphthol), soap or sulfated soap or fatty alcohol.
Direct	Dye, sodium carbonate, sodium chloride, hydrochloric acid, wetting agent or soluble oil or sodium sulfate.
Naphthol	Dye, caustic soda, soluble oil alcohol, soap, soda ash, sodium chloride, base, sodium nitrate, sodium nitrite, sodium acetate.
Sulfur	Dye, sodium sulfide, sodium carbonate, sodium chloride, sodium di-chromate, hydrogen peroxide.
Vat	Dye, caustic soda, sodium hydrosulfite, soluble oil, gelatin, perborate or hydrogen peroxide.
	Wool
Acid	Dye, sulfuric or acetic acid or ammonium sulfate and Glauber Salt.
Metalized	Dye, acetic or sulfuric acid or ammonium sulfate.
Mordant	Acetic acid, sodium sulfate, sodium di-chromate.

Source: Reference 3

Colored patterns on cloth are usually printed. In roller printing, the cloth is rolled around a large central cylinder on top of a "dark" cloth used to absorb any printing paste which may seep through. Copper rolls with engraved designs on the circumference of the cylinder are padded with dye paste (from close-by color boxes). These rolls, wiped free of excess paste by a "doctor" blade, pass tightly against the cloth. Dye paste in the engraved depressions is imprinted on the cloth. Steaming or aging treatments finally fix the color prior to washing, rinsing, drying and finishing. Pollution from color shops (where printing is usually done) comes mainly from the washing tubs, dippers, cloths, drums, and any equipment used to make and carry the printing pastes. Washing the printed cloth also contributes to pollution.

Printing wastes can contain high concentrations of BOD and dissolved solids. Printing pigments will also introduce suspended solids into the waste stream.

Wastewater characteristics are defined as the following ranges: BOD – 100 to 650 mg/1, TSS – 10 to 750 mg/1. TDS – 200 to 1000 mg/1, pH – 6 to 11 units, and water use – 1500 to 4000 gal/1000 lb. product.

4.2.7 Finishing

Finishing is a general term which covers the treatment of a fabric to give it a desired surface effect such as calendered, embossed, lacquered, napped, etc. Special finishes can be applied to make a fabric crease resistant, crease retentive, waterproof, etc. Starch, dextrin, wax, tallow, oil, clay, talc, and other weighting compounds are typical finishing compounds. In recent years, resins, cellulosic solutions, lacquers, sulfonated compounds, and quaternary ammonium salts have been used. Other finishing processes, such as leveling off (hot detergents) to produce a uniform appearance, softening (hot soap) to produce a soft feel, and rust stain removal (oxalic acid and sodium acid fluoride) to improve color are also sometimes used.

Finishing wastewaters are low in BOD and wastewater volume produced and can be characterized by the following ranges: BOD – 20 to 500 mg/l, TS – 40 to 2340 mg/l, pH – 6 to 8 units, and water use – 1,500 gal/1,000 lb. product.

TABLE 4-2
BOD CONTRIBUTED BY COTTON FABRIC MANUFACTURING PROCESSES

PROCESS	BOD SOURCES	BOD LB. / 1000 LB. PRODUCT	BOD mg/l	WATER USE GALLONS / 1000 LB. PRODUCT	REFERENCE
SLASHING:	Natural Starches, resins	0.5 – 5.0	(620 – 2,500)	60-940	7
DESIZING:					
Enzyme Starch	Glucose from Starch	45.6	(3,645)	1,500	6
Acid Starch	Glucose from Starch	45.6	(3,645)	1,500	6
Polyvinyl Alcohol	Soluble Polyvinyl Alcohol	2.5	(200)	1,500	6
Carboxymethyl Cellulose	Soluble Carboxymethyl Cellulose	3.93	(314)	1,500	6
		—	—	—	—
SCOURING:					
Unmercerized Greige Fabric		21.4	(855)	3,000	6
Mercerized Greige Fabric	Natural Waxes, Pectins, Alcohol, Etc.	16.4	(655)	3,000	6
MERCERIZING:					
Greige Fabric	Penetrants such as NaOH	12.9	(773)	2,000	6
Scoured Fabric		4.0	(240)	2,000	6
Bleached Fabric		1.66	(100)	2,000	6
BLEACHING:					
Hydrogen Peroxide (Woven Goods)		1.4	(84)	2,000	6
Hydrogen Peroxide (Knit Goods)	Penetrants	23.5	(282)	10,000	6
Sodium Hypochlorite (Woven Goods)		0.08	(5)	2,000	6
DYEING:					
Direct (Woven Goods)	Sodium Sulfate, Soluble Oil	2.59	(62)	5,000	6
Direct (Knit Goods)	Wetting Agent, Etc.	21.1	(84)	30,000	6
Developed (Woven Goods)	Penetrant, Sodium Nitrate, Developer, Soap, Etc.	5.22	(125)	5,000	6
Developed (Knit Goods)		26.8	(107)	30,000	6
Vat (Woven Goods)	Sodium Hydrosulfite, Soluble Oil, Gelatine, Etc.	19.1	(458)	5,000	6
Vat (Knit Goods)		42.4	(169)	30,000	6
Sulfur (Woven Goods)	Sodium Sulfide, Sodium Carbonate	24.0	(576)	5,000	6
Sulfur (Knit Goods)		42.4	(169)	30,000	6
Naphthol (Woven Goods)	Sodium Acetate, Soluble Oil, Soap, Etc.	5.4	(129)	5,000	6
Naphthol (Knit Goods)		30.6	(122)	30,000	6
Fiber Reactive (Woven Goods)	Sodium Ferrocyanide, Sodium Chlorite, Pigment	5.8	(139)	5,000	6
Fiber Reactive (Knit Goods)		26.6	(106)	30,000	6
PRINTING:					
Pigment (Woven Goods)		1.3	(101)	1,500	6
Pigment (Knit Goods)	Starch, Glycerol, Reducing Agent, Detergents, Soaps, Etc.	1.3	(101)	1,500	6
Vat Dye (Woven Goods)		21.5	(644)	4,000	6
Vat Dye (Knit Goods)		21.5	(644)	4,000	6
FINISHING:					
Starch	Glucose,	2.3	(184)	1,500	6
Resin	Cellulosic Solutions,	0.7	(56)	1,500	6
Resin Finishing & Flat Curing	Sulfonated compounds, Detergents, Soaps, Etc.	6.3	(505)	1,500	6
Softener		0.25	(20)	1,500	6

TABLE 4-3

TOTAL SUSPENDED SOLIDS (TSS) CONTRIBUTED BY COTTON FABRIC MANUFACTURING PROCESSES

PROCESS	BOD SOURCES	TOXIC MATERIAL LB. / 1000 LB. PRODUCT	mg/l	WATER USE GALLONS / 1000 LB. PRODUCT	REFERENCE
SLASHING:	—	—		60 - 940	7
DESIZING:					
Enzyme Starch	Substance Removed from the Yarn Applied in the Slashing Operation	89	(7,114)	1,500	6
Acid Starch		89.5	(7,154)	1,500	6
Polyvinyl Alcohol		5.0	(400)	1,500	6
Carboxymethyl Cellulose		5.0	(400)	1,500	6
SCOURING:					
Unmercerized Greige Fabric	Cotton, Wax, Non-Cellulosic Components of the Cotton	5.0	(200)	3,000	6
Mercerized Greige Fabric		5.0	(200)	3,000	6
MERCERIZING:					
Greige Fabric	Natural Impurities from Rinsed Water	5.0	(300)	2,000	6
Scoured Fabric		5.0	(300)	2,000	6
Bleached Fabric		5.0	(300)	2,000	6
BLEACHING:					
Hydrogen Peroxide (Woven Goods)	Residual from Rinsed Water	4.0	(240)	2,000	6
Hydrogen Peroxide (Knit Goods)	Impurities in the Fiber	—		10,000	6
Sodium Hypochlorite (Woven Goods)		4.0	(240)	2,000	6
DYEING:	No TSS	—		5,000 - 30,000	6
PRINTING:					
Pigment (Woven Goods)	Printing Paste, Thickener	0.13	(10)	1,500	6
Pigment (Knit Goods)	Rinsed Water Used for Cleaning Equipment	0.13	(10)	1,500	6
Vat Dye (Woven Goods)		25.0	(749)	4,000	6
Vat Dye (Knit Goods)		25.0	(749)	4,000	6
FINISHING:					
Starch		—		1,500	6
Resin		—		1,500	6
Resin Finishing & Flat Curing	Resin, Wax, Talc.	12	(959)	1,500	6
Softener		—		1,500	6

TABLE 4-4
TOTAL DISSOLVED SOLIDS (TDS) CONTRIBUTED BY COTTON FABRIC MANUFACTURING PROCESSES

PROCESS	TDS SOURCES	TDS LB. / 1000 LB. PRODUCT	TDS mg/l	WATER USE GALLONS / 1000 LB. PRODUCT	REFERENCE
		TOTAL SOLIDS			
SLASHING:	Sizing Liquid	47-67	(8,500-22,600)	60 - 940	7
DESIZING:					
Enzyme Starch	Dissolved Organic Compounds in Desizing Liquid	5.1	(408)	1,500	6
Acid Starch		7.5	(600)	1,500	6
Polyvinyl Alcohol		48.0	(3,837)	1,500	6
Carboxymethyl Cellulose		45.0	(3,597)	1,500	6
SCOURING:					
Unmercerized Greige Fabric	Soluble Impurities Removed	49.9	(1,994)	3,000	6
Mercerized Greige Fabric	By Hot Alkali and Soap Detergents	49.9	(1,994)	3,000	6
MERCERIZING:					
Greige Fabric	Dissolved Solids in NaOH and Acid Wash Rinsed Water	148	(8,873)	2,000	6
Scoured Fabric		148	(8,873)	2,000	6
Bleached Fabric		142	(8,513)	2,000	6
BLEACHING:					
Hydrogen Peroxide (Woven Goods)	Residual Chlorine from the Fabric in Rinsed Water	21.9	(1,313)	2,000	6
Hydrogen Peroxide (Knit Goods)		70.7	(838)	10,000	6
Sodium Hypochlorite (Woven Goods)		55.0	(3,297)	2,000	6
DYEING:					
Direct (Woven Goods)	Dye, Sodium Carbonate, Sodium Chloride, Wetting Agent	106	(2,542)	5,000	6
Direct (Knit Goods)		260	(1,039)	30,000	6
Developed (Woven Goods)	Dye, Penetrants, Sodium Chloride, Soap and Fatty Alcohol	225	(5,396)	5,000	6
Developed (Knit Goods)		318	(1,271)	30,000	6
Vat (Woven Goods)	Dye, Caustic Soda, Gelatine, Sodium Hydrosulfite	117-127	(2,806-3,046)	5,000	6
Vat (Knit Goods)		194	(775)	30,000	6
Sulfur (Woven Goods)	Dye, Sodium Sulfide, Sodium Chloride	154	(3,693)	5,000	6
Sulfur (Knit Goods)		193	(771)	30,000	6
Naphthol (Woven Goods)	Dye, Soda Ash, Caustic Soda, Soap, Alcohol	48.5	(1,163)	5,000	6
Naphthol (Knit Goods)		143	(572)	30,000	6
Fiber Reactive (Woven Goods)	Sodium Chloride, Pigment Soap	180	(4,317)	5,000	6
Fiber Reactive (Knit Goods)		273	(1,091)	30,000	6
PRINTING:					
Pigment (Woven Goods)	Printing Paste, Dyeing Assistant, Hydroscopic Substances and Other Chemicals	2.5	(200)	1,500	6
Pigment (Knit Goods)		2.5	(200)	1,500	6
Vat Dye (Woven Goods)		34.0	(1,019)	4,000	6
Vat Dye (Knit Goods)		34.5	(1,034)	4,000	6
FINISHING:					
Starch	Starch, Dextrin, Tallow, Lacquers, Sulfonated Compound, Ammonia Salt	4.65	(372)	1,500	6
Resin		22	(1,759)	1,500	6
Resin Finishing & Flat Curing		17.3	(1,383)	1,500	6
Softener	Hot Soap	0.5	(40)	1,500	6

TABLE 4-5

CHARACTERISTICS OF WASTEWATER BY pH FROM COTTON FABRIC MANUFACTURING PROCESSES

PROCESS	CHARACTERISTIC	pH UNIT	WATER USE GALLONS / 1000 LB. PRODUCT	REFERENCE
SLASHING:	Neutral	7.0 - 9.5	60 - 940	7
DESIZING:	Neutral Except Acid Starch Which is Low pH (1-2) Resulted From Solution of Sulfuric Acid	6 - 8	1,500	6
SCOURING:	High Alkalinity Resulted from Hot Alkaline Detergents or Soap Solutions	12.5	3,000	6
MERCERIZING:	High Alkalinity Resulted from 15 to 30 Percent Solution of Sodium Hydroxide Used in Process	12.0	2,000	6
BLEACHING:	Alkaline pH Resulted from Bleaching Solutions	9 - 12	2,000- 10,000	6
DYEING:	Neutral to Alkaline pH Resulted from Dye Used Except Developed Dyeing Which is Low pH (1-2) Due to Sulfuric Acid Solution Used in Dyeing Process	6 - 12	5,000- 30,000	6
PRINTING:	Neutral to High Alkaline	6 - 11	1,500 - 4,000	6
FINISHING:	Neutral	6 - 8	1,500	6

TABLE 4-6

COLOR CONTRIBUTED BY COTTON FABRIC MANUFACTURING PROCESSES

PROCESS	COLOR SOURCES	COLOR LB. / 1000 LB. PRODUCT	COLOR mg/l	WATER USE GALLONS / 1000 LB. PRODUCT	REFERENCE
SLASHING:	—	—		60 - 940	7
DESIZING:	—	—		1,500	6
SCOURING:	—	—		3,000	6
BLEACHING:	—	—		2,000 - 10,000	6
DYEING:					
Direct (Woven Goods)	Dye, Chemicals, Penetrants	0.5	(12)	5,000	6
Direct (Knit Goods)	Dye, Chemicals, Penetrants	0.75	(3)	30,000	6
Developed (Woven Goods)	Dye, Chemicals, Penetrants	1.0	(24)	5,000	6
Developed (Knit Goods)	Dye, Chemicals, Penetrants	1.0	(4)	30,000	6
Vat (Woven Goods)	Dye, Chemicals, Penetrants	1.6	(38)	5,000	6
Vat (Knit Goods)	Dye, Chemicals, Penetrants	2.0	(8)	30,000	6
Sulfur (Woven Goods)	Dye, Chemicals, Penetrants	3.2	(77)	5,000	6
Sulfur (Knit Goods)	Dye, Chemicals, Penetrants	3.5	(14)	30,000	6
Naphthol (Woven Goods)	Dye, Chemicals, Penetrants	0.6	(14)	5,000	6
Naphthol (Knit Goods)	Dye, Chemicals, Penetrants	0.6	(2)	30,000	6
Fiber Reactive (Woven Goods)	Dye, Chemicals, Penetrants	0.6	(14)	5,000	6
Fiber Reactive (Knit Goods)	Dye, Chemicals, Penetrants	0.6	(2)	30,000	6
PRINTING:					
Pigment (Woven Goods)		0.05	(4)	1,500	6
Pigment (Knit Goods)	Printing Paste, Dyeing Assistant, Chemicals	—		1,500	6
Vat Dye (Woven Goods)		0.5	(15)	4,000	6
Vat Dye (Knit Goods)		0.5	(15)	4,000	6
FINISHING:	—	—		1,500	6

TABLE 4-9

COMPARISON OF WASTEWATER CHARACTERISTICS FROM COTTON FABRIC MANUFACTURING PROCESSES

PROCESS/	pH, UNIT				BOD, LB/1000 LB. PRODUCT, (mg/l)				TOTAL SOLIDS, LB/1000LB. PRODUCT (mg/l)				WATER USE GALLONS/1000 LB. PRODUCT			
REFERENCES	REF 1	REF 6	REF 7	REF 8	REF 1	REF 6	REF 7	REF 8	REF 1	REF 6	REF 7	REF 8	REF 1	REF 6	REF 7	REF 8
SLASHING:	N/I	N/I	7 - 9.5	N/I	N/I	N/I	0.5 - 5.0 (620-2,500)	N/I	N/I	N/I	47 - 67 (8,500-22,600)	N/I	N/I	N/I	60 - 940	N/I
DESIZING:	6 - 8	6 - 8	N/I	6 - 8	55 (2,638)	2.5-45.6 (200-3,645)	14.1-16.1 (1,700-5,200)	N/I (3,000)	78.5 (3,765)	94.1 (7,522)	66 - 70 (16,000-32,000)	N/I (6,000)	2,500	1,500	300 - 1,100	N/I
SCOURING:	N/I	12.5	10 - 13	13	52.5 (1,399)	16.4-21.4 (650-850)	1.36-17.5 (50-2,900)	N/I (1,800)	86.6 (2,307)	54.9 (2,194)	19 - 47 (7,600-17,400	N/I (8,000)	4,500	3,000	310 - 5,100	N/I
MERCERIZING:	N/I	12	5.5-9.5	11 - 14	2.5 (75)	1.66-12.9 (100-773)	10.5-13.5 (45 - 65)	N/I (780)	10.7 (322)	152 (9,100)	185-450 (600-1,900)	N/I (8,000-18,000)	4,000	2,000	27,900-36,950	N/I
BLEACHING:	N/I	9 - 12	8.5-9.6	9 - 11	7.5 (200)	0.08-23.5 (5-282)	5.0-14.8 (90-1,700)	N/I (600)	40 (1,066)	26-70.7 (838-3,537)	38 - 290 (2,300-14,400)	N/I N/I	4,500	2,000-10,000	300-14,900	N/I
DYEING AND PRINTING:	N/I	1 - 12	5 - 10	4 - 8	7.5 - 30 (180-450)	1.3-42.4 (62-744)	N/I (11-1,800)	N/I (200-30,000)	11.7-47.5 (284-701)	2.63-378 (210-5,396)	25-1,200 (500-14,000)	N/I (500-40,000)	1,500-20,000	1,500-30,000	1,000-36,000	N/I
FINISHING:	N/I	6 - 8	N/I	N/I	N/I	0.25-6.32 (20-505)	N/I	N/I	N/I	0.5-29.3 (40-2,342)	N/I	N/I	N/I	1,500	N/I	N/I

NOTE: There is no information of TSS, TDS, oil and grease, color and toxic material from references 1, 7 and 8.
N/I No Information available.

4.3 Wool Processing

The five major sources of pollution which are produced during the processing of woolen fibers are:

1. Scouring
2. Washing after Fulling
3. Neutralization after Carbonizing
4. Bleaching
5. Dyeing

4.3.1 Scouring

Scouring, the first wet process wool receives, removes the natural and acquired impurities from the wool fibers. Since raw sheep wool contains from 25 to 75% suint (water soluble excretions and secretions of the sheep such as urine, feces, sweat, blood, dirt, grease, etc.), the production of one pound of scoured wool fiber also produces one and one-half pounds of waste impurities (5). Because of this, the process of wool scouring is known to have one of the strongest wastes in the textile industry.

Scouring is usually carried out in a series of 2 to 6 bowls (usually 4 bowls of 1,500 to 3,000 gallons capacity each), commonly known as a "scouring train" (1). The first two bowls of the train are filled with neutral detergents or detergents and a mild alkali such as sodium carbonate or soda ash. The third bowl is a standing rinse and the last may be either a standing or over-flowing rinse. In many plants, a counterflow arrangement may be used where the relatively cleaner waters at the end of the train flow backward for reuse in the preceding bowls.

The soap-alkali scouring baths are generally characterized by a temperature of 115 to 130° F and a pH of 9.5 to 10.5 while the neutral detergent baths normally have a pH of 6.5 to 7.5 and a temperature of 135 to 160° F (3).

The scouring process emulsifies the dirt and grease and produces a brown, thickly turbid waste which is often covered with a greasy scum and contains considerable, settleable mineral matter. It is strongly alkaline and very putrescible. The bowls are generally dumped once at the end of each 8-hour day at which time BOD concentration may reach 40,000 mg/l in the first bowl and the BOD concentration in each succeeding bowl is usually about 10% of that in the previous bowl. The scouring process contributes 55 to 75% of the total BOD produced during the processing of wool fibers (1).

Ref. 25

HAZARD RANKING SYSTEM

DATA COLLECTION AND DOCUMENTATION TECHNIQUES FOR HRS SCORING OF HAZARDOUS WASTE SITES

MARCH, 1987

Prepared By

NUS Corporation
Superfund Division

In Cooperation With

U.S. Environmental Protection Agency
Investigations and Compliance Ur
Region IV

DRAFT
(01-14-87)

Toxicity/Persistence Matrix Values

Table I is the listing of EPA Hazard Ranking System (HRS) Waste Characteristics Values (Toxicity/Persistence matrix) used by the NPL quality assurance team. These rating factor values are based on the criteria specified in the HRS (toxicity rating assigned to each substance in Sax, Dangerous Properties of Industrial Chemicals, 4th, 5th and 6th editions). The listing shows the matrix values for groundwater and surface water and the toxicity values for air. The values shown are "post multiplier" for use on the HRS worksheets. Changes to this list are made, albeit infrequently, as a result of response to public comment and changes in the reference material. Questions should be directed to the NPL quality assurance team via Mr. Steve Caldwell, EPA Headquarters, (202) 475-8103.

TABLE I

EPA Hazard Ranking System Waste Characteristics Values
(Toxicity/Persistence Matrix)

Chemical/Compound	Groundwater and Surface Water Pathway Values	Air Pathway Values
Acenapthene	9	3
Acetaldehyde	6	6
Acetic Acid	6	6
Acetone	6	6
2-Acetylaminofluorene	18	9
Aldrin	18	9
Ammonia	9	9
Aniline	12	9
Anthracene	15	9
Arsenic	18	9
Arsenic Acid	18	9
Arsenic Trioxide	18	9
Asbestos	15	9
Barium	18	9
Benzene	12	9
Benzidine	18	9
Benzo(a)pyrene	18	9
Benzopyrene, NOS*	18	9
Beryllium & Compounds, NOS	18	9
Beryllium Dust, NOS	18	9
Bis (2-Chloroethyl) Ether	15	9
Bis (2-Ethylhexyl) Phthalate	12	3
Bromodichloromethane	15	6
Bromoform	15	6
Bromomethane	15	9
Cadmium	18	9
Carbon Tetrachloride	18	9
Chlordane	18	9
Chlorobenzene	12	6
Chloroform	18	6
3-Chlorophenol	12	6
4-Chlorophenol	15	9
2-Chlorophenol	12	6
Chromium	18	9
Chromium, Hexavalent (Cr^{+6})	18	9

*NOS - Not otherwise specified

TABLE I
PAGE TWO

Chemical/Compound	Groundwater and Surface Water Pathway Values	Air Pathway Values
Chromium, Trivalent (Cr^{+3})	15	6
Copper & Compounds, NOS	18	9
Creosote	15	6
Cresols	9	6
4-Cresol	12	9
Cupric chloride	18	9
Cyanides (soluble salts), NOS	12	9
Cyclohexane	12	6
DDE	18	9
DDT	18	9
Diaminotoluene	18	6
Dibromochloromethane	15	6
1, 2-Dibromo, 3-chloropropane	18	9
Di-N-Butyl-Phthalate	12	6
1, 4-Dichlorobenzene, NOS	18	6
Dichlorobenzene, NOS	18	6
1, 1-Dichloroethane	12	6
1, 2-Dichloroethane	12	9
1, 1-Dichloroethene	15	9
1,2-cis-Dichloroethylene	12	3
1,2-trans-Dichloroethylene	12	3
Dichloroethylene, NOS	12	3
2, 4-Dichlorophenol	18	6
2, 4-Dichlorophenoxy-acetic Acid	18	9
Dicyclopentadiene	18	9
Dieldrin	18	9
2, 4-Dinitrotoluene	15	9
Dioxin	18	9
Endosulfan	18	9
Endrin	18	9
Ethylbenzene	9	6
Ethylene Dibromide	18	9
Ethylene Glycol	9	6
Ethyl Ether	15	3
Ethylmethacrylate	12	6
Fluorine	18	9
Formaldehyde	9	9
Formic Acid	9	6

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TABLE I
PAGE THREE

Chemical/Compound	Groundwater and Surface Water Pathway Values	Air Pathway Values
Heptachlor	18	9
Hexachlorobenzene	15	6
Hexachlorobutadiene	18	9
Hexachlorocyclohexane NOS	18	9
Hexachlorocyclopentadiene	18	9
Hydrochloric Acid	9	6
Hydrogen Sulfide	18	9
Indene	12	6
Isophorone	12	6
Isopropyl Ether	9	3
Kelthane	15	6
Kepone	18	9
Lead	18	9
Lindane	18	9
Magnesium & Compounds, NOS	15	6
*Manganese & Compunds, NOS	12	9
Mercury	18	9
Mercury Chloride	18	9
Methoxychlor	15	6
4, 4-Methylene-Bis-(2-Chloroaniline)	18	9
Methylene Chloride	12	6
Methyl Ethyl Ketone	6	6
Methyl Isobutyl Ketone	12	6
4-Methyl-2-Nitroaniline	12	9
Methyl Parathion	9	9
2-Methylpyridine	12	6
Mirex	18	9

*Subject to EPA HQ approval

NOTE: Iron is not a CERCLA listed hazardous waste per Federal Register of April 4, 1985.

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TABLE I
PAGE FOUR

Chemical/Compound	Groundwater and Surface Water Pathway Values	Air Pathway Values
Naphthalene	9	6
*Nickel & Compounds, NOS	12	9
Nitric Acid	9	9
Nitroaniline, NOS	18	9
Nitrogen Compounds, NOS	12	0
Nitroguanidine	12	9
Nitrophenol, NOS	15	9
m-Nitrophenol	15	0
o-Nitrophenol	12	0
p-Nitrophenol	15	0
Nitrosodiphenylamine	12	6
Parathion	9	9
Pentachlorophenol (PCP)	18	9
Pesticides, NOS	18	9
Phenanthrene	15	9
Phenol	12	9
Phosgene	9	9
Polybrominated Biphenyl (PBB), NOS	18	9
Polychlorinated Biphenyls (PCB), NOS	18	9
Potassium Chromate	18	9
Radium & Compounds, NOS	18	9
Radon & Compounds, NOS	15	9
RDX (Cyclonite)	15	0
2, 4-D, Salts & Esters	18	9
*Selenium	12	9
Sevin (Carbaryl)	18	9
Sodium Cyanide	12	9
Styrene	9	6
Sulfate	9	0
Sulfuric Acid	9	9
2, 4, 5-T	18	9
1, 1, 2, 2-Tetrachloroethane	18	9
Tetrachloroethane, NOS	18	9
1, 1, 2, 2-Tetrachloroethene	12	6

*Subject to EPA HQ approval

TABLE I
PAGE FIVE

Chemical/Compound	Groundwater and Surface Water Pathway Values	Air Pathway Values
Tetraethyl Lead	18	9
Tetrahydrofuran	15	6
Thorium & Compounds, NOS	18	9
Toluene	9	6
TNT	12	9
Toxaphene	18	9
Tribromomethane	18	9
1, 2, 4-Trichlorobenzene	15	6
1, 3, 5-Trichlorobenzene	15	6
1, 1, 1-Trichloroethane	12	6
1, 1, 2-Trichloroethane	15	6
Trichloroethane, NOS	15	6
Trichloroethene	12	6
1, 1, 1-Trichloropropane	12	6
1, 1, 2-Trichloropropane	12	6
1, 2, 2-Trichloropropane	12	6
1, 2, 3-Trichloropropane	15	9
Uranium & Compounds, NOS	18	9
Varsol	12	6
Vinyl Chloride	15	9
Xylene	9	6
*Zinc & Compounds, NOS	12	9
Zinc Cyanide	18	9

*Subject to EPA HQ approval

Ref. 26

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ENCYCLOPAEDIA OF OCCUPATIONAL HEALTH AND SAFETY

THIRD (REVISED) EDITION

Technical editor:
Dr. Luigi Parmeggiani

VOLUME 1 A-K

held by a head-strap across the worker's mouth and se. Commercial dust masks of simple design are dely available at relatively low cost; it should be possible to adjust them to the contours of the worker's face to prevent leaks of unfiltered air. However, in hot and humid climates, such equipment may be uncomfortable and readily discarded by workers unless close supervision is maintained.

Medical supervision. Workers should undergo a pre-employment medical examination before being exposed to vegetable dusts. Persons who show sensitivity to the dusts in question, who have a history of respiratory disease or who are heavy smokers should not be employed on this type of work. In the pre-employment medical examination, emphasis should be placed on chest examination, clinically, radiologically and, preferably, also by the measurement of ventilatory capacity.

Workers should receive periodic medical examinations for the early detection of effects of dust exposure and those who present skin, membrane or respiratory symptoms should be removed from exposure; the symptoms of incipient disease can usually be reversed in this way.

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Dyeing industry

Dyeing involves a chemical combination or a powerful physical affinity between the dye and the fibre of the fabric.

Classes of dyes. Acid or basic dyes are used in a weak acid bath for wool, silk or cotton. Some acid dyes are used after mordanting the fibres with metallic oxide, tannic acid or dichromates. Direct dyes which are not fast are used for the dyeing of wool, rayon and cotton. They are dyed at the boil. For dyeing of cotton fabrics with sulphur dyes, the dyebath is prepared by pasting the dye with soda ash and sodium sulphide and hot water. The dyeing is carried out at the boil. For dyeing cotton with azo dyes, naphthol is dissolved in aqueous caustic soda. The cotton is impregnated with the solution of the sodium naphthoxide thus formed and is then treated a solution of a diazo-compound to develop the dye in the material. Vat dyes are made into leuco-compounds with sodium hydroxide and sodium hydrosulphite. Dyeing is done at 30-60 °C. Disperse dyes are selected for dyeing of all synthetic fibres which are hydrophobic. Swelling agents or carriers which are phenolic in nature must be used to enable the disperse dyes to act. Mineral dyes are inorganic pigments which are salts of iron and chromium. After impregnation, their precipitation is done by addition of hot alkaline solution. Reactive dyes for cotton are used in a hot or a cold bath. Soda ash and common salt are needed for this type of dyeing.

Cotton dyeing. The preparatory processes before dyeing cotton fabrics consist of the following steps. The cloth passes through a shearing machine which cuts the loosely adhering fibres; then, to complete the trimming process, it is rapidly passed over a row of gas flames and the sparks are extinguished by passing the material through a water box. Desizing is carried out by passing the cloth through a diastase solution which removes the size completely. To remove other impurities it is scoured in a kier with dilute sodium hydroxide, sodium carbonate or turkey red oil for 8-12 h at high temperature and pressure.

For coloured woven material, an open kier is used and sodium hydroxide is avoided. The natural colouring in the cloth is removed by hypochlorite solution (figure 1)

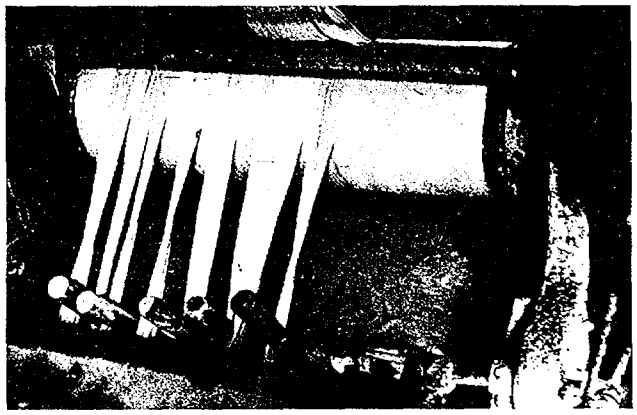

Figure 1. Yarn bleaching. *(By courtesy of Sayaji Mills.)*

in the bleaching pits after which the cloth is aired, washed, dechlorinated by means of a sodium bisulphite solution, washed again and scoured with dilute hydrochloric or sulphuric acid. After a final, thorough washing the cloth is ready for the dyeing or printing process.

Dyeing is carried out in a jig or padding machine in which the cloth is moved through a stationary dye solution which is prepared by dissolving the dyestuff powder in a suitable chemical and then diluting with water. After dyeing, the cloth is subjected to a finishing process.

Printing is carried out on a roller printing machine (figures 2 and 3). The dye is thickened with starch or

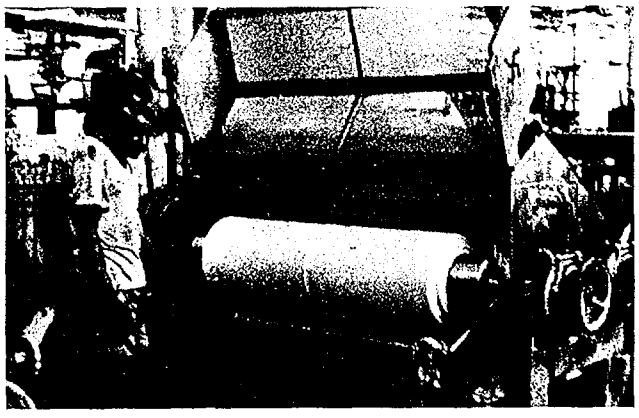

Figure 2. Fabric dyeing. *(By courtesy of Sayaji Mills.)*

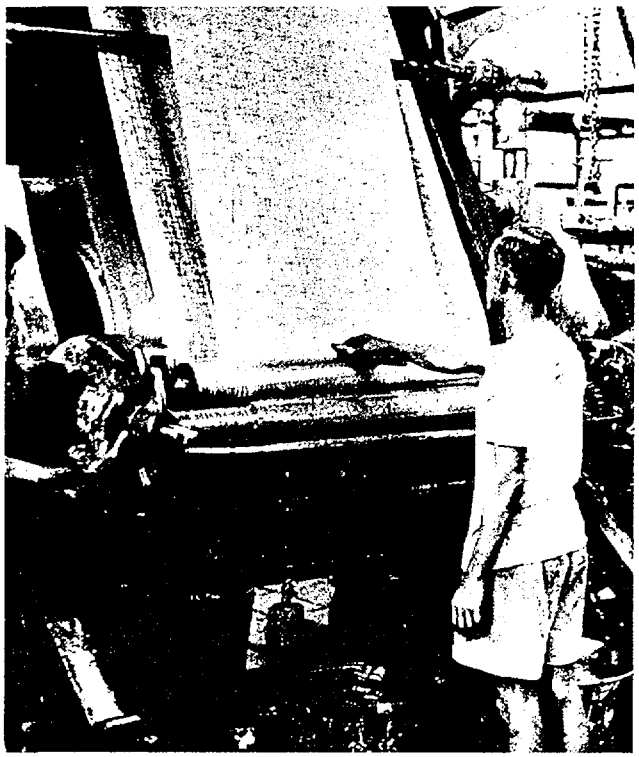

Figure 3. Roller printing of cloth. *(By courtesy of Sayaji Mills.)*

made into emulsion which, in the case of pigment colours, is prepared with an organic solvent. This paste or emulsion is taken up by the engraved rollers, which print the material, and the colour is subsequently fixed in the ager or curing machine; the printed cloth then receives the appropriate finishing treatment.

Nylon dyeing. The preparation of polyamide (nylon) fibres for dyeing involves scouring, some form of setting treatment and, in some cases, bleaching.

The treatment adopted for the scouring of woven polyamide fabrics depends mainly on the composition of the size used. Water soluble sizes based on polyvinyl alcohol or polyacrylic acid can be removed by scouring in a liquor containing soap and ammonia or Lissapol N or similar detergent and soda ash. After scouring, the material is rinsed thoroughly and is then ready for dyeing or printing.

A jigger or winch dyeing machine is used for dyeing polyamide fabric.

Wool dyeing. The raw wool is first scoured by the emulsification process in which soap and soda ash solutions are used. The operation is carried out in a washing machine which consists of a long trough, provided with rakes, false bottom and, at the exit, wringers. The wool, after thorough washing, is bleached with hydrogen peroxide or with sulphur dioxide, in which case the damp goods are left exposed to the sulphur dioxide gas overnight. The acid gas is neutralised by passing the fabric through a sodium carbonate bath and then washing thoroughly. After dyeing, the goods are rinsed, hydroextracted and dried.

HAZARDS AND THEIR PREVENTION

Fire and explosion. The fire hazards that characterise a dye works are those caused by the presence of flammable solvents used in the processes and certain flammable dyestuffs. Safe storage facilities should be provided for both. These facilities should comprise properly designed storerooms constructed of fire-resisting materials. Storerooms for flammable liquids should be provided with a raised and ramped sill at the doorway so that escaping liquid is contained within the room and is thus prevented from flowing to a place where it can become ignited. It is preferable that stores of this nature should be outside the main factory building. If large quantities are kept in tanks outside the building, the tank area should be mounded to contain escaping liquid. Similar arrangements should be made when the gaseous fuel used on the singeing machines is obtained from a light petroleum fraction. The gas-making plant and the storage facilities for the volatile petroleum spirit should preferably be outside the building.

Health hazards. Many factories use hypochlorite solution for bleaching; in others the bleaching agent is gaseous chlorine or bleaching powder from which chlorine is evolved when it is charged into the tank. In either case, workers may be exposed to a dangerous atmosphere unless precautions are taken. Chlorine is a skin and eye irritant and a dangerous pulmonary tissue irritant causing delayed lung oedema. To limit the escape of chlorine into the working atmosphere, bleaching vats should be designed as closed vessels provided with vents that allow a minimum escape of chlorine so that the relevant recommended maximum levels are not exceeded, and atmospheric chlorine estimations should be made periodically to check the concentration. The valves and other controls of the tank in which the liquid chlorine is supplied to the dyeworks should be controlled by a competent operator since the possibilities of an uncontrolled leak could well be disastrous.

The use of corrosive alkalis and acids and the treatment of cloth with boiling liquor expose the workers to the risk of burns. Both hydrochloric acid and sulphuric acid are used extensively in dyeing processes. Caustic soda is used in bleaching, mercerising and dyeing. Chips from the solid material fly and create hazards for the workers. Sulphur dioxide, which is used in bleaching and carbon disulphide, which is used as a solvent in the viscose process, can also pollute the workroom. Aromatic hydrocarbons such as benzol, toluol and xylol, solvent naphthas and aromatic amines such as aniline are common dangerous chemicals to which workers are likely to be exposed. Dichlorobenzene is emulsified with water with the help of an emulsifying agent and is used for dyeing of polyester fibres. Many dyestuffs are skin irritants that cause dermatitis and, in addition, workers are tempted to use a harmful mixture of abrasive, alkali and bleaching agent to remove dye stains from their hands. Organic solvents used in the processes and for the cleaning of machines may themselves cause dermatitis or render skin vulnerable to the irritant action of the other harmful substances that are used; furthermore, they may be the cause of peripheral neuropathy as in the case of methyl butyl ketone. Certain dyes have been found to be carcinogenic substances. These include rhodamine B, magenta, 2-naphthylamine and certain bases such as dianisidine. Besides allergies due to the fibre materials and their contaminants, allergy may be caused by the sizing and even by the enzymes used to remove the sizing. Appropriate articles should be referred to regarding the hazards associated with dusts, and physical agents such as heat, humidity and noise.

When a vessel that has contained chlorine or any other dangerous gas or vapour has to be entered, all precautions appropriate to work in confined spaces should be taken.

Suitable personal protective equipment including eye-protective equipment should be provided to prevent contact with these numerous harmful substances. If in

certain circumstances barrier creams may have to be used, care should be taken to ensure that they are effective for the purpose and that they can be removed by washing. They can seldom be regarded as providing protection that is equal in reliability to properly designed gloves. Even when all protective measures have been taken, some workers may prove to be particularly sensitive to the effects of these substances and may have to be transferred to other work. Personal hygiene is particularly important for workers in these processes. Protective clothing should be cleaned at regular intervals. Clothing that is splashed or contaminated by dyestuffs should be replaced by clean clothing at the earliest opportunity; sanitary facilities for washing and bathing should be provided and the workers should be encouraged to use them to ensure their personal hygiene.

Accidents. Serious scalding accidents have occurred when hot liquor has been accidentally admitted to a kier in which a worker has been arranging the cloth to be treated. This can occur when a valve is accidentally operated or when the hot liquor is discharged into a common discharge duct from another kier on the range and has entered the occupied kier through an open outlet. When a worker is inside a kier for any purpose the inlet valves should be locked in the closed position, and the kier should be isolated on the discharge end from the other kiers on the range. If the locking device is by means of a key, the person, who would be injured by the accidental admission of hot liquid, should keep the key until he leaves the vessel.

Mechanical hazards such as crushing, nips, cuts and knocks exist mainly at the roller printing machines. Other hazards are connected with handling and in-plant traffic.

It is essential that, in these factories, the factory management make arrangements for the proper observation and recording of industrial illnesses and accidents in order to determine when and how they occur and who is affected. From the statistics thus obtained, the management is able to identify the conditions which are likely to cause illnesses and accidents. Proper placing of workers after pre-employment medical examination is helpful. In addition to this, preventive safety and health education of workers by supervisors is absolutely essential.

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Dyes and dyestuffs

The term "dye" or "dyestuff" refers to products which cause reflection or selective transmission of incident light in such a way that they impart colour to the materials to which they have been applied. A distinction is made between dyes and pigments. Dyes are soluble, and the colour tends to attach itself to textile fibres or other materials immersed in the solution. Pigments, on the other hand, are insoluble, and they impart colour to an object by being dispersed throughout it in finely subdivided particles.

In the past, the number of colouring matters available for industrial use was very limited indeed, consisting of only a few organic dyes derived from natural sources (e.g. the tyrian purple of the Roman Emperor's toga, made from molluscs; indigo, made from a plant) and mineral pigments. The majority of dyes and pigments in use today are of synthetic origin. Since the discovery of mauve in 1856, numerous other synthetic dyes have been developed. They have made it possible to colour a wide variety of materials and have been adapted to meet increasingly strict technical requirements both for traditional and new materials (textile fibres, inks, plastics, paints, cosmetics, etc.).

Although many synthetic chemicals are themselves coloured, it does not follow that they have the properties of dyes or pigments. The quality of imparting colour is related to specific chemical structures, of which the most important are triphenylmethane compounds, indigoid and azo structures, azines and thiazines, anthraquinone derivatives and phthalocyanines. These basic chemical structures are shown in figure 1. To meet specific technical requirements, various chemical substituent groups (amino, hydroxy, nitro, sulpho, chloro, carboxy, etc.) are introduced into the base molecules, making it possible to produce differences in shade, fastness, solubility, etc. The final chemical composition of a dye is therefore usually a complex one.

With certain special types of dye the coloured molecule is formed in the mass of the substrate (e.g. by *in situ* oxidation of *p*-phenylenediamine), or is fixed by chemical reaction with the fibre (reactive dyes) thus giving the colour excellent fastness to washing, cleaning, etc.

Manufacture. The synthetic dye industry itself carries out all the manufacturing processes, i.e. it takes the most basic feedstocks (e.g. benzene, naphthalene, anthracene, caustic soda, inorganic acids, etc.) and converts them to a wide range of intermediates of differing degrees of complexity (e.g. aromatic amines, quinones, etc.), which are then used (following one or more intermediate processes) for the manufacture of the dyes themselves. In fact, in a dye factory hazardous exposure arises largely during the synthesis and handling of intermediates and not from contact with the finished dyes themselves.

Inorganic pigments still constitute an important part of the dyestuffs industry. These are mostly salts or oxides of metals such as lead, cadmium, antimony and titanium.

Uses. The purpose for which a dye is used is not primarily related to its molecular structure but to its physical

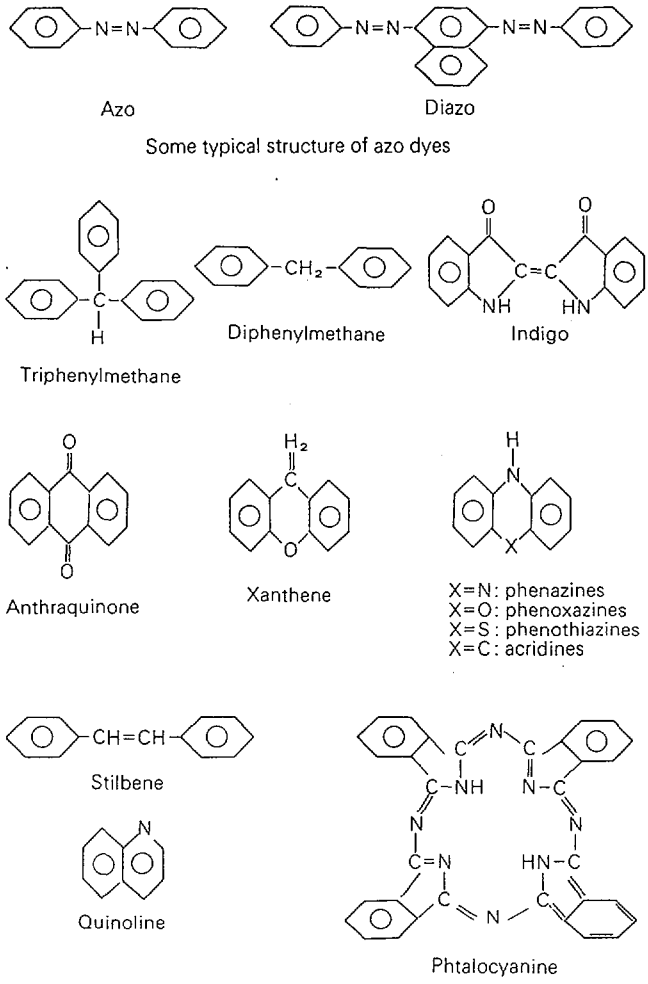

Figure 1. Basic structure of some typical dyestuff molecules.

properties. Thus, a particular chemical class of dyestuff (e.g. azo or triphenylmethane) may contain, within the group, colours falling into quite different usage categories, for example acid dyes (used for wool), disperse dyes (used for acetate, rayon and synthetic fibres), solvent

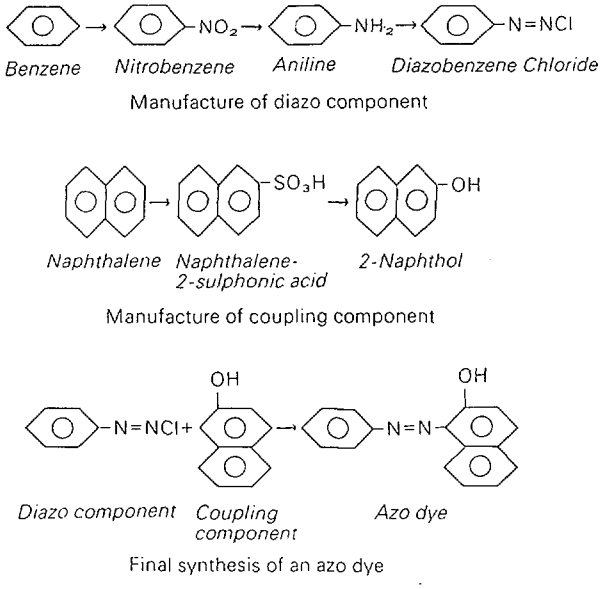

Figure 2. Diagrammatic presentation of the stages in the manufacture of CI solvent yellow 14.

dyes (used in spirit inks), pigments (used in paint, rubber, plastics, etc.), and food dyes. Conversely, in any particular usage category, several different types of structure may be represented. Disperse colours may be anthraquinone, azo, or nitroarylamine dyes, and food colours may be azo, triphenylmethane, or indigoid in structure.

The number of synthetic dyestuffs commercially available runs to several thousand. The need for a comprehensive work of reference is met by the *Colour Index* compiled jointly by the British Society of Dyers and Colourists and the American Association of Textile Chemists and Colourists. Dyes are listed therein by chemical constitution, by arrangement into recognised usage categories, and by an alphabetical list of commercial names, with a simple cross-reference system.

HAZARDS

A distinction should be made between synthetic dyes and inorganic pigments.

Synthetic dyes and pigments. In general, finished products (dyes and pigments) do not present serious toxic hazards to workmen in conditions of industrial exposure. However, the manufacturing processes entail the use of hazardous primary compounds (acids, alkalis, irritant and asphyxiant gases, hydrocarbon derivatives, etc.) or intermediary compounds (e.g. aromatic amines, etc.). (For the hazardous properties of these substances, see the relevant articles: in particular AMINES, AROMATIC; ANILINE; ACIDS AND ANHYDRIDES, INORGANIC; ALKALINE MATERIALS; AMMONIA; AZO AND DIAZO DYES; BLADDER CANCER; CHLORINE AND COMPOUNDS; etc.). There has been a considerable history of occupational diseases in the dye industry. However, modern technology combined with a better understanding of the hazards has led to a significant reduction in individual exposure to hazardous substances and, under normal working conditions, pathological effects are seldom encountered. However, potential hazards should not be forgotten.

Bladder cancer is still the most serious occupational hazard for the synthetic dye worker. There is no doubt that certain specific intermediates are the responsible agents. The production of two dyes—auramine and fuchsine or magenta—seems to have resulted in an increase in the incidence of bladder cancer among the workers involved; however, the epidemiological evidence does not make it clear whether the tumours are caused by intermediates or by the dyestuffs themselves. There is no evidence of cases arising in workmen using these dyes, as opposed to making them, despite the fact that auramine itself has been shown to produce liver tumours in rodents.

Intensified and improved experimental research has brought to light the carcinogenic potential of the various groups, in particular the azo dyes (*p*-dimethylaminobenzene, *o*-aminoazotoluene, citrus red 2, or CI solvent red 80, CI solvent orange 2, trypan blue, 3 R and MX poppy red and, more recently, dyes derived from benzidine) but also derivatives of triphenylmethane such as benzyl violet 4 B and fuchsine (magenta). Difficulties in the interpretation of mutagenicity tests further complicate this matter and there is currently no proof of mutagenicity in man.

Skin damage should be considered from various points of view:

(*a*) during manufacture, orthoergic dermatitis may result from contact with alkalis, acids or solvents; other substances may produce allergic dermatitis (amino derivatives, nitro and nitroso compounds, etc.);

(' ' during the use of dyes, specific dermatitis is rare except in the case of certain substances that cause the formation and fixing of a colour derivative on the substrate, such as for example, *p*-phenylenediamine and various derivatives and soluble salts (diazonium salts stabilised with aromatic amines).

Cases of respiratory intolerance (asthma) to certain of these substances have been reported.

Dyes have virtually no irritant action on the eyes, except for alkaline dyes which, when splashed into the eyes, may produce serious lesions that may lead to the loss of the involved eye.

Inorganic pigments. The most important inorganic pigments are salts and oxides of lead (particularly lead chromate), cadmium sulphide and selenium sulphides, iron oxides, antimony oxide, and titanium dioxide. The potential hazards of these compounds are all related to the biological properties of the parent metal. Thus iron and titanium oxides present very little hazard, but in appropriate conditions the inhalation of dust from lead pigments can readily cause lead poisoning.

Skin cleansing. A major problem among workmen handling dyes is the ease with which the superficial layers of the skin become dyed. The usual type of skin cleaners are virtually ineffective—or even aggressive. Workers often make use of sodium hypochlorite solution, which effectively bleaches the dyed skin. However, sodium hypochlorite is a powerful irritant which can destroy the skin with resultant hyperhidrosis and superimposed infections. When this substance is used for cleaning purposes, it should be in a dilute solution, rinsed off immediately with water and any residues neutralised with sodium bisulphite solution. Workers should be warned of the dermatitis hazard of thoughtless use of this type of cleaning. Certain industrial soap compounds provide relatively satisfactory cleansing. Above all, good process engineering and personal safety measures should limit this type of soiling to a minimum.

Miscellaneous hazards. Dyes used for colouring food now have to conform to increasingly stringent criteria regarding their safety for such a purpose. It is obvious that a dye, or any other chemical, which may be free from hazard in conditions of industrial exposure, is not necessarily safe when it is regularly consumed as part of the diet. Purity specifications also have to be laid down, as most commercial dyes contain significant amounts of metallic and organic impurities. Similar considerations apply to dyes used in cosmetics.

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CIS 80-1913 *Benzidine-, o-tolidine-, and o-dianisidine-based dyes* (US Department of Labor, Occupational Safety and Health Administration, 200 Constitution Avenue, NW, Washington, DC) (Apr. 1980), 38 p. 35 ref.

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CIS 78-1959 *Occupational allergic eczema in the textile industry* (Les eczémas allergiques professionnels dans l'industrie textile). Cywie, P. L.; Hervé-Bazin, B.; Fousse-reau, J.; Cavelier, C.; Coirier, A. Notes scientifiques et techniques de l'INRS, No. 11 (Institut national de recherche et de sécurité, 30 rue Olivier-Noyer, Paris) (Mar. 1977), 155 p. Illus. 68 ref. (In French)

CIS 78-475 "Pigmented cosmetic dermatitis and coal tar dyes". Sugai, T.; Takahashi, Y.; Takagi, T. *Contact Dermatitis* (Copenhagen), Oct. 1977, 3/5 (249-256). Illus. 5 ref.

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Ref. 27

EPA-625/3-74-004

WASTEWATER-TREATMENT SYSTEMS

Upgrading Textile Operations to Reduce Pollution

ENVIRONMENTAL PROTECTION AGENCY • Technology Transfer

October 1974

Chapter II

SOURCES AND STRENGTHS OF TEXTILE WASTEWATERS

Textile-mill operations consist of weaving, dyeing, printing, and finishing. Many processes involve several operations, each contributing a particular type of waste. Examples of waste-producing operations are sizing of the fibers, kiering (alkaline cooking), desizing the woven cloth, bleaching, rinsing, mercerizing, dyeing, and printing.

Textile wastes are generally colored, high in BOD and suspended solids, highly alkaline, and high in temperature. The wastes are characterized by extreme variability and may contain toxic compounds. The sources of pollution are the natural impurities extracted from the fiber together with the processing chemicals, which are either directly discharged batchwise (as with kier liquor, for example) or leached out during rinsing operations and discharged as waste.

The basic factors that bear on wastewater quantity and quality are as follows:

- Type of fiber
- Unit operations constituting the overall textile-finishing process
- Process chemicals
- Recycle and conservation procedures in force

While the last three factors play important roles in determining wastewater quality, it is both informative and useful to "hold them constant" for the moment and attempt to characterize textile wastes on the basis of process fiber—namely, cotton, wool, or synthetic. It must be emphasized that the design of treatment facilities must be custom tailored to the individual mill, based on the results of a carefully conducted wastewater survey. In discussing general characteristics, the objective is to introduce the plant engineer to the sources and problems of water pollution.

Waste constituents that present pollutional problems are those that deplete oxygen in the receiving stream (i.e., exert an oxygen demand), those that encourage excessive aquatic growth (by introducing nutrients), those that are toxic to aquatic life, and those that damage the esthetic nature of receiving streams. Biochemical and chemical oxygen demand, nitrogen and phosphorus, temperature, pH, chrome, phenol, sulfide, and color are all parameters that define wastewater quality.

COTTON

Cotton processing consists of two basic processes—weaving and finishing. Each comprises several operations, some of which use water while others do not. In the sequence of weaving operations, most of the water pollution originates with slashing. In slashing, the warp thread is sized with

Table II-1.—*Pollutional loads contributed by various cotton-mill processes*[1]

Department	Process	Pounds BOD per 1,000 pounds cloth	Percent of total
Desizing[2]		53	35
Scouring	Pressure kier, 1st scour	53	16
	Either pressure kier, 2d scour,	8	1
	or continuous scour	42	15
	Subtotal (scouring)	47	16
Dyeing		.5-32	1.5-30
Printing	Color shop wastes	12	7
	Wash after print, with soap	17-30	17-30
	Wash after print, with detergent	7	7
	Subtotal (printing)	19-32	15-35
Bleaching	Hypochlorite bleach	8	3
	Peroxide bleach	3	1
Mercerizing		6	1
Total		125-250	

[1] Part of the loadings shown are only indirectly contributed by these operations and, in fact, directly result from rinsing operations. For example, a rinse after dyeing will remove a portion of the dyestuff. The resulting BOD_5 is here attributed to dyeing.

[2] For acid desizing. Enzyme desizing or solvent desizing will produce different BOD_5 loadings.

Source: N. L. Nemerow, *Liquid Wastes of Industry, Theories, Practices, and Treatment*, Reading, Mass., Addison-Wesley, 1971.

starch or a substitute to give it the tensile strength and smoothness necessary for subsequent weaving. The sizing compounds used are natural starches, modified cellulose, and synthetics, which may exert either a short-term or long-term BOD. Conversion to synthetic sizing, such as carboxymethyl cellulose (CMC), has often made it appear that plants were reducing BOD. In fact, while CMC and other substitute sizes can have a very low BOD over a 5-day span (BOD_5, the common measure of BOD), they can exert a substantial BOD in the longer run, for example, over a 20-day period (BOD_{20}). In addition, a significant BOD_5 can result with an acclimated biological culture.

The weaving process produces fixed cloth or gray goods containing from 8 to 15 percent slashing compound. A pollutional loading occurs when the sizing is washed out during the finishing process that follows. In addition, desizing, kier boiling, bleaching, mercerizing, printing, dyeing, rinsing, resizing, and final finishing are all operations that may contribute waterborne waste. Table II-1 indicates typical pollution loads generated by these processes. A typical cotton-process flowsheet is shown in figure II-1, and table II-2 describes the overall characteristics of the mill wastewater.

The cotton-finishing mill using conventional process chemicals (no substitution for soap, starch, or acetic acid) discharges a composite waste that is decidedly alkaline, colored by the predominant dye, with a BOD_5 of approximately 300 mg/l and a volume of approximately 40,000 gallons per 1,000 pounds of finished cloth.

Recent data[1] indicate a trend toward lower water consumption, approximately 20,000 gallons per 1,000 pounds, with correspondingly higher concentrations. Substitution of synthetic sizing

Table II-2.—*Average character of composite waste, cotton finishing*

Constituent	Mill			
	1	2	3	4
Turbidity, ppm	–	125	Gray, colloidal	Gray, colloidal
Color	Variable, dark	Dyes	Dyes	Dyes
Total alkalinity, ppm	–	500	300-900	600
Hydroxide alkalinity, ppm	–	100	–	–
pH	10.5-11.9	9.0	8-11	10-11.5
Suspended solids, ppm	–	100	30-50	40
Settleable solids, percent	–	0.25	–	–
BOD_5, ppm	500-800	175	200-600	300
Total solids, ppm	–	–	1,000-1,600	1,300
Chromium, ppm	–	–	Up to 3.0	2.0
Volume, gal/1,000 lb	30,000-40,000	–	30,000-40,000	70,000

Sources: 1, Lockwood Greene Engineers, Inc.; 2, Bogren, "Treatment of Cotton Finishing Wastes at the Sayles Finishing Plant," *Sewage and Industrial Wastes*. 3, "An Industrial Waste Guide to the Cotton Textile Industry," USPH; 4, Joseph W. Masselli, Nicholas W. Masselli, and M. G. Burford, "A Simplification of Textile Waste Survey Treatment," N.E. Interstate Water Pollution Control Comm., 1959.

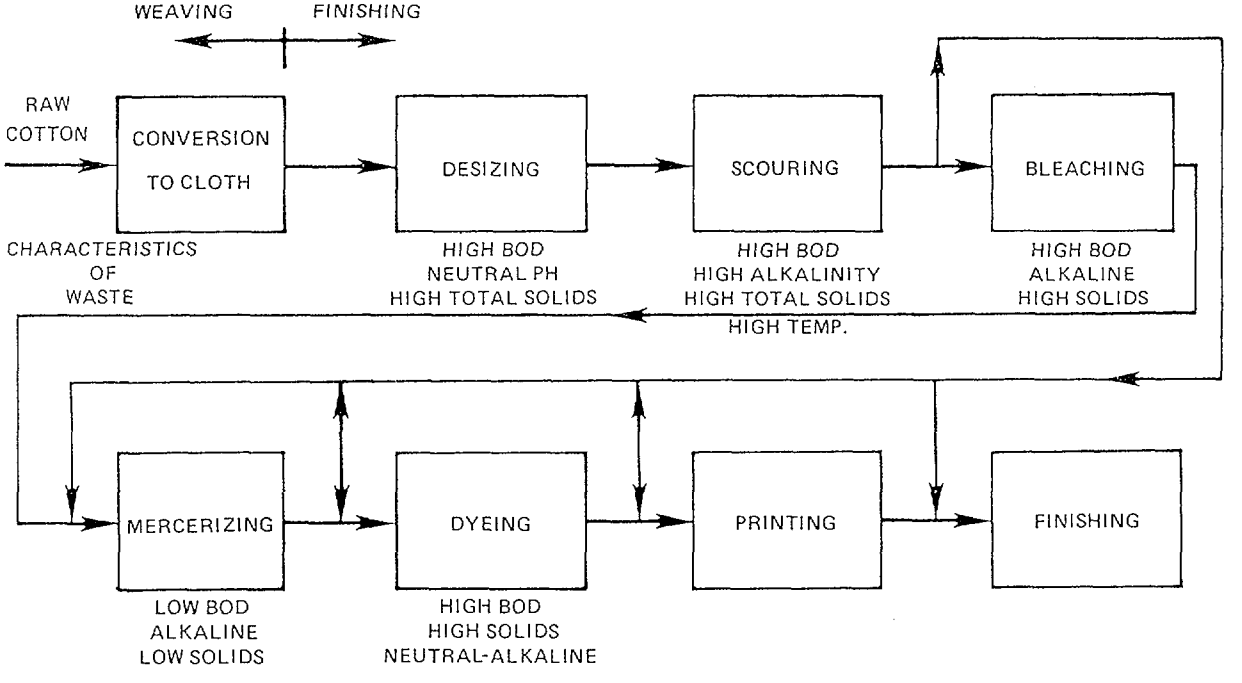

Figure II-1. Cotton-textile-finishing process flowsheet. (Rinsing operations not shown.)

for starch has appeared to reduce BOD_5 values as much as 50 percent. Researchers have shown, however, that activated-sludge populations can acclimate to the synthetic sizes, resulting in higher BOD_5.[2]

Within the cotton industry, as within the wool and synthetics industries, variation in processing, materials, styles, and finishes introduces substantial variability into wastewaters from mill to mill. For the average mill, however, starch waste will constitute about 16 percent of the total wastewater volume, 5.3 percent of the BOD, 36 percent of the total solids, and 6 percent of the alkalinity. Caustic waste constitutes some 19 percent of the volume, 37 percent of the BOD, 43 percent of total solids, and 60 percent of total alkalinity. Rinsing, bleaching, dyeing, and finishing generate the remaining portion of the composite.

Cotton-finishing wastes, although amenable to biological treatment methods, have peculiarities that may cause difficulties in biological processes. There may be toxic substances in the wastewater originating with the application of mildew depressants (fungicides), chromates (from dyes), and chloride or hydrogen peroxide (from bleaching). Occasionally, the waste will be deficient in nutrients (nitrogen and phosphorus). Because of the great variation in quantity and quality during the course of the day, owing to the batch operations involved in cotton finishing, equalization facilities may be required. Detergents may hinder settling of suspended solids and may also cause foaming problems in biological systems. Also, cationic detergents have been found to be bactericidal when present in concentrations as low as 1 ppm.

All cotton-finishing wastes contain fine fibers. Some are settleable and introduce problems in dewatering sludge. Suspended fibers can seal sand or carbon beds, clog equipment, and absorb certain chemicals leading to delayed pH changes. They also clog trickling filters, are unsightly in streams, and pose a long-term BOD.

High values of pH may necessitate neutralization before biological treatment. The low percentage of settleable solids usually makes primary sedimentation impractical. Fine screening is often necessary to protect mechanical equipment, such as pumps and mechanical aerators.

WOOL

Wool wastes originate from scouring, dyeing, rinsing, fulling, carbonizing, and washing operations. Practically all the natural and acquired impurities in wool are removed by scouring in a hot detergent-alkali solution producing a waste that is oily, alkaline, and high in solids and BOD. The actual wool-fiber content in "grease wool," as taken from the sheep's back, averages only 40 percent; the remaining 60 percent is composed of natural impurities such as sand, grease, suint (dried sheep perspiration), and burs. As a result, for every 1,000 pounds of scoured wool produced, 1,500 pounds of impurities are discharged, which corresponds to some 200 to 250 pounds of BOD_5 per 1,000 pounds of scoured wool.

Mills that both scour and finish wool produce a composite effluent with the following characteristics:

- pH, 9-10.5
- BOD_5, 900-3,000 ppm
- Total solids, 3,000 ppm
- Total alkalinity, 600 ppm
- Chromium, 4 ppm

- Suspended solids, 100 ppm
- Grease (for mill employing grease recovery), 100 ppm

Mills that only finish wool would be expected to produce a composite waste with much lower concentrations of BOD_5, suspended solids, and grease. The waste is likely to be brown in color, and the suspended solids are mainly colloidal. The major sources of BOD are the wool grease and suint removed in scouring and the soap used in fulling and washing. Approximately 7,500 and 13,800 gallons of water are required to scour and finish, respectively, each 1,000 pounds of wool.[1] Sedimentation, a common treatment to remove solids in domestic and some industrial wastes, is ineffectual in removing solids from wool wastes.

Many woolen mills in the United States are dyeing and finishing mills that purchase scoured wool. In these mills, 24 percent of the BOD_5 originates with dye operations, 75 percent with the wash that follows fulling, and 1 percent with neutralization that follows carbonizing.

Figure II-2 presents a wool process flowsheet, and table II-3 indicates pollutional loads of the untreated wastewaters.

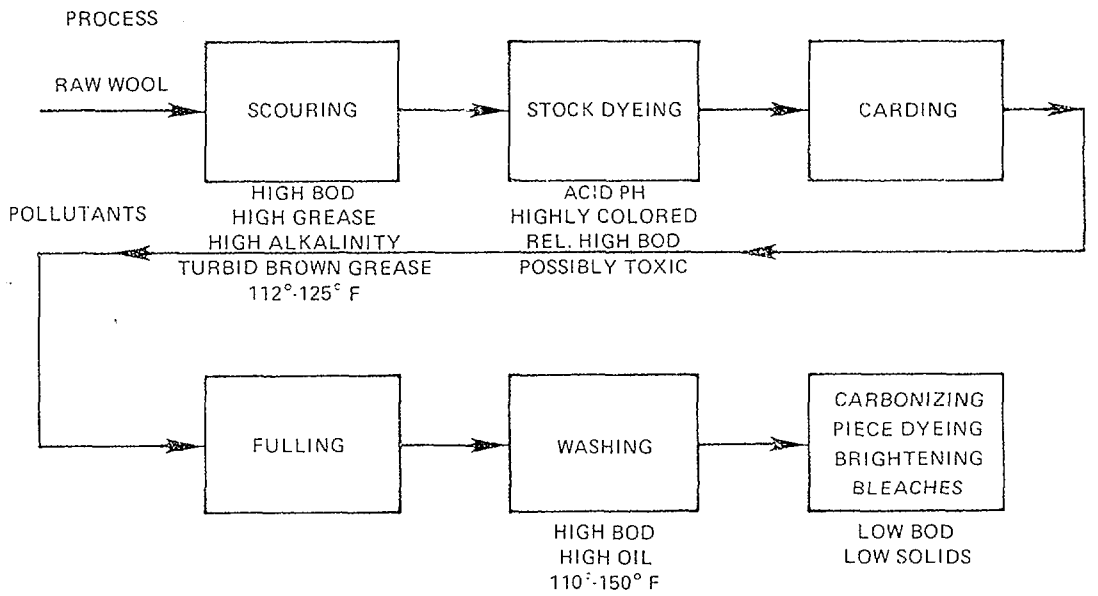

Figure II-2. Wool-process flowsheet. (Rinsing operations not shown.)

Table II-3.—*Pollution loads of wool, wet process*

Process	pH	BOD		Total solids, ppm	Volume, gal/1,000 lb
		ppm	lb/1,000 lb		
Scouring	9.0-10.4	30,000-40,000	104-221	1,129-64,448	5,500-12,000
Dyeing	4.8-8.0	380-2,200	9.0-34	3,855-8,365	1,900-2,670
Washing	7.3-10.3	4,000-11,455	31-94	4,830-19,267	40,000-100,000
Neutralization	1.9-9.0	28	1.7-2.1	1,246-4,830	12,500-15,700
Bleaching	6.0	390	1.4	908	300-2,680

Note.—Loads contributed from rinses are assigned to operation preceding rinse in each case.

Wool grease is a source of lanolin, which may be recovered and sold. Suint is a source of potassium salts. The combination of in-plant measures and wastewater treatment are generally designed to treat the following waste characteristics: variability, total flow, oil and grease, pH, color, temperature, BOD, chromium, and suspended solids. The presence of phenols, sulfides, and long-term BOD must be considered in surveys and studies. Nutrients, toxic compounds, and foam-causing detergents are all factors that must be dealt with before designing treatment facilities.

SYNTHETICS

Synthetic fibers are polymers derived from pure chemical compounds and have essentially no natural impurities. For this reason, no desizing is needed, and relatively light scouring and bleaching are all that is necessary to prepare the cloth for dyeing. The fibers and cloth are readily processed on the conventional machinery used for cotton and wool.

At present, the major synthetic fibers are rayon, acetate, nylon, Orlon, and Dacron. Scouring, dyeing, and finishing chemicals are the sources of waste in the synthetic textile industry. These fibers can all be considered as either cellulosic or noncellulosic. When such a distinction is made, it is possible to present process flowsheets representative of each of the two categories. Figures II-3 and II-4 illustrate the two processes. The noncellulosic fibers assume the greater portion of the textile market at present.

Tables II-4 and II-5 describe pollutional loads of synthetic fiber processes, and table II-6 presents qualitatively an analysis of waste associated with each of the major synthetic fibers.

Unlike wool and cotton, synthetic fibers of the same type can have different physical and chemical properties. The producers of synthetic textiles are frequently and continually changing their products, varying fiber blends, and investigating new finishes to keep abreast of changing market conditions. As a result, the wastewaters generated by the synthetic fiber industry are highly variable, and a general characterization of these wastes is useful only as an approximate indication of their composition.

GENERAL

Special finishing techniques can contribute from 5 to 15 percent of the total BOD_5 in any of the three fiber groups. Techniques vary greatly from mill to mill. There is little information on the toxicity of special finishing chemicals. Their purposes range from mildew proofing to imparting wash-and-wear properties.

Throughout the textile industry, the wastewaters are highly variable in quantity and composition. The sources of these wastes are, first, the natural impurities present in the fibers and, second, the process chemicals. Cotton and wool wastes are highly concentrated and primarily originate with natural impurities in the fibers.

Process chemicals constitute most of the wasteload from synthetic-textile processing. Industrywide, a great variety of process chemicals are used. Carriers used in synthetic dyeing present special problems. Chromium and derivatives of phenol and sulfur are often present. Color has become increasingly difficult to remove from wastewaters, since the market has demanded dyes that are increasingly more resistant to degradation. The substitution of synthetic sizing compounds often has resulted in merely shifting BOD from the short-term, 5-day BOD to a longer term oxygen demand. While in-plant pollution control measures can be quite effective

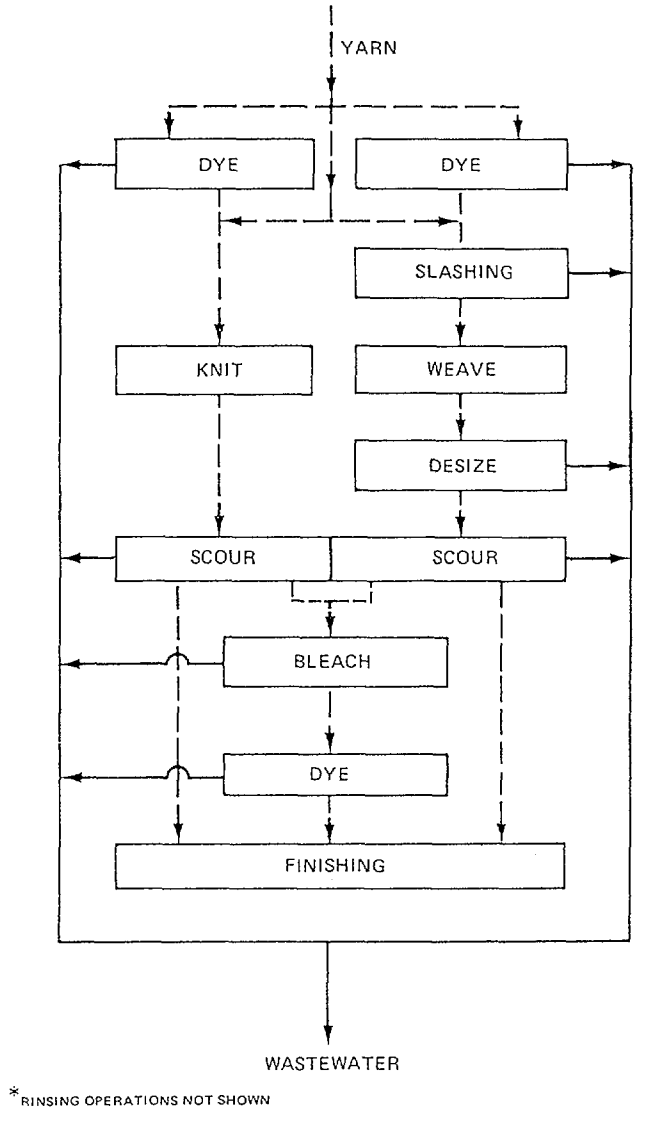

Figure II-3. Noncellulosic synthetic-textile-finishing process flowsheet. (Rinsing operations not shown.)

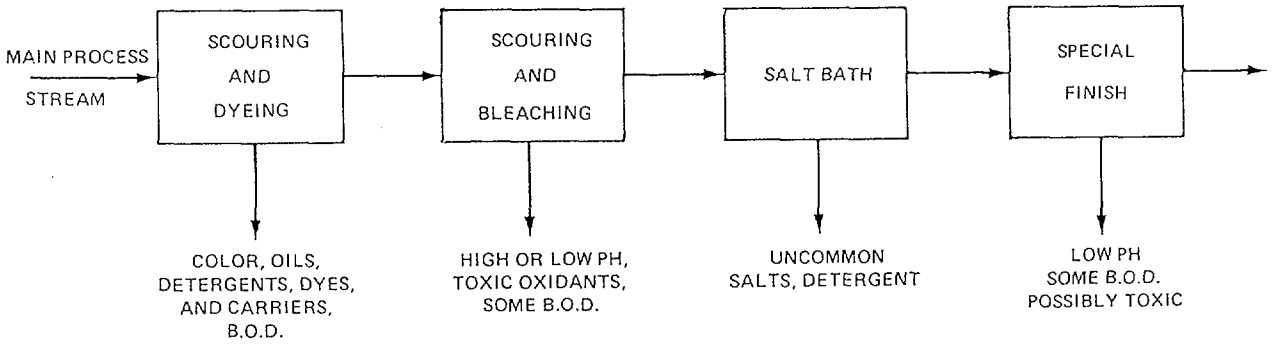

Figure II-4. Cellulosic synthetic-textile-finishing process flowsheet. (Rinsing operations not shown.)

Table II-4.—*Pollutional load of synthetic wet fiber processes*

Process[1]	Fiber	pH	BOD_5		Total solids		Suspended solids, lb/1,000 lb	Volume, gal/1,000 lb
			ppm	lb/1,000 lb	ppm	lb/1,000 lb		
Scour	Nylon	10.4	1,360	30-40	1,882	30-50	20-40	6,000-8,000
	Acrylic/ modacrylic	9.7	2,190	45-90	1,874	12-20	25-50	6,000-8,000
	Polyester	—	500-800	15-25	—	25-35	5-15	3,000-5,000
Scour and dye	Rayon	8.5	25-32	50-70	3,334	25-39	0-4	2,000-4,000
	Acetate	9.3	2,000	40-60	1,778	—	1-20	4,000-6,000
Dye	Nylon	8.4	368	5-20	641	20-34	2-42	2,000-4,000
	Acrylic/ modacrylic	1.5-3.7	175-2,000	2-40	833-1,968	6-9	5-20	2,000-4,000
	Polyester	—	480-27,000	15-800	—	30-200	—	2,000-4,000
Salt bath	Rayon	6.8	58	0-3	4,890	20-200	2-6	500-1,500
Final scour	Acrylic/ modacrylic	7.1	668	10-25	1,191	4-12	3-7	8,000-10,000
	Polyester	—	650	15-25	—	10-50	3-50	2,000-4,000
Special finishing	Rayon	—	—	20	—	3-100	3-50	500-1,500
	Acetate	—	—	40	—	3-100	3-50	3,000-5,000
	Nylon	—	—	10	—	3-100	3-50	4,000-6,000
	Acrylic/ modacrylic	—	—	60	—	3-100	3-50	5,000-7,000
	Polyester	—	—	2-80	—	3-100	3-50	1,500-3,000

[1] Waste load due to rinsing attributed to operation preceding rinse.
Source: F. H. Lund, *Industrial Pollution Control Handbook*, New York, McGraw-Hill, 1971.

Table II-5.—*Pollution loads*[a] *from textile processes with various fibers*

Fiber	Natural impurities	Sizes, oils, antistats	Scouring[1]	Dyes,[1] emulsifiers, carriers, etc.	Special finishes	Total
Cotton	3-5	0.5-10	0.5-6	0.2-8	0.2-8	4.4-37
Greasy wool[2]	20-30	0.2-9	[3] 1.5-15	0.5-10	0.2-8	[2] 21.9-72
Scoured wool	1-2	0.2-9	[3] 1.0-15	0.5-10	0.2-8	2.9-44
Rayon	0	0.5-6	.5-5	0.2-5	0.2-8	1.4-24
Acetate	0	0.5-6	.5-5	0.2-5	0.2-8	1.4-24
Orlon	0	0.5-6	.5-5	0.5-10	0.2-8	1.7-29
Nylon	0	0.5-6	.5-5	0.2-5	0.2-8	1.4-24
Dacron	0	0.5-6	.5-5	0.3-60	0.2-8	4.2-78

[a] Percent of fabric weight.
[1] Partial contribution from subsequent rinse operation.
[2] Reduced by 98 percent with solvent extraction.
[3] High values include soap (fulling).
Source: N. L. Nemerow, *Liquid Wastes of Industry, Theories, Practices, and Treatment*, Reading, Mass., Addison-Wesley, 1971.

Table II-6.—*Significant pollutants in synthetic fiber, wet processing*

Fiber	Process	Liquid waste pollutant
Rayon	Scour and dye	Oil, dye, synthetic detergent, and antistatic lubricants
	Scour and bleach	Synthetic detergent and hydrogen peroxide
	Salt bath	Synthetic detergent, chloride, or sulfate
Acetate	Scour and dye	Antistatic lubricants, dye, sulfonated oils, synthetic detergent, esters, and softeners
	Scour and bleach	Synthetic detergent, hydrogen peroxide, or chlorine
Nylon	Scour	Antistatic lubricants, soap, tetra-sodium pyrophosphate, soda, and fatty esters
	Developed dispersed dye	Dye, $NaNO_2$, hydrochloric acid, developer, and sulfonated oils
	Bleach	Peracetic acid
Acrylic/modacrylic	Dye	Dye, formic acid, wetting agents, aromatic amines, retarding agent, and sulfates
	Thermosol dyeing	Acid
	Bleach	Chlorite
	Scour	Synthetic detergent and pine oil
Acrylic/modacrylic	Dyeing with	Chlorobenzenes, hot water, and dye; or phenylmethyl carbinol, dye, and hot water; or orthophenylphenol and dye
	Scour	Antistatic lubricants, chlorite or hypochlorite, and nonionic synthetic detergent
	High temperature and pressure dyeing	Dye and hot water
	Bleach	Chlorite, $NaNO_2$, acetic acid, oxalic acid, nitric acid, bisulfite, proprietary bleaches

Note.—A source of potential toxicity and odor is dye carriers used with some of the synthetics (particularly polyesters). Examples are orthophenylphenol, phenylmethyl carbinol, and monochlorobenzene. Sodium dichromate, used in dyeing, will contribute toxic chrome to the wastes, but substitutes are available. Much of the pollutants contributed by these operations actually enter the waste stream through rinses that follow the operations.

Source: H. F. Lund, *Industrial Pollution Control Handbook*, New York, McGraw-Hill, 1971.

in their immediate objectives, the environmental effect in terms of long-term oxygen demand and toxicity must be considered.

For individual mills, there is no substitute for a wastewater survey. General characteristics are helpful in defining the nature of problems formed by an industrial process; however, the solution of the problems encountered in any one mill is achieved only after careful analysis of the mill wastewaters, together with determination of effluent limitations and laboratory and pilot-plant studies of treatability. This survey must be combined with carefully considered in-plant measures of waste reduction. Determining the most economical method of pollution control is only possible if complete and accurate wastewater analysis has been undertaken. Pollution-control measures, once installed, must be continually evaluated via ongoing wastewater monitoring programs. Existing wastewater-treatment facilities and effluent quality standards must be considered before making substantial process changes or chemical substitutions. The wastewater-treatment process should, in actuality, be considered a part of the overall manufacturing process, which begins with the raw product arriving at the plant and the finished product and resulting wastewater leaving the plant.

Appendix D

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D980559157

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Cone Mills Corp./Print Works Plant	1800 Fairview Street

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Greensboro	NC	27405	Guilford	41	6

09 COORDINATES LATITUDE	LONGITUDE	10 TYPE OF OWNERSHIP (Check one)
36 06 05	079 46 18	☒ A. PRIVATE ☐ B. FEDERAL ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION	02 SITE STATUS	03 YEARS OF OPERATION
5 / 16 / 90 (MONTH DAY YEAR)	☐ ACTIVE ☒ INACTIVE	1930 (BEGINNING YEAR) 1977 (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.
John P. McConney	Environmental Chemist	Superfund Sec.	(919 733-2801
09 OTHER INSPECTORS	10 TITLE	11 ORGANIZATION	12 TELEPHONE NO.
Jack Butler	Environmental Engineer	Superfund Sec.	(919 733-2801
			( )
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO
Arthur Toompas	Manager	1201 Maple Street	(919) 379-6226
John Summer	Plant Engineer	1201 Maple Street	(919) 379-6226
			( )
			( )
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
☒ PERMISSION ☐ WARRANT	0900	Sunny, cool

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO.
Arthur Toompas	Cone Mills Corporation	(919) 379-6226

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE
John P. McConney	DSWM	Superfund Sec.	919/733-2801	8 / 3 / 90 (MONTH DAY YEAR)

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EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D980559157

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
- 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
- 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			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

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

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION

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)

See attached listing.

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D980559157

II. HAZARDOUS CONDITIONS AND INCIDENTS

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

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

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

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

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

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

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

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

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

EPA

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

I. IDENTIFICATION	
01 STATE NC	02 SITE NUMBER D980559157

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

Contamination found in the sediments of an adjacent creek could not be attributed to the site.

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

See attached listing.

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. PERMIT INFORMATION

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

III. SITE DESCRIPTION

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

04 TREATMENT (Check all that apply)

- ☐ A. INCENERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL/PHYSICAL
- ☐ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☐ F. SOLVENT RECOVERY
- ☐ G. OTHER RECYCLING/RECOVERY
- ☐ H. OTHER _____ (Specify)

05 OTHER

- ☒ A. BUILDINGS ON SITE

06 AREA OF SITE

_____ (Acres)

07 COMMENTS

During the site investigation, no evidence of the on site storage treatment, or disposal of hazardous waste was found.

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.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ☐ YES ☒ NO

02 COMMENTS

The site is fenced, with a security guard present.

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

See attached listing.

EPA

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

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D980559157

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. 3.1 (mi)
B. 1.8 (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 1877

03 DISTANCE TO NEAREST DRINKING WATER WELL 1.8 (mi)

04 DEPTH TO GROUNDWATER	05 DIRECTION OF GROUNDWATER FLOW	06 DEPTH TO AQUIFER OF CONCERN	07 POTENTIAL YIELD OF AQUIFER	08 SOLE SOURCE AQUIFER
20 (ft)	unknown	20 (ft)	75 (gpd)	☐ YES ☐ NO

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

Wells in the area range in depth from 100 feet to 400+ feet and have an average yield of 75 gpm.

10 RECHARGE AREA
☐ YES
☐ NO
COMMENTS

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 Buffalo Creek	☐	0.04 (mi)
Buffalo Creek	☐	(mi)
	☐	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. 7,684 (est.) NO. OF PERSONS	B. 30,734 (est.) NO. OF PERSONS	C. 69,397 (est.) NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION 0.2 (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE.
unknown

04 DISTANCE TO NEAREST OFF-SITE BUILDING 0.1 (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)

CMC/PWP is located in the city of Greensboro, in an industrialized area near the northeastern part of town. There are several other textile manufacturing facilities owned by Cone Mills Corp. located near the facility, with several of these located upstream of the site. Residential areas are also located adjacent to and near the site. The majority of the city of Greensboro is located within a four mile radius of the site. Greensboro currently has a population of 196,000 individuals and a population density of 2447 individuals per square mile.

EPA
D980559157

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

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D980559157

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
unknown (ft)	unknown (ft)	unknown

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
3 (in)	3 (in)	%	NW	5.0 %

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)

32 (mi)

ENDANGERED SPECIES: Cape Fear Shiner

13 LAND USE IN VICINITY

DISTANCE TO:

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

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

CMC/PWP is located in the upland section of the Piedmont physiographic province. The Piedmont physiographic province is a submaturely to maturely dissected peneplane, a relatively flat land surface representing an advanced stage of erosion. The land surface near the streams is gently rolling and the interstream areas are relatively flat. CMC/PWP drains to North Buffalo Creek. The overland flow to this creek is 200 feet, with a drop of 10 feet. This yields a slope of 5.0%.

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

See attached listing.

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D980559157

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER			
SURFACE WATER			
WASTE			
AIR			
RUNOFF			
SPILL			
SOIL			
VEGETATION			
OTHER Sediment	3	NC Laboratory of Public Health	

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☒ GROUND ☐ AERIAL

02 IN CUSTODY OF included in report
(Name of organization or individual)

03 MAPS ☒ YES ☐ NO

04 LOCATION OF MAPS included in report

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

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

See attached listing.

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D980559157

II. CURRENT OWNER(S)

01 NAME	02 D+B NUMBER
Cone Mills Corporation	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
1201 Maple Street	

05 CITY	06 STATE	07 ZIP CODE
Greensboro,	NC	27405

01 NAME	02 D+B NUMBER

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

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

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

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

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

05 CITY	06 STATE	07 ZIP CODE

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

08 NAME	09 D+B NUMBER

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

12 CITY	13 STATE	14 ZIP CODE

08 NAME	09 D+B NUMBER

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

12 CITY	13 STATE	14 ZIP CODE

08 NAME	09 D+B NUMBER

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

12 CITY	13 STATE	14 ZIP CODE

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

01 NAME	02 D+B NUMBER

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

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

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

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

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

05 CITY	06 STATE	07 ZIP CODE

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

01 NAME	02 D+B NUMBER

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

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

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

05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER

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

05 CITY	06 STATE	07 ZIP CODE

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

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EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D980559157

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

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

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

See attached listing

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NC	D980559157

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	D980559157

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

III. 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	D980559157

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)

See attached listing.

Appendix E

SITE HEALTH AND SAFETY PLAN

A. General Information

Site Name Cone Mills Corp/Print Works Plant ID # NCD 980 559 157

Location 1800 Fairview Street, Greensboro, Guilford County, NC Date May 8, 1990

Proposed Date of Investigation May 16, 1990

Date of Briefing May 15, 1990

Date of Debriefing May 17, 1990

Site Investigation Team: All site personnel have read the Site Health and Safety Plan and are familiar with its provisions.

	Personnel	Responsibilities	Signature
Team 1	John McConney	team leader, sampling	John McConney
Team 1	Jack Butler	sampling	Jack Butler

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 X 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	TLV
Benzidine	Odor Threshold (OT) = no data	CA
Dichlorobenzene	OT = 2-50 ppm ceiling=	50 ppm
Chromium	OT = no data	0.05mg/m^3
Acetic acid	OT = 0.2-24 ppm	10 ppm
Formic acid	OT = 0.024-21 ppm	5 ppm
Caustic soda	OT = "odorless"	2 mg/m^3

HAZARD	WARNING PROPERTIES AND EFFECTS	TLV
Hydrogen peroxide	OT = "odorless"	1 ppm
Acetone	OT = 100 ppm	750 ppm
Bleaching agents (sodium hypochlorite, sodium chlorite, sodium bisulfate		
	sodium bisulfate =	no data
Sulfuric acid	OT = 0.6 - 2.4 mg/m^3	1 mg/m^3
Formaldehyde	OT = 1 ppm	1 ppm
Stoddard solvent (varsol)	OT = 1 - 30 ppm	100 ppm
Ethyl alcohol	OT = 5 - 100 ppm	1,000ppm
Peracetic acid	OT = pungent odor	no data
Naphtol dyestuffs	moderately toxic by ingestion and skin absorb.	
Potassium dichromate	OT = no data	no data

ID # NCD 980 559 157

Facility Description: Size unknown Buildings unknown

Disposal Methods Being Investigated Possible burial of wastes on-site.

Unusual Features on Site (dike integrity, power lines, terrain, etc.):

None known

History of the Site: The plant was used to manufacture and finish cotton and cotton/synthetic blend fabrics. Operations began at least as far back as 1936 and continued until the plant closed in 1977. Cone Mills owns the site and it is reportedly used for storage.

C. HAZARD EVALUATION

The site can be toured and sampled in level D protection. PE or PVC gloves will be worn while collecting water and soil samples, nitrile gloves under PE or PVC gloves will be worn if discolored soil or sludge is encountered. The OVA will be used to monitor breathing zone air while auguring. If OVA readings exceed 5 ppm in the breathing zone, fill in that hole and evacuate that area. Tyvek suits (saranex in wet conditions) are recommended to keep clothing clean. Steel toed hiking boots may be worn while conducting tour on gravel, asphalt, or vegetated soil, steel toed work boots will be worn while sampling or conducting tour on barren soil.

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: ____C ___X___D

Modifications Wear goggles and PVC gloves while preparing and collecting acid preserved samples. Avoid breathing acid vapors. Rinse pipetts with deionized water before disposing of in trash bag.

ID # NCD 980 559 157

Surveillance Equipment:

_____	HNU	_____	Detector Tubes and Pumps
X	OVA	_____	02 Meter
_____	Explosimeter	_____	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, on-site if possible.

Work Schedule/Visit Objectives The purpose of this visit is to determine if the site poses a threat to the public health or environment because of releases of contaminants to soil, surface water, groundwater, or air. Sampling may consist of surfacewater and sediment, surface, and subsurface soil sampling.

EMERGENCY PRECAUTIONS

Route of Exposure	First Aid
Eyes	irrigate immediately
Skin	soap and water wash
Inhalation	fresh air and artificial respiration
Ingestion	get medical attention immediately

ID # NCD 980 559 157

Location of Nearest Phone: nearby residences/businesses

Hospital (Address and Phone Number)

Moses H. Cone Memorial Hospital, 1200 N. Elm St. Greensboro, NC 27401-1020

(919) 379-3900 - can handle chemically contaminated patients

Emergency Transportation Systems (Phone Numbers)

Fire 911

Ambulance 911

Rescue Squad 911

Emergency Route to Hospital Take a left onto Fairview Street and follow it to Route 29 and take a right. Take 29 to N 220 and take a right to travel west. Follow N 220 to Elm St. and turn right, the hospital will be on the right.

PREVAILING WEATHER CONDITIONS AND FORECAST Partly cloudy with a chance of rain, highs in the 80s.

EQUIPMENT CHECKLIST

	Air purifying respirator	X	First Aid Kit
	Cartridges for respirator	X	3 gal. Distilled H20
	Dust Mask	X	Rainsuit
	O_2 Indicator	X	Gloves (PE/PVC/nitrile/cloth)
X	Eye Wash Unit	X	Boots/Boot Covers
	H NU	X	Coveralls (tyvek/saranex)
X	OVA	X	Eye Protection
	Explosimeter	X	Hard Hat
	Radioactive Monitor	X	Decontamination Materials.
	Detector Tubes and Pump		

Poison Control Center - State Coordinator
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

safeform.039

PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

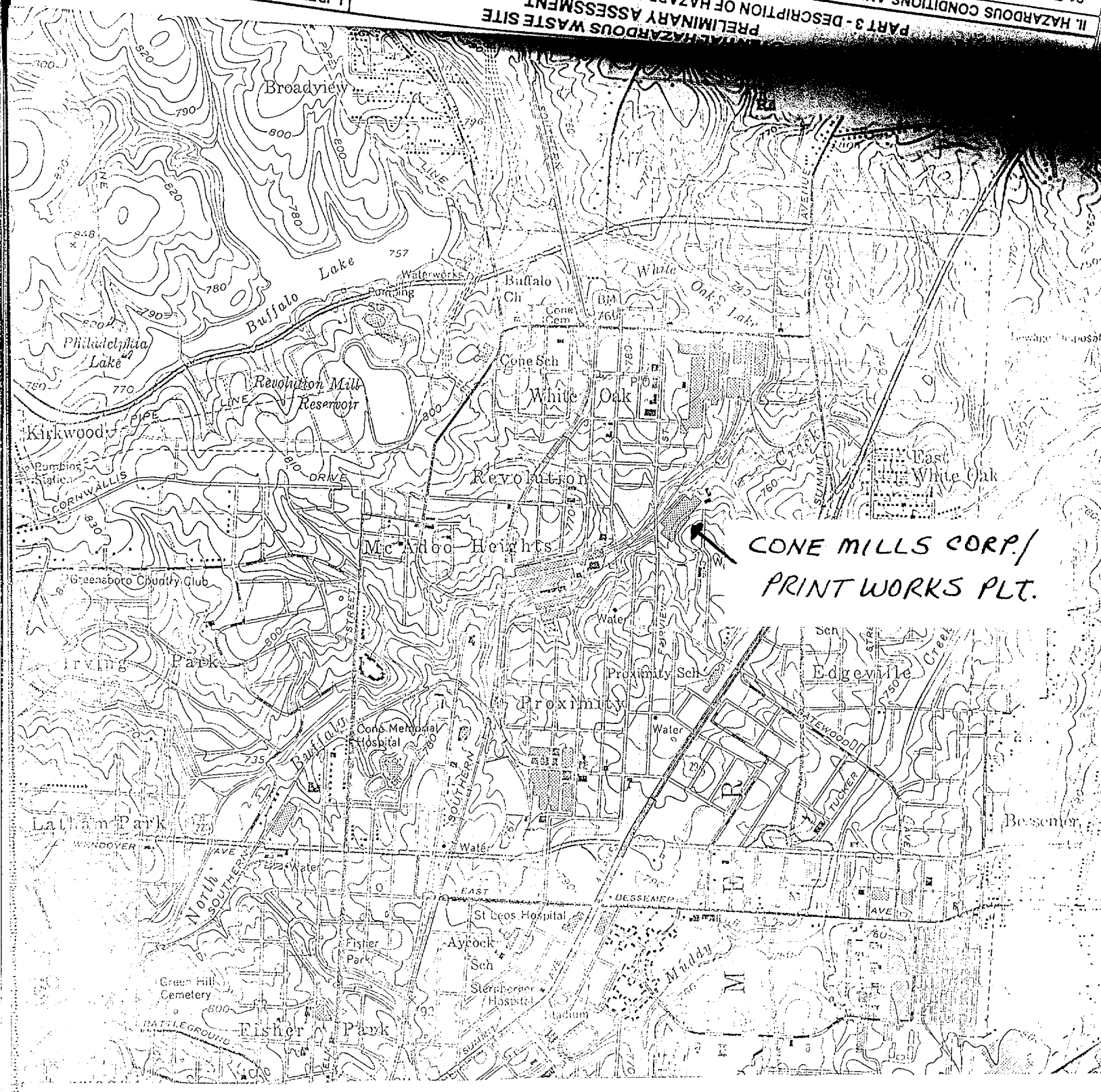
I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS (continued)

01 ☐ J. DAMAGE TO FLORA

04 NARRATIVE DESCRIPTION

02 ☐ OBSERVED



SCALE 1:24 000

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

MN GN
3½° 62 MILS
0°42' 12 MILS

UTM GRID AND 1968 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

TO BE COMPLETED BY PROJECT MANAGER

PROJECT MANAGER: John McConney PROJECT: Cone Mills/PWP
INVESTIGATION DATE: May 16, 1990

Materials Used (Please insert a number in the blank)

_____ Air Purifying respirator cartridges
_____ Detector tubes
_____ Eye Wash Units
_____ First Aid Kit
_____ Gloves (polyethylene)
_____ Gloves(PVC)
_____ Gloves (nitrile)
_____ Gloves (cloth)
_____ Boot covers
_____ Coveralls (tyvek)
_____ Coveralls (saranex)
_____ Auger Brushes

Respirator Worn By

Approximate Time in Respirator

Air Monitoring Data (Include Calibration Reading)

HNU:

OVA:

Explosimter:

Radiation Meter:

If the maximum personal protective equipment as outlined in the Hazard Evaluation Section was not used, please justify:

Visitors Present

Orginazation Represented

Signiture

DL/ds/Revised 11-88

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Benzidine

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula $C_{12}H_{12}N_2$	1
Natural Physical State at 25°C solid	2
Vapor Pressure ? mm Hg at 20°C	2
Melting Point 243 °F/°C Boiling Point 755 °F/°C	2
Flash Point (open or closed cup) combustible solid	2
Solubility - H_2O 400 mg/l at 12° C	2
Other alcohol, ether	1

Physical Features: (odor, color, etc.) colorless or slightly reddish crystalline compound that darkens on exposure to light and air (2).

II. TOXICOLOGICAL DATA

	confirmed human		OSHA Regulated			
Standards:	carcinogen (3)	TLV	carcinogen	PEL	carcinogen	IDLH 2

Routes of Exposure: Eye contact, skin contact, inhalation, ingestion

Acute/Chronic Symptoms: blood in the urine, anemia from bleeding, acute inflammation of the bladder, acute liver disorders, skin problems, painful and irregular urination (2).

First Aid: Eyes: irrigate immediately; Skin: water flush immediately; Inhalation: fresh air and artificial respiration; Ingestion: medical attention immediately.

Chemical Name: Benzidine

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products _____

B. Flammability — combustible solid — LEL _____ UEL _____ — 2

C. Reactivity Hazard — not available — 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 Merck Index, 10th Edition.

2) NIOSH Pocket Guide to Chemical Hazards, 1987.

3) Threshold Limit Values and Biological Exposure Indices for 1988-1989.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Dichlorobenzene (0)

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula $C_6H_4Cl_2$	1
Natural Physical State at 25°C liquid	1
Vapor Pressure 1.2 mm Hg at 20°C	1
Melting Point 0.5 °F/°C Boiling Point 356 °F/°C	1
Flash Point (open or closed cup) 151 °C/°F	1
Solubility - H_2O 0.015%	1
Other miscible with most organic solvents	2

Physical Features: (odor, color, etc.) colorless to pale yellow liquid with a pleasant, aromatic odor (1) 1P = 9.06 eV

II. TOXICOLOGICAL DATA

	ceiling =	ceiling =		
Standards:	50 ppm (3) TLV	50 ppm (4) PEL	1,700 ppm IDLH	1

Routes of Exposure: Inhalation, skin absorption, ingestion, eye contact

Acute/Chronic Symptoms: Irritation of the eyes and nose, liver and kidney damage, skin blistering.

First Aid: Eyes: irrigate immediately, Skin: water flush immediately; Inhalation: fresh air and artificial respiration; Ingestion: medical attention immediately.

Chemical Name: Dichlorobenzene (O)

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products _____

B. Flammability LEL 2.2% UEL 9.2% — 1

C. Reactivity Hazard strong oxidizers, hot aluminum or aluminum alloys. — 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) NIOSH Pocket Guide to Chemical Hazards, 1987

2) The Condensed Chemical Dictionary, 11th Edition, 1987

3) Threshold Limit Values and Biological Exposure Indices for 1988-1989, ACGIH

4) 20 CFR 1910.1000, 1989

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Chromium (VI), insoluble salts

I. PHYSICAL/CHEMICAL PROPERTIES

		Reference
Chemical Formula	varies with compound	1
Natural Physical State at 25°C	solid	1
Vapor Pressure	N/A mm Hg at 20°C	
Melting Point	°F/°C Boiling Point °F/°C	
Flash Point (open or closed cup)	N/A °C/°F	
Solubility - H_2O	not soluble in water	1
Other		

Physical Features: (odor, color, etc.) Properties vary depending upon specific compound. Compounds include: zinc chromate, lead chromate, calcium chromate, etc.

II. TOXICOLOGICAL DATA

Standards: 0.05 mg/m (2) TLV 1 mg/m (4) PEL 500 mg/m IDLH 3

Routes of Exposure: Inhalation and ingestion

Acute/Chronic Symptoms: Chronic: fibrosis of the lung and epidemiological studies have shown increased incidence of lung cancer among workers in the manufacture of chrome pigments

Chemical Name: Chromium (VI), insoluble salts

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes ___ No X ___ _____

Toxic by-products _____ _____

_____ _____

B. Flammability LEL N/A UEL _____ _____

C. Reactivity Hazard strong oxidizers 3

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 Merck Index, 10th Edition, 1983.
2. Threshold Limit Values and Biological Exposure Indices for 1988-1989, ACGIH
3. Pocket Giude to Chemical Hazards, NIOSH, 1987
4. 29 CFR 1910.1000, 1989

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Acetic Acid

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula CH_3COOH	1
Natural Physical State at 25°C liquid or solid	2
Vapor Pressure 11 mm Hg at 20°C	2
Melting Point 62 °F/°C Boiling Point 244 °F/°C	2
Flash Point (open or closed cup) 104 °C/°F	2
Solubility - H_2O Miscible	2
Other	

Physical Features: (odor, color, etc.) Colorless liquid or solid with a strong vinegar-like odor, IP = 10.37 eV(2)

II. TOXICOLOGICAL DATA

Standards: 10 ppm(3) TLV 10 ppm(4) PEL 1000 ppm(2) IDLH

Routes of Exposure: Inhalation, Ingestion, Skin/Eye contact

Acute/Chronic Symptoms: Conjunctives, tearing, irritation of nose and throat, swelling of throat, chronic bronchitis, burns eyes and skin, skin sensitizer, dental erosion, black skin (2)

First Aid: Eye: irrigate immediately, Skin: water flush immediately; Inhalation: artificial respiration; Ingestion: get medical attention immediately.

Chemical Name: Acetic acid

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products _____ — _____

_____ — _____

B. Flammability LEL 5.4% UEL 16% — 2

C. Reactivity Hazard Incompatible with strong oxidizers, chromic acid, sodium peroxide, nitric acid — 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 Merck Index, 10th Edition, 1983

(2) Pocket Guide to Chemical Hazards, NIOSH, 1985

(3) Threshold Limit Values and Biological Exposure Indices, 1988-89, ACGIH

(4) Air Contaminants-Permissible Exposure Limits, 29 CFR 1910.1000, 1989

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Formic Acid

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula CH_2O_2	1
Natural Physical State at 25°C liquid or gas	2
Vapor Pressure 33 mm Hg at 20°C	2
Melting Point 20 °F/°C Boiling Point 226 °F/°C	2
Flash Point (open or closed cup) 122 °C/°F	2
Solubility - H_2O miscible	1
Other miscible with alcohol, ether, glycerol	1

Physical Features: (odor, color, etc.) Colorless liquid, may be fuming with a pungent, penetrating odor (2) 1P = 11.05 eV

II. TOXICOLOGICAL DATA

Standards: 5 ppm (3) TLV 5 ppm (4) PEL 100 ppm IDLH 2

Routes of Exposure: Inhalation, Ingestion, Eye and/or skin contact

Acute/Chronic Symptoms: Eye irritation, nasal discharge, throat irritation, cough, nausea, skin burns, skin problems, difficulty breathing (2).

First Aid: Eyes: irrigate immediately; Skin: water flush immediately; Inhalation: fresh air and artificial respiration; Ingestion: medical attention immediately.

Chemical Name: Formic Acid

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products _____

B. Flammability LEL 18% UEL 57% — 2

C. Reactivity Hazard strong oxidizers, strong caustics, concentrated sulfuric acid. — 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 Merck Index, 10th Edition.

2) NIOSH Pocket Guide to Chemical Hazards, 1987.

3) ACGIH Threshold Values and Biological Exposure Indices, 1988-1989.

4) 29 CFR 1910.1000, 1989

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Sodium hydroxide

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula NaOH	1
Natural Physical State at 25°C solid	2
Vapor Pressure ~0 mm Hg at 20°C	2
Melting Point 590 °F/°C Boiling Point 2534 °F/°C	2
Flash Point (open or closed cup) --- °C/°F	2
Solubility - H_2O 50%	2
Other	

Physical Features: (odor, color, etc.) Colorless, odorless solid (2)

II. TOXICOLOGICAL DATA

Standards: ceiling= 2 mg/m^3 (3) TLV ceiling= 2 mg/m^3(4) PEL 250 mg/m^3(2) IDLH ___

Routes of Exposure: Inhalation, ingestion, skin and/or eye contact(2)

Acute/Chronic Symptoms: Irritation of the nose, inflammation of lungs, eye and skin irritation, temporary loss of hair (2)

First Aid: Eyes: irrigate immediately; Skin: flush with water immediately, Breath: artificial respiration; Swallow: Medical attention immediately

Chemical Name: Sodium hydroxide

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes ___ No X — 2

Toxic by-products _____

B. Flammability LEL _____ UEL _____ — 2

C. Reactivity Hazard Incompatible with water, acids, flammable liquids, organic halogens, metals, aluminum, tin, zinc, nitromethane and nitro compounds. — 2

D. Corrosivity Hazard yes/no pH: _____ — 1

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 Merck Index, 10th Edition, 1983

(2) Pocket Guide to Chemical Hazards, NIOSH, 1985

(3) Threshold Limit Values and Biological Exposure Indices for 1988-89.

(4) Air Contaminants-Permissible Exposure Limits, 29 CFR 1910.1000, 1989

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Hydrogen peroxide

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula H_2O_2	1
Natural Physical State at 25°C liquid	2
Vapor Pressure 86 mm Hg at 20°C	2
Melting Point 12 °F/°C Boiling Point 286 °F/°C	2
Flash Point (open or closed cup) -- °C/°F	2
Solubility - H_2O Miscible	2
Other Strong oxidizer	2

Physical Features: (odor, color, etc.) Colorless liquid with a slightly sharp odor, IP = 11 eV(2)

II. TOXICOLOGICAL DATA

Standards: 1 ppm (3) TLV 1 ppm (4) PEL 75 ppm(3) IDLH

Routes of Exposure: Inhalation, Ingestion, skin and eye contact (2)

Acute/Chronic Symptoms: Irritation of the nose, throat, and eyes, ulcers of the cornea of the eye, redness of skin, bleaching of hair (2)

First Aid: Eyes: irrigate immediately; Skin: water flush immediately; Inhalation: artificial respiration; Swallow: get medical attention immediately.

Chemical Name: Hydrogen peroxide

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes ___ No X — 2

Toxic by-products _____

B. Flammability LEL _____ UEL _____

C. Reactivity Hazard incompatible with oxidizers — 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 Merck Index, 10th Edition, 1983

(2) The Pocket Guide to Chemical Hazards, NIOSH, 1985

(3) Threshold Limit Values and Biological Exposure Indices for 1987-88, ACGIH

(4) 29 CFR 1910.1000, 1989.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Acetone

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula CH3COCH3	1,2
Natural Physical State at 25°C liquid	1,2
Vapor Pressure 266 mm Hg at 20°C	2
Melting Point -169 °F/°C Boiling Point 133 °F/°C	2
Flash Point (open or closed cup) 1.4 °C/°F	2
Solubility - H_2O soluble	2
Other	

Physical Features: (odor, color, etc.) colorless liquid with a fragrant, mint-like odor. IP=9.7eV (2) HNU Relative Response = 6.3 with the 10.2 eV probe. OVA Relative Response = 60%.

II. TOXICOLOGICAL DATA

Standards: 750 ppm (3) TLV 750 ppm (4) PEL 20,000 ppm IDLH 2

Routes of Exposure: Inhalation, contact with skin will cause dryness.

Acute/Chronic Symptoms: Irritation of eyes, nose and throat. Headaches, dizziness, and dermatitis. (2)

First Aid: Eyes: irrigate immediately for 15 minutes; Skin: soap and water wash; Inhalation: fresh air and artificial respiration; Ingestion: medical attention.

Chemical Name: Acetone

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products _____ — _____

_____ — _____

B. Flammability LEL 2.6% UEL 12.8% — 2

C. Reactivity Hazard oxidizing material and acids — _____

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. Chemical Safety Data Guide, BNA - 1985.
2. Pocket Guide to Chemical Hazards, NIOSH - 1985.
3. Threshold Limit Values and Biological Exposure Indices for 1988-1989
4. 29 CFR 1910.1000, 1989

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Bleaching agents

I. PHYSICAL/CHEMICAL PROPERTIES

		Reference
	sodium hypochlorite	
	sodium chlorite	
Chemical Formula	sodium bisulfate	1
Natural Physical State at 25°C	usually stored in aqueous	2
Vapor Pressure _____ mm Hg at 20°C	solution	
Melting Point _____ °F/°C Boiling Point _____ °F/°C		
Flash Point (open or closed cup) _____ °C/°F		
Solubility - H_2O	soluble in cold water	2
Other		

Physical Features: (odor, color, etc.) most solutions have sweetish odor and a pale, green color (3)

II. TOXICOLOGICAL DATA

Standards: no data TLV no data PEL no data IDLH _____

Routes of Exposure: Ingestion, Inhalation, Skin and/or eye contact (1)

Acute/Chronic Symptoms: Corrosive to skin, bronchial irritation, swelling of lungs(1)

First Aid: Eyes: Flush with water immediately; Skin: soap and water wash immediately; Inhalation: remove to fresh air, artificial respiration; Ingestion: Get to hospital immediately, do not induce vomiting.

Chemical Name: bleaching agents

III. HAZARDOUS CHARACTERISTICS | Reference

A. Combustibility Yes ___ No ___ _____

Toxic by-products fire risk in 2

presence of organics _____

B. Flammability LEL _____ UEL _____ _____

C. Reactivity Hazard _____ _____

D. Corrosivity Hazard yes/no pH: _____ 1

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 Merck Index, 10th Edition, 1983

(2) The Condensed Chemical Dictionary, 10th Edition

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Sulfuric acid

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula H_2SO_4	1
Natural Physical State at 25°C oily liquid	2
Vapor Pressure <0.001 mm Hg at 20°C	2
Melting Point 37 °F/°C Boiling Point 518 °F/°C	2
Flash Point (open or closed cup) ____ °C/°F	
Solubility - H_2O miscible	2
Other	

Physical Features: (odor, color, etc.) Colorless to dark brown, oily liquid, odorless (2)

II. TOXICOLOGICAL DATA

Standards: 1 mg/m^3(3) TLV 1 mg/m^3(4) PEL 80 mg/m^3(2) IDLH ____

Routes of Exposure: Inhalation, Ingestion, skin or/or eye contact (2)

Acute/Chronic Symptoms: Eye, nose, and throat irritation, swelling of lungs, conjunctivitis, stomatitis, dental erosion, skin and eye burns(2)

First Aid: Eyes: irrigate immediately; Skin: water flush immediately; Inhalation: artificial respiration; Swallow: get medical attention immediately, do not induce vomiting.

Chemical Name: Sulfuric acid

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes ___ No X — 2

Toxic by-products _____

B. Flammability LEL _____ UEL _____

C. Reactivity Hazard incompatible with organics, chlorates, carbides, fulminates, picrates, metals — 2

D. Corrosivity Hazard yes/no pH: _____ — 1

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 Merck Index, 10th Edition, 1983

(2) Pocket Guide to Chemical Hazards, NIOSH, 1985

(3) Threshold Limit Values and Biological Exposure Indices for 1988-89, ACGIH

(4) Air Contaminants-Permissible Exposure Limits, 29 CFR 1910.1000, 1989

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Formaldehyde

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula CH20	1,2
Natural Physical State at 25°C gas	1,2
Vapor Pressure -- mm Hg at 20°C	
Melting Point °F/°C Boiling Point -19.5 °F/°C	2
Flash Point (open or closed cup) -118 °C/°F	2
Solubility - H_2O miscible	1,2,3
Other ether and alcohol	

Physical Features: (odor, color, etc.) Pungent suffocating odor

IP = 10.88 eV

II. TOXICOLOGICAL DATA

Standards: 1 ppm(3) TLV 3 ppm (4) PEL potential carcinogen IDLH 5

Routes of Exposure: Inhalation, Eye contact

Acute/Chronic Symptoms: Irritation of eyes, nose, throat; tearing; coughing; bronchial spasms; respiratory tract irritation; skin problems; nausea; vomiting; loss of consciousness; suspect human carcinogen (5)

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: Formaldehyde

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 1

Toxic by-products _____ — _____

_____ — _____

B. Flammability LEL 7 UEL 73 — 5

C. Reactivity Hazard Strong oxidizers, alkalies, and acids; phenols; urea — 5

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 Merck Index, 10th Edition

(2) The Condensed Chemical Dictionary, Hawley, 11th Edition, 1987.

(3) Threshold Limit Values and Biological Exposure Indices for 1988-1989.

(4) Air Contaminants-Permissible Exposure Limits, 29 CFR 1910.1000, 1989.

(5) NIOSH Pocket Guide to Chemical Hazards, 1987.

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HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Stoddard Solvent

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula C_9 H20 –	1 –
Natural Physical State at 25°C liquid	1
Vapor Pressure ~2 mm Hg at 20°C	1
Melting Point ? °F/°C Boiling Point 302-329 °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 100 ppm(4) 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 1988-89, ACGIH

(4) 29 CFR 1910.1000, 1989

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 1000 ppm (4) 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 ____ | 1

Toxic by-products _____ | _____

_____ | _____

B. Flammability LEL 3.3% UEL 19% | 1

C. Reactivity Hazard _____ | _____

_____

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) Threshold Limit Values and Biological Exposure Indicies for 1987-88, ACGIH

(3) Enclyclopedia of Occupational Safety and Health, 3rd Edition, 1983.

(4) Air Contaminants - Permissible Exposure Limits, 29 CFR 1910.1000, 1989.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Peracetic acid

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula CH_3 COOH	1
Natural Physical State at 25°C liquid	1
Vapor Pressure _____ mm Hg at 20°C	
Melting Point _____ °F/°C Boiling Point 105 °F/°C	1
Flash Point (open or closed cup) 105 °C/°F	1
Solubility - H_2O soluble	1
Other alcohol, sulfuric acid	1

Physical Features: (odor, color, etc.) colorless liquid, strong odor (1)

II. TOXICOLOGICAL DATA

Standards: no data TLV no data PEL no data IDLH _____

Routes of Exposure: Ingestion, Inhalation, Skin and/or eye contact

Acute/Chronic Symptoms: Strongly irritating to skin and eyes (2)

First Aid: Inhalation: artificial respiration, Eye Contact: flush with water immediately, Skin: soap and water wash, Ingestion: get medical attention.

Chemical Name: Paracetic acid

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 1

Toxic by-products _____

B. Flammability LEL _____ UEL _____

C. Reactivity Hazard dangerous in contact with organic materials. — 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) The Condensed Chemical Dictionary, 10th Edition

(2) The Merck Index, 10th Edition, 1983

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Napthol dyestuffs

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula (1-naphthol) $C_{10}H_7OH$	1
Natural Physical State at 25°C Solid	1
Vapor Pressure _____ mm Hg at 20°C	
Melting Point 96 °F/°C Boiling Point 278 °F/°C	1
Flash Point (open or closed cup) _____ °C/°F	
Solubility - H_2O insoluble	1
Other benzene, alcohols, ether	1

Physical Features: (odor, color, etc.) colorless or yellow prisms of powder, disagreeable to taste (1).

II. TOXICOLOGICAL DATA

Moderately toxic by ingestion and skin absorption (1)

Standards: _____ TLV _____ PEL _____ IDLH _____

Routes of Exposure: Ingestion, skin and/or eye contact, Inhalation

Acute/Chronic Symptoms: Ingestion of large quantities can cause inflammation of kidneys, lens opacity, vomiting, diarrhea, abdominal pain, circulation, collapse, convulsions, anemia, death (2).

First Aid: Inhalation: artificial respiration; Skin: soap and water wash; Eye: irrigate immediately, Ingestion: get medical attention immediately

Chemical Name: Naphthol dyestuffs

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 1

Toxic by-products _____ — _____

_____ — _____

B. Flammability LEL _____ UEL _____ — _____

C. Reactivity Hazard _____ — _____

_____

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 Merck Index, 10th Edition, 1983

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Potassium dichcomate

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula $K_2Cr_2O_7$	1
Natural Physical State at 25°C crystals	1
Vapor Pressure _____ mm Hg at 20°C	
Melting Point 396 °F/°C Boiling Point _____ °F/°C	1
Flash Point (open or closed cup) _____ °C/°F	
Solubility - H_2O soluble	1
Other _____	

Physical Features: (odor, color, etc.) bright orange-red crystals (1)

II. TOXICOLOGICAL DATA

Standards: no data TLV no data PEL no data IDLH _____

Routes of Exposure: Ingestion, Inhalation, skin and/or eye contact

Acute/Chronic Symptoms: It is a corrosive poison.

First Aid: Inhalation: artificial respiration; Skin: soap and water wash; Eyes: irrigate immediately; Ingestion: get medical attention immediately, do not induce vomiting.

Chemical Name: Potassium dichcomate

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes ___ No ___ _____

Toxic by-products _____ _____

_____ _____

B. Flammability LEL _____ UEL _____ _____

C. Reactivity Hazard oxidizing agent, fire agent when in contact with organic materials 2

D. Corrosivity Hazard yes/no 1% ag. sol. has pH: pH =4.04 1

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 Merck Index, 10th Edition

(2) The Condensed Chemical Dictionary, 10th Edition

Rec'd
AUG 27 1990

State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

August 14, 1990

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

NFRAP
2/20/91
K. Cain

Subject: Hazard Ranking System (HRS) Score
Cone Mills Corp./Print Works Plant (CMC/PWP)
NCD980559157
Greensboro, Guilford County, North Carolina

Dear Ms. Cain:

Enclosed find the Hazard Ranking System (HRS) score for the subject site.

CMC/PWP was constructed in the 1930's and operated until 1977. Past activities conducted at the site included preparation for dyeing, dyeing or printing, and finishing. Waste disposal practices prior to 1960 are unclear. Reportedly, waste water was disposed of in the Greensboro sewer system. In 1960 Cone Mills Corp. constructed a dye waste disposal facility nearby to serve the site and other Cone Mill plants in the area. The discharge point for this facility is located well downstream of the site.

During the site investigation visit, no evidence of the on site treatment, storage, or disposal of hazardous waste was found. Sampling of the surface water pathway was conducted during this visit and contamination was found in an adjacent creek. However, the contamination found could not be attributed to the facility. Ground water samples could not be obtained.

According to file information regarding possible hazardous substances in textile waste, chromium has the highest Toxicity/Persistence value. There is no file information regarding the amount of waste produced at the site. For this reason, the maximum value of 8 has been used for the Hazardous Waste Quantity.

The great majority of the residents in the 4-mile radius surrounding CMC/PWP are provided drinking water by the city of Greensboro. The population utilizing ground water obtained from wells located within a 3 mile radius of the site as drinking water is estimated at 1877 individuals. The site area is drained by North Buffalo Creek, which enters Buffalo Creek. There are no surface water intakes used to provide drinking water located in the downstream fifteen path-length mile segment.

During the site investigation visit, no ground water samples could be obtained. For this reason, further remedial investigation of the site is recommended. In addition, due to the fact that the contamination found in North Buffalo Creek can not be attributed to the site, further investigation of this Creek to determine the source of this contamination is recommended.

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

Sincerely,

John P. McConney
Environmental Chemist
NC Superfund Section

JM/cone.hsl

Enclosure

Facility name: Cone Mills Corp./Print Works Plant

Location: Greensboro, Guilford County, North Carolina

EPA Region: Region IV

Person(s) in charge of the facility: Arthur J. Toompas

John Summer

Name of Reviewer: John P. McConney Date: August 14, 1990

General description of the facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

The site is a textile printing and finishing facility which was in operation from the 1930's until 1977. No evidence of the on-site treatment, storage or disposal of hazardous waste was found during the site investigation. Contaminants found in the surface water pathway could not be attributed to the site.

Scores: S_M =26.15 (S_{gw} =44.08 S_{sw} =10.18 S_a = 0)

S_{FE} = Not scored

S_{DC} = Not scored

FIGURE 1
HRS COVER SHEET

	S	S^2
Groundwater Route Score (S_{gw})	44.08	1943.05
Surface Water Route Score (S_{sw})	10.18	103.63
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		2046.68
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		45.24
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$		26.15

FIGURE 10
WORKSHEET FOR COMPUTING S_M

Ground Water Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)	References
1 Observed Release	(0) 45	1	0	45	3.1	8,9
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.						
2 Route Characteristics					3.2	
Depth to Aquifer of Concern 20 feet	0 1 2 (3)	2	6	6		10
Net Precipitation 3 inches	0 1 (2) 3	1	2	3		1
Permeability of the Unsaturated Zone clay loams	0 (1) 2 3	1	1	3		14
Physical State liquid	0 1 2 (3)	1	3	3		24
Total Route Characteristics Score			12	15		
3 Containment Unknown method of disposal	0 1 2 (3)	1	3	3	3.3	5,8,9
4 Waste Characteristics					3.4	
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18		23,24,26,27
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 (8)	1	8	8		5,8,9
Chromium Unknown quantity produced during 40+ years of operation.						
Total Waste Characteristics Score			26	26		
5 Targets					3.5	
Ground Water Use	0 1 2 (3)	3	9	9		18
Distance to Nearest Well/Population Served	0 4 6 8 10 / 12 16 (18) 20 / 24 30 32 35 40	1	18	40		21
Sole source for drinking water Nearest well 1.8 miles Estimated population of 1877 individuals						
Total Targets Score			27	49		
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			25272	57,330		
7 Divide line 6 by 57,330 and multiply by 100			S_{gw} = 44.08			

FIGURE 2
GROUND WATER ROUTE WORK SHEET

Surface Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)	References
1 Observed Release	(0) 45	1	0	45	4.1	8,22
If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.						
2 Route Characteristics					4.2	
Facility Slope and Intervening Terrain contamination found	0 1 2 (3)	1	3	3		22
1-yr. 24-hr. Rainfall 3 inches	0 1 (2) 3	1	2	3		2
Distance to Nearest Surface Water 200 feet	0 1 2 (3)	2	6	6		4
Physical State liquid	0 1 2 (3)	1	3	3		24
Total Route Characteristics Score			14	15		
3 Containment Unknown method of disposal	0 1 2 (3)	1	3	3	4.3	5,8,9
4 Waste Characteristics					4.4	
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18		23,24,25
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 (8)	1	8	8		5,8,9
Chromium unknown quantity produced during 40+ years of operation.						
Total Waste Characteristics Score			26	26		
5 Targets					4.5	
Surface Water Use Recreation	0 1 (2) 3	3	6	9		13
Distance to a Sensitive Environment 32 straight-line miles	(0) 1 2 3	2	0	6		3
Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 / 12 16 18 20 / 24 30 32 35 40	1	0	40		15
Zero population within 3 miles						
Total Targets Score			6	55		
6 If line 1 is 45, multiply 1 x 4 x 5. If line 1 is 0, multiply 2 x 3 x 4 x 5			6552	64,350		
7 Divide line 6 by 64,350 and multiply by 100			S_{sw} = 10.18			

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

NO Air Sampling Performed

~~Air~~ Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	0 45	1		45	5.1
Date and Location:					
Sampling Protocol:					
If line 1 is 0, the S_a = 0. Enter on line 5. If line 1 is 45, then proceed to line 2.					
2 Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
3 Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
	Total Targets Score			39	
4 Multiply 1 x 2 x 3				35,100	
5 Divide line 4 by 35,100 and multiply by 100		S_a = 0			

FIGURE 9
AIR ROUTE WORK SHEET

Reference List
Cone Mills Corp./Print Works Plant
NCD980559157

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2. 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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4. USGS 7-1/2' Topographic Quadrangles: Browns Summit, N.C., 1951 (photorevised 1968); Greensboro, N.C., 1951 (photorevised 1968); Mcleansville, N.C., 1952 (photorevised 1968); Lake Brandt, N.C., 1951 (photorevised 1968).

5. DeRosa, Pat. NC Superfund Section. Letter to Bland, Denise, US EPA, dated 16 September 1985, and EPA Form 2070-12 (7-81) completed September 11, 1985.

6. DeRosa, Pat. NC Superfund Section. Memo to file "Cone Mills Corporation/Print Works Plant NCD980559157", dated September 10, 1985.

7. Site Notification Form for Cone Mills Corp/Print Works Plant. Dated January 25, 1982.

8. McConney, John P. NC Superfund Section. Logbook notes taken during site investigation visit, dated May 16, 1990.

9. McConney, John P. NC Superfund Section. Letter to Cain, Kelly, US EPA, dated June 1, 1990.

10. Mundorff, M.J. Geology and Ground Water in the Greensboro Area, North Carolina. Bulletin No. 55. NC Department of Conservation and Development. Raleigh, 1948.

11. Heath, R.C. Basic Elements of Ground-Water Hydrology With Reference to Conditions in North Carolina. USGS Water-Resources Investigation Report 80-44, 1980.

12. Classifications and Water Quality Standards Assigned to the Waters of the Cape Fear River Basin. NC Department of Natural Resources and Community Development, Division of Environmental Management. Raleigh, NC. June 30, 1989.

13. McConney, John P. NC Superfund Section. Memo to file "Fishing and boating on North Buffalo Creek and Buffalo Creek", dated July 10, 1990.

14. Soil Survey of Guilford County, North Carolina. US Department of Agriculture, Soil Conservation Service. December 1977.

15. McConney, John P. NC Superfund Section. Memo to file "Drinking water intakes along Buffalo and Reedy Creeks, and Haw River", dated July 11, 1990.

16. North Carolina State Government Statistical Abstract. Office of State Budget and Management. Fifth Edition, 1984.

17. McConney, John P. NC Superfund Section. Memo to file "Irrigation from North Buffalo and Buffalo Creeks", dated July 11, 1990.

18. McConney, John P. NC Superfund Section. Memo to file "Water lines inside of the Greensboro city limits", dated July 18, 1990.

19. McConney, John P. NC Superfund Section. Memo to file "Population distribution of Greensboro", dated July 19, 1990.

20. McConney, John P. NC Superfund Section. Memo to file "Community water systems in the Cone Mills Corp/Print Works Plant (CMC/PWP) 4-mile radius", dated July 25, 1990 and NC Public Water Supply Branch. Listing of community and non-community water systems using ground water. Dated 7/11/90.

21. McConney, John P. NC Superfund Section. Memo to file "Ground water users in the Cone Mill Corp/Print Works Plant (CMC/PWP) 4-mile radius", dated July 26, 1990.

22. Laboratory Data Summary

23. Sax N.I. Dangerous Properties of Industrial Materials. Sixth Edition. Van Nostrand Reinhold Company. New York, NY.

24. Environmental Pollution Control Textile Processing Industry. EPA Document No. 625/7-78-002. USEPA. October 1978.

25. Data Collection and Documentation Techniques for HRS Scoring of Hazardous Waste Sites. NUS Corporation. March 1987.

26. Encyclopedia of Occupational Health and Safety. Third (Revised) Edition. International Labor Office. Geneva.

27. Wastewater-Treatment Systems - Upgrading Textile Operation to Reduce Pollution. EPA Document No. 625/3-74-004. USEPA. October 1974.

N/F

M.2 - SITE MAI NANCE FORM

* ACTION: _ *

EPA ID: NCD980559157

SITE NAME: CONE MILLS CORP/PRINT WORKS PLANT SOURCE: N

STREET: 1800 FAIRVIEW ST CONG DIST: 06

CITY: GREENSBORO ZIP: 27405

CNTY NAME: GUILFORD CNTY CODE: 081

LATITUDE: 36/05/36.0 LONGITUDE: 079/46/24.0

SMSA: 3120 HYDRO UNIT: 03030002

INVENTORY IND: Y REMEDIAL IND: Y REMOVAL IND: N FED FAC IND: N

NPL IND: N NPL LISTING DATE: NPL DELISTING DATE:

APPROACH: SITE CLASS:

SITE/SPILL IDS:

RPM NAME: RPM PHONE: - -

DIOXIN TIER: REG FLD1: REG FLD2:

RESP TERM: PENDING ( ) NO FURTHER ACTION (X) * PENDING (_) NO FURTHER ACTION (_)

ENF DISP: NO VIABLE RESP PARTY ( ) VOLUNTARY RESPONSE ( )

ENFORCED RESPONSE ( ) COST RECOVERY ( )

SITE DESCRIPTION:

M.2 - PROGRAM MAINTENANCE FORM

* ACTION: _ *

SITE: CONE MILLS CORP/PRINT WORKS PLANT

EPA ID: NCD980559157 PROGRAM CODE: H01 PROGRAM TYPE: * _ *

PROGRAM QUALIFIER: ALIAS LINK : * ___ __ *

PROGRAM NAME: SITE EVALUATION * _____ *

DESCRIPTION:

* _____ *
* _____ *
* _____ *
* _____ *

M.2 - EVENT MAINTENANCE FORM

* ACTION: _ *

SITE: CONE MILLS CORP/PRINT WORKS PLANT
PROGRAM: SITE EVALUATION

EPA ID: NCD980559157 PROGRAM CODE: H01 EVENT TYPE: DS1

FMS CODE: EVENT QUALIFIER: EVENT LEAD: E * _ ___ _ *

EVENT NAME: DISCOVERY STATUS: * _____ _ *

DESCRIPTION:

* _____ *
* _____ *
* _____ *
* _____ *

ORIGINAL	CURRENT	ACTUAL			
START:	START:	START:	__/__/__	__/__/__	__/__/__
COMP :	COMP :	COMP : 81/06/01	__/__/__	__/__/__	__/__/__

HQ COMMENT:

* _____ *

RG COMMENT:

* _____ *

COOP AGR #	AMENDMENT #	STATUS	STATE %
_____	_____	__	___

4.2 - EVENT MAINTENANCE FORM

* ACTION: _ *

SITE: CONE MILLS CORP/PRINT WORKS PLANT
PROGRAM: SITE EVALUATION

EPA ID: NCD980559157 PROGRAM CODE: H01 EVENT TYPE: PA1

FMS CODE: EVENT QUALIFIER: EVENT LEAD: * _ ___ _ *

EVENT NAME: PRELIMINARY ASSESSMENT STATUS: * _____ _ *

DESCRIPTION:

* _____ *
* _____ *
* _____ *
* _____ *

ORIGINAL	CURRENT	ACTUAL			
START:	START:	START:	__/__/__	__/__/__	__/__/__
COMP :	COMP :	COMP : 83/01/01	__/__/__	__/__/__	__/__/__

HQ COMMENT:

* _____ *

RG COMMENT:

* _____ *

COOP AGR #	AMENDMENT #	STATUS	STATE %
_____	_____	__	___

5.2 - EVENT MAINTENANCE FORM

* ACTION: _ *

SITE: CONE MILLS CORP/PRINT WORKS PLANT
PROGRAM: SITE EVALUATION

EPA ID: NCD980559157 PROGRAM CODE: H01 EVENT TYPE: PA2

FMS CODE: EVENT QUALIFIER: EVENT LEAD: S * _ ___ _ *

EVENT NAME: PRELIMINARY ASSESSMENT STATUS: * _____ _ *

DESCRIPTION:

* _____ *
* _____ *
* _____ *
* _____ *

ORIGINAL	CURRENT	ACTUAL			
START:	START:	START: 85/09/16	__/__/__	__/__/__	__/__/__
COMP :	COMP :	COMP : 85/09/16	__/__/__	__/__/__	__/__/__

HQ COMMENT:

* _____ *

RG COMMENT:

* _____ *

COOP AGR #	AMENDMENT #	STATUS	STATE %
_____	_____	__	___

M.2 - COMMENT MAINTENANCE FORM

SITE: CONE MILLS CORP/PRINT WORKS PLANT

EPA ID: NCD980559157

COM NO	COMMENT	ACTION
001	OLD TURN OF CENTURY PLANT, NOW CLOS	* _
	ED, BUT NO KNOWLEDGE WHETHER	*
002	MATERIALS NOW CONSIDERED HAZARDOUS	* _
	UNDER RCRA EVER LEFT PLANT AND	*
003	WERE BURIED IN LDFL. PLANT HAD PLAT	* _
	ING OPERATION FOR ROLLERS USED ON	*
004	PRINT MACHINE. PEOPLE WITH SOME KNO	* _
	WLEDGE DO NOT REMEMBER ANY.	*
005	CONTACT: THOMAS ALSPAUGH MGR WATER	* _
	AND AIR RESOURCES. 919-379-6579.	*

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

16 September 1985

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

SUBJECT: Final Preliminary Assessment Report
Cone Mills Corp./Print Works Plant NCD 980559157
Fairview Street
Greensboro, NC

Dear Ms. Bland:

Enclosed please find the Preliminary Assessment report for the subject site. This priority is based on our review of available data, and, sometimes, on conversations and correspondence with the site owner and operator. We have concluded that:

Cone Mills Corp./Print Works Plant is located on Fairview Street in Greensboro, NC. The plant was used to manufacture and finish cotton and cotton/synthetic blend fabrics. Operations began at least as far back as 1936 and continued until the plant closed in 1977. Cone Mills still owns the site and it is reportedly used for storage.

In 1981, the company manager of water and air resources filed a CERCLA 103 (C) notification indicating that textile waste had been buried on site. However, the specific constituents of the waste were not reported. There is also some indication that the waste may have been removed. Although written requests have been made, no additional information has been made available by the company regarding disposal of waste on this site.

Due to the nature of manufacturing at the site, a variety of organics and metals may be present in the buried waste. Contamination of soil, groundwater and surface water is possible. Additional information is needed to determine whether hazardous materials were indeed buried at the site and whether these materials threaten public health or the environment. A medium priority is therefore recommended for inspection of this site.

On 13 September 1985, this Preliminary Assessment was reviewed by CERCLA Unit personnel and by Faye Sweat from the North Carolina Department of Natural Resources and Community Development, Division of Environmental Management.

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

Sincerely,

Pat DeRosa
Waste Management Specialist
Solid and Hazardous Waste Management Branch
Environmental Health Section

PD/tb/0175b

EPA

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

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D980559157

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Cone Mills Corp./Print Works Plant	1800 Fairview Street

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Greensboro	NC	27405	Guilford	41	6

09 COORDINATES LATITUDE	LONGITUDE
~~36 06 05~~	~~079 46 18~~

10 DIRECTIONS TO SITE (Starting from nearest public road)

Take US 70 West to Wendover Ave. in Greensboro. Continue west on Wendover and turn right on Summit Ave. going north. Take a left on 16th Street (west) to Fairview St. Turn left on Fairview (south). Site just beyond RR tracks on left.

III. RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)
Cone Mills Corporation	1201 Maple Street

03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER
Greensboro	NC	27405	( )

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

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

13 TYPE OF OWNERSHIP (Check one)

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

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

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

☐ A. RCRA 3001 DATE RECEIVED: ___/___/___ (MONTH DAY YEAR) ☒ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: 06 09 81 (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION

☐ YES DATE ___/___/___ (MONTH DAY YEAR)
☒ NO

BY (Check all that apply)

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

CONTRACTOR NAME(S): _____

02 SITE STATUS (Check one)

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

03 YEARS OF OPERATION

1936 (?) (BEGINNING YEAR) | 1977 (ENDING YEAR) plant closed ☒ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED

Notified for on-site burial of unknown textile wastes. Plant was closed in 1977 but is still owned by Cone Mills. Plant was used to manufacture and finish cotton and cotton/synthetic blends. Materials buried on site were reportedly removed at a later

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

date. No information on the volume, or type of waste buried, nor the dates and methods of burial and removal. Waste may include organic dyes and heavy metals. Potential for contamination of soil, groundwater and surface water.

V. PRIORITY ASSESSMENT

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

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

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NUMBER
T.A. Allspaugh	Cone Mills	(919) 379-6579

04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
Pat DeRosa	NC DHR/DHS	SHW Mgmt. Br.	(919) 733-2178	09 11 85 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D980559157

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			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			Potential contaminants of buried
IOC	INORGANIC CHEMICALS			waste may include organic dye
ACD	ACIDS			waste and heavy metals.
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

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. CERCLA Files, NC Solid & Haz. Waste Management Branch, Raleigh, NC.
2. Central files, NC Division of Environmental Management, Dept. of Natural Resources and Community Development, Raleigh, NC.

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NC	D980559157

II. HAZARDOUS CONDITIONS AND INCIDENTS

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

Unknown.

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

Unknown.

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

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

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

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

Unknown.

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

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

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

EPA

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

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

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)*

GREENSBORO, N. C.
N3611-W7945/7.5

1951
PHOTOREVISED 1968
AMS 6062 IV SE-SERIES V842

CONE MILLS CORP./
PRINT WORKS PLT.

Broadview
Buffalo Lake
Philadelphia Lake
Waterworks
Pumping Sta
Revolution Mill Reservoir
Kirkwood
Buffalo Ch
White Oak Lake
Cone Sch
White Oak
Revolution
East White Oak
Mc Adoo Heights
Greensboro Country Club
Irving Park
Proximity Sch
Proximity
Edgeville
Cone Memorial Hospital
Latham Park
Bessemer
St Leos Hospital
Aycock Sch
Fisher Park
Green Hill Cemetery
Sternberger Hospital
Stadium
Maddy
Fisher Park

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

MN GN

3½° 62 MILS 0°42' 12 MILS

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

UTM GRID AND 1968 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

DATE: September 10, 1985

TO: File

FROM: Pat DeRosa

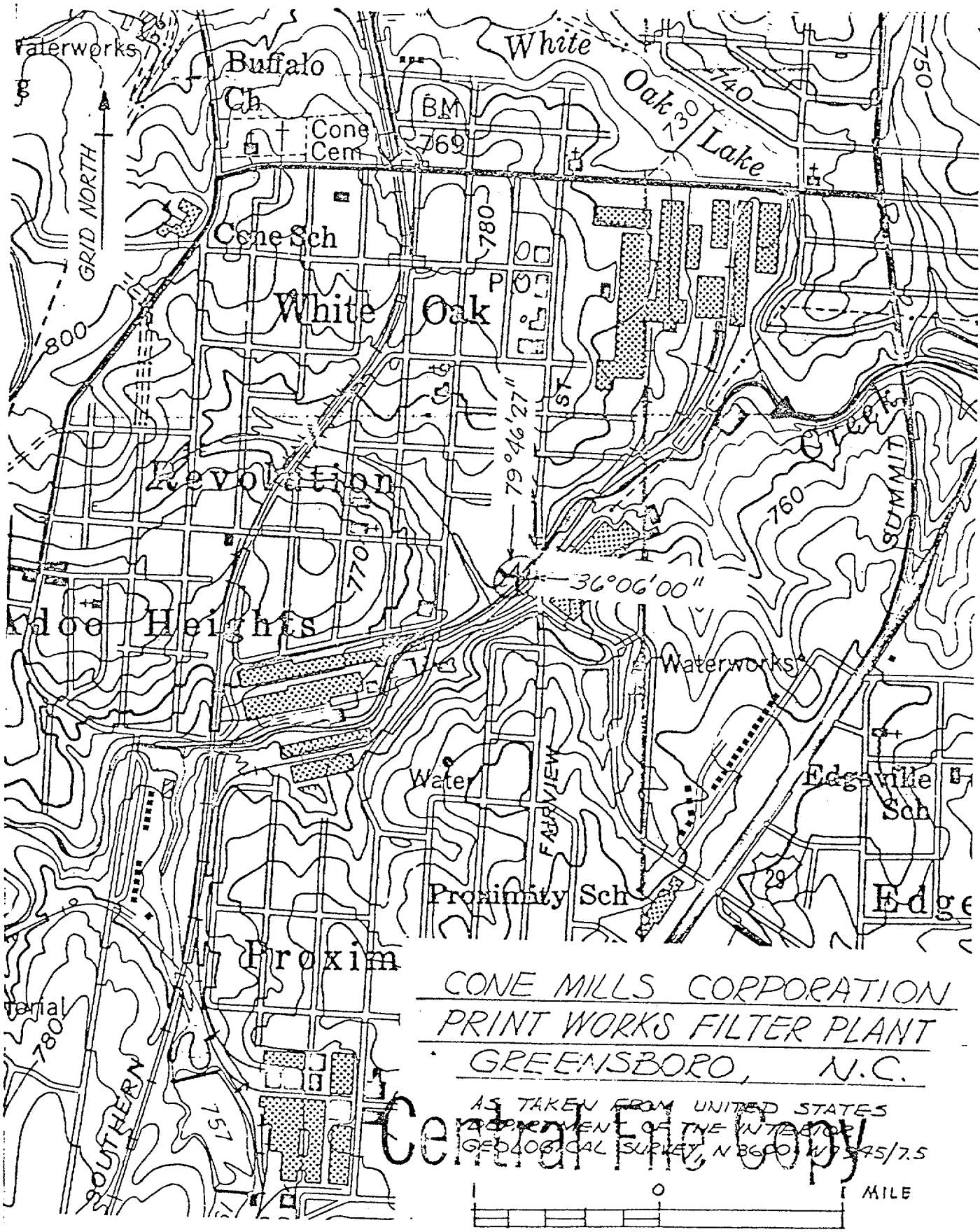
SUBJECT: Cone Mills Corporation/Print Works Plant
NCD 980559157

A review of the NPDES permit application filed with NC Dept. of NRCD by Cone Mills provided the following information:

Print Works Plant:	outfall 002
Date Discharge Began:	1936
Process:	Manufacture and finishing of cotton and cotton/synthetic blends generally falling under SIC 2211,2261,2262.

PD/tb/0175b

NPDES permit # NC0000876
outfall 002



CONE MILLS CORPORATION
PRINT WORKS FILTER PLANT
GREENSBORO, N.C.

AS TAKEN FROM UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, N3600 W7945/7.5

Central File Copy

Central file
Guilford Co.
Cone Mills Corp.
Print Work Plant
Greensboro, NC.

CONE MILLS CORPORATION

GREENSBORO, N. C. 27405

RECD AUG 01 1977

July 15, 1977

RECEIVED
JUL 20 1977
AIR QUALITY DIVISION
WINSTON-SALEM OFFICE

Mr. David Ligon
N.C. Dept. of Natural & Economic Resources
North Piedmont Field Office
3528 Vest Mill Road
Winston-Salem, North Carolina 27103

Dear Mr. Ligon:

Re: Application for Registration of
Air Emission Equipment
Print Works Plant
Cone Mills Corporation
Greensboro, N.C.

We have several applications on file for registration of processing equipment at the above plant which were transmitted to your office some months ago.

This plant was closed on June 15, 1977 and the processing equipment in it has been removed from Greensboro, therefore these applications are withdrawn.

Sincerely yours,

T. A. Alspaugh

T. A. Alspaugh
Manager, Water & Air Resources

TAA:lt

cc: Mr. Gene Lollis
Mr. Charles Younce

Central File Copy

Cone

Date: January 25, 1982

County: Guilford

Notifier's name and address: (b) (6) [redacted]

(b) (6) [redacted]

Contact's name: (b) (6) [redacted]

Site name and address: Cone Mills Corp./Print Works Plant

1800 Fairview St., Greensboro, N. C. 27405

Site location: 1800 Fairview St., Greensboro, N. C. 27405

Type of waste: Not known

What process generated the waste? Production of Textiles

Volume of waste: Not Known

Method of storage or disposal: buried on site

Dates of waste activity: Not known

Site history:

T. A. Alspaugh notified of waste disposal activity that occurred on property owned by Cone Mills Corp./Print Works Plant in Greensboro. He said waste was buried on site and later removed. More detailed information was not made available by the contact person.

NCD 000776914 ?

GEN, TSD

closed?

CHECK

FIP

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

ENVIRONMENTAL PROTECTION AGENCY
NOTIS DATA MANAGEMENT SYSTEM

NOTIS REPORT #4 — LISTING BY FACILITY — REPORT DATE: 10/20/81
REGION: 04 STATE: NC

NOTIFICATION ID NO.	SITE NAME / SITE STREET / SITE CITY / SITE COUNTY / EPA SITE ID NO.	NOTIFIER NAME / NOTIFIER STREET / NOTIFIER CITY / (CONTACT NAME/TITLE) / (CONTACT PHONE)	STATE	ZIP	NOTIFIER STATUS (PRES OWN, PAST OWN PRES OP, PAST OP TRANSPORTER, VOLUNTEER)
NCS000001133	CONE MILLS CORP/PRINT WORKS PLANT 1800 FAIRVIEW ST GREENSBORO 27405 GUILFORD NCD980559157	(b) (6) [redacted]			PRES OWN PAST OWN

RELEASES TO THE ENVIRONMENT:

DATES OF WASTE HANDLING: TO

WASTE AMOUNT: 0 AREA: 0 MAP PRESENT: NO FORM TYPE: 8900-1

NOTIF. POSTMARKED DATE: 81/06/09 SIGNATURE PRESENT: YES DATE OF LAST UPDATE: 81/10/19

TYPE OF FACILITY	TYPES OF WASTES	SOURCES OF WASTE
LANDFILL OTHER-(SEE COMMENTS)	UNKNOWN	TEXTILES

COMMENTS	SEQ NO.
SEE FILE	1
DO NOT KNOW WHETHER ANY HAZARDOUS	600
MATERIALS WENT TO LANDFILL FROM THIS	601
PLANT	602

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

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

November 5, 1984

Mr. T. A. Alspaugh
Cone Mills Corporation
1201 Maple Street
Greensboro, N.C. 27405

Dear Mr. Alspaugh:

As a follow-up to our telephone conversation on November 2, 1984, I would like to request information concerning the Cone Mills Corporation/Print Works Plant site in Greensboro, N.C.. The Solid and Hazardous Waste Management Branch is evaluating a list of potential problem sites compiled under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Program.

Please provide any documentation or explanations that would describe the following activities since the start-up of operations at your plant site:

1. Waste storage, treatment, and disposal practices of RCRA hazardous wastes. Include types, amounts, transporters, and disposal locations and dates for each waste.

2. Waste storage, treatment, and disposal practices for other toxic or hazardous substances not regulated by RCRA but designated as a hazardous substance under CERCLA (example PCBs). Include types, amounts, transporters, and disposal locations and dates for each waste.

3. Information concerning releases of CERCLA and/or RCRA hazardous substances both on your plant site, or off-site; such as spills of feedstocks, waste waters, materials at transfer areas, leaking storage tanks, and other waste handling and/or recovery areas with descriptions of any remedial actions undertaken.

4. Any chemical analysis results indicating soil, groundwater, or surface water contamination as a result of hazardous substance releases that have occurred. Identify locations of any groundwater monitoring wells or other sampling points used to monitor areas of potential concern.

5. Provide a chronological history of site owners and/or operators where applicable. Identify date facility was established.

6. Include copies of any notifications of correspondence made to the United States Environmental Protection Agency or the State of North Carolina in reference to possible CERCLA site activities and/or releases.

7. Provide a general description of plant operations and processes.

8. Provide a list of permits issued to this site (example NPDES, RCRA, RCRA Interim Status). Include permit number, date issued and expiration date.

This information will be used to assess and process this site through the RCRA Section 3012 System. The information will be on file at the North Carolina Solid and Hazardous Waste Management Branch 3012 Office and copies will be forwarded to the United States Environmental Protection Agency, Region IV in Atlanta, Georgia, in the near future.

Your assistance in compiling this information is very much appreciated. Please contact me at (919) 733-2178 if you are not able to complete this information request within the next four weeks. I am enclosing information on the RCRA 3012/CERCLA Program for your use.

If you have questions or if I can be of any assistance, please contact me.

Sincerely,

Lenox E. Bramble

Lenox E. Bramble
Environmental Engineer

Solid & Hazardous Waste Mgt. Branch
Environmental Health Section

LEB:lw/1299A

EPA Notification of Hazardous Waste Site

R

United States Environmental Protection Agency
Washington DC 20460

This initial notification information is required by Section 103(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and must be mailed by June 9, 1981.

Please type or print in ink. If you need additional space, use separate sheets of paper. Indicate the letter of the item which applies.

810609

NCS 000001133

A Person Required to Notify:

Enter the name and address of the person or organization required to notify.

Name: Cone Mills Corporation, Print Works Plant
Street: 1800 Fairview Street
City: Greensboro State: NC Zip Code: 27405

B Site Location:

Enter the common name (if known) and actual location of the site.

NCD 980 559 157

Name of Site: Print Works Plant
Street: 1800 Fairview Street
City: Greensboro County: Guilford State: NC Zip Code: 27405

C Person to Contact:

Enter the name, title (if applicable), and business telephone number of the person to contact regarding information submitted on this form.

Name (Last, First and Title): Alspaugh, Thomas, Manager, Water & Air Resources
Phone: (919) 379-6579

D Dates of Waste Handling:

Enter the years that you estimate waste treatment, storage, or disposal began and ended at the site.

From (Year) To (Year) Unknown

E Waste Type: Choose the option you prefer to complete

Option I: Select general waste types and source categories. If you do not know the general waste types or sources, you are encouraged to describe the site in Item I—Description of Site.

General Type of Waste:
Place an X in the appropriate boxes. The categories listed overlap. Check each applicable category.

1. ☐ Organics
2. ☐ Inorganics
3. ☐ Solvents
4. ☐ Pesticides
5. ☐ Heavy metals
6. ☐ Acids
7. ☐ Bases
8. ☐ PCBs
9. ☐ Mixed Municipal Waste
10. XX Unknown
11. ☐ Other (Specify)

Source of Waste:
Place an X in the appropriate boxes.

1. ☐ Mining
2. ☐ Construction
3. XX 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. ☐ Photofinish
16. ☐ Lab/Hospital
17. ☐ Unknown
18. ☐ Other (Specify)

Option 2: This option is available to persons familiar with the Resource Conservation and Recovery Act (RCRA) Section 3001 regulations (40 CFR Part 261).

Specific Type of Waste:
EPA has assigned a four-digit number to each hazardous waste listed in the regulations under Section 3001 of RCRA. Enter the appropriate four-digit number in the boxes provided. A copy of the list of hazardous wastes and codes can be obtained by contacting the EPA Region serving the State in which the site is located.

0 0 2 2 1

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Form Approved
OMB No. 2000-0138

EPA Form 8900-1

Notification of Hazardous Waste Site **Side Two**

F Waste Quantity:

Place an X in the appropriate boxes to indicate the facility types found at the site.

In the "total facility waste amount" space give the estimated combined quantity (volume) of hazardous wastes at the site using cubic feet or gallons.

In the "total facility area" space, give the estimated area size which the facilities occupy using square feet or acres.

Facility Type

1. ☐ Piles
2. ☐ Land Treatment
3. ☒ Landfill
4. ☐ Tanks
5. ☐ Impoundment
6. ☐ Underground Injection
7. ☐ Drums, Above Ground
8. ☐ Drums, Below Ground
9. ☐ Other (Specify) do not know whether any hazardous materials went to landfill from this plant.

Total Facility Waste Amount

cubic feet Not known

gallons

Total Facility Area

square feet Not known

acres

G Known, Suspected or Likely Releases to the Environment:

Place an X in the appropriate boxes to indicate any known, suspected, or likely releases of wastes to the environment.

☐ Known ☐ Suspected ☐ Likely ☐ None
☒ Unknown

Note: Items H and I are optional. Completing these items will assist EPA and State and local governments in locating and assessing hazardous waste sites. Although completing the items is not required, you are encouraged to do so.

H Sketch Map of Site Location: (Optional)

Sketch a map showing streets, highways, routes or other prominent landmarks near the site. Place an X on the map to indicate the site location. Draw an arrow showing the direction north. You may substitute a publishing map showing the site location.

I Description of Site: (Optional)

Describe the history and present conditions of the site. Give directions to the site and describe any nearby wells, springs, lakes, or housing. Include such information as how waste was disposed and where the waste came from. Provide any other information or comments which may help describe the site conditions.

Old turn of century plant, now closed, but no knowledge whether materials now considered hazardous under RCRA ever left plant and were buried in landfill. Plant had plating operation for rollers used on print machine. People with some knowledge do not remember any.

J Signature and Title:

The person or authorized representative (such as plant managers, superintendents, trustees or attorneys) of persons required to notify must sign the form and provide a mailing address (if different than address in item A). For other persons providing notification, the signature is optional. Check the boxes which best describe the relationship to the site of the person required to notify. If you are not required to notify check "Other".

Name T. A. Alspaugh
Manager, Water & Air Resources

Street 1201 Maple Street

City Greensboro State NC Zip Code 27405

Signature T. A. Alspaugh Date 6/5/81

☒ Owner, Present
☒ Owner, Past
☐ Transporter
☐ Operator, Present
☐ Operator, Past
☒ Other