523SERBSF10,631

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Site Name (Subject):	TEXFI INDUSTRIES, INC/NEW BERN
Site ID (Document ID):	NCD981928088
Document Name (DocType):	Preliminary Assessment/Site Inspection (PA/SI)
Report Segment:	
Description:	Site Screening Investigation
Date of Document:	12/10/1991
Date Received:	
Box: *Enter SF and # with no spaces*	SF10,631
Access Level:	PUBLIC
Division:	WASTE MANAGEMENT
Section:	SUPERFUND
Program (Document Group):	SERB (SERB)
Document Category:	FACILITY

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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

10 December 1991

Ms. Kathy Amoroso
EPA Project Officer
EPA Region IV Waste Division
345 Courtland Street, NE
Atlanta, Georgia 30365

Subject: Texfi New Bern
New Bern, Craven County, NC
NCD 981 928 088

Dear Ms. Amoroso:

Enclosed please find the Site Investigation Report for the subject site. If you have any questions or comments please contact me at (919) 733-2801.

Sincerely,

Jack Butler

Jack Butler
Environmental Engineer
Superfund Section

JB/dk

Enclosure

NORTH CAROLINA

DEHNR/DSWM

Texfi New Bern
NCD981928088

Site Investigation
December 1991

By Jack Butler
Environmental Engineer
SUPERFUND SECTION
SOLID WASTE MANAGEMENT SECTION

SITE INSPECTION REPORT

Texfi New Bern
Bosch Boulevard
New Bern, Craven County, North Carolina

NCD 981 928 088

Prepared By:
Jack Butler
Environmental Engineer
NC Superfund Section

Jack Butler

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EXECUTIVE SUMMARY

The Texfi New Bern site is located at the end of Bosch Blvd. (SR 1317) approximately 0.50 miles from its intersection with NC 55 in New Bern, Craven County, NC. The county code for Craven County is 25 and it is in the first congressional district. The latitude is 35° 08' 16" and the longitude is 77° 06' 36".

From 1972 until 1980 Texfi Industries, Inc. operated a polyester manufacturing facility at this site. Prior to 1972, the site was vacant land. Texfi Industries closed in 1980 and the facility was not used again until 1987 when Amital Spinning Corporation reopened the facility. Amital Spinning Corporation originally leased the facility from Texfi Industries. More recently Amital Spinning Corporation purchased 74 acres of the site form Texfi Industries. The area purchased by Amital Spinning includes the facility and land running east along Bosch Blvd. to NC 55. Texfi Industries has maintained title to 100 acres west of the facility.

Seven areas of concern were identified during this Site Investigation. These areas are: (1) an underground storage tank (UST) used to store 1,1,1-trichloroethane (1,1,1-TCA) near monitoring well 4A (MW-4A), under the main plant building, (2) a smaller above ground tank used to store 1,1,1-TCA near the extreme northeast corner of the plant building, (3) the presence of Dowtherm in groundwater near recovery well 9 (RW-9), (4) a landfill west of the facility, and (5) possible contamination in two residential wells approximately 1,000 to 1,500 feet northeast of the facility, (6) a spill of an unknown quantity of 1,1,1-TCA near monitoring wells 9 and 9A (HW-9 and MW 9A) on the southside of the main plant building, and (7) a spill of an unknown quantity of 1,1,1-TCA near monitoring well 3A (MW-3A) near the northwest corner of the main plant building (see Maps 1 and 2, Appendix A).

The UST near MW-4 was removed prior to Amital occupying the site in 1987. A small spill of TCA also occurred in this same area. A TCA plume has been identified in this area extending southeast under the plant building.

The smaller aboveground TCA tank near the extreme northeast corner of the plant building has been removed since 1987 and is presently stored on site southwest of the main plant building. No soil was removed during this aboveground tank removal; however, the cradle holding the tank was removed and some minor regrading of the site was done.

The Dowtherm was discovered after an odor was noted in soil from this area. RW-9 was installed in this area to remove the Dowtherm. The groundwater extraction and remediation program is scheduled to begin in about December or early 1992. This remediation is being conducted by Texfi Industries.

Approximately 900 drums were removed from the top of the ground in the landfill area west of the facility in about 1980 or 1981. These drums were moved to a concrete pad

at the site and the contents were analyzed. Most were found to contain only rainwater. EPA reportedly oversaw this drum removal.

Texfi Industries is also working with the North Carolina Division of Environmental Management (DEM) Washington Regional Office on remediation of chlorinated solvent contamination in groundwater at the site.

1.0 Background

1.1 Location

The Texfi New Bern site is located at the end of Bosch Blvd. (SR 1317) approximately 0.50 miles from its intersection with NC 55 in New Bern, Craven County, NC. The county code for Craven County is 25 and it is in the first congressional district. The latitude is 35° 08' 16" and the longitude is 77° 06' 36" (Map 1, Appendix A) (1).

1.2 Site Layout

The main plant building that was formerly used by Texfi Industries, and is presently owned and used by Amital Spinning, is near the western end of the facility property (1.2). During this site investigation, seven areas of concern were identified as follows: (1) an underground storage tank (UST) used to store 1,1,1-trichloroethane (1,1,1- TCA) near monitoring well 4A (MW-4A) under the main plant building, (2) a small aboveground tank used to store 1,1,1-TCA near the northeast corner of the main plant building, (3) the presence of Dowtherm in groundwater near the recovery well 9 (RW-9) south of the tank farm and west of the main plant building, (4) a landfill west of the facility on property still owned by Texfi Industries, (5) possible contamination in two residential wells approximately 1,000 to 1,500 feet northeast of the facility, (6) a spill of an unknown quantity of 1,1,1-TCA near monitoring wells 9 and 9A (MW-9 and MW-9A) on the southside of the main plant building, and (7) a spill of an unknown quantity of 1,1,1-TCA near monitoring well 3A (MW-3A) near the northwest corner of the main plant building (1,2,3,4). Map 1 in Appendix A shows the location of the Texfi New Bern site and Map 2 in Appendix A shows the layout of the facility presently owned and operated by Amital Spinning (5).

1.3 Ownership and Site Use History

From 1972 until 1980 Texfi Industries Inc. owned and operated a polyester manufacturing facility at this site. Prior to 1972. the site was vacant land. Texfi Industries closed in 1980 and the facility was not used again until 1987 when Amital Spinning Corporation reopened the facility. Amital Spinning presently owns and operates a polyester manufacturing facility at the site (1).

1.4 Permit and Regulatory History

This facility has always been served by city water and sewer from the city of New Bern (6,7). The North Carolina DEM issued a Notice of Noncompliance (NON) which prompted Texfi Industries to hire Chas T. Main, Inc. to perform an environmental site assessment (3,4,5,8,9).

1.5 Remedial Action to Date

Approximately 900 drums were removed from the top of the ground in the landfill area west of the facility in about 1980 or 1981. These drums were moved to a concrete pad at the site and the contents were analyzed. Most were found to contain only rainwater (1).

Prior to Amital Spinning occupying the site in 1987 the UST near MW-4 was removed. Approximately 5 to 10 gallons of TCA had also been spilled in the same area (1,10).

The smaller aboveground TCA tank near the extreme northeast corner of the plant building was removed after 1987 and is presently stored on site southwest of the main plant building. No soil was removed during this aboveground tank removal; however, the cradle holding the tank was removed and some minor regrading of the site was done (1).

Equipment for the remediation of groundwater is presently being assembled by Texfi Industries to be placed on a concrete pad at the site. An infiltration gallery for the treated groundwater has been approved by the Washington Regional Office. This infiltration gallery will be located in the wooded area on the northside of the plant. Groundwater remediation was planned to begin in December 1991; however, several of the extraction wells have gone dry due to the water table on the site dropping approximately 8 feet. This drop in the water table is believed to be due to mining operations northwest of the site (2).

1.6 Summary Trip Report (1)

On 4 December 1990, Mr. Jerry Curry and Mr. Jack Butler, North Carolina Superfund Section, performed a Site Investigation visit to the subject site. Mr. James Ipock, Amital Spinning Corporation, was present during this visit and provided background information on the site, and conducted a tour of the site. Mr. Rick Griffiths, C.T. Main Inc. (704/529-6246, ext. 4706), the environmental contractor for Texfi Industries, was also contacted by phone during this visit.

During the Site Investigation Visit on 4 December 1990, an attempt was made to sample the two nearby residential wells. One well is reportedly approximately 50 feet deep and the other well is approximately 100 feet deep. Due to low yield, both residences have been connected to community water from an unthreatened source, although both wells are reportedly operational and used for outside uses such as washing cars, watering lawns, etc. Also due to low yield, only one volatile organic analysis (VOA) sampled could be collected from the 50 ft. deep well. A complete set of samples for volatile, semi-volatile, and acid/base/neutral extractable organic and inorganic analysis was collected from the 100 ft. deep well. These samples were grab samples from an outside faucet with minimum purging of the system due to the low yields of the wells. A background surface soil sample was

collected approximately 30 ft. north of Bosch Blvd. Subsurface soil samples were collected from a depth of approximately 2 ft. near the area of the former location of the aboveground TCA tank near the northeast corner of the plant building and from the landfill area. Samples were submitted to the North Carolina Division of Health Services Laboratory on 5 December 1990.

2.0 Environmental Setting

2.1 Topography

The Texfi New Bern site is located in the Tidewater Region of the Coastal Plain of North Carolina approximately 25 to 30 feet above sea level (see Map 1 Appendix A). The Tidewater Region characteristically is extremely flat and contains large swamps and lakes indicative of poor drainage condition (11).

2.2 Surface Water

The site is essentially flat and does not drain directly to any surface water body. Runoff from the site enters drainage ditches along Bosch Street. These drainage ditches appear to eventually enter the Neuse River approximately 1.5 to 2.0 miles northeast of the site (see Map 1, Appendix A). The Neuse River is classified as a Class SC Tidal Salt Water. It is also classified as a nutrient sensitive water requiring limitations on nutrient inputs (12). No drinking water intakes were identified within 15 miles of the site.

2.3 Geology, Soil and Groundwater

The Texfi New Bern site is situated in the eastern portion of the Coastal Plain physiographic province of North Carolina. In the subsurface, the Coastal Plain is characterized by a wedge of sediments which thickens in the seaward direction from a thin veneer along the western margin. The sediments which compose this wedge may be divided into several hydrogeologic units depending on differences in hydraulic conductivity and media properties. These units dip eastward at a gradient slightly greater than the topography (3).

Both phreatic and confined aquifer conditions exist in the region. Phreatic conditions are typically found in the younger unconsolidated post-Miocene sediments of Pliocene, Pleistocene, and Holocene age, which overlie the older lithified sediments. The groundwater for phreatic aquifers is generally derived from localized precipitation and subsequent infiltration (3).

Groundwater also occurs in confined or leaky-confined aquifers. Primary recharge for these aquifers occurs in locations where the aquifer is sufficiently close to the surface to receive rainfall infiltration. These recharge areas are regional in size and are positioned west of New Bern and hydrographically upgradient. It is not unusual for the potentiometric surface of these aquifers to be located near or above the topographical surface. Secondary recharge occurs through infiltration of water stored in overlying material (3).

In the New Bern area, groundwater within 100 feet of the surface may be found in three water bearing stratigraphic units; the post-Miocene sediments, the Yorktown

Formation, and the Castle Hayne Formation. Groundwater in each unit apparently moves in the general direction of the Neuse River (3).

The oldest geologic unit encountered at the study area is the Castle Hayne Formation which is dated as Eocene in age, or approximately 22 million years old. This formation is described as a biomicrite (fossil limestone) composed almost entirely of pelecypod molds. The Castle Hayne Formation was encountered on site at depths ranging from 37 feet below grade in well MW-12 to 40 feet in well MW-9A (4). The hydraulic conductivity of the Castle Hayne aquifer is variable with a conductivity as high as 1.48×10^{-2} cm/sec (42 ft/day) being reported (3).

The Yorktown Formation lies unconformably over the Castle Hayne on this site. The Yorktown Formation is considered to be Miocene in age, or approximately 12 million years old. This formation has been described as a semi-consolidated unit consisting of fragmented shell debris and quartz sand. This unit ranges in thickness across the site from 9.5 feet in well MW-6 to 15 feet in well MW-9A (4).

Although the Yorktown and Castle Hayne Formations are readily discernible on a lithologic and stratigraphic basis, they are not easily distinguished hydrologically. It is therefore reasonable and justified to group the Castle Hayne and Yorktown Formations into one hydrogeologic unit until sufficient hydrogological data on each unit can be obtained (3).

Overlying the Yorktown Formation on site is a unit referred to as post-miocene sediments. Sediments from Pliocene, Pleistocene and Holocene are included in this unit (3,4). These sediments appear to be lagoonal in origin, probably associated with a back barrier depositional environments (3). It is common for sediment sequences deposited in this environment to contain interbedded sand and clay (mud) lenses that formed in response to bar and/or channel migration. It should be noted that the uppermost clay pinches out in the Well 9 direction while the lower clay pinches out in the Well 8 direction. Although the upper clay is above the zone of saturation, it may be partially responsible for contaminant transport by supporting perched water conditions. In lieu of the fact that several different types of sediments are found within the post-miocene sequence, they are sufficiently similar to be grouped into two subdivisions, clayey sands and silty to sandy clays. Each of these two sediment groups occurs once within the zone of saturation (3).

Hydraulic conductivity data obtained from slug tests indicate that the sandy clay conductivity is 3.3×10^{-5} cm/sec (8.5 ft/day) (3). This value was obtained using Well 7 which is screened roughly within the sandy clay unit. Conductivity for Well 9, which is screened subequally through both sediment groups, was calculated at 2.4×10^{-4} cm/sec (0.68 ft/day) (3). Although rapid recovery rates did not allow the hydraulic conductivity to be calculated at Well 8, it is probable that the value is close to 3.0×10^{-3} cm/sec (8.5 ft/day) (3). Well 8 is screened entirely within the clayey sand and thus should yield a hydraulic conductivity higher than either Well 9 or Well 7. Since an order of magnitude increase in conductivity was noted between Well 7 (clay screen interval) and Well 9 (subequal sand and

clay interval), it was assumed that a similar increase in conductivity would result from the Well 8 screen interval which is composed entirely of sand (3).

The depth to groundwater on the site varies. A depth to groundwater was measured at 8.5 ft in MW-3A when it was installed in 1986 (9).

2.4 Climate and Meteorology (11,13)

Seasonal Temperatures:

°F	January	July
Mean Max.	54-58	90-92
Mean Min.	32-36	68-72
Mean	46-48	78-80

Precipitation:

(inches)

Mean annual precipitation:	54
Mean annual evaporation:	41
Net annual precipitation:	13
Mean annual snowfall:	3
One year 24-hr. rainfall:	3.75

Storm Events:

Mean days/year with thunderstorms: 40-60
Prevailing winds with wind speeds: South at 12 mph

Emissions Inventory Summary for Craven County (Tons/Year) (14)

Type	Area Sources	Point Sources
Particulates	6,501	3,358
Sulfur Dioxide	399	6,706
Nitrogen Oxides	3,677	2,614
Volatile Organics and Hydrocarbons	6,682	1,048
Carbon Monoxide	32,514	7,085

2.5 Land Use

The Texfi New Bern site is located at the northwest edge of New Bern, NC. The surrounding area is a mixture of industrial and rural/residential (see Map 1, Appendix A).

2.6 Population Distribution and Water Supply

Approximately 200 to 225 employees presently work for Amital Spinning at the Texfi New Bern site (2). The population distribution around the Texfi New Bern site was calculated using a combination of counting houses on the USGS topographic map for the area and estimating percentages of the total populations of New Bern and Trent Woods in areas where individual houses are not shown on area maps (15). The number of groundwater users in the area was calculated by counting houses on the USGS topographic map in areas not served by city or county water systems (7,15,16,17). A factor of 2.64 people per household was applied to the house count numbers (18). A total population of New Bern of 17,363 persons and of Trent Woods of 2,366 persons was also used in the population distribution calculations (15,18). The population distribution and groundwater users are summarized as follows:

Radius (miles) Onsite	Total Population	Groundwater Users
0-¼	225	0
¼-½	55	0
½-1	484	5
1-2	1,031	5
2-3	5,370	182
3-4	5,826	502

The Craven County Water Service obtains its water from three wells approximately 15 miles west of New Bern (16). The City of New Bern obtains water from several wells in the Cove City area which is also approximately 15 miles west of New Bern (7,16). The City of New Bern has also purchased and presently operates the former Trent Woods water system as part of its complete system serving New Bern and Trent Wood (17).

2.7 Critical Environments

The alligator, a federally designated threatened species, has been sited in the Neuse River near New Bern approximately 5 or 6 miles downstream from the Texfi New Bern site. In addition, the Neuse River Floodplain and Bluff System, the Neuse River Sand Ridge, and the Duck Creek Sand Ridge are Priority Areas along the Neuse River within about 7 miles of the subject site. The Neuse River Floodplain and Bluff System is an area of High Island

approximately 2 to 3 miles northeast of the Texfi New Bern site. The Neuse River Sand Ridge is an area on the northeast bank of the Neuse River approximately 3 miles northeast of the subject site. The Duck Creek Sand Ridge is a wetland south of Duck Creek and east of the Neuse River approximately 6.5 miles southeast of the subject site. These Priority Areas are considered unique geological and ecological areas.

3.0 Waste Types and Quantities

The introduction of TCA into the groundwater reportedly occurred as the result of a one time spill of the solvent during dismantling of an aboveground storage tank in the vicinity of Wells 4A and 6. Five to ten gallons were believed to have been spilled on the ground. The exact time of the spill is unknown, but the event could have occurred as long ago as ten years (3).

Other compounds, in addition to TCA, have also been detected in groundwater at the site including 1,1-dichloroethane (DCA), chloroethane, 1,1-dichloroethene (DCE), and methylene chloride. DCA and DCE are degradient products of TCA and chloroethane is a degradation product of DCA. DCA, DCE, and chloroethane were reportedly not used at this facility. Methylene chloride is a common paint solvent. History of its use at this facility is unknown (3).

A review of laboratory results leads to the conclusion that contamination found in Wells 2, 3A, and 4A resulted from isolated spills which probably occurred at significantly different times. The compounds found in Well 3A have undergone more complete degradation than compounds found in 4A. TCA has achieved complete degradation at Well 3A since none was detected, but DCA and chloroethane were detected at .14 and 0.62 mg/l, respectively (3).

Methylene chloride at Well 2 is probably the result of a separate spill incident because this compound is not found at any other location (3). The Dowtherm found near RW-9 also has not been found at any other location and is, therefore, also believed to be the result of a separate spill incident (3,4,5,9).

4.0 Laboratory Data

During the site investigation visit on 4 December 1990, two residential wells approximately 1,000 to 1,500 feet northeast of the Texfi New Bern site were sampled. One of these wells was found to contain 607.9 parts per billion (ppb) 1,1,-DCA, 11.5 ppb 1,1-DCE, and 28.9 ppb tetrahydrofuran; 150.0 ppb of p-dioxane was also reported but the identify of this could not be confirmed in the laboratory. The other well was also found to contain 53.7 ppb 1,1,-DCA and 6.0 ppb tetrahydrofuran. These wells are reportedly not presently used for drinking water (1).

As discussed in previous sections of this report, the presence of 1,1,1-TCA in groundwater at the site has been acknowledged by Texfi Industries (3,4,9). They have also acknowledged that this contamination resulted from operations on the site and are presently working with the North Carolina Division of Environmental Management to remediate this site (3,4,5,9).

5.0 Toxicological/Chemical Characteristics

The toxicological/chemical characteristics of major contaminants found on this site are presented on the following pages (20).

DICHLOROETHYLENE

CAS RN: 25323302 NIOSH #: KV 9250000
mf: $C_2H_2Cl_2$; mw: 96.94

TOXICITY DATA: 2	CODEN:
ihl-mus LCLo:76 gm/m3/2H	AEXPBL 83,235,18
ihl-gpg LCLo:155 gm/m3/1H	AEXPBL 83,235,18

THR: MOD ihl in mus and gpg.
Disaster Hazard: When heated to decomp it emits tox fumes of Cl^-.

1,1-DICHLOROETHYLENE

CAS RN: 75354 NIOSH #: KV 9275000
mf: $C_2H_2Cl_2$; mw: 96.94

Colorless volatile liquid. bp: 31.6°, lel = 7.3%, uel = 16.0%, fp: −122°, flash p: 0°F (OC), d: 1.213 @ 20°/4°, autoign. temp.: 1058°F.

SYNS:

CHLORURE DE VINYLIDENE (FRENCH)	1-1-DCE
	NCI-C54262
1,1-DICHLOROETHENE	VINYLIDENE DICHLORIDE

TOXICITY DATA: 3	CODEN:
orl-rat TDLo:200 mg/kg (6-15D preg)	TXAPA9 49,189,79
ihl-rat TCLo:80 ppm/7H (6-15D preg)	TXAPA9 49,189,79
ihl-rbt TCLo:160 ppm/7H (6-15D preg)	TXAPA9 49,189,79
mmo-sat 5 pph	MUREAV 57,141,78
mma-sat 3 pph/2H	MUREAV 58,183,78
ihl-rat TCLo:55 ppm/52W-I:ETA	JTEHD6 4,15,78
ihl-mus TCLo:55 ppm/6H/1Y-I:ETA	EVHPAZ 21,25,77
skn-mus TDLo:4840 mg/kg:NEO	JJIND8 63,1433,79
ihl-rat TC:55 ppm/1Y-I:ETA	EVHPAZ 21,25,77
ihl-mus TC:55 ppm/43W-I:ETA	JTEHD6 4,15,78
ihl-hmn TCLo:25 ppm:SYS	CHINAG 11,463,76
orl-rat LD50:200 mg/kg	DCTODJ 1,63,77
ihl-rat LCLo:10000 ppm/24H	EXMPA6 20,187,74
ihl-mus LC50:98 ppm/22H	JTEHD6 3(5-6),913,77
orl-dog LDLo:5750 mg/kg	QJPPAL 7,205,34
ivn-dog LDLo:225 mg/kg	QJPPAL 7,205,34
scu-rbt LDLo:3700 mg/kg	QJPPAL 7,205,34

Aquatic Toxicity Rating: TLm96:1000-100 ppm WQCHM* 3,-,74. Carcinogenic Determination: Animal Positive IARC** 19,439,79.
TLV: Air: 10 ppm DTLVS* 4,432,80. *Toxicology Review:* CTOXAO 8,633,75; CMTVAS 10(3),49,73; NTIS** ORNL/TIRC-77/3. Occupational Exposure to Vinyl Halides recm std: Air: TWA 1 ppm; CL 5 ppm/15M NTIS**. NTP Carcinogenesis Bioassay Completed as of December 1980. "NIOSH Manual of Analytical Methods" VOL 4 266*. NIOSH Current Intelligence Bulletin 28, 1978. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.
THR: An exper MUT, ETA, NEO, CARC. HIGH acute orl, ihl. See also vinyl chloride.
Fire Hazard: Highly dangerous, when exposed to heat or flame.
Explosion Hazard: Mod, in the form of gas, when exposed to heat or flame. Also can explode spontaneously; reacts violently with chlorosulfonic acid, HNO_3, oleum.
Disaster Hazard: Highly dangerous; see chlorides; can react vigorously with oxidizing materials.
To Fight Fire: Alcohol foam, CO_2, dry chemical.
Incomp: Air; chlorotri-fluoroethylene; ozone; perchloryl fluoride.

cis-DICHLOROETHYLENE

CAS RN: 156592 NIOSH #: KV 9420000
mf: $C_2H_2Cl_2$; mw: 96.94

Colorless liquid, pleasant odor. mp: −80.5°, bp: 59°, lel = 9.7%, uel = 12.8%, flash p: 39°F, d: 1.2743 @ 25°/4°, vap. press: 400 mm @ 41.0°, vap. d: 3.34.

SYNS:

1,2-DICHLOROETHYLENE	ACETYLENE DICHLORIDE

TOXICITY DATA: 1	CODEN:
ihl-mus LCLo:65000 mg/m3/2H	AHBAAM 116,131,36
ihl-cat LCLo:20000 mg/m3/6H	AHBAAM 116,131,36

Reported in EPA TSCA Inventory, 1980.
THR: LOW via oral route. In high conc it is irr and narcotic. Has produced liver and kidney injury in exper animals.
Fire Hazard: Dangerous, when exposed to heat or flame. Reacts violently with N_2O_4, KOH, Na, NaOH.
Spontaneous Heating: No.
Explosion Hazard: Mod, in the form of vapor when exposed to flame.
Disaster Hazard: Dangerous; see chlorides; can react vigorously with oxidizing materials.
To Fight Fire: Water spray, foam, CO_2, dry chemical.

cis, 1,2-DICHLOROETHYLENE

mf: $C_2H_2Cl_2$; mw: 96.94

Flash p: 42.8°F; lel = 3.3%; uel = 15%.

trans-1,2-DICHLOROETHYLENE

mf: $C_2H_2Cl_2$; mw: 96.94

Flash p: 35.6°F; lel = 9.7%; uel = 12.8%.
Can cause fire hazard.
Incomp: Alkalies; difluoromethylene dihypofluorite; nitrogen tetraoxide.

DICHLOROETHANE

CAS RN: 1300216 NIOSH #: KH 9800000
mf: $C_2H_4Cl_2$; mw: 98.96

Lel = 5.6%; uel = 11.4%.

TOXICITY DATA: 2	CODEN:
orl-rat LD50:1120 mg/kg	HYSAAV 32,349,67
orl-mus LD50:625 mg/kg	HYSAAV 32,349,67
ihl-mus LCLo:10 gm/m3	GISAAA 20(8),19,55
skn-rbt LD50:3890 mg/kg	UCDS** 3/23/70
ihl-rat TCLo:6000 ppm (6-15D preg) TER	TXAPA9 28,452,74
ihl-rat TCLo:6000 ppm (6-15D preg)	TXAPA9 28,452,74

THR: MOD orl in rat, mus; MOD skn in rbt.
Disaster Hazard: When heated to decomp it emits very tox fumes of Cl^-.

1,2-DICHLOROETHANE

mf: $C_2H_4Cl_2$; mw: 98.96

Lel = 6.2%; uel = 15.9%; flash p: 55.4°F.

Incomp: Dinitrogen tetraoxide; metals.
For further information see Vol. 1, No. 4 of *DPIM Report.*

METHANE DICHLORIDE

CAS RN: 75092 NIOSH #: PA 8050000
mf: CH_2Cl_2; mw: 84.93

Colorless volatile liquid. bp: 39.8°, lel = 15.5% in O_2, uel = 66.4% in O_2, fp: −96.7°, d: 1.326 @ 20°/4°, autoign. temp.: 1139°F, vap. press: 380 mm @ 22°, vap. d: 2.93.

SYNS:

CHLORURE DE METHYLENE (FRENCH)
DICHLOROMETHANE (DOT)
FREON 30
METHYLENE BICHLORIDE
METHYLENE CHLORIDE (DOT)
METHYLENE DICHLORIDE
METYLENU CHLOREK (POLISH)
NCI-C50102

TOXICITY DATA: 3

	CODEN:
skn-rbt 810 mg/24H SEV	JETOAS 9,171,76
eye-rbt 162 mg MOD	JETOAS 9,171,76
eye-rbt 10 mg MLD	TXCYAC 6,173,76
eye-rbt 17500 mg/m3/10M	TXCYAC 6,173,76
mmo-sat 5700 ppm	MUREAV 56,245,78
mma-sat 5700 ppm	MUREAV 56,245,78
dni-hmn:fbr 5000 ppm/1H-C	MUREAV 81,203,81
dni-ham:lng 5000 ppm/1H-C	MUREAV 81,203,81
sce-ham:lng 5000 ppm/1H-C	MUREAV 81,203,81
ihl-rat TCLo:4500 ppm/24H (1-17D preg)	TXAPA9 52,29,80
ihl-rat TCLo:1250 ppm/7H (6-15D preg)	TXAPA9 32,84,75
ihl-mus TCLo:1250 ppm/7H (6-15D preg)	TXAPA9 32,84,75
ihl-rat TCLo:500 ppm/6H/2Y:ETA	TXAPA9 48,A185,79
ihl-hmn TCLo:500 ppm/1Y-I:CNS	ABHYAE 43,1123,68
ihl-hmn TCLo:500 ppm/8H:BLD	SCIEAS 176,295,72
orl-rat LD50:167 mg/kg	DOWSD* 1/26/76
ihl-rat LC50:88000 mg/m3/30M	FAVUAI 7,35,75
ihl-mus LC50:14400 ppm/7H	NIHBAZ 191,1,49
ipr-mus LD50:1500 mg/kg	TXAPA9 9,139,66
scu-mus LD50:6460 mg/kg	TXAPA9 4,354,62
orl-dog LDLo:3000 mg/kg	QJPPAL 7,205,34
ihl-dog LCLo:14108 ppm/7H	NIHBAZ 191,1,49
ipr-dog LDLo:950 mg/kg	TXAPA9 10,119,67
scu-dog LDLo:2700 mg/kg	QJPPAL 7,205,34
ivn-dog LDLo:200 mg/kg	QJPPAL 7,205,34
ihl-cat LCLo:43400 mg/m3/4.5H	AHBAAM 116,131,36
orl-rab LDLo:1900 mg/kg	HBTXAC 1,94,56
scu-rbt LDLo:2700 mg/kg	QJPPAL 7,205,34
ihl-gpg LCLo:5000 ppm/2H	FLCRAP 1,197,67

Aquatic Toxicity Rating: TLm96:1000-100 ppm WQCHM* 3,-,74. Carcinogenic Determination: Indefinite IARC** 20,449,79.

TLV: Air: 100 ppm DTLVS* 4,275,80. *Toxicology Review:* FAZMAE 18,365,74; 27ZTAP 3,94,69. OSHA Standard: Air: TWA 500 ppm; CL 1000; Pk 2000/5M/2H (SCP-J) FEREAC 39,23540,74. DOT-ORM-A, Label: None FEREAC 41,57018,76. Occupational Exposure to Methylene Chloride recm std: Air: TWA 75 ppm; Pk 500 ppm/15M NTIS**. Currently tested by NTP for Carcinogenesis by Standard Bioassay Protocol as of December 1980. "NIOSH Manual of Analytical Methods" Vol 1 127, Vol 3 S329. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.

THR: MUT data. A skn, eye irr. An exper ETA, ± CARC. A hmn CNS, BLD. HIGH orl, ivn; MOD ipr, orl, scu, ihl; LOW ihl, scu. See also chlorinated aliphatic hydrocarbons. Very dangerous to the eyes. Except for its property of inducing narcosis, it has very few other acute toxicity effects. Its narcotic powers are quite strong, and in view of its great volatility, care should be taken in its use. It will not form explosive mixtures with air at ordinary temp. However, it can be decomp by contact with hot surfaces and open flame, and it can then yield toxic fumes, which are irr and will thus give warning of their presence. It has been used as an anesthetic in Europe and is still used there for local anesthesia. Exper have shown that 25,000 ppm conc for 2 hr exposures were not lethal. Conc of 7,200 ppm after 8 min caused paresthesia of the extremities; after 16 min, acceleration of the pulse to 100; during the first 20 min, congestion in the head, a sense of heat and slight irr of the eyes. At a level of 2,300 ppm, there was no feeling of dizziness during 1-hr exposures, but nausea did occur after 30 min of exposure. The limit of perception by smell is set at 25-50 ppm conc. Can cause a dermatitis upon prolonged skin contact. A respirator for organic vapors and fumes should be worn to avoid excessive inhal. Used as a food additive permitted in food for human consumption.

Fire Hazard: Reacts violently with Li, NaK, potassium-*tert*-butoxide, (KOH + *n*-methyl-*n*-nitrosourea).

Explosion Hazard: None under ordinary conditions, but will form explosive mixtures in atmosphere having high oxygen content, in liquid O_2, N_2O_4, K, Na, NaK.

Disaster Hazard: Dangerous; when heated to decomp, emits highly tox fumes of phosgene.

1,1,1-TRICHLOROETHANE

CAS RN: 71556 NIOSH #: KJ 2975000
mf: $C_2H_3Cl_3$; mw: 133.40

Colorless liquid. bp: 74.1°, fp: −32.5°, flash p: none, d: 1.3376 @ 20°/4°, vap. press: 100 mm @ 20.0°. Insol in water; sol in acetone, benzene, carbon tetrachloride, methanol, ether.

SYNS:

CHLOROETHENE
CHLOROTHANE NU
CHLOROTHENE
METHYL CHLOROFORM
METHYLTRICHLOROMETHANE
NCI-C04626
1,1,1-TRICHLOORETHAAN (DUTCH)
1,1,1-TRICHLORAETHAN (GERMAN)
TRICHLORO-1,1,1-ETHANE (FRENCH)
ALPHA-TRICHLOROETHANE
1,1,1-TRICLOROETANO (ITALIAN)

TOXICITY DATA: 2-1	CODEN:
ihl-rat TCLo:2100 ppm/24H (14D pre/1-20D preg)	TOXID9 1,28,80
eye-man 450 ppm/8H	BJIMAG 28,286,71
skn-rbt 5 gm/12D-I MLD	AIHAAP 19,353,58
skn-rbt 500 mg/24H MOD	28ZPAK -,28,72
eye-rbt 100 mg MLD	AIHAAP 19,353,58
eye-rbt 2 mg/24H SEV	28ZPAK -,28,72
ihl-man LCLo:27 gm/m3/10M	JOCMA7 8,358,66
ihl-man TCLo:350 ppm:PSY	WEHSAL 10,82,73
orl-hmn TDLo:670 mg/kg:GIT	NTIS** PB257-185
ihl-hmn TCLo:920 ppm/70M:CNS	AIHAAP 19,353,58
orl-rat LD50:10300 mg/kg	NTIS** PB257-185
ihl-rat LCLo:1000 ppm	FMCHA2 -,D317,80
ipr-rat LD50:5100 mg/kg	NTIS** PB257-185
orl-mus LD50:11240 mg/kg	NTIS** PB257-185
ihl-mus LCLo:11000 ppm/2H	HBTXAC 5,72,59
ipr-mus LD50:4700 mg/kg	TXAPA9 13,287,68
orl-dog LD50:750 mg/kg	FMCHA2 -,D317,80
ipr-dog LD50:3100 mg/kg	TXAPA9 10,119,67
ivn-dog LDLo:95 mg/kg	HBTXAC 5,72,59
orl-rbt LD50:5660 mg/kg	AIHAAP 19,353,58
scu-rbt LDLo:500 mg/kg	HBTXAC 5,72,59
orl-gpg LD50:9470 mg/kg	AIHAAP 19,353,58

Aquatic Toxicity Rating: TLm96:100-10 ppm WQCHM* 3,-,74. Carcinogenic Determination: Indefinite IARC** 20,515,79.

TLV: Air: 350 ppm DTLVS* 4,269,80. *Toxicology Review:* FAZMAE 18,365,74; EATR** EB-TR-75047; AIHAAP 40,A46,79. OSHA Standard: Air: TWA 350 ppm (SCP-J) FEREAC 39,23540,74. DOT: ORM-A, Label: None FEREAC 41,57018,76. Occupational Exposure to 1,1,1-Trichloroethane recm std: Air: CL 350 ppm/15M NTIS**. NCI Carcinogenesis Bioassay Completed; Results Negative (NCITR* NCI-CG-TR-3,77). Currently Tested by NTP for Carcinogenesis by Standard Bioassay Protocol as of December 1980. "NIOSH Manual of Analytical Methods" VOL 1 127, VOL 3 S328. NIOSH Current Intelligence Bulletin 27, 1978. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.

THR: In hmn it causes PSY, GIT, CNS effects. A MOD skn irr, a SEV eye irr in rbts. LOW orl, ipr, ihl in rat, mus. MOD orl, ipr dog; Narcotic in high conc. Causes a proarrhythmic activity which sensitizes the heart to epinephrine-induced arrhythmias. This sometimes will cause a cardiac arrest particularly when this material is massively inhaled as in drug abuse for euphoria. Reacts violently with N_2O_4, O_2, O_2 liquid, Na, NaOH, Na-K alloy.

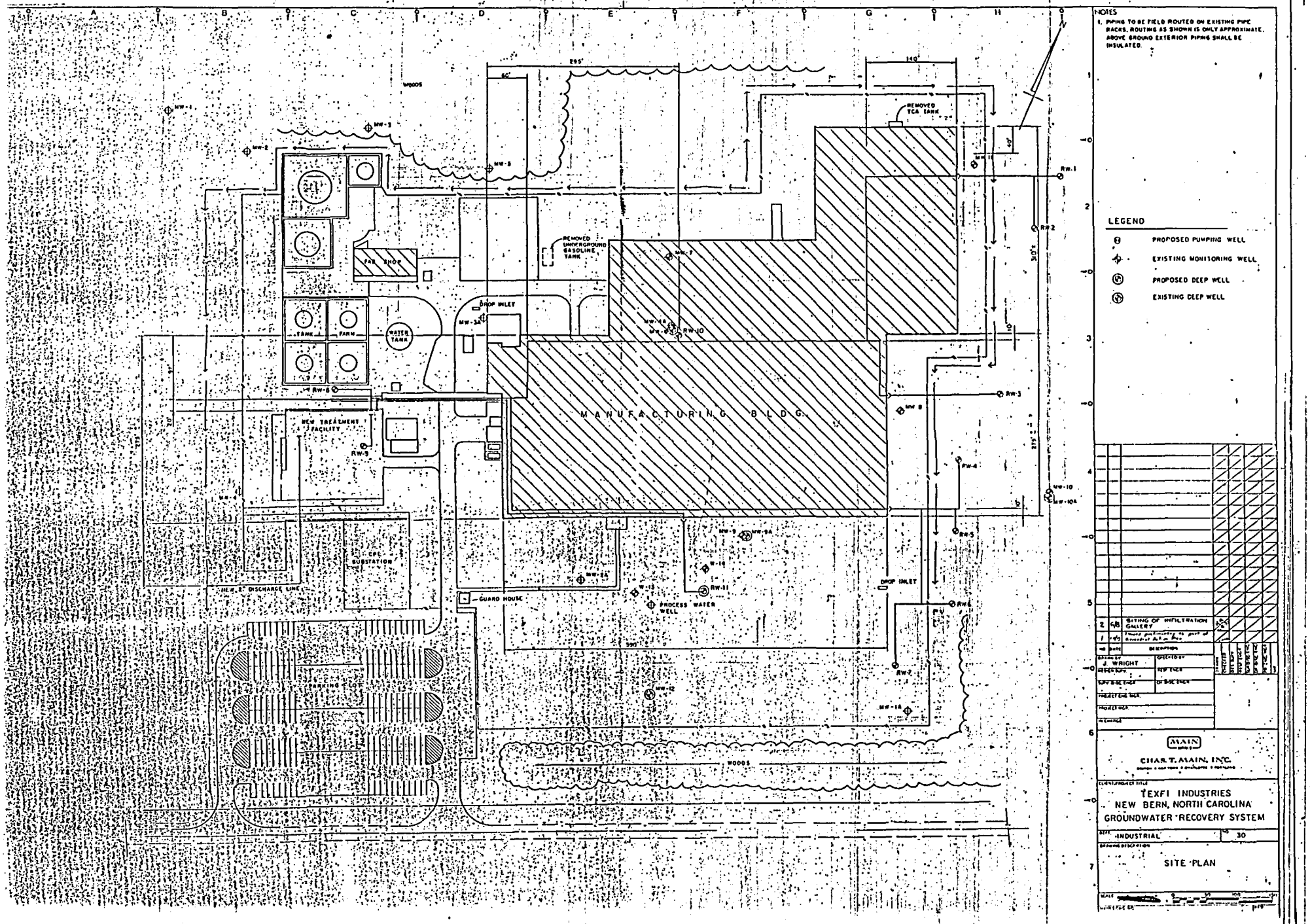
Disaster Hazard: Dangerous; see chlorides.

For further information see Vol. 2, No. 1 of *DPIM Report.*

Appendix A

Maps and Photographs

MAP 2 (from reference 5)



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF NORTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES
AND COMMUNITY DEVELOPMENT
RALEIGH, NORTH CAROLINA
JASPER, N. C.
NW/4 NEW BERN 15' QUADRANGLE
35077-B2-TF-024
1978
PHOTOREVISED 1983
JASPER QUADRANGLE
NORTH CAROLINA—CRAVEN CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 NEW BERN 15' QUADRANGLE
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF NORTH CAROLINA
DEPARTMENT OF NATURAL AND ECONOMIC RESOURCES
RALEIGH, NORTH CAROLINA
ASKIN, N.C.
NE/4 NEW BERN 15' QUADRANGLE
35077-B1-TF-024
1978
PHOTOREVISED 1983
ASKIN QUADRANGLE
NORTH CAROLINA—CRAVEN CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 NEW BERN 15' QUADRANGLE
77°15'
35°15'
12'30"
77°07'30"
77°00'
2 550 000 FEET
2 590 000 FEET
550 000 FEET
510 000 FEET
WASHINGTON 24 MI.
VANCEBORO 4.7 MI.
KINSTON 26 MI.
FORT BARNWELL 6 MI.
GOLDSBORO 49 MI.
KINSTON 22 MI.
4.5 MI. TO N.C. 41
SPRING HOPE 1.4 MI.
NEUSE RIVER
Redhill Landing
Shell Landing
Cowpen Landing
Boat Ramp
Turkey Quarter Creek
Taylor Cr
Greens Thorofare
McCoy Br
St Johns Ch
Mill Branch
Run
Stony
Jasper
Bethany Ch
St Marks Ch
Jumping Run
Sewage Disposal
West Craven High Sch
Chip
SWIFT CREEK
Pinetree Creek
Spring Garden Landing
West Craven Jr High Sch
Rio Grande Ch
Trailer Park
Spring Garden
Spring Garden Ch
Round Tree
Beech Tree Branch
Lima
Substation
Streets Ferry
Mixer
INDUSTRIAL WASTE PONDS
Swift 2
Cool Springs Landing
The Gut
HOG ISLAND
BACHELOR CREEK
Bachelor Creek
Grave
Beaverdam Swp
Fisher Swamp
Little Swift Creek
Kit Swamp
Askin
Kit Swamp Ch
NORFOLK SOUTHERN
DUFFY TRAIL
Morgan Swamp
Askin 2
Pine Tree Swamp
PIPELINE
ATLANTIC AND EAST CAROLINA
Lookout Tower
Tuscarora
Beaverdam Branch
Hymans
Caswell Branch
Bellair
Beach Grove Ch
Rollover Creek
Gethsemane Ch
Deep Creek
Clark
Rest Area
OLD RAILROAD GRADE
GREAT DOVER SWAMP
Virgil Hill Ch
Wesley Chapel
Washington Forks
QUARRY
Shad Cove
Marsh Island
RIVER
Gap Landing
Boat Ramp
Glenburnie Park
Sewage Disposal
Quarry
Radio Tower (WCTI)
Radio Tower
Rennys Creek
Ruths Chapel
NEW BERN
NEW BERN CORP BDY
Jack Smith Cr
Evergreen Cem
NATIONAL CEM
Greenwood Cem
Daybeacon
OVERHEAD CABLE
OVERHEAD TELEPHONE LINE
Foul Area
Wildlife Landing
Ferry
Mills Branch
Antioch
Forest
Trailer Park
Drag Strip
Rowes Corner
Mill Swamp
Dickerson
Bridgeton
Bridgeton Cem
Pile
Stack
Dolphin
Spire
Piling
35°07'30"

Mapped by the U. S. Coast and Geodetic Survey
Edited and published by the Geological Survey

Control by NOS/NOAA and USCE(E)

Culture and drainage in part compiled from aerial photographs taken 1946
Topography by planetable surveys 1948. Field checked 1950

Polyconic projection. 10,000-foot grid ticks based on North Carolina coordinate system. 1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 13 meters south and 27 meters west as shown by dashed corner ticks

No distinction is made between dwellings, barns, commercial, and industrial buildings

There may be private inholdings within the boundaries of the National or State reservations shown on this map

UTM GRID AND 1983 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

7½° 133 MILS 1°15′ 22 MILS

Revisions shown in purple and woodland compiled by the Geological Survey in cooperation with North Carolina agencies from aerial photographs taken 1980 and other sources
This information not field checked. Map edited 1983

SCALE 1:24 000

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE PERIODIC TIDES IN THIS AREA ARE NEGLIGIBLE

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION

Heavy-duty — 4 LANE | 6 LANE — Light-duty
Medium-duty — 4 LANE | 6 LANE — Unimproved dirt
U. S. Route — State Route

N.C.
QUADRANGLE LOCATION

POLLOCKSVILLE, N. C.
SW/4 NEW BERN 15′ QUADRANGLE
35077-A2-TF-024

1950
PHOTOREVISED 1983
DMA 5554 II SW—SERIES V842

Mapped by the U. S. Coast and Geodetic Survey
Edited and published by the Geological Survey
Control by NOS/NOAA
Culture and shoreline in part compiled from aerial photographs taken 1946
Topography by planetable surveys 1948. Field checked 1950
Polyconic projection. 10,000-foot grid ticks based on North Carolina coordinate system. 1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue. 1927 North American Datum. To place on the predicted North American Datum 1983 move the projection lines 13 meters south and 27 meters west as shown by dashed corner ticks
Red tint indicates area in which only landmark buildings are shown
No distinction is made between dwellings, barns, commercial, and industrial buildings
There may be private inholdings within the boundaries of the National or State reservations shown on this map

UTM GRID AND 1983 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

7½° 133 MILS 1°11′ 21 MILS

Revisions shown in purple and woodland compiled by the Geological Survey in cooperation with State of North Carolina agencies from aerial photographs taken 1980 and other sources
This information not field checked. Map edited 1983
Purple tint indicates extension of urban area

SCALE 1:24 000

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS MEAN LOW WATER
THE RELATIONSHIP BETWEEN THE TWO DATUMS IS VARIABLE
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE PERIODIC TIDES IN THIS AREA ARE NEGLIGIBLE

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

N.C.
QUADRANGLE LOCATION

ROAD CLASSIFICATION

Heavy-duty — 4 LANE | 6 LANE — Light-duty
Medium-duty — 4 LANE | 6 LANE — Unimproved dirt
U. S. Route — State Route

NEW BERN, N. C.
SE/4 NEW BERN 15′ QUADRANGLE
35077-A1-TF-024

1950
PHOTOREVISED 1983
DMA 5554 II SE—SERIES V842

Appendix B

Laboratory Data

SUPERFUND

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

SAMPLE ANALYSES REQUEST

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

Site Number 250981928088 Field Sample Number 15979

Name of Site Textile New Bern Site Location New Bern, N.C.

Collected By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 1:10

RECEIVED
FEB 13 1991
SUPERFUND SECTION

Type of Sample:

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

Comments: 2. Neighbor Well (Acidified with 3ml HNO_3)

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
___ Arsenic		✓ Arsenic	<0.01	✓ Silver	<0.05
___ Barium		✓ Barium	<0.04	___ Sulfates	
___ Cadmium		✓ Cadmium	<0.005	___ Zinc	
___ Chromium		___ Chloride		___ Ph	
___ Lead		✓ Chromium	<0.01	___ Conductivity	
___ Mercury		___ Copper		___ TDS	
___ Selenium		___ Fluoride		___ TOC	
___ Silver		___ Iron			
		✓ Lead	0.006		
		___ Manganese			
		✓ Mercury	<0.0002		
		___ Nitrate			
		✓ Selenium	<0.005		

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received ___ Date Reported ___

Date Extracted ___ Date Analyzed ___

Reported By ___ Lab Number 029484 290

SUPERFUND

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

SAMPLE ANALYSES REQUEST

State Laboratory of Public Heal
P. O. Box 280
306 N. Wilmington Stre
Raleigh, 276

Site Number 25098192808 8 Field Sample Number 15980

Name of Site Texfi New Bern Site Location New Bern, N.C.

Collected By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 1:15

Type of Sample:

Environmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	3: Bkgr. Surface Soil
___ Surface Water (2)	___ Liquid (6)	
✓ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

RECEIVED
FEB 13 1991
SUPERFUND SECTION

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
✓ Arsenic	<0.01	✓ Arsenic	<2	✓ Silver	<20
✓ Barium	0.28	✓ Barium	38	___ Sulfates	
✓ Cadmium	<0.08	✓ Cadmium	<16	___ Zinc	
✓ Chromium	<0.10	___ Chloride		___ Ph	
✓ Lead	<0.50	✓ Chromium	<20	___ Conductivity	
✓ Mercury	<0.02	___ Copper		___ TDS	
✓ Selenium	<0.005	___ Fluoride		___ TOC	
✓ Silver	<0.10	___ Iron			
		✓ Lead	<20		
		___ Manganese			
		✓ Mercury	<0.1		
		___ Nitrate			
		✓ Selenium	<1		

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received ___ Date Reported ___

Date Extracted ___ Date Analyzed ___

Reported By ___ Lab Number 029485 590

C. Department of Human Resources
sion of Health Services

SAMPLE ANALYSES REQUEST

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

Number 25098192808 8 Field Sample Number 15981

Name of Site Textile New Bern Site Location New Bern, N.C.

Collected By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 1:30

Type of Sample:

Environmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	4. 2ft. deep soil Near TCA tank.
___ Surface Water (2)	___ Liquid (6)	
✓ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

RECEIVED
FEB 13 1991
SUPERFUND SECTION

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
✓ Arsenic	<0.01	✓ Arsenic	<2	✓ Silver	<20
✓ Barium	0.73	✓ Barium	47	Sulfates	
✓ Cadmium	<0.08	✓ Cadmium	<16	Zinc	
✓ Chromium	<0.10	Chloride		Ph	
✓ Lead	<0.50	✓ Chromium	31	Conductivity	
✓ Mercury	<0.02	Copper		TDS	
Selenium	<0.005	Fluoride		TOC	
✓ Silver	<0.10	Iron			
		✓ Lead	37		
		Manganese			
		✓ Mercury	<0.09		
		Nitrate			
		✓ Selenium	<1		

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
Gross Alpha	
Gross Beta	

Date Received ___ Date Reported ___

Date Extracted ___ Date Analyzed ___

Reported By ___ Lab Number 029486 590

Department of Human Resources
ion of Health Services

SAMPLE ANALYSES REQUEST

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

. mber 25098/928088 Field Sample Number 15987

me of Site Textil New Bern Site Location New Bern, N.C.

ected By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 2:10

pe of Sample:

Environmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	5.2 ft. deep soil North of Ldf.
___ Surface Water (2)	___ Liquid (6)	
✓ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

RECEIVED
FEB 13 1991
SUPERFUND SECTION

INORGANIC CHEMISTRY

Extractables		Total			
Parameter	Results mg/1	Parameter	Results mg/1	Parameter	Results mg/1
✓ Arsenic	<0.01	✓ Arsenic	<2	✓ Silver	<20
✓ Barium	0.77	✓ Barium	48	___ Sulfates	
✓ Cadmium	<0.08	✓ Cadmium	<16	___ Zinc	
✓ Chromium	<0.10	___ Chloride		___ Ph	
✓ Lead	<0.50	✓ Chromium	24	___ Conductivity	
✓ Mercury	<0.02	___ Copper		___ TDS	
✓ Selenium	<0.005	___ Fluoride		___ TOC	
✓ Silver	<0.10	___ Iron			
		✓ Lead	22		
		___ Manganese			
		✓ Mercury	<0.09		
		___ Nitrate			
		✓ Selenium	<1		

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received ___ Date Reported ___

Date Extracted ___ Date Analyzed ___

Reported By ___ Lab Number 029487 590

DIVISION OF HEALTH SERVICES
SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH

Chain of Custody Record

Hazardous Waste Materials

SUPERFUND

cation of Sampling: ___ Generator ___ Transporter ___ Treatment Facil
___ Storage Facility ___ Disposal Facility ___ Landfill
✓ Other: CERCLA

RECEIVED
JAN 11 1991
SUPERFUND SECTION

ompany's Name Textile New Bern Telephone( )
dress New Bern, N.C.
llector's Name Jack Butler Telephone(919) 733-2801
signature
ate Sampled 4 Dec. 1991 Time Sampled 1:00 - 2:10
ype of Process Generating Waste Textile
eld Information

eld Sample No. 14492 14493 14494 14495 14496 14497

ain. of Possession:

signature	title	inclusive dates
Jack Butler	Env. Eng.	4-5 Dec. 1990
William DeMent	Chemist	12-5-90

esults reported

signature	title	date
John L. Neal	Chemist	1-9-91

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

SUPERFUND

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 250981928088 Field Sample Number 14492

Name of Site Textfi New Bern Site Location New Bern, N.C.

Collected By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 1:00

Type of Sample:

Environmental	Concentrate	Comments
✓ Groundwater (1)	___ Solid (5)	L. Scarano Well
___ Surface Water (2)	___ Liquid (6)	
___ Soil (3)	___ Sludge (7)	(Acidified with 4 drops HCl)
___ Other (4)	___ Other (8)	No duplicate submitted

INORGANIC CHEMISTRY

RECEIVED JAN 11 1991 SUPERFUND SECTION

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

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received 12-5-90 BQ Date Reported 1-9-91

Date Extracted ___ Date Analyzed PT (VOC) 12-20-90

Reported By John L. Neal Lab Number 907487

#907487-907492

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

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

SAMPLE ANALYSES REQUEST

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

Si Jumber Z50981928088 Field Sample Number 14493

Name of Site Textí New Bern Site Location New Bern, N.C.

Collected By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 1:10

Type of Sample:

Environmental	Concentrate	Comments
✓ Groundwater (1)	___ Solid (5)	Z: Neighbor well
___ Surface Water (2)	___ Liquid (6)	
___ Soil (3)	___ Sludge (7)	(Acidified with 4 drops HCl)
___ Other (4)	___ Other (8)	

RECEIVED
JAN 11 1991
SUPERFUND SECTION

INORGANIC CHEMISTRY

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

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received 12-5-90 BD Date Reported

Date Extracted Date Analyzed PT(VOC) 12-20-90 nw

Reported By Lab Number 907488

DHS 3191 (Revised 7/85)
Hazardous Waste (Revised 7/87)

SUPERFUND

. C. Department of Human Resources
ivision of Health Services

SAMPLE ANALYSES REQUEST

State Laboratory of Public Heal
P. O. Box 280
306 N. Wilmington Stre
Raleigh, 276

ite Imber 250981928088 Field Sample Number 14494

Name of Site Textil New Bern Site Location New Bern, N.C.

Collected By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 1:10

Type of Sample:

Environmental	Concentrate	Comments
✓ Groundwater (1)	___ Solid (5)	2. Neighbor Well
___ Surface Water (2)	___ Liquid (6)	
___ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

RECEIVED
JAN 11 1991
SUPERFUND SECTION

INORGANIC CHEMISTRY

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

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received 12-5-90 BD Date Reported

Date Extracted 12-14-90 BD, NW, AA Date Analyzed 12-19-90 BD

Reported By Lab Number 907489

DHS 3191 (Revised 7/85)

Department of Human Resources
n of Health Services

SAMPLE ANALYSES REQUEST

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

Number Z50981928088 Field Sample Number 14495

or Site Texfi New Bern Site Location New Bern, N.C.

cted By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 1:15

of Sample:

nvironmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	3, BKGr, Surface Soil
___ Surface Water (2)	___ Liquid (6)	
✓ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

RECEIVED
JAN 11 1991
SUPERFUND SECTION

INORGANIC CHEMISTRY

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

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
Gross Alpha	
Gross Beta	

Date Received 12-5-90 BD Date Reported

Date Extracted 12-17-90 BD Date Analyzed BNA 12-19-90 BD PT 1-2-91 mw

Reported By Lab Number 907490

DHS 3191 (Revised 7/85)

Department of Human Resources
on of Health Services

SAMPLE ANALYSES REQUEST

P. O. Box 28047
306 N. Wilmington Street
Raleigh, 27611

Number Z5098192808 8 Field Sample Number 14496

o. ite Textile New Bern Site Location New Bern, N.C.

ected By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 1:30

of Sample:

nvironmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	4.2ft. deep soil near TCA tank.
___ Surface Water (2)	___ Liquid (6)	
✓ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

RECEIVED
JAN 11 1991
SUPERFUND SECTION

INORGANIC CHEMISTRY

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

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
Gross Alpha	
Gross Beta	

Date Received 12-5-90 BD Date Reported

Date Extracted 12-17-90 BD Date Analyzed BNA 12-19-90 BD PT 1-2-91 MW

Reported By Lab Number 907491

DHS 3191 (Revised 7/85)
Hazardous Waste (Revised 7/87)

C. Department of Human Resources
ision of Health Services

SAMPLE ANALYSES REQUEST

State Laboratory of Public Healt
P. O. Box 2804
306 N. Wilmington Stree
Raleigh, 2761

e Number 250981928088 Field Sample Number 14497

ame of Site Texfi New Bern Site Location New Bern, N.C.

ollected By Jack Butler ID# 44 Date Collected 4 Dec 1990 Time 2:10

pe of Sample:

Environmental	Concentrate	Comments
___ Groundwater (1)	___ Solid (5)	5.2ft. deep soil North of Ldf.
___ Surface Water (2)	___ Liquid (6)	
✓ Soil (3)	___ Sludge (7)	
___ Other (4)	___ Other (8)	

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JAN 11 1991
SUPERFUND SECTION

INORGANIC CHEMISTRY

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

ORGANIC CHEMISTRY

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

MICROBIOLOGY

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

RADIOCHEMISTRY

Parameter	Results PCi/1
___ Gross Alpha	
___ Gross Beta	

Date Received 12-5-90 BD Date Reported

Date Extracted 12-17-90 BD Date Analyzed BNA 12-19-90 BD PT 12-9 mw

Reported By Lab Number 907492

DHS 3191 (Revised 7/85)
Hazardous Waste (Revised 7/87)

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	907489	907490	907491	907492		
	FIELD #	14494	14495	14496	14497		
COMPOUND	TYPE	(1)	(3)	(3)	(3)	( )	( )
	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	↓	↓	↓	↓	↓		
hexachlorobutadiene	↓	↓	↓	↓	↓		
4-chloro-m-cresol	↓	↓	↓	↓	↓		
hexachlorocyclopentadiene	↓	↓	↓	↓	↓		
2,4,6-trichlorophenol	↓	↓	↓	↓	↓		
2/ 2-chloronaphthalene	↓	↓	↓	↓	↓		
acenaphthylene	↓	↓	↓	↓	↓		
dimethyl phthalate	↓	↓	↓	↓	↓		
2,6-dinitrotoluene	↓	↓	↓	↓	↓		
acenaphthene	↓	↓	↓	↓	↓		
2,4-dinitrophenol	50/1650						
2,4-dinitrotoluene	10/330						
4-nitrophenol	50/1650						
fluorene	10/330						
4-chlorophenylphenylether	↓						
diethyl phthalate	↓						
4,6-dinitro-o-cresol	50/1650						
diphenylamine	↓						
azobenzene	↓						
4-bromophenylphenylether	10/330						
hexachlorobenzene	10/330						
pentachlorophenol	50/1650						
phenanthrene	10/330						
anthracene	↓						
dibutyl phthalate	↓						
fluoranthene	↓	✓	✓	✓	✓		

MDL
H_2O/SOIL

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

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JAN 11 1991
SUPERFUND SECTION

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	907489	907490	907491	907492		
	FIELD #	14494	14495	14496	14497		
COMPOUND	TYPE	(1)	(3)	(3)	(3)	( )	( )
	UNITS	µg/l ~~mg/kg~~	~~µg/l~~ µg/kg	~~µg/l~~ µg/kg	~~µg/l~~ µg/kg	µg/l µg/kg	µg/l µg/kg
pyrene	10/330	U	U	U	U		
benzidine	50/1650						
butyl benzyl phthalate	10/330						
benz(a)anthracene							
chrysene							
3,3-dichlorobenzidine	50/1650						
bis(2-ethylhexyl)phthalate	10/330						
di-n-octyl phthalate	10/330						
benzo(b)fluoranthene	50/1650						
benzo(k)fluoranthene							
benzo(a)pyrene							
indeno(1,2,3-cd)pyrene							
dibenzo(a,h)anthracene							
benzo(g,h,i)perylene							
aniline	50/1650	U	U	U	U		
benzoic acid							
benzyl alcohol							
4-chloroaniline							
dibenzofuran	10/330						
2-methylnaphthalene							
2-methylphenol							
4-methylphenol							
2-nitroaniline	50/1650						
3-nitroaniline							
4-nitroaniline							
2,4,5-trichlorophenol							

RECEIVED
JAN 1 1 1991
SUPERFUND SECTION

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
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

Laboratory No. 907487 PURGEABLE COMPOUNDS Date of Analysis 12/19-12/20/90

COMPOUND	µg/l
Dichlorodifluoromethane	U
Chloromethane	
✓Vinyl Chloride	
Bromomethane	
Chloroethane	
Trichlorofluoromethane	
✓1,1-Dichloroethylene	1K
Methylene Chloride	1K
tert-Butyl Methyl Ether	U
(Trans)1,2-Dichloroethylene	
Isopropyl ether	
1,1-Dichloroethane	53.7
2,2-Dichloropropane	U
(Cis) 1,2-Dichloroethylene	
Chloroform	
(BCM) Bromochloromethane	
✓1,1,1-Trichloroethane	
1,1-Dichloropropene	
✓Carbon Tetrachloride	
✓Benzene	
✓1,2-Dichloroethane	
✓Trichloroethylene	
1,2-Dichloropropane	
Bromodichloromethane	
Dibromomethane	
Toluene	
1,1,2-Trichloroethane	
Tetrachloroethene	
1,3-Dichloropropane	
Dibromochloromethane	
1,2-Dibromoethane (EDB)	
1-Chlorohexane	
Tetrahydrofuran	6.0

COMPOUND	µg/l
Chlorobenzene	U
Ethylbenzene	
1,1,1,2-Tetrachloroethane	
p-Xylene	
m-Xylene	
o-Xylene	
Styrene	
Bromoform	trace
Isopropylbenzene	U
1,1,2,2-Tetrachloroethane	
Bromobenzene	
n-Propylbenzene	
1,2,3-Trichloropropane	
2-Chlorotoluene	
1,3,5-Trimethylbenzene	
4-Chlorotoluene	
(Tert) Butyl Benzene	
Pentachloroethane	
1,2,4-Trimethylbenzene	
(Sec) Butyl Benzene	
p-Isopropyltoluene	
1,3-Dichlorobenzene	
✓1,4-Dichlorobenzene	
n-Butylbenzene	
1,2-Dichlorobenzene	
(Bis) 2 Chloroisopropyl Ether	
1,2-Dibromo-3 Chloropropane	
1,2,4-Trichlorobenzene	
Hexachlorobutadiene	
Naphthalene	
1,2,3-Trichlorobenzene	

COMMENTS: Unidentified peaks present

MDL - Minimum Detection Limit for water (EPA Method 502.2), is 1.0 µg/l.

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.
NA - Not analyzed.
1/ - Tentative identification.
✓ - Regulated VOC
T - Trihalomethane

N.C. Division of Health Services
DHS 3068-O (1/89 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

Laboratory No. 907488 PURGEABLE COMPOUNDS Date of Analysis 12/19/90

COMPOUND	µg/l
Dichlorodifluoromethane	U
Chloromethane	
✓Vinyl Chloride	
Bromomethane	
Chloroethane	
Trichlorofluoromethane	
✓1,1-Dichloroethylene	11.5
Methylene Chloride	U
tert-Butyl Methyl Ether	
(Trans) 1,2-Dichloroethylene	
Isopropyl ether	
1,1-Dichloroethane	607.9
2,2-Dichloropropane	U
(Cis) 1,2-Dichloroethylene	
Chloroform	
(BCM) Bromochloromethane	
✓1,1,1-Trichloroethane	
1,1-Dichloropropene	
✓Carbon Tetrachloride	
✓Benzene	
✓1,2-Dichloroethane	
✓Trichloroethylene	
1,2-Dichloropropane	
Bromodichloromethane	
Dibromomethane	
Toluene	
1,1,2-Trichloroethane	
Tetrachloroethene	
1,3-Dichloropropane	
Dibromochloromethane	
1,2-Dibromoethane (EDB)	
1-Chlorohexane	
Tetrahydrofuran	28.9
* P-Dioxane	150.0

COMPOUND	µg/l
Chlorobenzene	U
Ethylbenzene	
1,1,1,2-Tetrachloroethane	
p-Xylene	
m-Xylene	
o-Xylene	
Styrene	
Bromoform	1K
Isopropylbenzene	U
1,1,2,2-Tetrachloroethane	
Bromobenzene	
n-Propylbenzene	
1,2,3-Trichloropropane	
2-Chlorotoluene	
1,3,5-Trimethylbenzene	
4-Chlorotoluene	
(Tert) Butyl Benzene	
Pentachloroethane	
1,2,4-Trimethylbenzene	
(Sec) Butyl Benzene	
p-Isopropyltoluene	
1,3-Dichlorobenzene	
✓1,4-Dichlorobenzene	
n-Butylbenzene	
1,2-Dichlorobenzene	
(Bis) 2 Chloroisopropyl Ether	
1,2-Dibromo-3 Chloropropane	
1,2,4-Trichlorobenzene	
Hexachlorobutadiene	
Naphthalene	
1,2,3-Trichlorobenzene	

COMMENTS: Unidentified peaks present

MDL - Minimum Detection Limit for water (EPA Method 502.2), is 1.0 µg/l.

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.
NA - Not analyzed.
1/ - Tentative identification.
✓ - Regulated VOC
T - Trihalomethane

* unable to confirm p-dioxane by PT/GC/MS due to detection limit.

N.C. Division of Health Services
DHS 3068-0 (1/89 Laboratory)

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

ORGANIC CHEMICAL ANALYSIS

PURGEABLE COMPOUNDS	LAB NO	907490	907491	907492			
	FIELD #	14495	14496	14497			
COMPOUND	TYPE	(3)	(3)	(3)	( )	( )	( )
	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	10 ppb	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			
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.
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

References

REFERENCES

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7. Memo from John McConney, NC Superfund Section to File, 29 March 1989.

8. Memo from Jack Butler, NC Superfund Section to File, 26 February 1987.

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Ref. 1

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

December 10, 1990

Mr. Earl Bozeman
EPA NC CERCLA Project Officer
Air and Hazardous Material Division
345 Courtland Street, N.E.
Atlanta, GA 30365

SUBJECT: Site Investigation Trip Report
Texfi New Bern
Bosch Blvd.
NCD 981 928 088
New Bern, Craven County, NC 27864

Dear Mr. Bozeman:

The Texfi New Bern site is located at the end of Bosch Blvd. (SR 1317) approximately 0.50 miles from its intersection with NC 55 in New Bern, Craven County, NC. The county code for Craven County is 25 and it is in the first congressional district. The latitude is 35° 08' 15" and the longitude is 77° 06' 42".

From 1972 until 1980 Texfi Industries, Inc. operated a polyester manufacturing facility at this site. Prior to 1972, the site was vacant land. Texfi Industries closed in 1980 and the facility was not used until 1987 when Amital Spinning Corporation reopened the facility. Amital Spinning presently operates on the site and leases this facility from Texfi. Texfi Industries appears to have accepted responsibility for any environmental problems presently at the site that can be related to their years of operation.

On 4 December, Mr. Jerry Curry and Mr. Jack Butler, North Carolina Superfund Section, performed a Site Investigation visit to the subject site. Mr. James Ipock, Amital Spinning Corporation, was present during this visit and provided background information on the site, and conducted a tour of the site. Mr. Rick Griffiths, C.T. Main Inc. (704/529-6246, ext. 4706), the environmental contractor for Texfi Industries, was also contacted by

phone during this visit. C.T. Main has prepared four environmental reports dated March 1987, July 30, 1987, January 15, 1988, and October 11, 1989, addressing contamination at the site. Mr. Griffiths agreed to make copies of these reports and forward them to the North Carolina Superfund Section Office. During the Site Investigation visit five areas of concern were discussed; (1) an underground storage tank (UST) used to store trichloroethane (TCA) near monitoring well 4A (MW-4A), (2) a smaller above ground tank used to store TCA near the extreme northeast corner of the plant building, (3) the presence of Dowtherm in groundwater near recovery well 9 (RW-9), (4) a landfill west of the facility, and (5) possible contamination in two residential wells approximately 1,000 to 1,500 feet northeast of the facility.

Mr. Ipock reported that the UST near MW-4 was removed prior to Amital occupying the site in 1987. Mr. Griffiths reported that a small spill of TCA had also occurred in this same area. A TCA plume has been identified in this area extending southeast under the plant building.

The smaller above ground TCA tank near the extreme northeast corner of the plant building has been removed since 1987 and is presently stored on site southwest of the main plant building. Mr. Ipock reported that no soil was removed during this above ground tank removal, however, the cradle holding the tank was removed and some minor regrading of the site was done.

Mr. Ipock reported that the Dowtherm was discovered after an odor was noted in soil from this area. RW-9 was installed in this area to remove the Dowtherm. The groundwater extraction and remediation program is scheduled to begin in about July 1991.

Mr. Ipock reported that approximately 900 drums were removed from the top of the ground in the landfill area west of the facility in about 1980 or 1981. These drums were moved to a concrete pad at the site and the contents were analyzed. Most were found to contain only rainwater. Mr. Ipock, who worked for Texfi Industries at the time, reported that EPA oversaw the drum removal. Mr. Griffiths reported that he thought Delta Environmental of Charlotte, North Carolina was the contractor for the drum removal. Neither Mr. Ipock nor Mr. Griffiths were associated with the site when the drums were removed from the site, however, Mr. Ipock reported that he though at least some of the drums were shipped to Waste Recovery Inc. in Alabama.

Mr. Ipock reported that Mr. Richard Powers with the North Carolina Division of Environmental Management (DEM) Washington Regional Office had installed groundwater monitoring wells near the wells at the nearby residences and between the residences and the plant site. Reportedly, DEM has sampled both the residential wells and the monitoring wells.

Mr. Ipock and Mr. Griffiths reported that Texfi Industries is working with the NC DEM Washington Regional Office to remediate groundwater contamination present at the site. During the tour of the site a number of monitoring wells were noted on the site. Originally water from these wells was to be treated by air stripping and discharged to surface water under an NPDES permit. These plans are being modified however to allow discharge of the treated water to an infiltration field under a non-discharge permit. As previously mentioned, this groundwater extraction system is scheduled to begin operation in about July 1991.

During the Site Investigation Visit on 4 December 1990, an attempt was made to sample the two nearby residential wells. One well is reportedly approximately 50 feet deep and the other well is approximately 100 feet deep. Due to low yield, both residences have been connected to community water from an unthreatened source although both wells are reportedly operational and used for outside uses such as washing cars, watering lawns, etc. Also due to low yield, only one volatile organic analysis (VOA) sample could be collected from the 50 ft. deep well. A complete set of samples for volatile, semi-volatile, and acid/base/neutral extractable, organic and inorganic analysis was collected from the 100 ft. deep well. These samples were grab samples from an outside faucet with minimum purging of the system due to the low yields of the wells. A background surface soil sample was collected approximately 30 ft. north of Bosch Blvd. Subsurface soil samples were collected from a depth of approximately 2 ft. near the area of the former location of the above ground TCA tank near the northeast corner of the plant building and from the landfill area. Samples were submitted to the North Carolina Division of Health Services Laboratory on 5 December 1990. Laboratory results are pending.

If you have any questions or need additional information, please contact me at (919) 733-2801.

Sincerely,

Jack Butler

Jack Butler
Environmental Engineer
Superfund Section

JB/ds/texfi.3-5

26 November 1991

Ref. 2

TO: File

FROM: Jack Butler

SUBJECT: Texfi, New Bern
NCD981928088

Mr. James Ipock, Amital Spinning (919/636-3435), was contacted on this date to obtain an update on the subject site. Mr. Ipock reported that Amital Spinning has exercised its lease option and purchased 74 acres of the property from Texfi Industries. The purchased property includes the facility and land along Bosch Avenue east to NC 55. As part of the purchase agreement, Texfi Industries has accepted financial responsibility for correcting any environmental problems on the site resulting from their former operation. Texfi Industries also maintains title to 100 acres of adjoining land, including the former landfill area west of the facility. Presently, approximately 200 to 225 employees of Amital Spinning work at the site.

When Mr. Ipock was asked about the pumping and treating of groundwater contaminated with Dowtherm, he responded that the equipment was being assembled to be placed on the pad at the site. An infiltration gallery for the treated groundwater has been approved by the Division of Environmental Management (DEM). This infiltration gallery will be located in the wooded area on the north side of the plant. Mr. Ipock added that the groundwater remediation was planned to begin in December 1991, however; several of the extraction wells had gone dry due to the water table on the site dropping approximately 8 feet. This drop in the water table is believed to be due to mining operations north west of the site.

JB/dk/10

Ref. 3

TEXFI INDUSTRIES
PRELIMINARY GROUNDWATER ASSESSMENT

3136-8-1000 March 17, 1987

Robert L. Martin

Robert Martin, P.G.
Geologist

Henry W. Lyon

Henry W. Lyon
Hydrogeologist

MAIN
1893

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PRELIMINARY GROUNDWATER ASSESSMENT
FORMER TEXFI PLANT
NEW BERN, NORTH CAROLINA

1. INTRODUCTION

This report summarizes the findings of a preliminary groundwater assessment investigation for the plant site formerly owned by Texfi Industries in New Bern, North Carolina. The investigation was initiated December 15, 1986 by authorization of Mr. John E. Tate, representative for Texfi Industries in accordance with the Chas. T. Main, Inc. (MAIN) proposal to Mr. Tate dated December 11, 1986.

Law Engineering Testing Company (LETCo) was contracted in August, 1986 by Amital Spinning Corporation to perform an environmental audit and preliminary groundwater assessment at the former Texfi plant.

As a result of this assessment, groundwater contamination was identified. MAIN was contracted to provide additional horizontal contaminant delineation in the upper aquifer, conduct initial contaminant screening in the Castle Hayne Limestone aquifer, and quantify basic hydrological parameters in an attempt to identify possible pathways of migration in which contaminated groundwater might travel.

The following is a general description of the investigation conducted during this phase of groundwater assessment. Four monitoring wells were installed, three in the upper aquifer and

one in the Castle Hayne Limestone aquifer. Geologic cross sections were generated from drilling logs and soil samples obtained during drilling. Soil and water samples collected were analyzed for 1,1,1-trichloroethane and 1,1-dichloroethane on the basis of analyses from previously conducted studies. Static water levels were measured and falling head hydraulic conductivity tests were conducted to estimate groundwater/contamination flow directions and velocities.

2. BACKGROUND

A. Site Location

The former Texfi plant is located on the northwest side of Stanley Boulevard (SR 1304), 0.4 miles southwest of State Highway 55 in New Bern, North Carolina (Figure 1). The property is bordered to the southwest by the Atlantic and East Carolina Railway easement and to the northeast by State Highway 55.

A revised site plan indicating the position of existing structures, drainage ditches, and monitoring well locations is shown on drawing 3136-8-1000-R1.

B. Sources of Contamination

During the years of operation (1971-1981), Texfi maintained two above ground trichloroethane storage tanks which were located on the north side of the plant, adjacent to the outside back wall of the manufacturing building. One of these tanks has been removed. The locations of the existing and removed trichloroethane tanks are shown on drawing 3136-8-1000-R1. Following the termination of fiber production at the Texfi plant, the trichloroethane tanks were drained and piping disconnected. According to discussions with representatives of Texfi, a spill located in the vicinity of wells 4A and 6 probably occurred during dismantling operations.

A second area of contamination (1,1 dichloroethane) has been found to exist in the vicinity of well 3A. Texfi

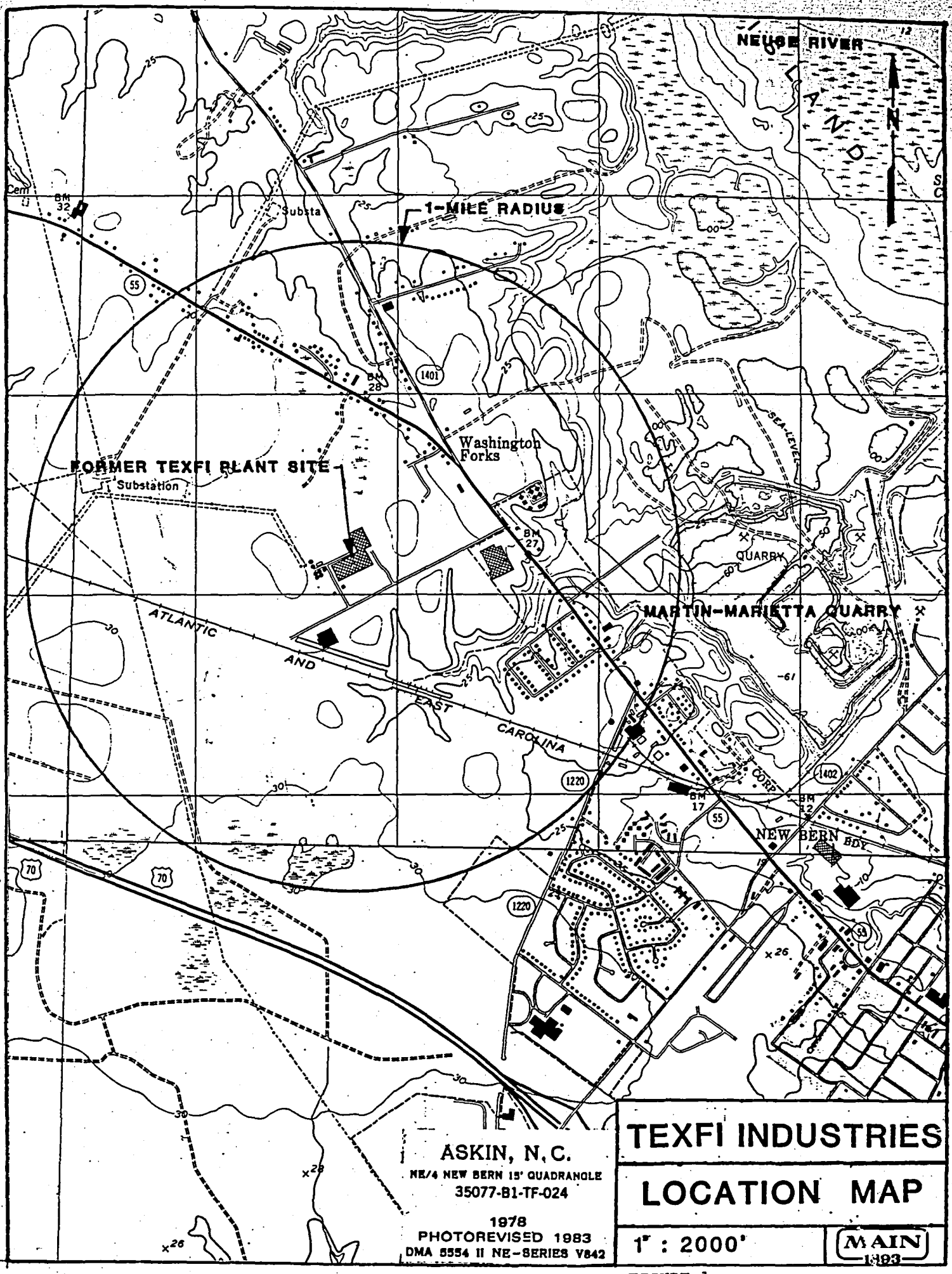
NEUSE RIVER
N
1-MILE RADIUS
Substa
Cem
BM 32
55
1401
BM 28
Washington Forks
FORMER TEXFI PLANT SITE
Substation
BM 27
QUARRY
MARTIN-MARIETTA QUARRY
ATLANTIC AND EAST CAROLINA
1220
BM 17
55
1402
NEW BERN BDY
70
70
1220
55
TEXFI INDUSTRIES
LOCATION MAP
ASKIN, N.C.
NE/4 NEW BERN 15' QUADRANGLE
35077-B1-TF-024
1978
PHOTOREVISED 1983
DMA 5554 II NE-SERIES V842
1" : 2000'
MAIN
1993

FIGURE 1

has indicated that this compound was not used in plant operations. Although 1,1-dichloroethane is a degradation product of 1,1,1-trichloroethane, it is hydrogeologically improbable that contamination in the vicinity of well 3A is the result of migration and degradation of trichloroethane spilled in the vicinity of well 6.

C. Previous Investigations

Law Engineering Testing Company (LETCo) conducted an environmental audit in 1986. During a preliminary groundwater assessment, nine (9) permanent and temporary monitoring wells were installed and analyses were conducted on water samples collected from five of the wells. One sample was analyzed for selected volatile organic compounds, metals, oil and grease residue, pesticides, PCB's, semi-volatiles, and total organic carbon. Four wells were analyzed for volatile organics, metals and oil and grease residues.

The report submitted by LETCo on November 14, 1986, indicated two areas of groundwater contamination. At the well 4A location, trichloroethane, dichloroethane, and dichloroethene were detected at concentrations of 370, 240, and 16 ppm respectively. Laboratory analyses conducted on groundwater collected from well 3A yielded concentrations of 0.14, 0.062, and 0.017 for dichloroethane, chloroethane, and dichloroethene respectively. Because the previous investigation only identified contamination locations and did not include determination of vertical and horizontal hydraulic conductivities, no estimates of contaminant transport velocities were given. However, groundwater elevation data

indicated that the general direction of groundwater flow was toward the northeast.

D. Drilling and Well Installation Program

MAIN utilized wells drilled by LETCo to gather water table data. This data was used to identify locations for new monitoring wells. Four (4) permanent groundwater monitoring wells were installed as a part of MAIN's investigation in the locations indicated on drawing 3136-8-1000-R1. The wells were constructed and permitted in accordance with appropriate state regulations. All wells were constructed with PVC casings, manufactured screens, clean sand packing in the screened intervals, bentonite seals, grout seals, concrete collars, and lockable protective caps. Well completion records are included in Appendix A.

Well 6 was installed within 8 feet of Well 4A to a depth of 40.5 feet below grade. Well 6 was screened in the Castle Hayne Formation to collect groundwater samples for analysis and to measure hydraulic head differences between the Castle Hayne and the surficial sediments. Well 4A is screened in the surficial sediments. See drawing 3136-8-1000-R1 for well locations.

Well 7 was located approximately 110 feet north of Well 6 and was screened in the surficial sediments. Water table measurements and groundwater samples were collected from this well.

Wells 8 and 9 were installed on the east and south side of the plant building respectively. Both wells were utilized for potentiometric information and plume delineation.

Wells 7, 8, and 9 were installed in boreholes which were advanced by rotary method utilizing hollow stem augers with split spoon soil samples taken at 2.5 foot intervals. The borehole for Well 6 was advanced to auger refusal then a 4 inch diameter PVC casing was lowered into the hole and grouted in place. The grout was allowed to solidify then a NQ size rock core was drilled to 40.5 feet. The 2 inch diameter well was constructed inside the 4 inch diameter casing. The larger diameter casing allowed the hole to remain open and prevented contamination from moving down the bore hole into the lower formations.

Following construction, all wells were developed by hand bailing and repeated surging of water through the sand filter. Bailing continued until the water in all wells was clear.

E. Groundwater Sampling and Analysis

At completion of well development, all wells were allowed to recover for 48 hours. Wells 7, 8 and 9 were purged one well volume prior to sampling. Well 6 was purged 10 volumes because tap water was used by the drill rig to core and clean out the hole during construction of the well.

Existing Wells 3A and 4A were developed and purged prior to sampling.

All wells were allowed to recover overnight following purging. At the time of sampling, water levels, specific conductance, pH, and temperature were recorded. Samples were collected in septum top vials, packed in ice and transported to MAIN's analytical laboratory within 24 hours.

Each water sample was analyzed for 1,1,1-trichloroethane and 1,1 dichloroethane. Field and laboratory analytical results are summarized in Table 1.

Of the wells screened in the surficial sediments, Wells 3A, 4A, 8, and 9 detected 1,1 dichloroethane (DCA) in the groundwater.

1,1,1-trichloroethane (TCA) was detected in Wells 4A and 9. The highest concentrations for both parameters were encountered in Well 4A at 219 mg/l for DCA and 146 mg/l for TCA. Well 9 contained 5.08 mg/l of DCA and 5.83 mg/l of TCA.

Groundwater samples taken from Well 6 showed .055 mg/l of DCA. No TCA was detected in this well. Laboratory data sheets showing groundwater analytical results are included in Appendix B.

F. Soil Sampling and Analysis

Four soil samples were taken during the drilling operations to better determine the extent of contamination

TABLE - 1

TEXFI INDUSTRIES
LABORATORY ANALYSIS SUMMARY

WATER SAMPLES

WELL	CONC. (PPM) 1,1 DICHLOROETHANE	CONC. (PPM) 1,1,1 TRICHLOROETHANE	pH	SC (umohs)	TEMP (DEG C)
3A	0.37	<.001	5.96	1150	14.0
4A	219.0	146.0	4.95	3600	15.2
6	0.055	<.001	6.93	580	15.5
7	<.005	<.001	6.39	805	15.3
8	0.357	<.001	5.56	1000	15.2
9	5.080	5.83	5.33	850	15.2

SC - SPECIFIC CONDUCTIVITY (umhos/cm)

SOIL SAMPLES

WELL OR LOCATION	DEPTH (FEET)	CONC. (MG/KG) 1,1 DICHLOROETHANE	CONC. (MG/KG) 1,1,1 TRICHLOROETHANE
6	4.0 - 4.5'	<.01	<.005
6	10.5 - 11.0'	0.012	<.005
S-1	1.0'	<.01	0.006
S-2	1.0'	<.01	<.005

above the saturated zone. Two soil samples were taken from split spoon samples in Wells 6 and analyzed for DCA and TCA. One sample taken from 4.0-4.5 feet below grade detected no contamination. The sample from 10.5-11.0 detected .012 mg/kg of DCA.

Two other soil samples taken in the vicinity of Well 6 at a depth of 1 foot detected no contamination. Analytical results for soil samples are found in Table 1. Laboratory data sheets showing analytical results for soil samples are included in Appendix B.

G. Hydrological Field Testing

Hydraulic parameters for the different strata underlying the former Texfi plant were determined by falling head permeability tests performed in the new permanent monitoring wells installed during this phase and on existing Wells 3A and 4A. This test involved measuring the initial water level in the well then instantaneously introducing a sufficient volume of clean water to the well to bring the water level to the top of the casing. Measurements of the falling water level were taken at timed intervals.

Tests conducted on Wells 7 and 9 yielded hydraulic conductivities of 3.3×10^{-5} cm/sec and 2.4×10^{-4} cm/sec, respectively. See Table 2 for a summary of field hydraulic data.

Permeability tests conducted on Wells 6 and 8 produced inconclusive data. The permeability of the stratum screened in each well was too high to accurately deter

mine conductivity using this test method. Hydraulic conductivities for these strata were, therefore, estimated from field tests and published data.

3. HYDROGEOLOGY

A. Regional Hydrogeology

The former Texfi plant is situated in the eastern portion of the Coastal Plain physiographic province of North Carolina. In the subsurface, the Coastal Plain is characterized by a wedge of sediments which thickens in the seaward direction from a thin veneer along the western margin. The sediments which compose this wedge may be divided into several hydrogeologic units depending on differences in hydraulic conductivity and media properties. These units dip eastward at a gradient slightly greater than the topography.

Both phreatic and confined aquifer conditions exist in the region. Phreatic conditions are typically found in the younger unconsolidated post-Miocene sediments of Pliocene, Pleistocene, and Holocene age, which overlie the older lithified sediments. The groundwater for phreatic aquifers is generally derived from localized precipitation and subsequent infiltration. Precipitation averages 50 inches yearly in the New Bern area.

Groundwater also occurs in confined or leaky-confined aquifers. Primary recharge for these aquifers occurs in locations where the aquifer is sufficiently close to the surface to receive rainfall infiltration. These recharge areas are regional in size and are positioned

TABLE - 2

TEXFI INDUSTRIES
WELL AND GROUNDWATER DATA

WELL	BOTTOM ELEV	T/S ELEV	B/S ELEV	SWL (2-17-87)	HYDRAULIC CONDUCTIVITY CM/SEC (FT/D)
1	9.70	19.70	9.70	25.73	NOT MEASURED
1A	9.10	19.10	9.10	14.94	NOT MEASURED
2	9.80	19.80	9.80	23.02	NOT MEASURED
2A	9.10	19.10	9.10	19.55	NOT MEASURED
3	10.70	20.70	10.70	24.92	NOT MEASURED
3A	9.80	19.80	9.80	22.17	1.4 E-04 (0.40)
4	8.50	18.50	8.50	17.14	NOT MEASURED
4A	9.60	19.60	9.60	14.85	7.5 E-05 (0.21)
5	12.30	22.30	12.30	25.69	NOT MEASURED
6	-11.53	-1.86	-10.61	10.85	est 3.53 E-02 (100.0)
7	6.94	16.61	7.86	16.86	3.3 E-05 (0.094)
8	7.00	16.67	7.92	11.19	est 3.0 E-03 (8.5)
9	6.70	16.37	7.62	14.42	2.4 E-04 (0.68)

TOS - TOP OF SCREEN ELEVATION
BOS - BOTTOM OF SCREEN ELEVATION
SWL - STATIC WATER LEVEL ELEVATION
est - ESTIMATED

ALL ELEVATIONS ARE IN FEET RELATIVE TO MEAN SEA LEVEL

NOTE: 1.4 E-04 IS EQUIVALENT TO 1.4×10^{-4}

west of New Bern and hydrographically upgradient. It is not unusual for the potentiometric surface of these aquifers to be located near or above the topographical surface. Secondary recharge occurs through infiltration of water stored in overlying material.

In the New Bern area, groundwater within 100 feet of the surface may be found in three water bearing stratigraphic units; the post-Miocene sediments, the Yorktown Formation, and the Castle Hayne Formation. Groundwater in each unit apparently moves in the general direction of the Neuse River. Preliminary calculations, using published hydraulic conductivity data for the Castle Hayne Limestone, indicate that the natural potentiometric surface in the vicinity of the former Texfi plant has been modified to some degree by the continuing operations at the nearby Martin Marietta Quarry; however, the effect of the quarry on contaminant miration and velocity can not be calculated without additional data.

According to Craven County Environmental Health personnel, city water is supplied for residential and industrial use in an area which extends from the city of New Bern along State Highway 55 to the intersection at Washington Forks. Assuming that production wells were abandoned upon connection with city water supply lines, the area which is downgradient of the site should be relatively inactive with respect to residential or industrial groundwater usage. However, it is possible several downgradient wells are still functioning. Craven County Environmental Health has also informed

MAIN that plans have been made to extend city water further to the northwest.

Existing water supply wells within 1 mile of the former Texfi plant are shown on Figure 2 and associated well data are presented in Table 3. According to the North Carolina Department of Natural Resources and Community Development Division of Environmental Management (DEM), not all water supply wells are properly permitted. It is probable that a number of unpermitted wells may exist within 1 mile of the former Texfi plant.

B. Site Hydrogeology

1. Stratigraphic and Hydrogeologic Unit Descriptions

Subsurface material at the former Texfi plant may be subdivided into three stratigraphic units; the Castle Hayne Formation (Eocene), the Yorktown Formation (Miocene), and a sequence of post-Miocene sediments. Refer to the geologic cross sections (Drawing 3136-8-1000-R2) and boring logs (Appendix C) throughout the following discussion.

a. Castle Hayne Formation

The Castle Hayne Limestone is the oldest material encountered at the study area. In Well 6, the Castle Hayne was encountered at a depth of 35.5 ft. (Elev -7.2 ft.). Based on observations at the nearby Martin Marietta quarry, it appears the upper contact of the Castle Hayne is quite uniform throughout the

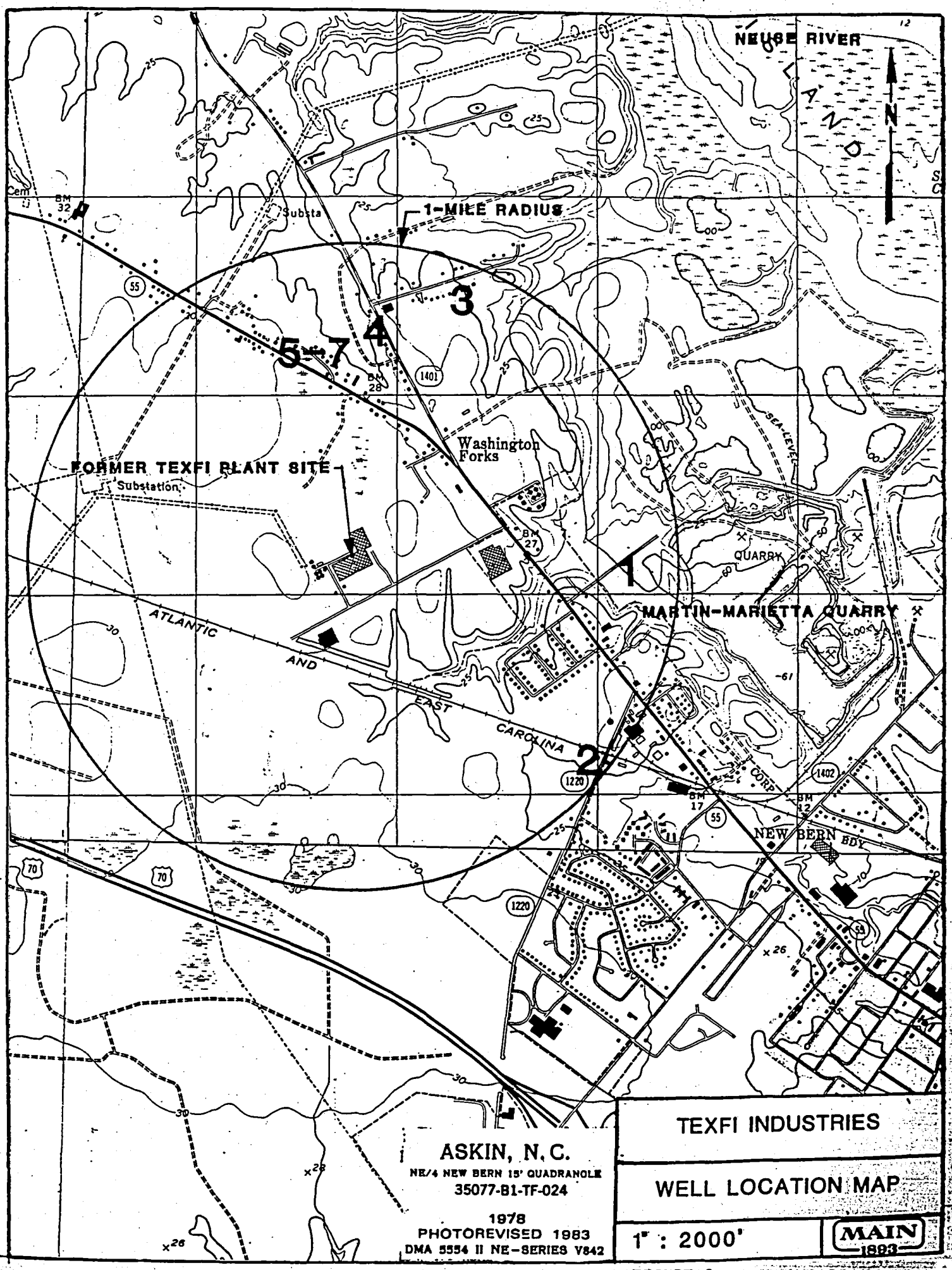
NEUSE RIVER
N
1-MILE RADIUS
3
4
5-7
1
2
FORMER TEXFI PLANT SITE
Substation
Washington Forks
MARTIN-MARIETTA QUARRY
QUARRY
ATLANTIC AND EAST CAROLINA
NEW BERN
ASKIN, N.C.
NE/4 NEW BERN 15' QUADRANGLE
35077-B1-TF-024
1978
PHOTOREVISED 1983
DMA 5554 II NE-SERIES V842
TEXFI INDUSTRIES
WELL LOCATION MAP
1" : 2000'
MAIN
1893

FIGURE 2

TABLE - 3

RECORDED WATER WELLS WITHIN ONE MILE
OF THE FORMER TEXFI PLANT

MAP LOCATION	OWNER	GENERAL LOCATION	PRODUCTION INTERVAL	TOTAL DEPTH	YIELD (GPM)	USE
1	MARTIN MARIETTA	HIGHWAY 55 WEST	45-55'	45'	-	MONITORING
2	READY MIX CONCRETE	SR 1220	47-87'	87'	220	COMMERCIAL
3	DOODLE LEE CONTR.	BRAIRWOODS DR.	31-45'	45'	15	DOMESTIC
4	CARPENTER ASSOC. BUILD.	SPRING GARDEN RD.	45-55'	55'	15	DOMESTIC
5	PEARL JONES	PLEASANT HILL	35-45'	45'	15	DOMESTIC
6	CLARK RESIDENCE	PLEASANT HILL	35-45'	45'	15	DOMESTIC
7	H.M. CARPENTER BUILD.	PLEASANT HILL	35-55'	55'	15	DOMESTIC

MAP LOCATION NUMBERS CORRESPOND TO WELL LOCATIONS ON FIGURE 2.

area. Castle Hayne material encountered during coring operations at Well 6 is a biomicrite (fossil limestone) composed almost entirely of pelecypod molds. The Castle Hayne is easily distinguished from other material at the site by the presence of large voids (former shell casts) which are formed by the removal of soluble calcareous shell material as result of circulating groundwater. These large voids are responsible for high hydraulic conductivities, thus the Castle Hayne aquifer is the most productive hydrogeologic unit in the area.

Hydraulic conductivity of the Castle Hayne aquifer is variable. A conductivity of 42 ft/day was reported by the North Carolina Department of Natural and Economic Resources in Groundwater Bulletin No. 21, 1974, where as, 300 ft/day was reported by Heath in the USGS Open-File report 80-44, 1980. Both conductivities are very high and under moderate gradient conditions, capable of transmitting a substantial volume of water. Because of the high hydraulic conductivity, MAIN was unable to determine the in-situ hydraulic conductivity using single well slug testing procedures. It is possible to infer a lower conductivity limit based on the observation that material with a hydraulic conductivity greater than 1.0×10^{-3} (2.83 ft/day) screened over a ten foot interval recovers too quickly for accurate measure

ments to be made. Thus, it appears that the published data mentioned above are reasonable values. In the absence of pump test data, 100 ft/day was assumed to be a representative value for the Castle Hayne hydraulic conductivity in the vicinity of the former Texfi plant.

b. Yorktown Formation

Overlying the Castle Hayne limestone is a semi-consolidated unit of fragmented shell debris and quartz sand belonging to the Miocene Yorktown Formation. This unit, as logged in Well 6, begins at a depth of 26.0 ft. (Elev. 2.3 ft.) and extends to a depth of 35.5 ft. (Elev. -7.2 ft.) where it exists in probable unconformable contact with the Castle Hayne Limestone. Stratigraphically the Yorktown is easily distinguished from the overlying and underlying sediments by a fragmented shell content with a sandy matrix and carbonate cement.

Although the Yorktown and the Castle Hayne Formations are readily discernible on a lithologic and stratigraphic basis, they are not easily distinguished hydrologically according to LeGrand (NC Department of Water Resources, Groundwater Bulletin Number 1, 1960). It is therefore reasonable and justified to group the Castle Hayne and Yorktown Formations into one hydrogeologic

unit until sufficient hydrogological data on each unit can be obtained. For the purpose of the investigation, MAIN will consider the hydrological properties of the Yorktown and the Castle Hayne identical and will therefore refer to this pairing as simply the "Castle Hayne".

c. Post-Miocene Sediments

The upper most sequence of sediments beneath the former Texfi plant consists of Pliocene, Pleistocene, and Holocene (recent) sediments.

These sediments appear to be lagoonal in origin, probably associated with a back barrier depositional environment. It is common for sediment sequences deposited in this environment to contain interbedded sand and clay (mud) lenses that formed in response to bar and/or channel migration. The fence diagram (Figure 3) constructed from boring logs illustrates the relationship between these sands and clays. It should be noted that the uppermost clay pinches out in the Well 9 direction while the lower clay pinches out in the Well 8 direction. Although the upper clay is above the zone of saturation, it may be partially responsible for contaminant transport by supporting perched water conditions. In lieu of the fact that several different types of sediments are found within the post-miocene sequence, they

are sufficiently similar to be grouped into two subdivisions, clayey sands and silty to sandy clays. Each of these two sediment groups occurs once within the zone of saturation.

Hydraulic conductivity data obtained from slug tests indicate that the sandy clay conductivity is 3.3×10^{-5} cm/sec (0.094 ft/day). This value was obtained using Well 7 which is screened roughly within the sandy clay unit (see Well 7 on Drawing 3136-8-100-R2). Conductivity for Well 9, which is screened subequally through both sediment groups (see Well 9 on Drawing 3136-8-1000-R2), was calculated at 2.4×10^{-4} cm/sec (0.68 ft/day). Although rapid recovery rates did not allow the hydraulic conductivity to be calculated at Well 8, it is probable that the value is close to 3.0×10^{-3} cm/sec (8.5 ft/day). Well 8 is screened entirely within the clayey sand (see Drawing 3136-8-1000-R2) and thus should yield a hydraulic conductivity higher than either Well 9 or Well 7. Since an order of magnitude increase in conductivity was noted between Well 7 (clay screen interval) and Well 9 (subequal sand and clay interval), it was assumed that a similar increase in conductivity would result from the Well 8 screen interval which is composed entirely of sand.

Apparently, a two order of magnitude difference in hydraulic conductivity exists between the clayey sand and the sandy clay which suggests that each should be considered a different hydrogeologic unit.

2. Estimation of Groundwater Velocity

Groundwater occurs in both phreatic and leaky-confined conditions at the former Texfi plant site. The phreatic, or groundwater table, aquifer is restricted to the post-Miocene sediment sequence. Water levels in monitoring wells screened in this interval are somewhat variable. Water within the "Castle Hayne" aquifer occurs in leaky-confined conditions as indicated by the differing static water levels in Wells 4A and 6 (shown on Drawing 3136-8-1000-R2). According to LeGrand (1960), this condition is normal and should be expected throughout the New Bern area. Based on existing observation well and published data, it appears two flow systems are present and are operating conjunctively. Perched water conditions are common within the soil zone (0-7.0' below grade) as evidenced by standing water in the drainage ditch surrounding the site.

Groundwater velocities within the post-Miocene sediment sequence are variable as a function of hydraulic conductivity and hydraulic gradient. The sandy clay horizontal velocity is estimated to be 1.09×10^{-3} ft/day. Since the "Castle Hayne" is not totally confined, a component of flow also

acts in the vertical direction. Vertical groundwater velocity is calculated from the head differential between Wells 4A and 6 and only applies to the least permeable unit (sandy clay). The estimated vertical velocity is 1.74×10^{-2} ft/day. Horizontal velocity for the clayey sand unit is estimated to be 9.86×10^{-2} ft/day. It appears the less permeable nature of the sandy clay controls the position of the phreatic surface as evidenced by the position of the water table above the sandy clay unit (Drawing 3136-8-1000-R2, Sections A and B). A preliminary potentiometric surface map (Drawing 3136-8-1000-R1) has been generated from water level data obtained from wells 4A, 7, 8, and 9. It is important to realize that the groundwater flow direction determined from these wells may not be indicative of the groundwater flow field on a scale equal in size to the former Texfi property limits. The impermeable floor of the manufacturing building appears to influence the groundwater table surface by restricting infiltration and recharge. This is evidenced by the abrupt change in orientation of the equipotential lines beneath the building.

Site specific groundwater velocity in the "Castle Hayne" cannot be determined due to lack of gradient data. In the absence of gradient data, a regional groundwater gradient of .001 ft/ft may be assumed. This gradient corresponds roughly to the published dip of the Castle Hayne limestone within the region. Thus, the horizontal velocity of

water within the "Castle Hayne" aquifer is estimated at 0.1 ft/day.

As mentioned previously, the aquifer depressurization resulting from the nearby Martin Marietta quarry operation is probably "felt" beneath the former Texfi site. The effect of this depressurization on the position of the potentiometric surface at the study area may not be calculated until additional site specific hydrological information is acquired, however, an estimate may be made based on information obtained from Martin Marietta.

Using a reported groundwater withdrawal rate of 10 million gallons per day, an assumed storativity of 0.05 (to simulate leaky-confined conditions), an effective aquifer thickness of 60 feet, an assumed hydraulic conductivity of 100 ft/day, and assuming that equilibrium within the aquifer is achieved after six months at a constant withdrawal rate; the radius of influence should extend about 2.5 miles beyond the former Texfi plant. Since the plant is located upgradient, the drawdown effect will be less than estimated. Pumping in the Castle Hayne by Texasgulf Phosphate in Aurora, NL has demonstrated that a two-thirds reduction in upgradient radius of influence can be expected (North Carolina Department of Natural and Economic Resources, Groundwater Bulletin No. 21, 1974). Thus, the effective radius of influence of the New Bern quarry is estimated to be 6,000 feet in the direction of the former Texfi plant, or about

1,250 feet beyond the site in the upgradient direction. Proportionally, reducing the drawdown radius to one-third of the zero-gradient value and adding to the existing gradient, a gradient of 0.0018 ft/ft is estimated for the vicinity of the former Texfi plant. The resulting "Castle Hayne" groundwater velocity is thus increased from 0.1 ft/day to .18 ft/day in response to the induced gradient.

In summary, flow nets cannot be developed for this site due to insufficient hydraulic data for the Castle Hayne Formation. Based on the preliminary data available, the flow direction of groundwater in the water table aquifer appears to generally be in the east to northeast direction. The horizontal and vertical velocities of the uppermost aquifer appear to be 9.86×10^{-2} ft/day and 1.74×10^{-2} ft/day, respectively.

The estimated flow direction for the Castle Hayne appears to be east toward the Martin Marietta quarry. The horizontal flow velocity is estimated to be about 0.2 ft/day.

4. CONTAMINATION PLUME DELINEATION

A. Contamination Source

The introduction of TCA into the groundwater reportedly occurred as the result of a one time spill of the solvent during dismantling of an above ground storage tank in the vicinity of Wells 4A and 6. Five to ten

gallons were believed to have been spilled on the ground. The exact time of the spill is unknown, but the event could have occurred as long ago as ten years.

TCA, with specific gravity of 1.34 and solubility of 4,400 mg/l of water, tends to move vertically through the unsaturated zone to the water table. Upon contact with the groundwater, some of the solvent becomes soluble in the water and tends to move in the direction of groundwater flow at the same velocity. If a sufficient volume reaches the water table, some solvent may move downward as a separate phase through the soil and rock at a higher rate than the groundwater flow velocity.

Other compounds, in addition to TCA, have been detected during this investigation and previous studies. DCA, chloroethane, 1,1 dichloroethene, and methylene chloride have been detected.

1,1 dichloroethene (DCA) is a degradation product of TCA, and chloroethane is a degradation product of DCA.

1,1 dichloroethene is synonomous with 1,1 dichloroethylene which is a degradation product of trichloroethylene and tetrachloroethylene. These particular products were not used at this facility according to Texfi sources. Methylene chloride is a common paint solvent. History of its use at this facility is unknown.

A review of laboratory results obtained from previous studies, leads to the conclusion that contamination

found in Wells 2, 3A, and 4A resulted from isolated spills which probably occurred at significantly different times. The compounds found in Well 3A have undergone more complete degradation than compounds found in 4A, as evidenced by the fact that chloroethane was detected in 3A and not in 4A. TCA has achieved complete degradation at Well 3A since none was detected but DCA and chloroethane were detected, at .14 and 0.62 mg/l, respectively.

TCA and DCA were detected in Well 4A and Well 9 during the most recent sampling event in approximately equal concentrations with no chloroethane detected in either well. Since Well 3A is upgradient of 4A and degradation of the compounds in Well 3A is more advanced than Well 4A, separate sources of contamination are indicated.

Methylene chloride at Well 2 is probably the result of a separate spill incident because this compound is not found at any other location.

B. Plume Migration

Solubilized TCA and DCA have moved within the upper aquifer and the Castle Hayne from the area near Wells 4A and 6 under the plant building towards the east and northeast.

Based on calculated and estimated groundwater flow velocities at this site, and the concentrations of contaminants in Wells 8 and 9, it appears that the downgradient edge of the plume has migrated horizontal

ly more than 380 feet from the source. The depth of travel cannot be estimated without additional wells in the Castle Hayne Formation, but contamination is known to exist at .055 mg/l to a depth 40 feet below grade, based on analytical results in Well 6. See Table 1 for a summary of analytical results.

Complete delineation of the contaminant plume(s) will require additional shallow and deep wells to determine additional hydraulic information on the Castle Hayne Formation and collect groundwater samples for analysis.

Soil contamination does not appear to be significant within the unsaturated zone based on analytical results. No contamination was detected in the upper soil strata until a depth of 10.5-11.0 feet. DCA was detected at this depth at .012 mg/kg. See Table 1 for results of soil analysis.

5. REGULATORY CONSIDERATIONS

North Carolina Administrative Code, Title 15, Subchapter 2L, Section .0201 classifies the waters beneath the former Texfi plant as Class GB and Class GA.

Class GB waters are groundwaters occurring "above a depth of 20 feet below land surface". This zone is considered a cycling or mixing zone where natural treatment of water takes place by "adsorption, absorption, filtration, or other natural processes". Water quality standards for Class GB

waters require that there be no increase in deleterious substances unless it can be shown that:

- the increase will not affect adjacent waters of a different class;

- the increase will not cause a threat to public health or environment due to unusual or different hydrological conditions; and

- the increase will not cause an existing or potential water supply to become unsafe or unsuitable for its current use.

Class GA waters in this case are groundwaters suitable for drinking culinary use and food processing without treatment except where necessary to correct naturally occurring conditions. These waters occur at depths greater than 20 feet below land surface and in the saturated zone above a depth of 20 feet where these waters are a principal source of potable water supply. Water quality standards for Class GA waters, with respect to the types of contaminants present, prohibit the introduction of any synthetic, man-made or other substances that do not naturally occur.

By regulation, clean-up of the contamination at this site is required because contamination has been detected in Class GB groundwater and is affecting the quality of an adjacent Class GA groundwater. Since the plume does appear to have traveled beyond the property boundary, imminent hazard or threat to the public health or safety does not seem to exist at this time.

The groundwater regulations have established a criteria for determination of a compliance perimeter for existing facilities. The rules define this location as being 500 feet from the point of discharge (source) or the property boundary, which ever is less.

The compliance perimeter for this facility, by definition, is an imaginary line 500 feet from and concentric to well 4A. The 500 foot boundary applies to this site since the property line is located beyond the 500 foot limit.

According to calculations of groundwater flow velocities and other conservative assumptions it appears that the contamination plume has not traveled beyond the compliance perimeter.

6. GROUNDWATER REMEDIATION

All contaminants found to date at the former Texfi plant can be removed from the groundwater by means of pumping and air stripping or filtration by carbon adsorption.

Pumping can be accomplished through partially cased deep wells drilled into the Castle Hayne Formation and fully cased and screened wells drilled into the surficial sediments. Pumping rates cannot be determined at this time without additional field data.

Air stripping of these solvents will require an efficient treatment system since contaminant levels in the surficial sediments are very high and treated effluent will most likely have to be discharged into surface waters through an NPDES permit or back into the groundwater through injection wells. Discharge of treated effluent into the municipal

sewer/treatment system will not be possible unless all contaminants are removed to levels below the detection limit. The local sewer authority is under a compliance order issued by the State of North Carolina for effluent discharge violations and is restricting sewer discharge permits at the present time.

Air stripping can be accomplished by a manufactured stripping tower with resulting concentrations in the treated discharge less than the detection limit. The use of an existing cooling tower for stripping will require further study to determine its efficiency.

A carbon adsorption unit may be an option if air emissions from stripping are a problem. The carbon unit is very efficient at removing most organics but does not adsorb methylene chloride well. Selection of the type of treatment system and sizing of the units, wells and pumps cannot be accomplished without additional field data on plume size, total concentrations of contaminants and types of contaminants to be removed.

Ref. 4

TEXFI INDUSTRIES
PHASE III GROUNDWATER ASSESSMENT

3136-9-1000 JANUARY 15, 1988

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Phase III Groundwater Assessment

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TEXFI INDUSTRIES

Phase III Groundwater Assessment

1. Introduction

This report summarizes the findings of Phase III of the Groundwater Assessment Investigation for the plant site formerly owned by Texfi Industries in New Bern, North Carolina. This investigation was initiated under the authorization of Mr. John E. Tate, representative for Texfi Industries, in accordance with the Chas. T. Main, Inc. (MAIN) proposal to Mr. Tate dated September 24, 1987.

A. Site Background

In August 1986 Amital Spinning Company contracted Law Engineering Testing Company (LETCo) to perform an environmental audit and preliminary groundwater assessment at the former Texfi facility. The results of this study were presented in Preliminary Groundwater Assessment Former Texfi Plant Site, New Bern, North Carolina dated November 14, 1986. As a result of this assessment, MAIN was contracted to provide additional horizontal and vertical contamination delineation. The results of MAIN's investigation were submitted in two reports on March 17 and July 30, 1987. These reports were entitled Texfi Industries Preliminary Groundwater Assessment, and Texfi Industries Phase II Groundwater Assessment. In a letter dated September 1, 1987, the North Carolina Department of Natural Resources and Community Development, Division of Environmental Management, responded to these reports by submitting comments and recommendations to continue the investigation.

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B. Project Scope

The Scope of this project entailed installing two groundwater monitoring wells at the facility. One of the wells was installed to sample the watertable aquifer, the other well screened the Castle Haynes Aquifer. Groundwater samples were collected from the two new wells and eight existing wells. Samples were analyzed for volatile organic compounds in accordance with EPA Method 624.

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2. Drilling Program

A. Well Installation Procedures

Two additional groundwater monitoring wells (wells MW-11 and MW-12) were installed in locations to assist in delineating the horizontal extent of contamination (see drawing R-1). These wells were constructed and permitted in accordance with North Carolina Administrative Code Title 15, Subchapter 2C, Well Construction Standards Criteria and Standards Applicable to Water Supply and Certain Other Type Wells. Each well was constructed of 2-inch diameter Schedule 40 PVC casing with 10-foot manufactured screens. The screen interval was packed with a clean coarse sand and sealed with bentonite. The remaining annulus was backfilled with lean grout and finished with a concrete collar and locking steel cap. Well completion records for these wells are included in Appendix A.

B. Well Locations

Well MW-11 was installed at the north corner of the manufacturing building. This well was drilled to a depth of 20.5-feet below grade and screened 10 feet into the watertable aquifer in the surficial sediments. Well MW-12 was installed approximately 265 feet south of the facility and was drilled to a depth of 40-feet. The ten foot screen was installed in the Yorktown and Castle Hayne Formations, to determine water quality.

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3. Hydrogeology

A. Site Geology

The geology underlying the site has been described in previous reports as consisting of three major stratigraphic units. Detailed descriptions are included in the Phase I report entitled Texfi Industries Preliminary Groundwater Assessment dated March 17, 1987.

The following is a brief description of each unit. Geologic cross-sections have been revised to include well MW-12. Cross-sections are shown on Dwgs. R-2 and R-3. The oldest geologic unit encountered at the study area is the Castle Hayne Formation which is dated as Eocene in age, or approximately 22 million years old. This formation is described as a biomicrite (fossil limestone) composed almost entirely of pelecypod molds. The Castle Hayne Formation was encountered on site at depths ranging from 37 feet below grade in well MW-12 to 40-feet in well MW-9A.

The Yorktown Formation lies unconformably over the Castle Hayne on this site. The Yorktown Formation is considered to be Miocene in age, or approximately 12 million years old. This formation has been described as a semi-consolidated unit consisting of fragmented shell debris and quartz sand. This unit ranges in thickness across the site from 9.5-feet in well MW-6 to 14 feet in well MW-9A.

Overlying the Yorktown Formation on site is a unit referred to as post-miocene sediments. Sediments from Pliocene, Pleistocene and Holocene are included in this unit. These sediments consist primarily of interbedded clays and sands.

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B. Site Hydrology

Groundwater elevations measured on October 26, 1987 are presented in Table 1. The elevations were utilized in developing the site potentiometric map (drawing R-1) for both the watertable aquifer and the Castle Hayne Aquifer.

As discussed in the Phase II report, the groundwater flow directions for each aquifer are shown on Drawing R-1. The watertable aquifer appears to mound in the vicinity of wells MW-3A and 2A. This mound allows the groundwater to flow off the site in a southeastern, southern and western directions with an average horizontal hydraulic gradient of approximately 0.012 ft/ft.

The groundwater direction in the Castle Hayne Aquifer underlying this site appears to be in a southern direction with a horizontal hydraulic gradient of approximately 0.008 ft/ft.

A detailed discussion of the aquifer characteristics for these two aquifers was presented in the Phase II Groundwater Assessment report dated July 30, 1987.

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TABLE - 1
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WELL AND GROUNDWATER DATA

WELL #	TOC ELEV.	SWL (10-27-87)	T/S ELEV.	B/S ELEV.
1	29.26	18.85	19.70	9.70
1A	29.65	12.53	19.10	9.10
2	28.46	18.69	19.80	9.80
2A	29.28	17.50	19.10	9.10
3	29.62	19.84	20.70	10.70
3A	30.06	20.43	19.80	9.80
4	28.21	12.82	18.50	8.50
4A	29.81	16.07	19.60	9.60
5	31.81	21.67	22.30	12.30
6	29.95	10.89	-1.86	-10.86
7	29.17	17.09	16.61	7.86
8	29.88	12.91	16.67	7.92
9	29.61	14.80	16.37	7.62
9A	29.53	10.48	-1.72	-10.80
10	29.05	11.71	12.35	3.27
10A	29.86	10.89	-2.56	-11.64
11	30.24	13.26	17.11	8.11
12	29.50	10.42	-0.66	-9.66
PW	28.40	6.99	-	-

TOC: Top of casing
SWL: Static water level
T/S: Top of screen
B/S: Bottom of screen

4. Groundwater Sampling Program

A. Sampling Procedure

On October 28, 1987, MAIN collected groundwater samples from wells 2A, 3A, 4A, 4, 6, 8, 9, 9A, 11 and 12 to be analyzed for volatile organic compounds, pH, temperature and specific conductance. Samples were collected utilizing procedures consistent with accepted EPA protocols. The sampling procedures utilized included:

1. Measurement of water levels in all wells.

2. Evacuation of three well volumes or until dry.

3. Collection of groundwater samples within 24 hours of purging.

Purging of the watertable wells was accomplished by bailing with teflon bailers. Wells screened in the Yorktown/Castle Hayne Formations were evacuated using a Brainard-Killman 1.7 hand-pump. The pump and bailers were decontaminated between wells. All field measurements and parameters are included on the field data sheets in Appendix C.

B. Analytical Results

Groundwater samples collected from 10 wells were transported to the laboratory for analysis by EPA Method 624 as published in the Federal Register, Volume 29, No. 209, October 26, 1984. Laboratory data sheets are included in Appendix C.

A total of 13 volatile organic compounds were detected in monitoring wells at the site. Some compounds are degradation products of 1,1,1 trichloroethane (1,1,1-TCA), which was one of the original contaminants detected. Table 2 summarizes the analytical results for all wells sampled during the Phase III investigation.

Well MW-4A located in the area of a known 1,1,1-TCA spill, tested positively for all 13 compounds. Concentrations for individual compounds ranged as high as 120,000 ug/l for 1,1-dichloroethane (1,1-DCA). The total volatile organic concentration in MW-4A is 212,582 ug/l.

Well MW-9, which is also located in a suspected spill area, tested positively for 10 volatile organic compounds. The highest concentration recorded is 32,000 ug/l for 1,1,1-TCA. Analytical results for Wells MW-3A, MW-4A, MW-8, MW-9 and MW-9A were generally consistent with results obtained in previous sampling events. One notable difference between this sampling event and previous events was observed in samples collected from MW-6. 1,1-DCA was not detected in MW-6 during the latest event. This well is screened in the Castle Hayne Formation.

Two new monitoring wells were installed prior to the latest sampling event. Well MW-11, located near the north corner of the plant building, is screened into the watertable aquifer. 1,1-DCA was detected in this well at 360 ug/l which may indicate a possible spill or overfilling of a former above ground 1,1,1-TCA storage tank located approximately 130 feet west of MW-11. Well MW-12 was installed approximately 265 feet south of the plant building and screened in the Castle Hayne Formation. Trace concentrations of methylene chloride were detected in this well. No other compounds were detected.

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TABLE - 2
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ANALYTICAL RESULTS

PARAMETER	WELL (ug/l)									
	2A	3A	4	4A	6	8	9	9A	11	12
1. Vinyl Chloride				38						
2. Chloroethane		40		110			10	11		
3. Methylene Chloride (Dichloromethane)	15	11	11	62	16	15	12	13	12J	11
4. 1,1 - Dichloroethylene		10		1200		37	1100		15J	
5. 1,1 - Dichloroethane	7J	230		120,000		290	8300	200	360	
6. Chloroform (Trichloromethane)				23			17			
7. 1,2 - Dichloroethane				460			20			
8. 1,1,1 Trichloroethane				90,000			32,000			
9. Trichloroethylene				620			11			
10. 1,1,2 - Trichloroethane				22			31			
11. Tetrachloroethylene				19						
12. 1,1,2,2 Tetrachloroethane				20						
13. Toluene				8J			18			

J = Estimated Concentration; values between the detection limit and one-half of that limit.

As stated previously, many compounds detected in wells at this site are degradation products of a few volatile organic compounds. According to published data (Smith & Dragun, 1984) the following are assumed to be the source compounds at this site:

1,2-Dichloroethane
Tetrachloroethylene
1,1,2,2-Tetrachloroethane
1,1,1-Trichloroethane
Trichloroethylene (possible)
Toluene

Microbial degradation of many of the source compounds occurs as a result of reductive dechlorination which is the replacement of chlorine by hydrogen under anaerobic conditions (Smith & Dragun, 1984). Under these conditions 1,1,1-TCA reduces to 1,1 dichloroethane, chloroethane and vinyl chloride. Tetrachloroethylene reduces to trichloroethylene and ultimately to vinyl chloride. Table 3 shows the identified source compounds, the reaction pathways and associated degradation products.

TABLE 3

REACTION PATHWAYS, PRODUCTS, AND REFERENCES FOR DETECTED VOLATILE CHLORINATED ORGANIC COMPOUNDS AT AMITAL SPINNING PLANT, NEW BERN, NORTH CAROLINA

SOURCE COMPOUNDS	REACTION PATHWAYS	DEGRADATION PRODUCT	REFERENCES
1,1,1-TCA	MICROBIAL DEGRADATION	1,1-DCA CHLOROETHANE VINYL CHLORIDE	BOUWER (1983), PARSONS et al. (1982,1983)
TETRACHLOROETHYLENE	MICROBIAL DEGRADATION	TRICHLOROETHYLENE	BOUWER(1983), BOUWER AND McCARTY (1983a), McCARTY (1984), PARSONS et al. (1982,1983,1984)
CHLOROFORM	MICROBIAL DEGRADATION	METHYLENE CHLORIDE	SMITH AND DRAGUN (1984)
1,2-DICHLOROETHANE	UNKNOWN	CHLOROETHANE	SMITH AND DRAGUN (1984)
1,1,2,2-TETRACHLOROETHANE	MICROBIAL DEGRADATION	1,1,2-TRICHLOROETHANE	BOUWER AND McCARTY (1983b), McCARTY (1984)
1,1,1-TCA	UNKNOWN	CHLOROFORM	

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Figures 1, 2, 3, 4 and 5 are flow diagrams for selected monitoring wells detailing the chronology of degradation of compounds detected in each well. The diagrams are taken from Smith and Dragun, 1984. The history of use of the identified source compounds at the plant site is incomplete. 1,1,1-TCA was widely used on Texfi to service machinery. The remaining compounds are commonly used as degreasing agents and paint solvents.

Methylene chloride was detected in each well with concentrations ranging from 11 ug/l to 16 ug/l. Well MW-4A is the exception with a concentration of 62 ug/l. It should be noted that this compound was detected in the samples from wells MW-6, MW-9A and MW-12 which are all screened in the Castle Hayne Formation. With the exception of MW-4, it appears that the occurance of methylene chloride is probably a laboratory artifact associated with this sampling event. This conclusion is based on the following observations:

a. Previous analyses detected methylene chloride only in well 2.

b. Concentrations are very close to the detection limit.

c. Concentrations are unusually consistent across the site.

d. Concentrations in the Castle Hayne Aquifer are similar to concentrations within the watertable aquifer. In addition, the spatial distribution within the lower aquifer implies no attenuation with distance from possible sources.

One possible explanation for detection of methylene chloride may be that the sample containers may have been contaminated prior to arrival on to the site. Another possibility may

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WELL 3A

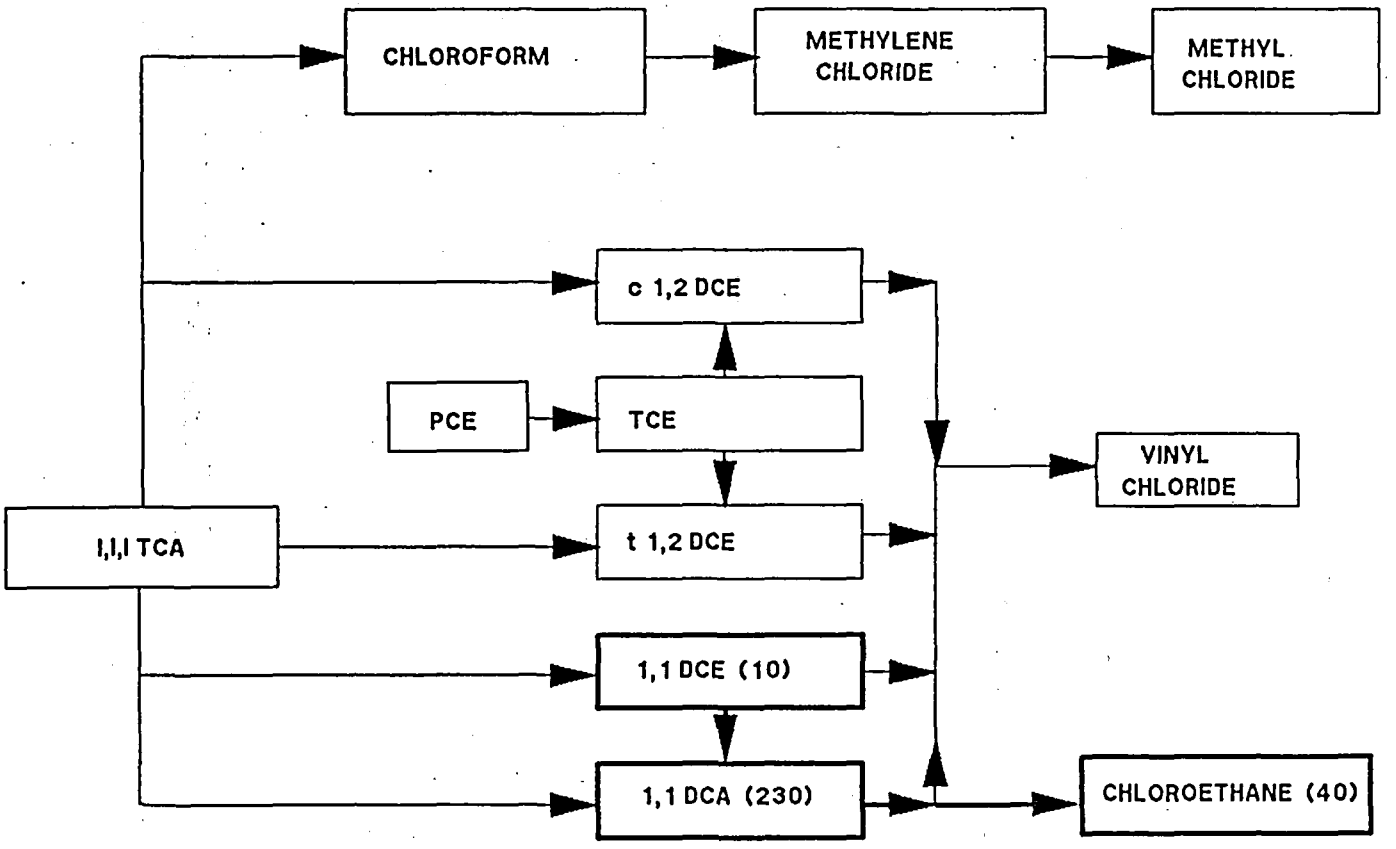

FIGURE 1 Transformation Pathways For Various Volatile Priority Pollutants In Soil-Groundwater Systems From Smith and Dragun, 1984. The Volatile Compounds Detected During The October 28, 1987 Sampling Are Are Shown In Parentheses In ug/l.

TEXFI INDUSTRIES
WELL 4A

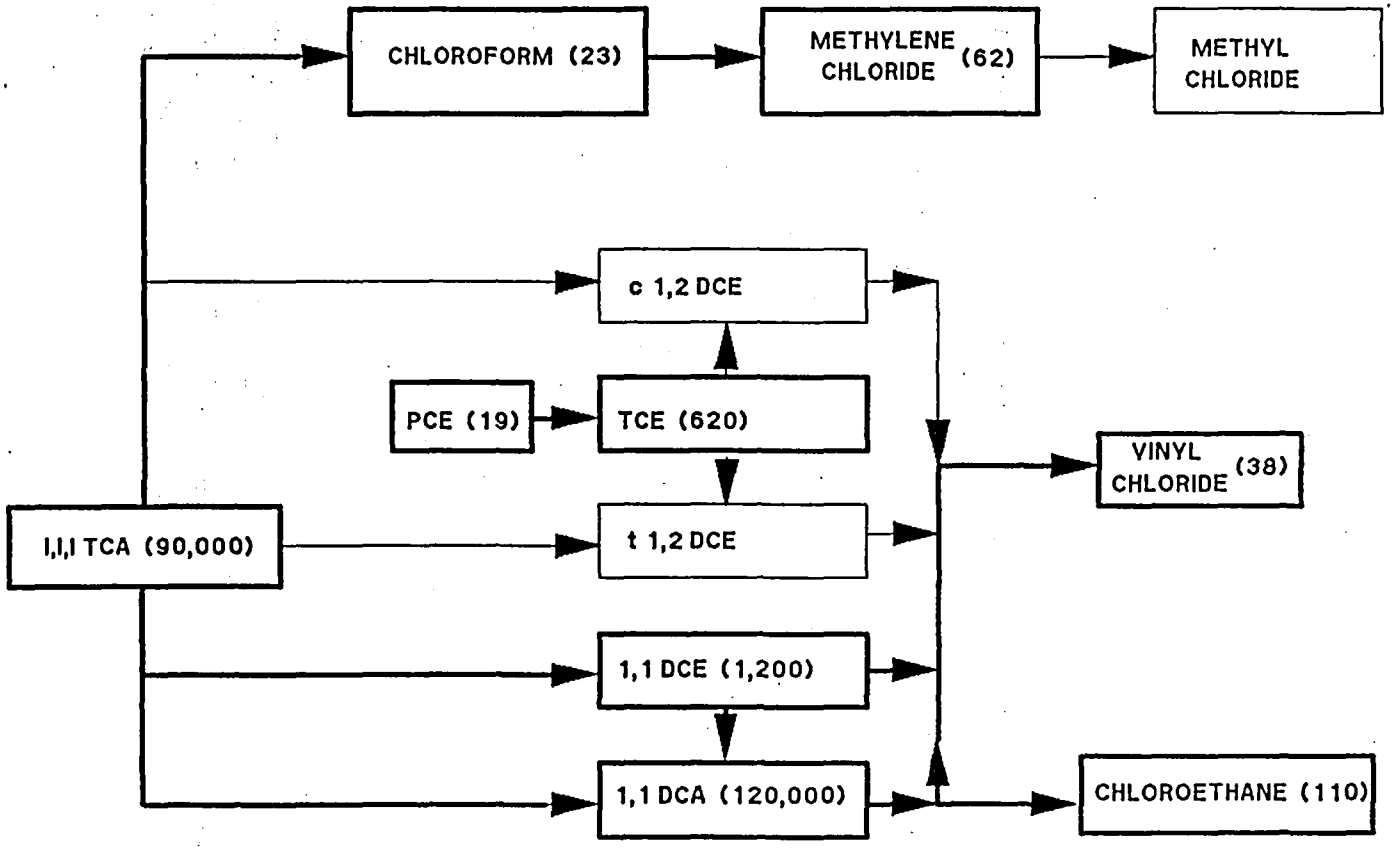

FIGURE 2 Transformation Pathways For Various Volatile Priority Pollutants In Soil-Groundwater Systems From Smith and Dragun, 1984. The Volatile Compounds Detected During The October 28, 1987 Sampling Are Are Shown In Parentheses In ug/l.

TEXFI INDUSTRIES
WELL 8

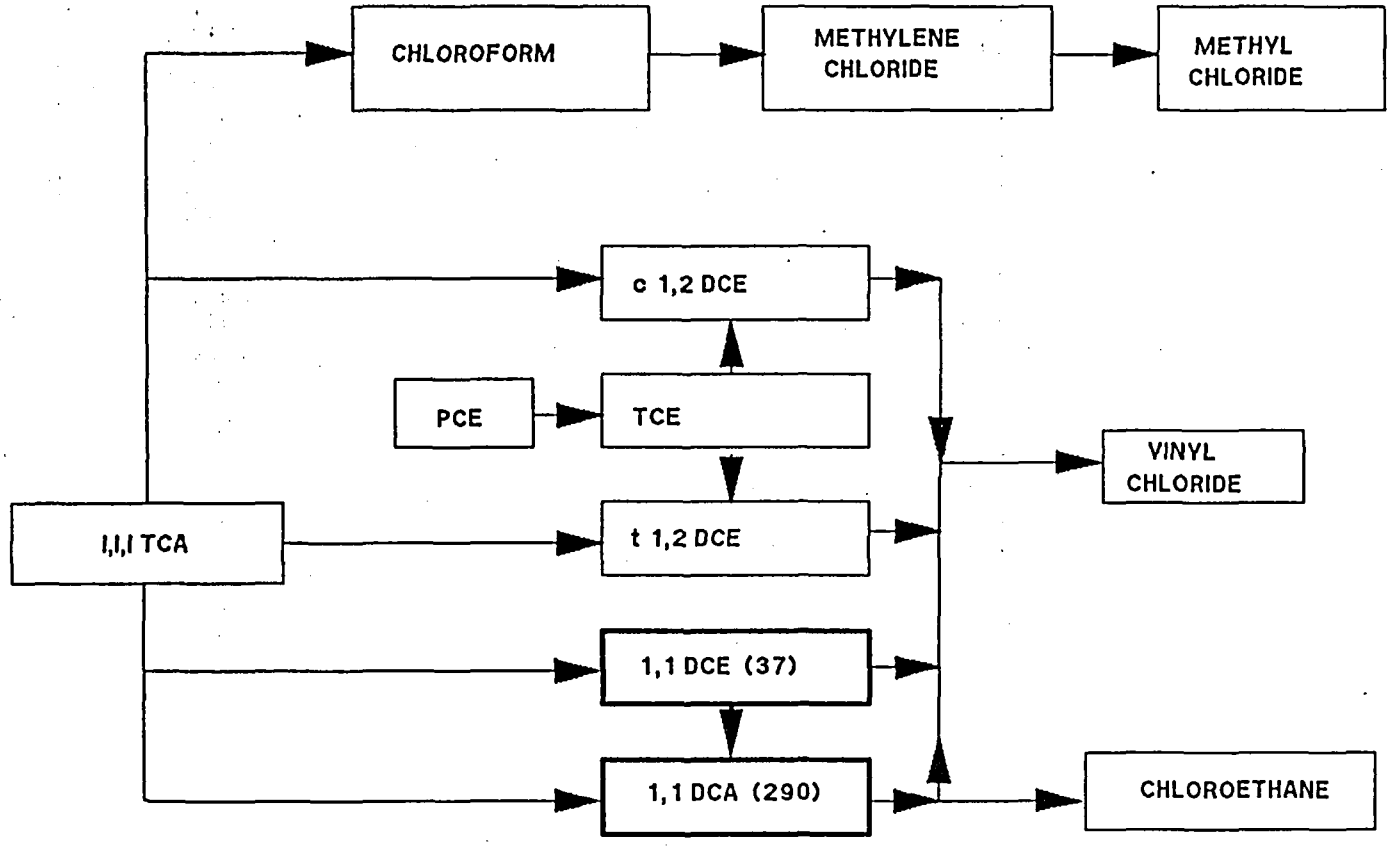

FIGURE 3 Transformation Pathways For Various Volatile Priority Pollutants In Soil-Groundwater Systems From Smith and Dragun, 1984. The Volatile Compounds Detected During The October 28, 1987 Sampling Are Are Shown In Parentheses In ug/l.

TEXFI INDUSTRIES
WELL 9

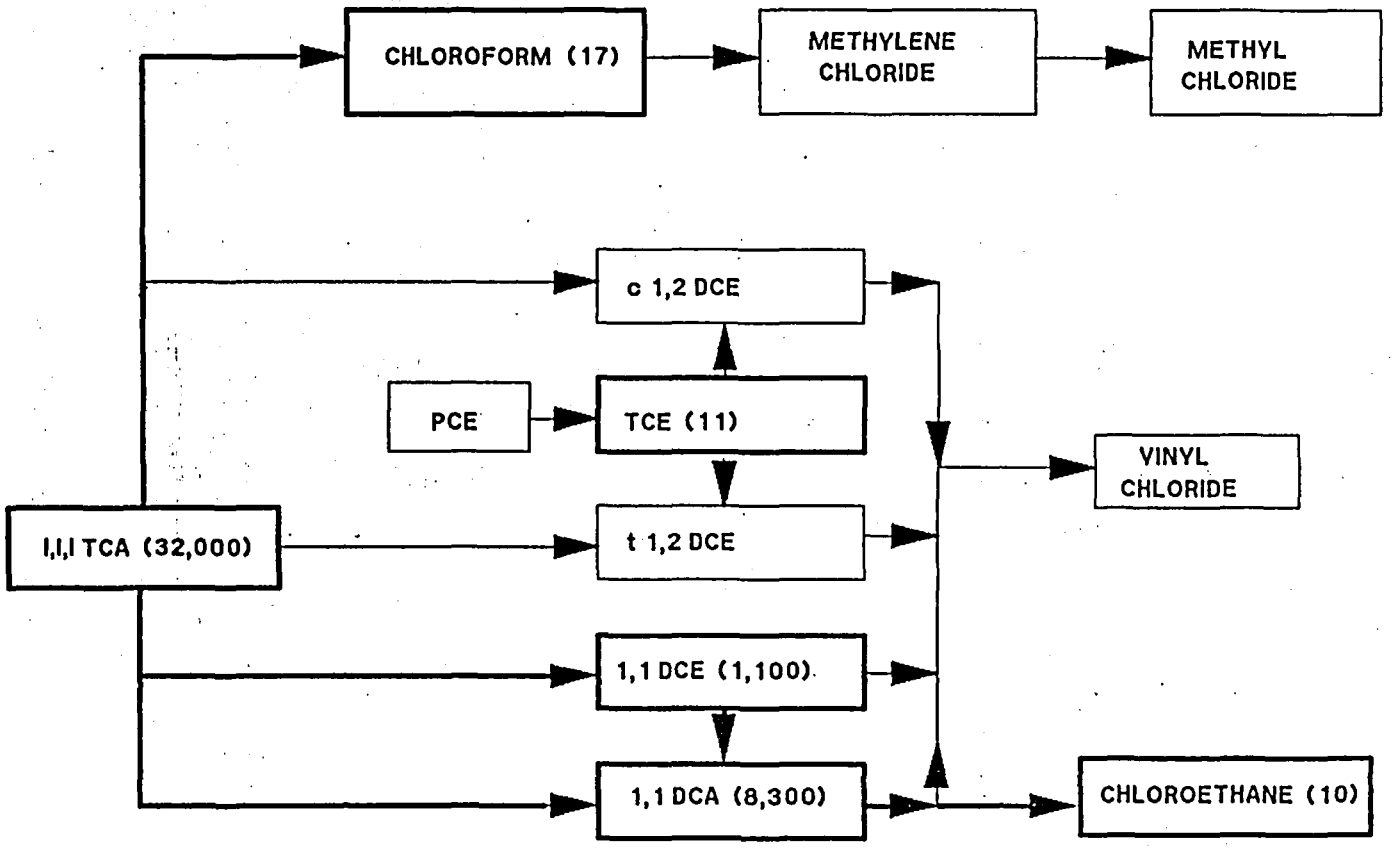

FIGURE 4 Transformation Pathways For Various Volatile Priority Pollutants In Soil-Groundwater Systems From Smith and Dragun, 1984. The Volatile Compounds Detected During The October 28, 1987 Sampling Are Are Shown In Parentheses In ug/l.

TEXFI INDUSTRIES
WELL 11

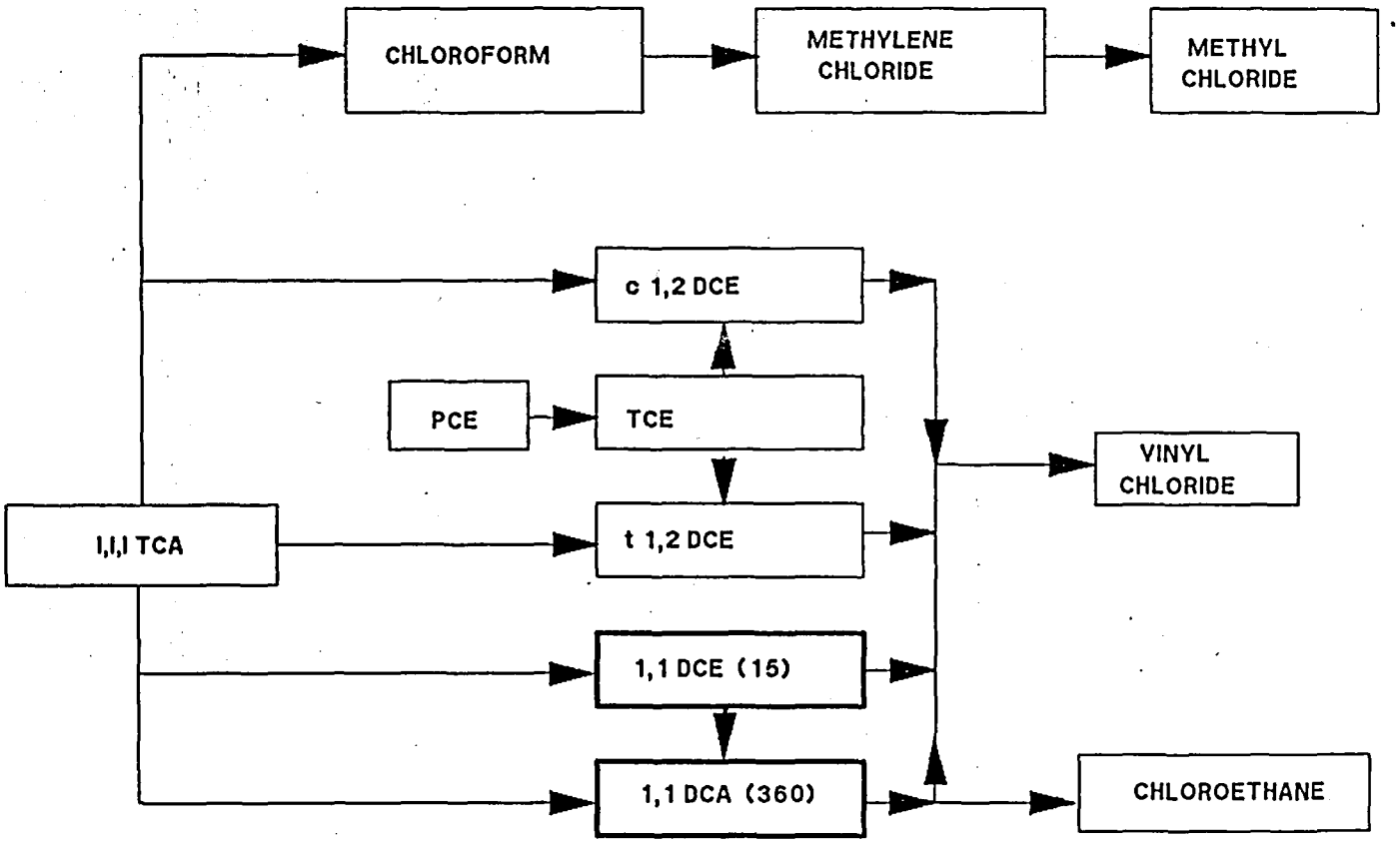

FIGURE 5 Transformation Pathways For Various Volatile Priority Pollutants In Soil-Groundwater Systems From Smith and Dragun, 1984. The Volatile Compounds Detected During The October 28, 1987 Sampling Are Are Shown In Parentheses In ug/l.

be that traces of methylene chloride may have been present in laboratory instruments at the time of analysis.

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5. Conclusions

Much is still unknown about the history of this site which would aid in removing contamination from the groundwater. Testing still points to the probability that a number of releases have occurred. Some locations are known and others are suspect. The spill from the 1,1,1-TCA tank at well MW-4A appears to have moved horizontally within the upper aquifer about 400 feet eastward, under the plant building toward well MW-8. In addition, leakage of contamination into the Castle Hayne from this spill has occurred and is migrating southward. This plume has migrated horizontally about 300 to 400 feet. This is based on velocity calculations using aquifer characteristics obtained from literature on the Castle Hayne Formation and an assumed travel time of approximately 10 years as stated in previous reports. The vertical migration of this plume cannot be determined due to the lack of vertical hydraulic conductivity data in the Castle Hayne Formation at this site. See Dwg. R-1 for locations of suspected and known spill locations.

A second release is assumed to have occured in the area around wells 9 and 9A. The age of this spill is unknown but, it is assumed to be substantially younger than the spill at well 4A. This assumption is based on an evaluation of degradation products from 1,1,1-TCA which were detected in well 9. The degradation of 1,1,1-TCA to 1,1-DCA appears more complete at well 4A than at well 9.

The horizontal extent of contamination within the upper aquifer is unknown, but is known to be less than 500 feet from the spill location since no contamination has been detected in well 10. Contamination has been detected within the Castle Hayne Formation at well 9A. Migration towards the south is known to be less than 290 feet since well MW-12 tested clean. The vertical extent of this plume is unknown for the reasons stated above.

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A release may have occurred at either the former 1,1,1-TCA tank located at the north corner of the plant or at the door leading from the plant at that same location. This is evidenced by monitoring results at well MW-11 showing 360 ug/l of 1,1-DCA. The size and extent of this plume is known since only one well exists in this area. It would appear from the relatively low concentration of 1,1-DCA in well MW-11 that the downgradient edge of the plume in the upper aquifer may be very near the perimeter drainage ditch. The extent of contamination within the Castle Hayne Formation cannot be determined at this time due to the fact that any plume from this location would be moving directly under the plant building.

A fourth release is suspected in the area around the stormwater drop inlet near well MW-3A. Neither the horizontal nor vertical extent of this plume in the upper aquifer or Castle Hayne Formation are known. It is also unknown as to whether well MW-3A is located upgradient or downgradient of the plume. Well MW-4 is located approximately 450 feet downgradient of the suspected release location and has not detected a plume from this area. The Castle Hayne Formation is not presently being monitored downgradient of this location.

In summary, the data collected from the site to date indicate that as many as four individual releases have occurred and have resulted in a least four contamination plumes. The depth of contamination cannot be quantified at this time. Hydraulic calculations indicate that the horizontal extent of contamination, at least near the ground surface, is confined to the property and is well within the limits of a "perimeter of compliance" if developed in accordance with the North Carolina Administrative Code T15: 02L.0100, .0200 and .0300. It appears, at this time, that due to the relatively low rates of plume migration, the fact that contamination has not been detected off-site and the fact that no groundwater users are located immediately downgradient of this facility, contamination from

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this site presents no immediate threat to the public health and safety or the environment beyond the proposed perimeter of compliance.

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6. Recommendations For Corrective Action

The general components of a corrective action system for this facility should include a groundwater monitoring system, groundwater recovery system, groundwater treatment system, and an effluent discharge system.

A. Groundwater Monitoring System

The groundwater monitoring system should be a series of four (4) monitoring wells screened 10 feet into the watertable and five (5) deep monitoring wells screened in the Castle Hayne Formation. The locations are shown on Dwg. R1. Three of the shallow wells should be located approximately 80 feet east of the perimeter fence on the east side of the plant. They should be located hydraulically downgradient of spill locations as described in Section 5. Well MW-4 should be used as the fourth shallow well as long as it continues to yield representative groundwater samples.

The five deep monitoring wells should be located on the south side of the plant within the perimeter fence. These wells will monitor the plumes within the Castle Hayne Formation. Well MW-12 should remain in use as one of the five deep wells. The wells should be constructed of schedule 40 PVC casing with manufactured screens and lockable caps. Samples from the perimeter of compliance wells should be analyzed semi-annually for the following:

1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethylene
1,2-Dichloroethane
Trichloroethylene

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Field parameters should include:

Water Levels
pH
Specific Conductance
Temperature

B. Groundwater Treatment System

Alternatives for treatment of contaminated groundwater at this site are being evaluated at this time. The alternatives are being analyzed for technical and economic feasibility. A letter report detailing the development and permitting strategies will be forwarded to the Division of Environmental Management at the completion of this evaluation.

MAIN
1893

BIBLIOGRAPHY

Smith, Leverett R., Dragun, James; "Degradation of Volatile Chlorinated Aliphatic Priority Pollutants in Groundwater", Environment International, Vol. 10 pp. 291-198; 1984.

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1893

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR Froehling & Robertson, Inc.
DRILLER REGISTRATION NUMBER 421
STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0111

WELL LOCATION: (Show sketch of the location below)
Nearest Town: New Bern
County: Craven
(Road, Community, or Subdivision and Lot No.)
OWNER Amital Spinning Corp.
ADDRESS Stanley Blvd. (Street or Route No.)
New Bern, N.C. 28561 (City or Town, State, Zip Code)
DATE DRILLED 10-20-87 USE OF WELL monitoring
TOTAL DEPTH 20.5 ft CUTTINGS COLLECTED ☒ Yes ☐ No
DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
STATIC WATER LEVEL: 16.98 FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2.62 FT. ABOVE LAND SURFACE.
YIELD (gpm): _____ METHOD OF TEST _____
WATER ZONES (depth): _____
CHLORINATION: Type _____ Amount _____

Depth From	Depth To	DRILLING LOG Formation Description
0	.5 ft	crusher run coquina
.5	20.5	sandy clays and clays

If additional space is needed use back of form.

CASING:

From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	10.5 ft	2 in	SCH40	PVC

GROUT:

From	To	Material	Method
0	8.5 ft	portland	poured

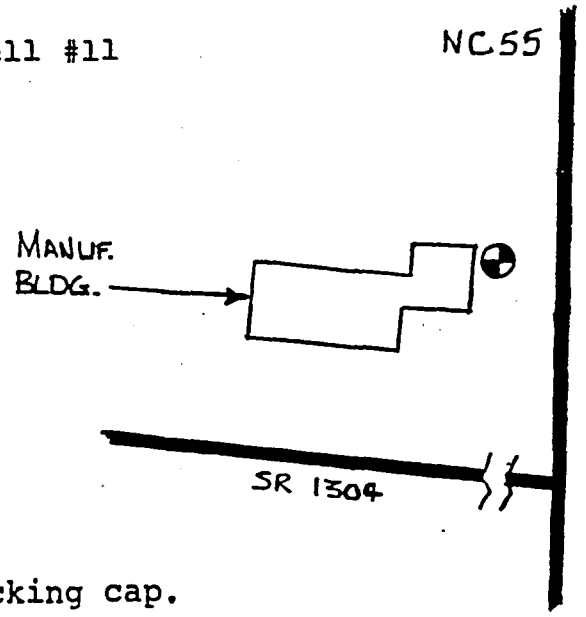
SCREEN:

From	To	Diameter	Slot Size	Material
10.5	20.5 ft	2 in	.01 in	PVC

GRAVEL PACK:

From	To	Size	Material
9.5	20.5 ft	coarse	sand

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)



REMARKS: 1' bentonite seal above sand pack, locking cap.

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Ray T. Whitaker 11-9-87
SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner

GW-1 Revised 11/84

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR Froehling & Robertson, Inc.

DRILLER REGISTRATION NUMBER 421

STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0111

1. WELL LOCATION: (Show sketch of the location below)

Nearest Town: New Bern

County: Craven

(Road, Community, or Subdivision and Lot No.)

2. OWNER Amital Spinning Corp.

ADDRESS Stanley Blvd. (Street or Route No.)

New Bern, NC 28651 (City or Town, State, Zip Code)

DATE DRILLED 10-21-87 USE OF WELL monitoring

TOTAL DEPTH 39.5 ft CUTTINGS COLLECTED ☒ Yes ☐ No

DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No

STATIC WATER LEVEL: 19.08 FT. ☐ above ☒ below TOP OF CASING,

TOP OF CASING IS 1:22 FT. ABOVE LAND SURFACE.

YIELD (gpm): _____ METHOD OF TEST _____

WATER ZONES (depth): _____

CHLORINATION: Type _____ Amount _____

Depth From	Depth To	DRILLING LOG Formation Description
0	2 ft	tan fine sand
2	27 ft	interbedded gray fine sandy clay and clay
27	37 ft	yorktown formation - cemented shell hash
37	39.5 ft	Castle Hayne - fossil limestone

If additional space is needed use back of form.

3. CASING:

	Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
	0	30 ft.	2 in	SCH40	PVC
		ft.			
		ft.			

4. GROUT:

	Depth From	Depth To	Material	Method
	0	28 ft.	Portland	Poured
		ft.		

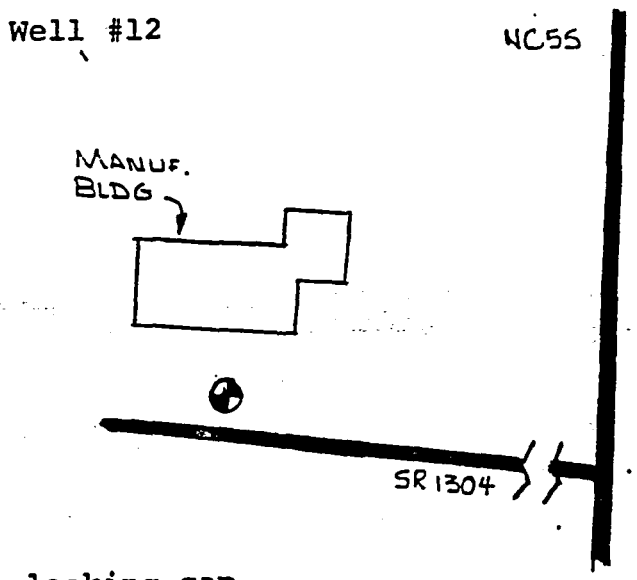
5. SCREEN:

	Depth From	Depth To	Diameter	Slot Size	Material
	30	40 ft.	2 in.	.01 in.	PVC
		ft.	in.	in.	
		ft.	in.	in.	

6. GRAVEL PACK:

	Depth From	Depth To	Size	Material
	29	40 ft.	coarse	sand
		ft.		

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)



14. REMARKS: 1' bentonite seal above sand pack, locking cap

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Ray T. Whitaker 11-9-87

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 Revised 11/84

Submit original to Division of Environmental Management and copy to well owner

Ref. 5

TEXFI INDUSTRIES
REMEDIAL ACTION PLAN
NEW BERN, NORTH CAROLINA

3136-011-1000 OCTOBER 11, 1989

3136-011-3000

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
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3	TREATMENT OBJECTIVES	6
4	HYDROGEOLOGICAL CHARACTERISTICS	10
5	SITE MONITORING AND EVALUATION OF THE REMEDIAL ACTION SYSTEM	11

APPENDIX	
A	STATE GUIDELINES WITH REPORT REFERENCES
B	RESULTS OF LABORATORY ANALYSES
C	CALCULATIONS

LIST OF FIGURES

(FIGURES IN POCKET AT END OF REPORT)

NO.	TITLE
3136-11-1000-D1	SITE PLAN
3136-11-1000-I1	GROUNDWATER TREATMENTS SYSTEM PIPING AND INSTRUMENTATION DIAGRAM SHEET 1 OF 2
3136-11-1000-I2	GROUNDWATER TREATMENTS SYSTEM PIPING AND INSTRUMENTATION DIAGRAM SHEET 2 OF 2

1. BACKGROUND

Amital Spinning Corporation contracted with Law Engineering Company (LETCo) in August 1986 to perform an environmental audit and preliminary groundwater assessment at the former Texfi plant in New Bern, North Carolina. As a result of this assessment, groundwater contamination was identified.

Charles T. Main (MAIN) was contracted to provide additional horizontal contaminant delineation in the upper aquifer, conduct initial contaminant screening in the Castle Hayne limestone aquifer, and quantify basic hydrological parameters in an attempt to identify possible pathways of migration in which contaminated groundwater might travel. Geologic cross-sections were generated from drilling logs and soil samples obtained during drilling. The results of this study were reported in the Preliminary Groundwater Assessment.

The Phase II Groundwater Assessment conducted by MAIN provided additional hydrogeologic information further defining the nature of the contaminant migration within the aquifers. More detailed potentiometric data generated during this study supported the idea of multiple contaminant source locations.

MAIN's Phase III Groundwater Assessment entailed the installation of additional monitoring wells and extensive sampling and analysis for volatile organic compounds (VOC's). The two new wells and eight existing wells were sampled and tested for VOC's in accordance with EPA Method 624.

2. INTRODUCTION

The North Carolina Division of Environmental Management has requested the submission of a Remedial Action Plan (RAP) for the remediation of groundwater contamination existing at the property owned by Texfi Industries located in New Bern, North Carolina. This report comprises the Remedial Action Plan.

The state of North Carolina requires that a Remedial Action Plan provide certain information necessary to the remediation of groundwater contamination. Significant efforts have been made to identify the groundwater contamination and the extent of the problem. The results of these efforts have been have been detailed in the following reports:

Law Engineering Preliminary Assessment
Preliminary Groundwater Assessment
Groundwater Assessment - Phase II
Groundwater Assessment - Phase III

The information contained in the above-mentioned reports along with information contained herein collectively fulfills the requirements of a Remedial Action Plan. Appendix A consists of a verbatim copy of North Carolina's Outline for Evaluation of Site Characterization Data and Remedial Action Plans for Groundwater Restoration. The components of the above investigative reports which satisfy each element of the Outline have been referenced and incorporated into the outline found in Appendix A.

Additional analyses have also been performed and the results of these analyses are also presented in this report. Finally, this

report recommends a strategy and treatment goals toward the removal of contamination from the groundwater.

The RAP consists of the following concept. A series of eleven recovery wells are planned to collect contaminated groundwater (see Drawing 3136-011-1000-D1). Ten of the recovery wells will be shallow wells. The eleventh well will be a deep recovery well.

The ten shallow wells will be screened in the Post-Miocene sands and clays. One of the shallow wells will be located adjacent to wells MW-4A and MW-6. Seven of the shallow wells will be located in a belt perpendicular to the downgradient flow and approximately 100 feet from the eastern side of the manufacturing building. The wells in the belt will be spaced approximately 125 feet from one another. The remaining two wells will be situated midway between the manufacturing building and well MW-4.

One deep recovery well will be installed in the Castle Hayne Formation and will be located in the vicinity of wells MW-9 and MW-9A. This well will recover contaminated groundwater in the lower aquifer. It is anticipated that the pumping rate for the deep well will be approximately 50 gpm. Individual pumping rates for the shallow wells will range from 0.25 to 1.0 gpm.

Contaminated groundwater will be pumped from the wells to a groundwater treatment facility for removal of volatile organic compounds (VOC's) and possibly nickel and zinc. An air stripper will be utilized to remove the VOC's. See Drawings 3136-011-1000 I1 and I2 for the proposed treatment schematic.

The background levels for nickel and zinc near the Texfi facility are currently under investigation. The NPDES permit may require the levels of nickel and zinc be reduced before treated groundwater may be discharged. If it is determined that the levels of nickel and zinc in the groundwater are elevated, physical/chemical treatment for the reduction of nickel and zinc may be included in the treatment process.

The treated groundwater will be discharged directly to a swale located adjacent to the plant building. Twenty-four hour operation of the recovery/discharge system is expected.

The treatment process will be operated until the treatment goals have been attained. Attainment of the treatment goals will be verified by the analysis of a minimum of two additional samplings. Upon confirmation that the treatment goals have been met, the treatment process will be discontinued.

3. TREATMENT OBJECTIVES

The presence of contaminants which might pose a health risk in the groundwater necessitates that the groundwater be treated for the reduction of these substances. Certain volatile organic compounds (VOC's) are present in the groundwater which have been associated with cancer risk. A toxicity test done early in the project indicates chronic toxicity. The cause of the toxicity is unknown at this time. The possibility of it being caused by elevated nickel and zinc levels is currently being investigated; therefore, the remediation action system will include reduction of VOC's and possibly nickel and zinc.

Volatile Organic Compounds (VOC's)

An analysis of the contaminated groundwater by EPA Method 624 determined the presence of thirteen (13) volatile organic compounds (VOC's) in detectable quantities. Treatment goals were developed for the VOC's based on North Carolina Division of Environmental Management guidelines such that the concentration of any one VOC will not exceed a cancer risk of 1:100,000. Of the thirteen VOC's present in the groundwater in detectable quantities, it is recommended that the following five VOC's be monitored and treated to the indicated levels:

Vinyl chloride	0.15 µg/L
Methylene chloride	47.00 µg/L
1,1 - Dichloroethylene	2.80 µg/L
1,2 - Dichloroethane	3.80 µg/L
Trichloroethylene	32.00 µg/L

The eight VOC's not included in the above list were eliminated because they met one of the following criteria:

- Non-carcinogenic
- Cancer risk dosage a minimum of ten (10) times greater than the calculated weighted average concentration of the groundwater before treatment

Appendix C provides backup calculations for the determination of the treatment goals.

Nickel and Zinc

Composite groundwater samples were found to have 237.0 µg/L nickel and 396.5 µg/L zinc. Levels in individual wells vary from 30.5 µg/L to 1185.0 µg/L for nickel and from less than 5.0 µg/L to 2585.0 µg/L for zinc. These results are given in Appendix B and are from a single sampling event. Nickel and zinc may require treatment in order to meet groundwater quality and/or surface water quality (NPDES) criteria. The NPDES permit has not been issued but may include nickel, zinc, and toxicity limits. Groundwater nickel and zinc limits are a function of background levels. The Groundwater Section of the Division of Environmental Management requires that the concentration of these metals in the groundwater be less than 150 percent of the background concentrations for the region.

Groundwater treatment goals for nickel and zinc would need to be derived by first establishing the background concentrations for these metals. Sampling to determine these background levels is in progress. The background levels will be established by

taking two deep and two shallow aquifer samples from upgradient wells adjacent to the Texfi property, plus two shallow aquifer samples from upgradient wells on the Texfi property. Once the NPDES permit is issued and the background for nickel and zinc has been set, it can be determined whether nickel and zinc treatment is necessary.

If it is required, treatment for the reduction of nickel and zinc is expected to be accomplished by physical/chemical treatment. This treatment would principally utilize precipitation to remove the metals. The solids from the precipitation process would be disposed of in an appropriate manner. Treatability and toxicity testing would be performed to verify the effectiveness of the treatment.

The treatment goals would be to reduce the nickel and zinc concentrations to less than 150 percent of the established background levels of nickel and zinc in the groundwater.

Treatment Design

Preliminary design work calls for physical/chemical treatment for the reduction of nickel and zinc followed by air stripping for the removal of VOC's. Several outstanding issues remain unresolved that may necessitate altering the final design of the treatment plant. The decision on the nickel and zinc issue will impact the final design of the treatment plant. The NPDES permit for the discharge of treated groundwater is under review. The Water Quality Section of the Division of Environmental Management will issue a list of revisions to the permit which may include treatment for the reduction of nickel and zinc, and toxicity limits. The permit is currently under review. The

final NPDES permit requirements may necessitate further alterations to the treatment design.

4. HYDROGEOLOGICAL CHARACTERISTICS

Aquifer Characteristics

Aquifer characteristics, as reported in all phases of the groundwater assessment, were developed from existing published data, actual pump test data and slug test data acquired in the field. A pump test was conducted on the existing process water well located on the south side of the plant building. Wells W-13 and W-14 were used as piezometers during a 48 hour pump test. The results of the test indicated that a sustained flow rate of 50 gpm could be pumped from the recovery well in the Castle-Hayne aquifer. Slug tests were performed on wells 3A, 4A, 6, 7, 8 and 9. The data indicated low hydraulic conductivity for the water table aquifer consisting of Coastal Plain sediments. The flow rate of each recovery well in the upper aquifer is anticipated to be less than one gallon per minute.

Plume Delineation

An attempt was made to further approximate the depth of the contaminant plume by sampling one of the deep wells in the vicinity of MW-9. Well W-14 has been drilled to a depth of 90 feet and double-cased to prevent introduction of contaminants from the upper aquifer to a lower level. Samples were obtained from two deep wells, Well W-14 and the process water well. Analysis of the samples indicated that there is no VOC contamination of the deep aquifer (see Appendix B).

5. SITE MONITORING AND EVALUATION OF THE REMEDIAL ACTION SYSTEM

The proposed monitoring regimen in the first year would begin with monthly measurements of the well water elevations in order to establish the zones of depression. Quarterly sampling and analysis of pre-treatment and post-treatment water samples would also be performed. After the first year, monitoring would consist of sampling and analysis of pre-treatment and post-treatment water samples collected twice a year. The results of all analyses would be reported to the State quarterly the first year and twice a year in subsequent years.

The treatment process will be operated until the treatment goals have been attained. Attainment of the treatment goals will be verified by the analysis of a minimum of two additional samplings. Upon confirmation that the treatment goals have been met and with consent from the State, the treatment process will be discontinued.

3 December 1990

Ref. 6

TO: File

FROM: Jack Butler

SUBJECT: Texfi New Bern, NCD981928088

An attempt was made to contact Milton Gold, President of Amital (919/636-3435), on 30 November 1990. Mr. Gold was not in, however Mr. James Ipock, Amital was contacted on 30 November 1990 and on 3 December 1990. A Site Investigation visit was scheduled for about 9:30 a.m. on 4 December 1990. Mr. Ipock reported on 3 December 1990 that Mr. Mike Miller, Texfi, would be sending a Texfi representative to the Site Investigation visit. Mr. Ipock reported that Texfi is working with the North Carolina Division of Environmental Management (DEM), Washington Regional Office, to remediate groundwater contamination present at the site. Mr. Ipock reported that he had worked with Richard Powers, Randy Jones, Buster Powell, Roger Thorp, and Buddy Bulow with the DEM office in Washington.

Mr. Richard Powers, DEM Washington Regional Office (919/946-6481) was also contacted to obtain background information on this date. Mr. Powers confirmed that Texfi representatives were working with his office to address groundwater contamination at the site. Texfi has contracted with C.T. Main Inc. for engineering services. The C.T. Main contact is Richard Griffiths (704/529-6246). Mr. Powers reported that C.T. Main had prepared four volumes of work on this site addressing a 3 phase cleanup. A single Comprehensive Corrective Action Plan is still to be submitted. Texfi has proposed a ring of recovery wells with pH adjustment. Originally the treated water was to be discharged to surface waters under a NPDES permit, however Mr. Powers reported that an infiltration gallery has now been proposed under a non-discharge permit.

Mr. Powers reported that the areas of concern that he was aware of were drums in a landfill to the far left as one faces the plant, the presence of 1,200 parts per billion (ppb) of trichloroethane (TCA) in one drinking water well, the presence of 600 ppb TCA in a second drinking water well, and the presence of Dowtherm in groundwater in an area to the left of the plant as one faces the plant. Mr. Powers added that he thought the landfilled drums had been removed as part of a site cleanup in about 1978. Mr. Powers also reported that three aquifers on the site had shown some contamination. These aquifers are a surficial aquifers, a semi-confined aquifer, and a limestone aquifer. The surficial aquifer appears to flow toward a nearby quarry, and the semiconfined aquifer appears to flow in a direction about 45° southeast from the surficial aquifer. Mr. Powers also added that he thought this area was served by the North West Craven Utilities.

Ref. 7

29 March 1989

TO: File

FROM: John McConney

RE: Water Supply for New Bern and surrounding area

During a visit to a site in the New Bern area, the site investigation team of Jack Butler, Ed Wallingford, and John McConney visited the offices of Randy G. Gould, city engineer of the city of New Bern. Mr. Gould states that New Bern used a number of wells in Cove City for their water supply. He indicated on a copy of a USGS topographic map exactly what areas were serviced by the distribution system of the city of New Bern. Following this, the team visited the office of the Craven County Water and Sewer Superintendent, Frank K. Ralph, Jr. Mr. Ralph was not in the office; however, Helen Reed of his office indicated on a copy of a USGS topographic map exactly what areas were serviced by the distribution system of Craven County. The supply wells for Craven County are located past Cove City.

JM/ds/texfi.doc/p.2

Ref. 8

26 February 1987

TO: File

FROM: Jack Butler

RE: Telephone conversation with Willy Hardison (919-946-6481), NRCD, about Texfi New Bern Site NC D TBA.

Mr. Hardison was contacted on this date to determine the street address for the subject site and its present status. Mr. Hardison said that he did not think this site had a street number but that it was located at the end of SR 1317 (Bosch Street) behind the big Richard Bosch plant.

Mr. Hardison reported that Texfi had been served with a Notice of Noncompliance (NON) by NRCD. Texfi has hired Law Engineering and Main Consulting who have installed 4 monitoring wells on the site. One of these wells extends to the top of the Castle Hayne aquifer which is at about 50 ft.

JB/tb/0193b

Ref. 9

LAW ENGINEERING
TESTING COMPANY

PRELIMINARY GROUND-WATER ASSESSMENT
FORMER TEXFI PLANT SITE
NEW BERN, NORTH CAROLINA
LETCO JOB NO.: J47286-1913A

FOR

COLE SCHOTZ

LAW ENGINEERING TESTING COMPANY
geotechnical, environmental & construction materials consultants
3301 ATLANTIC AVENUE
P.O. BOX 18288 • RALEIGH, NORTH CAROLINA 27619
(919) 876-0416

November 14, 1986

Cole Schotz
P. O. Box 800
Hackensack, NJ 07602-0800

Attention: Mr. Harold Tolchinsky

Subject: Preliminary Ground-Water Assessment
Former Texfi Plant Site
New Bern, North Carolina
LETCO: Job No.: J47286-1913A

Dear Mr. Tolchinsky:

The Law Engineering Testing Company (LETCo) has performed a preliminary ground-water assessment of the former Texfi Plant site in New Bern, North Carolina. This project was in accordance with your authorization on behalf of the Amital Spinning Corporation. Enclosed is a report of the preliminary ground-water assessment performed.

LETCo is pleased to have performed the assessment for Amital and looks forward to a continued association. Please, contact us should you have any questions.

Very truly yours,

LAW ENGINEERING TESTING COMPANY

J. Michael Watson

J. Michael Watson
Environmental Attorney

J. Allan Tice

J. Allan Tice, P.E.
Corporate Geotechnical Consultant

JMW:JAT/nb

Attachment

I. INTRODUCTION

Law Environmental Services, a Division of Law Engineering Testing Company (LETCo) performed a Preliminary Environmental Liability Assessment dated August 6, 1986 for the former Texfi textile manufacturing plant in New Bern, North Carolina. That assessment recommended that a preliminary ground-water assessment be performed at the site to determine if ground-water or soil contamination had occurred as a result of past manufacturing operations at the site. This report presents the findings of the preliminary ground-water assessment.

II. EVALUATION METHODS

The preliminary evaluation has included a sequence of well installation, sampling and analyses. The site topography did not clearly indicate a probable direction of ground-water flow. As an initial step, several inexpensive borings were hand augered and a PVC pipe inserted to maintain an open hole to allow checking of ground-water levels. Survey elevations were obtained for the ground surface and top of PVC pipe using an arbitrary site benchmark.

Based on the direction of ground-water flow indicated by these data, locations for five ground-water sampling wells were selected. The wells were installed as shown on the Well Record Sheets in Appendix A. Ground-water samples were taken from the five wells and from two of the hand auger locations on August 29, 1986. At the same time, elevation data were obtained on three of the initial monitoring wells. A subsequent review of the elevation data showed that the ground-water flow direction was, in fact, different from that originally estimated from the initial hand auger boring data. (It is believed that the initial hand auger data was affected by an extreme rainfall that occurred in New Bern just prior to the data collection.)

Four additional ground-water sampling wells were then installed at selected locations downgradient from areas of the plant where chemicals had been previously stored. Locations of all wells installed are shown on Drawing No. 1 in Appendix A. Well record forms, as required by the State, are also included in Appendix A for each well.

Ground-water samples were collected September 4 and September 18, 1986 from the additional wells after first removing four to five well volumes by bailing or using a submersible pump. The samples were placed in properly prepared sample containers furnished by the analytical laboratory, placed on ice, and transported to the laboratory on the day of sampling.

LAW ENGINEERING TESTING COMPANY

Chemical analyses were conducted by Industrial and Environmental Analysts, Inc. (IEA), in Raleigh, North Carolina. The parameters for analysis were selected to include the types of chemicals commonly used by textile plants, and to check for common contaminants listed by EPA in their list of 129 priority pollutants. Table 1 indicates the types of analyses performed on ground water from all the monitoring wells sampled. Table 2 specifies which individual metals and volatile organic carbon compounds were analyzed. Samples from the two hand auger borings were analyzed for selected parameters, but the results are not believed valid in view of the extreme rainfall and the lack of a surface seal around the temporary casings in these holes.

III. HYDROGEOLOGICAL CONSIDERATION

Available geological information for the New Bern-Craven County areas indicates that the first confined aquifer in the vicinity of the site is probably the Castle Hayne formation at a depth of 70 to 90 feet. Numerous domestic and commercial wells obtain water from this aquifer. Soils above the Castle Hayne are generally sandy with some clay and silt zones. While the presence of clay and silt would retard downward seepage, movement of organic contaminants is often not totally precluded by clay barriers.

The plant area is bounded by ditches on the west and south sides. It appears that some fill was placed in the southwest end of the plant area. Based on the ground-water elevation data, the general direction of ground-water flow is apparently toward the northeast. However, the data also indicate a ground-water mound that drains toward the adjacent perimeter ditches on the west and south.

To evaluate the potential for vertical migration of contamination, additional data, including the hydrostatic levels in the Castle Hayne aquifer and analyses of ground-water samples from various depths within the surficial aquifer, is necessary. This would require clusters of wells specifically screened and sealed at selected intervals. If it becomes necessary to drill into the Castle Hayne formation within an area of surficial contamination, special precautions and procedures will be required.

IV. GROUND-WATER CHEMICAL ANALYSES

The ground-water chemical analyses conducted to date indicate the presence of several chemicals on the EPA List of Priority Pollutants. All chemicals found above the analytical detection limits and the concentrations at which they were found have been listed in Table 3.

Copies of the IEA reports are included as Appendix B. Chlorinated solvents were found in the two wells, Well W-3A and Well W-4A, on the north side of the plant building. No EPA Priority Pollutant List volatile organics were detected in the two wells (W-1A and W-2A) downgradient (south) of the plant building.

From the data obtained, the primary concern related to contamination appears to be 1,1,1-trichloroethane (TCA). The data suggest that there may have been a past release of TCA on the north side of the plant building. A tank labeled 1,1,1-trichloroethane was observed on this side of the building during the initial site reconnaissance.

A much lower level of volatile organic compounds (VOC's) was found in well W-3A than in W-4A. VOC's were not detected in wells W-2A or W-1A. This suggests that the area of contaminant migration may still be totally within the plant property. The data are not sufficient to fully define a vertical or horizontal extent of migration or to draw conclusions or inferences on rates of migration.

V. REGULATORY CONSIDERATIONS

The North Carolina ground-water regulations utilize several classifications for ground-water. Water suitable for drinking water purposes and located within 20 feet of the ground surface is classified as GB and is considered a mixing zone and a recharge source for the surficial water table aquifer. Ground water suitable for drinking water purposes below 20 feet is classified GA. Until proven otherwise detection of contaminants in the upper 20 feet is considered as potential for contamination of the GA ground-waters below 20 feet. Permissible levels of substances are set by 15 NCAC 2L .0202 et seq. for class GA ground-water. Accordingly, the detection of a non-naturally occurring organic substance at any level is considered evidence of contamination.

Through Mr. Derr Leonhardt of the North Carolina Department of Commerce, there have been a number of telephone conversations with state personnel in the Department of Health and the Division of Environmental Management about the regulatory response to potential ground-water contamination at a site. For past releases, North Carolina's ground-water regulations establish a perimeter of compliance located at 500 feet from the release. If data are presented that show constituents in ground-water exceeding drinking water standards, the Division of Environmental Management's first step is to order a study. Such study would be conducted by the owner or responsible party to determine the horizontal and vertical extent of the contamination and prepare a remedial action plan. Remedial action can range from only monitoring at the perimeter of compliance, to clean-up of in-ground concentrations to meet applications standards.

Although the concentration permitted in ground-water varies for different constituents, Dr. Ted Taylor of the Department of Human Resources reports that maximum concentration criteria of less than ten parts per billion are typical for organic solvents such as TCA. Even if a study shows that no contamination is present at the perimeter of compliance, the NCDEM can order clean-up if, in its opinion, there is a reasonable risk that the contamination will reach the perimeter of compliance or if the contamination within the perimeter is equal to or greater than 50 percent of the unit cancer risk levels.

Factors such as the hydrogeology of the site, the potential for off-site users of the water, and the projected rate of contaminant migration are taken into account by NCDEM in reviewing individual cases.

VI. POTENTIAL CORRECTIVE ACTION

If a corrective action is required for the site, it appears that use of ground-water recovery and treatment with air stripping and/or carbon adsorption would be applicable. In air stripping, contaminated ground-water is pumped to the top of a vertical column and allowed to trickle down through the column while air is forced upward through the column. As the two streams pass each other, volatile organics are transferred from the water to the air which is vented to the atmosphere. High initial concentrations of contaminant usually require two stages to achieve the desired end concentration.

Depending on the amount of chemicals removed by the process, air emission controls can be required. A preliminary discussion with North Carolina Air Quality permit personnel suggests that controls may not be required for ground-water clean-up operations, but that a permit would be required. The need for emission controls will depend on the amount of organics being emitted per day and the expected duration of the operation.

Use of activated carbon filtration is another means of removing certain organics from ground-water. This method is generally more costly than air stripping. The spent carbon (in the system after use) must be disposed of as a hazardous waste.

Data and evaluation necessary to develop estimates of clean up times are beyond the scope of this initial assessment.

VII. POTENTIAL CORRECTIVE ACTION COSTS

Establishing a definitive cost estimate for Corrective Action at this site is not possible with the present information. The extent of the problem and the regulatory agency requirements are not yet known. To prepare a cost estimate would require a significant amount of engineering study. Based on our experience with similar projects, we estimate the cost of a study to define the horizontal and vertical extent of contamination and to develop a Corrective Action Plan could be in the range of $80,000 to $120,000. This assumes no extensive off-site exploration and relatively limited sources, and does not include permitting.

For a general estimate of the range of corrective costs, we have reviewed our experience with sites using air stripping to remove organic chemicals, and we have received information from Mr. Leonhardt on four similar sites in North Carolina that required ground-water recovery and treatment. Our experience suggests such costs can range from $500,000 to $1,000,000 or more. Mr. Leonhardt's information showed a range of $200,000 to $1,000,000. These estimates assume no extensive off-site contaminations, nominal annual operating costs for a period of less than 10 years and no extensive air emission controls. The projected clean up time and need for emission controls require additional data and evaluations.

Even if only a continued monitoring activity is required, designing and installing ground-water monitoring wells is estimated to cost $20,000 to $30,000 with annual costs for sampling, analyses, and reporting of about $10,000.

VIII. CONCLUSIONS

The available data indicate the presence of several organic compounds in the shallow ground-water at the site. The highest concentrations detected were for 1,1,1 trichloroethane (TCA). The extent of the contamination is not known, but two wells located 500 feet or more downgradient from the well with highest measured level of TCA did not indicate the presence of TCA. It must be emphasized that these conclusions are based on the results of a single (one time) sampling and analyses for a given well. Additional data are necessary to confirm the magnitude and extent of contaminants.

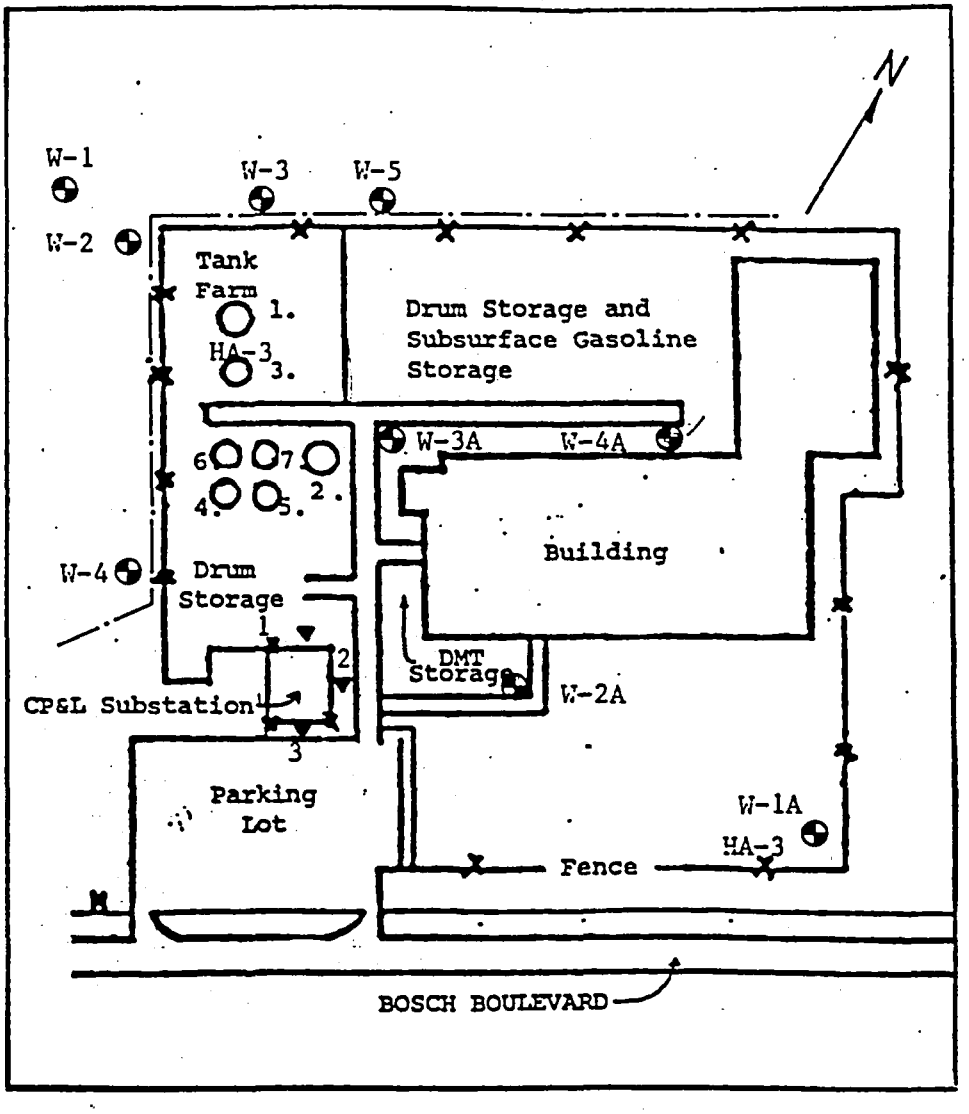
Published geologic information and local area experience indicate that the hydro-geologic setting of the site could result in lateral or vertical movement of the contamination.

From our general discussions with various state personnel, we believe that once the level of contamination is reported to the State Division of Environmental Management, a study would be ordered to determine the lateral and vertical extent of the contamination and to recommend a remedial approach. Our experience with such studies suggests that the cost would be on the order of $100,000 or more.

Available information on somewhat similar settings with corrective action suggest a cost range for clean-up could be $200,000 to $1,000,000 or more with most experience suggesting costs in excess of $500,000. Again, the actual costs are very site specific.

IX. RECOMMENDATIONS

We understand that Amital is pursuing an agreement with Texfi whereby Amital would conduct an assessment to confirm the need for and extent of corrective action. Texfi would then be responsible for implementing such corrective action. Therefore, we recommend a program be designed to further assess the contamination at the site. Once this program has been developed it is recommended that the actions to be undertaken be discussed with the NCDGM prior to initiating work.



Monitoring Well Location

Perimeter Ditch

Soil sample from top 12 inches

Hand auger boring with temporary casing

Scale approximately 1"=300'

AMITAL SPINNING CORPORATION	LAW ENVIRONMENTAL SERVICES MARIETTA, GEORGIA	SKETCH MAP OF PLANT AND EXTERIOR FACILITIES. PROPOSED AMITAL SPINNING CORPORATION PROPERTY ACQUISITION JOB NO. J1913A FIGURE 1

TABLE 1 MATRIX OF ANALYSES PERFORMED ON GROUND-WATER QUALITY SAMPLES COLLECTED FROM THE TEXFI TEXTILE MILL IN NEW BERN, NORTH CAROLINA

WELL 2	WELL 1A	WELL 2A	WELL 3A	WELL 4A
VOC Metals O & G TOC	VOC Metals O & G Pest/PCB B/N A/E	VOC Metals O & G	VOC Metals O & G	VOC Metals O & G

VOC	Volatile Organic Carbon Compounds (listed in Table 2)
Metals	Dissolved Heavy Metals (listed in Table 2)
O & G	Residue Oil and Grease
Pest/PCB	Pesticides and PCB's in the Priority Pollutant List
B/N	Base/Neutral Extractables in the Priority Pollutant List
A/E	Acid Extractables in the Priority Pollutant List
TOC	Total Organic Carbon

TABLE 2 SPECIFIC METALS AND VOC COMPOUNDS ANALYZED

METALS

Dissolved Antimony	Dissolved Chromium	Dissolved Selenium
Dissolved Arsenic	Dissolved Copper	Dissolved Silver
Dissolved Barium	Dissolved Lead	Dissolved Thallium
Dissolved Beryllium	Dissolved Mercury	Dissolved Zinc
Dissolved Cadmium	Dissolved Nickel	

VOLATILE ORGANIC CARBON COMPOUNDS

Benzene	1,1-Dichloroethene
Bromodichloromethane	trans-1,2-Dichloroethene
Bromoform	1,2-Dichloropropane
Carbon tetrachloride	cis-1,3-Dichloropropane
Chlorobenzene	trans-1,3-Dichloropropane
Chloroethane	Ethyl benzene
2-Chloroethylvinyl ether	Methylene chloride
Chloroform	1,1,2,2-Tetrachloroethane
Chloromethane	Tetrachloroethene
Dibromochloromethane	Toluene
1,2-Dichlorobenzene	1,1,1-Trichloroethane
1,3-Dichlorbenzene	1,1,2-Trichloroethane
1,4-Dichlorobenzene	Trichloroethene
1,1-Dichloroethane	Trichlorofluoromethane
1,2-Dichloroethane	Vinyl chloride

TABLE 3 GROUND-WATER COMPONENTS DETECTED AT THE TEXFI TEXTILE MILL IN NEW BERN, NORTH CAROLINA

	WELL 2	WELL 1A	WELL 2A	WELL 3A	WELL 4A
			ORGANIC COMPOUNDS (mg/1)		
Chloroethane	BDL	BDL	BDL	0.062	BDL
1,1-Dichloroethane	BDL	BDL	BDL	0.14	240
1,1-Dichloroethene	BDL	BDL	BDL	0.017	16.
Methylene chloride	0.10	BDL	BDL	BDL	BDL
Tetrachloroethene	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	BDL	BDL	BDL	BDL	370
Total organic carbon	5.7	NA	NA	NA	NA
			DISSOLVED METALS (mg/1)		
Copper	BDL	0.02	BDL	0.02	BDL
Lead	BDL	0.007	BDL	BDL	BDL
Nickel	0.06	BDL	BDL	BDL	BDL
Selenium	BDL	0.005	0.016	BDL	BDL
Thallium	0.34	BDL	BDL	BDL	BDL
Zinc	0.02	BDL	BDL	0.01	BDL

BDL Below Detection Limit

NA Not Analyzed

APPENDIX A

WELL INSTALLATION RECORDS

LAW ENGINEERING TESTING COMPANY

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR LAW ENGINEERING
DRILLER REGISTRATION NUMBER 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0100

1. WELL LOCATION: (Show sketch of the location below) WELL W-1A
Nearest Town: NEW BERN
County: CRAVEN
BOSCH RD
(Road, Community, or Subdivision and Lot No.)
OWNER AMITAL SPINNING CO.
ADDRESS P.O. BOX 31
(Street or Route No.)
HAWTHORNE N.J. 07507
City or Town State Zip Code

2. DATE DRILLED 9-2-86 USE OF WELL MONITORING
TOTAL DEPTH 18.5 CUTTINGS COLLECTED ☐ Yes ☒ No
DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
5. STATIC WATER LEVEL: 12 FT. ☐ above ☒ below TOP OF CASING.
TOP OF CASING IS 2 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST _____
WATER ZONES (depth): 10 - 18.5'

9. CHLORINATION: Type N/A Amount _____

CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
	0	8 Ft.	2"	Sch 40	PVC
		Ft.			
		Ft.			

GROUT:

	Depth From	To	Material	Method
	0	6 Ft.	Cement	Pumped
		Ft.		

12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	8	18 Ft.	2" in.	.01 in.	PVC
		Ft.	in.	in.	
		Ft.	in.	in.	

13. GRAVEL PACK:

	Depth From	To	Size	Material
	7	18 Ft.	SAND	
		Ft.		

14. REMARKS: BENTONITE PLUG 6-7'

Depth From	To	DRILLING LOG Formation Description

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

SEE ATTACHED MAP

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT _____ DATE 11/13/86

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR LAW ENGINEERING
DRILLER REGISTRATION NUMBER 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0100

1. WELL LOCATION: (Show sketch of the location below) WELL W-2A
Nearest Town: NEW BERN
County: CRAVEN
BOSCH RD
(Road, Community, or Subdivision and Lot No.)

2. OWNER AMITAL SPINNING CO.
ADDRESS P.O. BOX 31
(Street or Route No.)
HAWTHORNE N.J. 07507
City or Town State Zip Code

3. DATE DRILLED 9-2-86 USE OF WELL MONITORING
4. TOTAL DEPTH 18.5 CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 11.3 FT. ☒ above ☐ below TOP OF CASING,
TOP OF CASING IS 2 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST
WATER ZONES (depth): 9 - 18.5

9. CHLORINATION: Type N/A Amount

10. CASING:

	Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
	0	8	2"	Sch 40	PVC

11. GROUT:

	Depth From	Depth To	Material	Method
	0	6	Cement	Pumped

12. SCREEN:

	Depth From	Depth To	Diameter	Slot Size	Material
	8	18	2"	.01 in.	PVC

13. GRAVEL PACK:

	Depth From	Depth To	Size	Material
	7	18	SAND	

14. REMARKS: BENTONITE PLUG 6-7'

Depth From	Depth To	DRILLING LOG Formation Description

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

SEE ATTACHED MAP

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT 11/13/86 DATE

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-6083

FOR OFFICE USE ONLY

Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR LAW ENGINEERING

DRILLER REGISTRATION NUMBER 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0100

1. WELL LOCATION: (Show sketch of the location below) WELL W-3A

Nearest Town: NEW BERN

County: CRAVEN

BOSCH RD
(Road, Community, or Subdivision and Lot No.)

2. OWNER AMITAL SPINNING CO.

ADDRESS P.O. BOX 31
(Street or Route No.)

HAWTHORNE N.J. 07507
City or Town State Zip Code

3. DATE DRILLED 9-2-86 USE OF WELL MONITORING

TOTAL DEPTH 18.5 CUTTINGS COLLECTED ☐ Yes ☒ No

DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No

6. STATIC WATER LEVEL: 8.5 FT. ☐ above ☒ below TOP OF CASING,

TOP OF CASING IS 2 FT. ABOVE LAND SURFACE.

7. YIELD (gpm): N/A METHOD OF TEST

ATER ZONES (depth): 6.5 - 18.5

9. CHLORINATION: Type N/A Amount

1. CASING:

	Depth From	To	Ft.	Diameter	Wall Thickness or Weight/Ft.	Material
	0	8		2"	Sch 40	PVC

1. GROUT:

	Depth From	To	Ft.	Material	Method
	0	6		Cement	Pumped

2. SCREEN:

	Depth From	To	Ft.	Diameter	Slot Size	Material
	8	18		2" in.	.01 in.	PVC
				in.	in.	
				in.	in.	

3. GRAVEL PACK:

	Depth From	To	Ft.	Size	Material
	7	18		SAND	

4. REMARKS: BENTONITE PLUG 6-7'

DRILLING LOG

Depth From	To	Formation Description

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

SEE ATTACHED MAP

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 11/13/86

SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR LAW ENGINEERING
DRILLER REGISTRATION NUMBER 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0100

1. WELL LOCATION: (Show sketch of the location below) WELL W-4A
Nearest Town: NEW BERN
County: CRAVEN
BOSCH RD
(Road, Community, or Subdivision and Lot No.)

2. OWNER AMITAL SPINNING CO.
ADDRESS P.O. BOX 31
(Street or Route No.)
HAWTHORNE N.J. 07507
City or Town State Zip Code

3. DATE DRILLED 9-2-86 USE OF WELL MONITORING
4. TOTAL DEPTH 18.5 CUTTINGS COLLECTED ☐ Yes ☒ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 18.5 FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST _____
ATER ZONES (depth): _____
9. CHLORINATION: Type N/A Amount _____
10. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
	0	8	2"	Sch 40	PVC

11. GROUT:

	Depth From	To	Material	Method
	0	6	Cement	Pumped

12. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
	8	18	2"	.01 in.	PVC

13. GRAVEL PACK:

	Depth From	To	Size	Material
	7	18	SAND	

14. REMARKS: BENTONITE PLUG 6-7'

Depth From	To	DRILLING LOG Formation Description

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

SEE ATTACHED MAP

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT _____ DATE 11/13/86

Submit original to Division of Environmental Management and copy to well owner

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY	
Quad. No.	Serial No.
Lat.	Long. / Pc
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW ENGINEERING

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0100

WELL LOCATION: (Show sketch of the location below) WELL W-1

Nearest Town: NEW BERN

County: CRAVEN

BOSCH RD.
(Road, Community, or Subdivision and Lot No.)

OWNER: AMITAL SPINNING Co.

ADDRESS: P.O. Box 31
(Street or Route No.)

HAWTHORNE N.J. 07507
City or Town / State / Zip Code

6. DATE DRILLED: 8/26/86 USE OF WELL: TEMP. MONITORING

TOTAL DEPTH: 18' CUTTINGS COLLECTED: ☒ Yes ☐ No

5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No

STATIC WATER LEVEL: 9.25 FT. ☐ above ☒ below TOP OF CASING.

TOP OF CASING IS 1.6 FT. ABOVE LAND SURFACE.

7. YIELD (gpm): N/A METHOD OF TEST

WATER ZONES (depth):

9. CHLORINATION: Type N/A Amount

10. CASING:

	Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
	0	8	2	Sch 40	PVC

11. GROUT:

	Depth From	Depth To	Material	Method
	0	6	Cement	Pump
BENTONITE	6	7	BENTONITE	PELLETS

12. SCREEN:

Depth From	Depth To	Diameter	Slot Size	Material
8	18'	2 in.	.015 in.	PVC

13. GRAVEL PACK:

Depth From	Depth To	Size	Material
7	18	SAND	

Depth From	Depth To	DRILLING LOG Formation Description
0	9	BROWN Fi SA CLAY
9	18	Gray Clayey fine-med SAN

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

SEE ATTACHED MAP

14. REMARKS: TEMPORARY WELL - TO BE ABANDONED WITHIN 30 DAYS

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT: [signature] DATE: 9/30/86

Submit original to Division of Environmental Management and copy to well owner.

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT – GROUNDWATER SECTION
P.O. BOX 27687 – RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY	
Quad. No.	Serial No.
Lat.	Long. / Pc
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW ENGINEERING

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: ZA-0267-WM-0100

WELL LOCATION: (Show sketch of the location below) Well W-2

Nearest Town: NEW BERN

County: CRAVEN

BOSCH RD.
(Road, Community, or Subdivision and Lot No.)

OWNER: AMITAL SPINNING Co.

ADDRESS: P.O. BOX 31
(Street or Route No.)

HAWTHORNE N.J. 07507
City or Town State Zip Code

DATE DRILLED: 8/26/86 USE OF WELL: TEMP. MONITORING

TOTAL DEPTH: 18' CUTTINGS COLLECTED: ☒ Yes ☐ No

DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No

STATIC WATER LEVEL: 8.7 FT. ☐ above ☒ below TOP OF CASING,

TOP OF CASING IS 0.6 FT. ABOVE LAND SURFACE.

YIELD (gpm): N/A METHOD OF TEST

WATER ZONES (depth):

CHLORINATION: Type N/A Amount

CASING:

	Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
	0	8	2	Sch 40	PVC

GROUT:

	Depth From	Depth To	Material	Method
	0	6	Cement	Pump
BENTONITE	6	7	BENTONITE	PELLETS

SCREEN:

Depth From	Depth To	Diameter	Slot Size	Material
8	18'	2 in.	.015 in.	PVC
		in.	in.	
		in.	in.	

GRAVEL PACK:

Depth From	Depth To	Size	Material
7	18	SAND	

Depth From	Depth To	DRILLING LOG Formation Description
0	9	Brown silty to fine sandy CLAY
9	18	Gray fine sandy clay to very clayey fine SAND

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

SEE ATTACHED MAP

REMARKS: TEMPORARY WELL – TO BE ABANDONED WITHIN 30 DAYS

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT: [signature] DATE: 9/30/86

Division of Environmental Management copy to well owner

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT – GROUNDWATER SECTION
P.O. BOX 27687 – RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY	
Quad. No.	Serial No.
Lat.	Long. / Pc
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW ENGINEERING

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0100

1. WELL LOCATION: (Show sketch of the location below) Well W-3

Nearest Town: NEW BERN

County: CRAVEN

BOSCH RD.
(Road, Community, or Subdivision and Lot No.)

2. OWNER: AMITAL SPINNING Co.

ADDRESS: P.O. BOX 31
(Street or Route No.)

HAWTHORNE N.J. 07507
City or Town State Zip Code

3. DATE DRILLED: 8/26/86 USE OF WELL: TEMP. MONITORING

4. TOTAL DEPTH: 18' CUTTINGS COLLECTED: ☒ Yes ☐ No

5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No

6. STATIC WATER LEVEL: 9.1 FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2 FT. ABOVE LAND SURFACE.

7. YIELD (gpm): N/A METHOD OF TEST

WATER ZONES (depth):

8. CHLORINATION: Type N/A Amount

Depth From	Depth To	DRILLING LOG Formation Description
0	9	Gray to brown Silty to fine sandy CLAY
9	18	Gray fine sandy CLAY

If additional space is needed use back of form.

10. CASING:

	Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
	0	8	2	Sch 40	PVC

11. GROUT:

	Depth From	Depth To	Material	Method
	0	96	Cement	Pump
BENTONITE	6 ~~8~~	7 ~~8~~	BENTONITE	PELLETS

12. SCREEN:

Depth From	Depth To	Diameter	Slot Size	Material
8	18'	2 in.	.015 in.	PVC
		in.	in.	
		in.	in.	

13. GRAVEL PACK:

Depth From	Depth To	Size	Material
~~8~~ 7	18	SAND	

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

SEE ATTACHED MAP

14. REMARKS: TEMPORARY WELL – TO BE ABANDONED WITHIN 30 DAYS

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT: [signature] DATE: 9/29/86

Submit original to Division of Environmental Management and copy to well owner.

TH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

RILLING CONTRACTOR LAW ENGINEERING
LLER REGISTRATION NUMBER 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0100

WELL W-4

WELL LOCATION: (Show sketch of the location below)
arest Town: NEW BERN
BOSCH RD.
(Road, Community, or Subdivision and Lot No.)

County: CRAVEN

WNER AMITAL SPINNING Co.
ADDRESS P.O. Box 31
(Street or Route No.)
HAWTHORNE N.J. 07507
City or Town State Zip Code

DATE DRILLED 8/26/86 USE OF WELL TEMP. MONITORING
OTAL DEPTH 18' CUTTINGS COLLECTED ☒ Yes ☐ No
DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
STATIC WATER LEVEL: 11.1 FT. ☐ above ☒ below TOP OF CASING.
TOP OF CASING IS 2' FT. ABOVE LAND SURFACE.
YIELD (gpm): N/A METHOD OF TEST _____
ER ZONES (depth): _____

CHLORINATION: Type N/A Amount _____

CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From	0	To 8 Ft.	2	Sch 40	PVC
From		To Ft.			
From		To Ft.			

GROUT:

	Depth		Material	Method
From	0	To 6 Ft.	Cement	Pump
ENTONITE From	6	To 7 Ft.	BENTONITE	PELLETS

12. SCREEN:

	Depth		Diameter	Slot Size	Material
From	8	To 18' Ft.	2 in.	.015 in.	PVC
From		To Ft.	in.	in.	
From		To Ft.	in.	in.	

13. GRAVEL PACK:

	Depth		Size	Material
From	7	To 18 Ft.	SAND	
From		To Ft.		

Depth From	Depth To	DRILLING LOG Formation Description
0	4	Lt. gray Fine Sandy CLAY
4	9	Brown Fine Sandy CLAY
9	12	Gray very clayey Fine to medium SAND
12	18	Gray fine Sandy CLAY

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

SEE ATTACHED MAP

4. REMARKS: TEMPORARY WELL - TO BE ABANDONED WITHIN 30 DAYS

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT — DATE 9/29/86

Submit original to Division of Environmental Management and copy to well owner.

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919)-733-5083

FOR OFFICE USE ONLY
Quad. No. _____ Serial No. _____
Lat. _____ Long. _____ Pc _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR LAW ENGINEERING
DRILLER REGISTRATION NUMBER 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 24-0267-WM-0100

1. WELL LOCATION: (Show sketch of the location below) WELL W-5
Nearest Town: NEW BERN
BOSCH RD.
(Road, Community, or Subdivision and Lot No.)
County: CRAVEN

2. OWNER AMITAL SPINNING Co.
ADDRESS P.O. Box 31
(Street or Route No.)
HAWTHORNE N.J. 07507
City or Town State Zip Code

3. DATE DRILLED 8/26/96 USE OF WELL TEMP. MONITORING
4. TOTAL DEPTH 18' CUTTINGS COLLECTED ☒ Yes ☐ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 9.1 FT. ☐ above ☒ below TOP OF CASING,
TOP OF CASING IS 2 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST
8. WATER ZONES (depth):
9. CHLORINATION: Type N/A Amount

Depth From	Depth To	DRILLING LOG Formation Description
0	5	GRAY AND BROWN SILTY CLAY
5	14	BROWN FINE SANDY CLAY
14	18	BROWN AND GRAY SILTY to CLAYEY FINE SAND

If additional space is needed use back of form.

10. CASING:

	Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
	0	8	2	Sch 40	PVC

11. GROUT:

	Depth From	Depth To	Material	Method
	0	6	Cement	Pump
BENTONITE	6	7	BENTONITE	PELLETS

12. SCREEN:

Depth From	Depth To	Diameter	Slot Size	Material
8	18'	2 in.	.015 in.	PVC
		in.	in.	
		in.	in.	

13. GRAVEL PACK:

Depth From	Depth To	Size	Material
7	18	SAND	

LOCATION SKETCH
(Show direction and distance from at least two State Roads or other map reference points)
SEE ATTACHED MAP

14. REMARKS: TEMPORARY WELL - TO BE ABANDONED WITHIN 30 DAYS

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT DATE 9/29/96

Submit original to Division of Environmental Management and copy to well own

APPENDIX B
LABORATORY
REPORTS

LAW ENGINEERING
TESTING COMPANY

Industrial & Environmental Analysts, Inc.
P.O. Box 12846 • Research Triangle Park, NC 27709 • 919-467-9919

RECEIVED BY
SEP 23 1986
LAW ENGINEERING

September 19, 1986

Mr. Al Tice
Law Engineering Testing Company
3301 Winton Road
P.O. Box 18288
Raleigh, NC 27619

Reference: IEA Report No. 287-28

Dear Mr. Tice:

Transmitted herewith are the results of analyses on two samples submitted to our laboratory on September 18, 1986.

Please see the enclosed reports for your results.

Very truly yours,

INDUSTRIAL & ENVIRONMENTAL ANALYSTS, INC.

Joseph B. Adamovic
Senior Chemist

JBA/jcl

Industrial & Environmental Analysts, Inc.
P.O. Box 12846 • Research Triangle Park, NC 27709 • 919-467-9919

September 5, 1986

RECEIVED BY
SEP 8 1986
LAW ENGINEERING

Al Tice
Law Engineering Testing Company
3301 Winton Road
P.O. Box 18288
Raleigh, NC 27619

Reference: IEA Report No. 287-25

Dear Mr. Tice:

Transmitted herewith are the results of analyses on three samples submitted to our laboratory on August 29, 1986.

		Well W-2
Oil & Grease	mg/L	<2.0
Arsenic	mg/L	<0.005
Barium	mg/L	<0.2
Cadmium	mg/L	<0.01
Chromium	mg/L	<0.03
Lead	mg/L	<0.005
Mercury	mg/L	<0.0005
Selenium	mg/L	<0.005
Silver	mg/L	<0.05
Thallium	mg/L	0.34
Beryllium	mg/L	<0.01
Zinc	mg/L	0.02
Copper	mg/L	<0.02
Antimony	mg/L	<0.2
Nickel	mg/L	0.06

Please see the enclosed reports for your volatile reports.

Very truly yours,

INDUSTRIAL & ENVIRONMENTAL ANALYSTS, INC.

Joseph B. Adamovic
Senior Chemist

JBA/jcl

		Well W-2	HA-3	HA-5
Total Organic Carbon	mg/L	5.7*	5.6*	5500*

*This value indicates the need for more detailed analysis to identify organic compounds.

Industrial & Environmental Analysts, Inc.
P.O. Box 12846 • Research Triangle Park, NC 27709 • 919 467-9919

September 16, 1986

RECEIVED
SEP 17 1986

Mr. Al Tice
Law Engineering Testing Company
3301 Winton Road
P.O. Box 18288
Raleigh, NC 27619

Reference: IEA Report No. 287-26

Dear Mr. Tice:

Transmitted herewith are the results of analyses on four samples submitted to our laboratory on September 4, 1986. The samples were filtered through a 0.45 micron filter prior to analysis.

Please see the enclosed reports for your results.

Very truly yours,

INDUSTRIAL & ENVIRONMENTAL ANALYSTS, INC.

Joseph B. Adamovic

Joseph B. Adamovic
Senior Chemist

JBA/jcl

		W-1A	W-2A	W-3A	W-4A
Oil & Grease	mg/L	<5.0	<5.0	<5.0	<5.0
Arsenic	mg/L	<0.005	<0.005	<0.005	<0.005
Barium	mg/L	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	<0.01	<0.01	<0.01	<0.01
Chromium	mg/L	<0.03	<0.03	<0.03	<<0.03
Lead	mg/L	0.007	<0.005	<0.005	<0.005
Selenium	mg/L	0.005	0.016	<0.005	<0.005
Silver	mg/L	<0.05	<0.05	<0.05	<0.05
Mercury	mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Thallium	mg/L	<0.05	<0.05	<0.05	<0.05
Beryllium	mg/L	<0.01	<0.01	<0.01	<0.01
Zinc	mg/L	<0.01	<0.01	0.01	<0.01
Antimony	mg/L	<0.2	<0.2	<0.2	<0.2
Nickel	mg/L	<0.03	<0.03	<0.03	<0.03
Copper	mg/L	0.02	<0.02	0.02	<0.02

Industrial & Environmental Analysts, Inc.
P.O. Box 12846 • Research Triangle Park, NC 27709 • 919-467-9919

September 29, 1986

RECEIVED BY
OCT 1 1986
LAW ENGINEERING

Al Tice
Law Engineering Testing Company
3301 Winton Road
P.O. Box 18288
Raleigh, NC 27619

Reference: IEA Report No. 287-29

Dear Mr. Tice:

Transmitted herewith are the results of analyses on three samples submitted to our laboratory on September 19, 1986.

	Total PCB mg/Kg
#1	<1.0
#2	<1.0
#3	<1.1

Very truly yours,

INDUSTRIAL & ENVIRONMENTAL ANALYSTS, INC.

Joseph B. Adamovic

Joseph B. Adamovic
Senior Chemist

JBA/jcl

Comments

BDL - BELOW DETECTION LIMIT

GC/MS Purgeables

IEA Sample No. 287028 1

Client Identification W-1A

Date Analyzed September 18, 1986 **By** Daniels

Number	Compound	Detection Limit µg/L	Results Concentration µg/L
1	BENZENE	10	BDL
2	BROMODICHLOROMETHANE	10	BDL
3	BROMOFORM	10	BDL
4	BROMOMETHANE	10	BDL
5	CARBON TETRACHLORIDE	10	BDL
6	CHLOROBENZENE	10	BDL
7	CHLOROETHANE	10	BDL
8	2-CHLOROETHYLVINYL ETHER	10	BDL
9	CHLOROFORM	10	BDL
10	CHLOROMETHANE	10	BDL
11	DIBROMOCHLOROMETHANE	10	BDL
12	1,2-DICHLOROBENZENE	10	BDL
13	1,3-DICHLOROBENZENE	10	BDL
14	1,4-DICHLOROBENZENE	10	BDL
15	1,1-DICHLOROETHANE	10	BDL
16	1,2-DICHLOROETHANE	10	BDL
17	1,1-DICHLOROETHENE	10	BDL
18	trans-1,2-DICHLOROETHENE	10	BDL
19	1,2-DICHLOROPROPANE	10	BDL
20	cis-1,3-DICHLOROPROPENE	10	BDL
21	trans-1,3-DICHLOROPROPENE	10	BDL
22	ETHYL BENZENE	10	BDL
23	METHYLENE CHLORIDE	10	BDL
24	1,1,2,2-TETRACHLOROETHANE	10	BDL
25	TETRACHLOROETHENE	10	BDL
26	TOLUENE	10	BDL
27	1,1,1-TRICHLOROETHANE	10	BDL
28	1,1,2-TRICHLOROETHANE	10	BDL
29	TRICHLOROETHENE	10	BDL
30	TRICHLOROFLUOROMETHANE	10	BDL
31	VINYL CHLORIDE	10	BDL

Comments | BDL - BELOW DETECTION LIMIT

GC/MS PCB/Pesticides

IEA Sample No. 287026 1
Client Identification W-1A
Date Extracted September 10, 1986 **Date Analyzed** September 11, 1986
By King

Number	Compound	Detection Limit µg/L	Results Concentration µg/L
1	ALDRIN	40	BDL
2	Alpha - BHC	40	BDL
3	Beta - BHC	40	BDL
4	Delta - BHC	40	BDL
5	Gamma - BHC	40	BDL
6	CHLORDANE	40	BDL
7	4,4'-DDD	40	BDL
8	4,4'-DDE	40	BDL
9	4,4'-DDT	40	BDL
10	DIELDRIN	40	BDL
11	ENDOSULFAN I	40	BDL
12	ENDOSULFAN II	40	BDL
13	ENDOSULFAN SULFATE	40	BDL
14	ENDRIN	40	BDL
15	ENDRIN ALDEHYDE	40	BDL
16	HEPTACHLOR	40	BDL
17	HEPTACHLOR EPOXIDE	40	BDL
18	TOXAPHENE	40	BDL
19	PCB 1016	40	BDL
20	PCB 1221	40	BDL
21	PCB 1232	40	BDL
22	PCB 1242	40	BDL
23	PCB 1248	40	BDL
24	PCB 1254	40	BDL
25	PCB 1260	40	BDL

Comments

BDL - BELOW DETECTION LIMIT

GC/MS Acid Extractables

IEA Sample No. 287026 1
Client Identification W-1A
Date Extracted September 10, 1986 **Date Analyzed** September 11,
By King

Number	Compound	Detection Limit µg/L	Results Concentration µg/L
1	4-CHLORO-3-METHYLPHENOL	100	BDL
2	2-CHLOROPHENOL	100	BDL
3	2,4-DICHLOROPHENOL	100	BDL
4	2,4-DIMETHYLPHENOL	100	BDL
5	2,4-DINITROPHENOL	1000	BDL
6	2-METHYL-4,6-DINITROPHENOL	1000	BDL
7	2-NITROPHENOL	100	BDL
8	4-NITROPHENOL	100	BDL
9	PENTACHLOROPHENOL	100	BDL
10	PHENOL	100	BDL
11	2,4,6-TRICHLOROPHENOL	100	BDL

Comments | BDL - BELOW DETECTION LIMIT
Phthalates present but not quantitated due to sample matrix interferences.
Please see Chromato gram.

IEA Sample No. 287026 1 **Client Identification** W-1A

Date Extracted September 10, **Date Analyzed** September 11, 1986

By King

GS/MS Base/Neutral Extractables

Number	Compound	Detection Limit µg/L	Concentration µg/L
1	ACENAPHTHENE	100	BDL
2	ACENAPHTHYLENE	40	BDL
3	ANTHRACENE	40	BDL
4	BENZIDINE	40	BDL
5	BENZO (a) ANTHRACENE	40	BDL
6	BENZO (a) PYRENE	40	BDL
7	BENZO (b) FLUORANTHENE	40	BDL
8	BENZO (ghi) PERYLENE	100	BDL
9	BENZO (k) FLUORANTHENE	40	BDL
10	BIS (2-CHLOROETHOXY) METHANE	40	BDL
11	BIS (2-CHLOROETHYL) ETHER	40	BDL
12	BIS (2-CHLOROISOPROPYL) ETHER	40	BDL
13	BIS (2-ETHYLHEXYL) PHTHALATE	40	BDL
14	4-BROMOPHENYL PHENYL ETHER	40	BDL
15	BENZYL BUTYL PHTHALATE	40	BDL
16	2-CHLORONAPHTHALENE	40	BDL
17	4-CHLOROPHENYL PHENYL ETHER	40	BDL
18	CHRYSENE	40	BDL
19	DIBENZO (a,h) ANTHRACENE	40	BDL
20	1,2-DICHLOROBENZENE	40	BDL
21	1,3-DICHLOROBENZENE	40	BDL
22	1,4-DICHLOROBENZENE	40	BDL
23	3,3'-DICHLOROBENZIDINE	40	BDL
24	DIETHYL PHTHALATE	40	BDL
25	DIMETHYL PHTHALATE	40	BDL
26	DI-N-BUTYL PHTHALATE	40	BDL
27	2,4-DINITROTOLUENE	40	BDL
28	2,6-DINITROTOLUENE	40	BDL
29	DI-N-OCTYLPHTHALATE	40	BDL
30	FLUORANTHENE	40	BDL
31	FLUORENE	40	BDL
32	HEXACHLOROBENZENE	40	BDL
33	HEXACHLOROBUTADIENE	40	BDL
34	HEXACHLOROCYCLOPENTADIENE	40	BDL
35	HEXACHLOROETHANE	40	BDL
36	INDENO(1,2,3-cd)PYRENE	100	BDL
37	ISOPHORONE	40	BDL
38	NAPHTHALENE	40	BDL
39	NITROBENZENE	40	BDL
40	N-NITROSODIMETHYLAMINE	40	BDL
41	N-NITROSO-DI-N- PROPYLAMINE	40	BDL
42	N-NITROSODIPHENYLAMINE	40	BDL
43	PHENANTHRENE	40	BDL
44	PYRENE	40	BDL
45	1,2,4,-TRICHLOROBENZENE	40	BDL

Comments

BDL - BELOW DETECTION LIMIT

GC/MS Purgeables

IEA Sample No. 287026 2

Client Identification W-2A

Date Analyzed September 10, 1986 **By** King

Number	Compound	Detection Limit µg/L	Results Concentration µg/L
1	BENZENE	10	BDL
2	BROMODICHLOROMETHANE	10	BDL
3	BROMOFORM	10	BDL
4	BROMOMETHANE	10	BDL
5	CARBON TETRACHLORIDE	10	BDL
6	CHLOROBENZENE	10	BDL
7	CHLOROETHANE	10	BDL
8	2-CHLOROETHYLVINYL ETHER	10	BDL
9	CHLOROFORM	10	BDL
10	CHLOROMETHANE	10	BDL
11	DIBROMOCHLOROMETHANE	10	BDL
12	1,2-DICHLOROBENZENE	10	BDL
13	1,3-DICHLOROBENZENE	10	BDL
14	1,4-DICHLOROBENZENE	10	BDL
15	1,1-DICHLOROETHANE	10	BDL
16	1,2-DICHLOROETHANE	10	BDL
17	1,1-DICHLOROETHENE	10	BDL
18	trans-1,2-DICHLOROETHENE	10	BDL
19	1,2-DICHLOROPROPANE	10	BDL
20	cis-1,3-DICHLOROPROPENE	10	BDL
21	trans-1,3-DICHLOROPROPENE	10	BDL
22	ETHYL BENZENE	10	BDL
23	METHYLENE CHLORIDE	10	BDL
24	1,1,2,2-TETRACHLOROETHANE	10	BDL
25	TETRACHLOROETHENE	10	BDL
26	TOLUENE	10	BDL
27	1,1,1-TRICHLOROETHANE	10	BDL
28	1,1,2-TRICHLOROETHANE	10	BDL
29	TRICHLOROETHENE	10	BDL
30	TRICHLOROFLUOROMETHANE	10	BDL
31	VINYL CHLORIDE	10	BDL

Comments

BDL - BELOW DETECTION LIMIT

GC/MS Purgeables

IEA Sample No. 287026 3

Client Identification W-3A

Date Analyzed September 10, 1986 **By** King

Number	Compound	Detection Limit µg/L	Results Concentration µg/L
1	BENZENE	10	BDL
2	BROMODICHLOROMETHANE	10	BDL
3	BROMOFORM	10	BDL
4	BROMOMETHANE	10	BDL
5	CARBON TETRACHLORIDE	10	BDL
6	CHLOROBENZENE	10	BDL
7	CHLOROETHANE	10	62
8	2-CHLOROETHYLVINYL ETHER	10	BDL
9	CHLOROFORM	10	BDL
10	CHLOROMETHANE	10	BDL
11	DIBROMOCHLOROMETHANE	10	BDL
12	1,2-DICHLOROBENZENE	10	BDL
13	1,3-DICHLOROBENZENE	10	BDL
14	1,4-DICHLOROBENZENE	10	BDL
15	1,1-DICHLOROETHANE	10	140
16	1,2-DICHLOROETHANE	10	BDL
17	1,1-DICHLOROETHENE	10	17
18	trans-1,2-DICHLOROETHENE	10	BDL
19	1,2-DICHLOROPROPANE	10	BDL
20	cis-1,3-DICHLOROPROPENE	10	BDL
21	trans-1,3-DICHLOROPROPENE	10	BDL
22	ETHYL BENZENE	10	BDL
23	METHYLENE CHLORIDE	10	BDL
24	1,1,2,2-TETRACHLOROETHANE	10	BDL
25	TETRACHLOROETHENE	10	BDL
26	TOLUENE	10	BDL
27	1,1,1-TRICHLOROETHANE	10	BDL
28	1,1,2-TRICHLOROETHANE	10	BDL
29	TRICHLOROETHENE	10	BDL
30	TRICHLOROFLUOROMETHANE	10	BDL
31	VINYL CHLORIDE	10	BDL

Comments

BDL - BELOW DETECTION LIMIT
Sample diluted by 1000 prior to analysis.

GC/MS Purgeables

IEA Sample No. 287028 2

Client Identification W-4A

Date Analyzed September 19, 1986 **By** Daniels

Number	Compound	Detection Limit µg/L	Results Concentration µg/L
1	BENZENE	10,000	BDL
2	BROMODICHLOROMETHANE	10,000	BDL
3	BROMOFORM	10,000	BDL
4	BROMOMETHANE	10,000	BDL
5	CARBON TETRACHLORIDE	10,000	BDL
6	CHLOROBENZENE	10,000	BDL
7	CHLOROETHANE	10,000	BDL
8	2-CHLOROETHYLVINYL ETHER	10,000	BDL
9	CHLOROFORM	10,000	BDL
10	CHLOROMETHANE	10,000	BDL
11	DIBROMOCHLOROMETHANE	10,000	BDL
12	1,2-DICHLOROBENZENE	10,000	BDL
13	1,3-DICHLOROBENZENE	10,000	BDL
14	1,4-DICHLOROBENZENE	10,000	BDL
15	1,1-DICHLOROETHANE	10,000	240,000
16	1,2-DICHLOROETHANE	10,000	BDL
17	1,1-DICHLOROETHENE	10,000	16,000
18	trans-1,2-DICHLOROETHENE	10,000	BDL
19	1,2-DICHLOROPROPANE	10,000	BDL
20	cis-1,3-DICHLOROPROPENE	10,000	BDL
21	trans-1,3-DICHLOROPROPENE	10,000	BDL
22	ETHYL BENZENE	10,000	BDL
23	METHYLENE CHLORIDE	10,000	BDL
24	1,1,2,2-TETRACHLOROETHANE	10,000	BDL
25	TETRACHLOROETHENE	10,000	BDL
26	TOLUENE	10,000	BDL
27	1,1,1-TRICHLOROETHANE	10,000	370,000
28	1,1,2-TRICHLOROETHANE	10,000	BDL
29	TRICHLOROETHENE	10,000	BDL
30	TRICHLOROFLUOROMETHANE	10,000	BDL
31	VINYL CHLORIDE	10,000	BDL

Comments

BDL - BELOW DETECTION LIMIT
Acetone detected at 70 µg/L

GC/MS Purgeables

IEA Sample No. 287025 2

Client Identification J1913A W-2

Date Analyzed September 3, 1986 **By** King

Number	Compound	Detection Limit µg/L	Results Concentration µg/L
1	BENZENE	10	BDL
2	BROMODICHLOROMETHANE	10	BDL
3	BROMOFORM	10	BDL
4	BROMOMETHANE	10	BDL
5	CARBON TETRACHLORIDE	10	BDL
6	CHLOROBENZENE	10	BDL
7	CHLOROETHANE	10	BDL
8	2-CHLOROETHYLVINYL ETHER	10	BDL
9	CHLOROFORM	10	BDL
10	CHLOROMETHANE	10	BDL
11	DIBROMOCHLOROMETHANE	10	BDL
12	1,2-DICHLOROBENZENE	10	BDL
13	1,3-DICHLOROBENZENE	10	BDL
14	1,4-DICHLOROBENZENE	10	BDL
15	1,1-DICHLOROETHANE	10	BDL
16	1,2-DICHLOROETHANE	10	BDL
17	1,1-DICHLOROETHENE	10	BDL
18	trans-1,2-DICHLOROETHENE	10	BDL
19	1,2-DICHLOROPROPANE	10	BDL
20	cis-1,3-DICHLOROPROPENE	10	BDL
21	trans-1,3-DICHLOROPROPENE	10	BDL
22	ETHYL BENZENE	10	BDL
23	METHYLENE CHLORIDE	10	100 —
24	1,1,2,2-TETRACHLOROETHANE	10	BDL
25	TETRACHLOROETHENE	10	BDL
26	TOLUENE	10	BDL
27	1,1,1-TRICHLOROETHANE	10	BDL
28	1,1,2-TRICHLOROETHANE	10	BDL
29	TRICHLOROETHENE	10	BDL
30	TRICHLOROFLUOROMETHANE	10	BDL
31	VINYL CHLORIDE	10	BDL

Comments

BDL - BELOW DETECTION LIMIT

GC/MS Purgeables

IEA Sample No. 287025 6

Client Identification HA-3 Water Sample

Date Analyzed September 3, 1986 **By** King

Number	Compound	Detection Limit µg/L	Results Concentration µg/L
1	BENZENE	10	BDL
2	BROMODICHLOROMETHANE	10	BDL
3	BROMOFORM	10	BDL
4	BROMOMETHANE	10	BDL
5	CARBON TETRACHLORIDE	10	BDL
6	CHLOROBENZENE	10	BDL
7	CHLOROETHANE	10	BDL
8	2-CHLOROETHYLVINYL ETHER	10	BDL
9	CHLOROFORM	10	BDL
10	CHLOROMETHANE	10	BDL
11	DIBROMOCHLOROMETHANE	10	BDL
12	1,2-DICHLOROBENZENE	10	BDL
13	1,3-DICHLOROBENZENE	10	BDL
14	1,4-DICHLOROBENZENE	10	BDL
15	1,1-DICHLOROETHANE	10	BDL
16	1,2-DICHLOROETHANE	10	BDL
17	1,1-DICHLOROETHENE	10	BDL
18	trans-1,2-DICHLOROETHENE	10	BDL
19	1,2-DICHLOROPROPANE	10	BDL
20	cis-1,3-DICHLOROPROPENE	10	BDL
21	trans-1,3-DICHLOROPROPENE	10	BDL
22	ETHYL BENZENE	10	BDL
23	METHYLENE CHLORIDE	10	BDL
24	1,1,2,2-TETRACHLOROETHANE	10	BDL
25	TETRACHLOROETHENE	10	13
26	TOLUENE	10	BDL
27	1,1,1-TRICHLOROETHANE	10	BDL
28	1,1,2-TRICHLOROETHANE	10	BDL
29	TRICHLOROETHENE	10	BDL
30	TRICHLOROFLUOROMETHANE	10	BDL
31	VINYL CHLORIDE	10	BDL

Comments

BDL - BELOW DETECTION LIMIT
Acetone detected at 740 µg/L

GC/MS Purgeables

IEA Sample No. 287025 7

Client Identification HA-5 Water Sample

Date Analyzed September 3, 1986 **By** King

Number	Compound	Detection Limit µg/L	Results Concentration µg/L
1	BENZENE	20	BDL
2	BROMODICHLOROMETHANE	20	BDL
3	BROMOFORM	20	BDL
4	BROMOMETHANE	20	BDL
5	CARBON TETRACHLORIDE	20	BDL
6	CHLOROBENZENE	20	BDL
7	CHLOROETHANE	20	BDL
8	2-CHLOROETHYLVINYL ETHER	20	BDL
9	CHLOROFORM	20	BDL
10	CHLOROMETHANE	20	BDL
11	DIBROMOCHLOROMETHANE	20	BDL
12	1,2-DICHLOROBENZENE	20	BDL
13	1,3-DICHLOROBENZENE	20	BDL
14	1,4-DICHLOROBENZENE	20	BDL
15	1,1-DICHLOROETHANE	20	BDL
16	1,2-DICHLOROETHANE	20	BDL
17	1,1-DICHLOROETHENE	20	BDL
18	trans-1,2-DICHLOROETHENE	20	BDL
19	1,2-DICHLOROPROPANE	20	BDL
20	cis-1,3-DICHLOROPROPENE	20	BDL
21	trans-1,3-DICHLOROPROPENE	20	BDL
22	ETHYL BENZENE	20	BDL
23	METHYLENE CHLORIDE	20	BDL
24	1,1,2,2-TETRACHLOROETHANE	20	BDL
25	TETRACHLOROETHENE	20	BDL
26	TOLUENE	20	BDL
27	1,1,1-TRICHLOROETHANE	20	BDL
28	1,1,2-TRICHLOROETHANE	20	BDL
29	TRICHLOROETHENE	20	BDL
30	TRICHLOROFLUOROMETHANE	20	BDL
31	VINYL CHLORIDE	20	BDL

3 December 1990

Ref. 10

TO: File

FROM: Jack Butler

SUBJECT: Texfi New Bern, NCD981928088

Mr. Richard Griffiths, C.T. Main Inc. (704/529-6246) contacted our office on this date to inform us that delivery of the reports promised during the North Carolina Superfund Section visit at the subject site on 4 December 1990 would be delayed a few days due to problems encountered copying the blueprints in the reports. Mr. Griffiths also reported that the trichloroethane (TCA) spill that he has mentioned during our phone conversation during the site visit on 4 December 1990 involved approximately 20 to 25 gallons of TCA.

NORTH CAROLINA ATLAS

PORTRAIT OF A CHANGING SOUTHERN STATE

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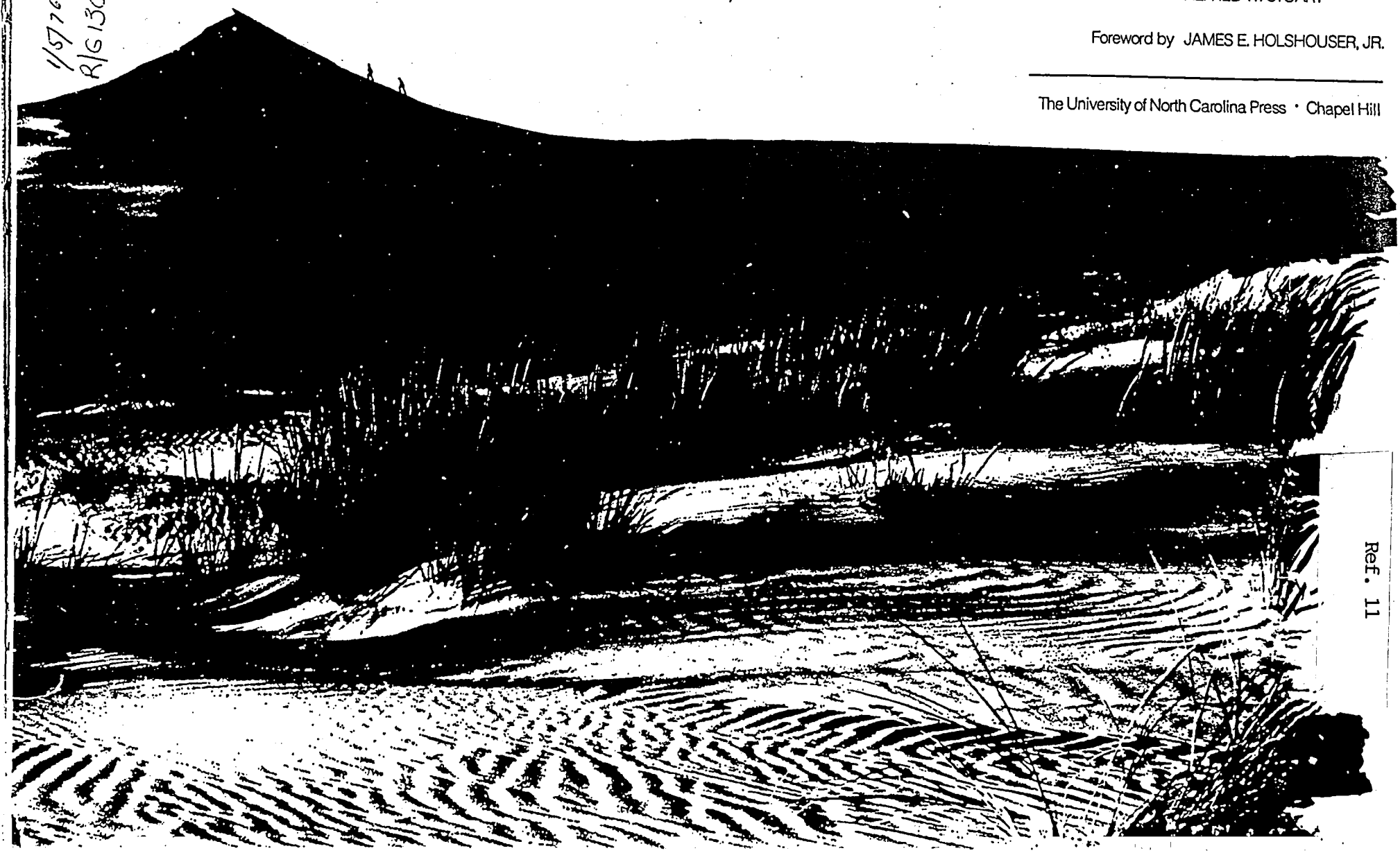
Edited by JAMES W. CLAY
DOUGLAS M. ORR, JR.
ALFRED W. STUART

Foreword by JAMES E. HOLSHOUSER, JR.

The University of North Carolina Press · Chapel Hill



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5. Climate and Air Quality

RICHARD J. KOPEC
JAMES W. CLAY

CLIMATE

Very sensitive to the condition and quality of the atmosphere, man views climate not only as a fundamental resource but also as his natural adversary. Despite notable advances in technology, mankind remains subject to the whims and vagaries of the weather, and humanity's ever-increasing numbers only intensify the negative impact of climate on man and his activities. As the production of food becomes more critical to his growing needs, man is made acutely aware that agriculture is climate-controlled and that floods or prolonged droughts result in losses measurable in lives as well as in dollars and cents. With civilizations becoming evermore complex, the extent of death and damage wrought by storms and abnormal weather multiplies. Tidal inundation and destruction along densely settled coasts, disruption of communications and transportation due to heavy snowfalls, and power shortages resulting in "brownouts" and "blackouts" brought on by spells of unusually hot or cold temperatures are constant reminders of the influence that climate exerts on our lives. An increasing awareness of and concern for air quality problems have also heightened man's interest in atmospheric processes and patterns.

Climatic influences, however, are not primarily catastrophic. To the contrary, the atmosphere should be viewed as a resource essential to man's existence. As such, it exists as an impartial component of the natural fundament and, carefully considered, can be utilized as are other resources.

It has long been recognized that climate exerts important influences on such activities as settlement patterns and agricultural specialization. The fastest-growing population densities in the United States are in those areas where climate is considered to be an environmental amenity: California, Florida, and Hawaii, for example. Man has judiciously exploited the climate to his own advantages by farming such agricultural entities as corn belts, wheat belts, and fruit belts. By capitalizing on his knowledge of climatic characteristics, by living in harmony with its regimes, and by refraining from abusing atmospheric quality, man can optimize his benefits from the utilization of this natural resource.

Dominant Climatic Controls

There are four primary controls responsible for the nature and variation of North Carolina's climate: latitude, altitude, proximity to the Atlantic Ocean, and positional location on the continent. An examination of each of these variables will help in understanding North Carolina's climatic pattern.

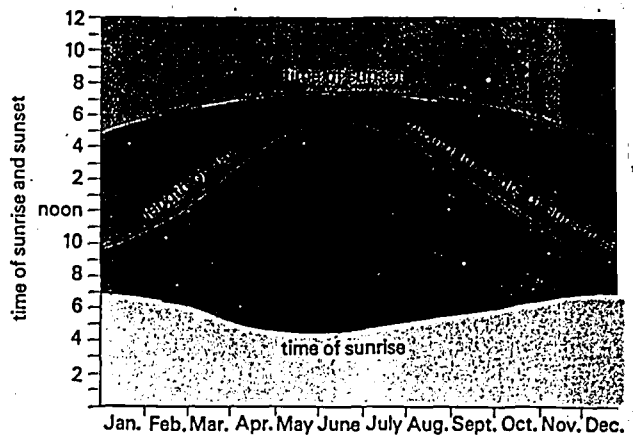
Latitude The significance of latitude is essentially one of sun control. As it accounts for 99.98 percent of the energy at the earth's surface, the sun is the force underlying all weather processes. Variations in latitudinal receipt of radiant energy from the sun cause temperature inequities in the lower atmosphere that in turn cause pressure differences. As it attempts to equilibrate these pressure differences, the atmosphere moves and, in doing so, carries with it water vapor and moisture as well as its unique thermal conditions. Hence the atmosphere, propelled by the sun's energy, remains in a constant state of flux in order to moderate the impact caused by differences in solar energy received.

Aside from the amount of cloudiness, fogginess, or degree of pollution, the latitudinal variation in radiation results from two fundamental factors: the angle at which the energy from the sun reaches the earth's surface, and the length of time that the earth is exposed to this radiation. Both of these considerations are a function of a place's position north or south of the equator. The higher the sun is in the sky, the more directly energy is delivered to the earth's surface—both by passing through less atmosphere and by concentrating more energy per unit area. The length of the daylight period is equally important, for it determines the amount of energy that will be received.

As illustrated in Figure 5.1, at Raleigh, North Carolina, in mid-June, the noon sun is approximately seventy-two degrees above the southern horizon, and the length of the daylight period is approximately fourteen and one-half hours. At this time of year, a location on the equator has a maximum sun angle of only sixty-six degrees, and a daylight period of twelve hours. Thus, during summer months, Raleigh receives more solar radiation than does an equatorial position.

In winter, the sun is much lower in the southern sky, and the daylight period is only nine hours long at Raleigh. Consequently, because less solar energy is being received at this time, temperatures are reduced to their annual minimums. Compared, however, with such cities as New York and Miami, Raleigh has relatively moderate temperature regimes. Warmer than New York in the winter and cooler than Miami in the summer, temperatures at Raleigh reflect the intermediacy of its latitude between the two cities.

Figure 5.1. Hours of Sunshine by Months for Raleigh, N



Source: U.S. Naval Observatory, *Nautical Almanac*, 1973.

In winter, with low sun angles and very short days, temperatures drop markedly in the high latitudes of North America. Large masses of surface air, chilled by contact with the cold earth, move equatorward across the northern and central United States, causing great temperature contrasts within the country. In the summer, the thermal differences between those places in the United States where the sun is highest and the polar regions of the continent where daylight prevails continuously are much reduced, and latitudinal temperature gradients show an average of 12° F. from Florida to Canada. While Raleigh, North Carolina, is normally 17° F. warmer than Albany, New York, in January, it is only an average of 5° F. warmer in July.

Altitude It is a climatic axiom that the atmosphere is fueled from below; or, in other words, the earth's surface is the atmosphere's primary source of heat. Absorbing the sun's shortwave radiation, the earth converts this energy to long wave length. Through the transfer processes of radiation, conduction, convection, and evaporation and condensation, this reformed energy is diffused into the lower atmosphere. Hence, air temperatures are generally highest at the surface in the troposphere (the layer of air adjacent to the earth), and decrease as altitude increases. Normally, this decrease, called the lapse rate, amounts to about 3.5° F. for every one thousand feet increase in altitude.

The effects of elevation on air temperatures are significant in North Carolina. The range of elevation within our state is the greatest of any eastern state—almost seven thousand feet—and it affects temperatures in North Carolina in several ways. Areas having high elevations experience markedly colder temperatures than low-lying eastern sections of the state. North Carolina's mountains also serve to block and modify incursions of cold, polar air from the north and west. In the same latitudes as Tennessee, North Carolina had January temperatures averaging some 5° F. warmer because of its position to the east of the Blue Ridge Mountains.

There are additional climatic effects resulting from the influence of mountains and their high elevations. Because the mountains provide a barrier to the surface flow of air, the air is forced to rise or move around the mountains. In rising over the highlands, the air is chilled. The ability of the atmosphere to evaporate and maintain water as a gas is based mainly on its heat content; this ability is reduced when air is raised, for energy is consumed in the lifting process, and the temperature of the air is lowered. If raised sufficiently, the cooled air will condense its water vapor and form clouds. The ultimate result of this orographic process is precipitation. Measured against the yearly precipitation total in the country (except for Hawaii and the northwestern states), North Carolina's western counties have a high percentage of cloudy and wet days. However, air upon crossing the mountains is diverted downward. Descension causes the air to compress and its temperature to rise. This process is the antithesis of the precipitation-producing process, and settlements on the lee or sheltered side of mountain barriers are usually drier and warmer than places along the windward slopes. Asheville, North Carolina, located to the lee of the Appalachians, has an average annual precipitation of thirty-seven inches and a January mean temperature of 44° F., which contrasts notably with its wetter, cooler surroundings.

Oceanic Influence Land and water surfaces react differently to the receipt and release of solar energy. Being opaque, immobile, and a relatively poor conductor of heat, ground surfaces, when exposed to sunlight, absorb solar radiation only to shallow depths. Because of this, the energy is concentrated and soil temperatures rise rapidly. Similarly, at night, land temperatures are quickly reduced as the soil radiates heat to the atmosphere, and lower soil depths are unable to keep the cooled-surface layer heated. The result is a large variation in soil temperatures from day to night, which is reflected in the behavior of air temperatures adjacent to the ground. For the same reasons, continents heat rapidly in the summer, when energy from the sun is delivered more directly and days are longer; in winter, they lose heat rapidly and become centers of low air temperatures.

A water surface characteristically responds more slowly in absorbing and radiating heat energy. Water is comparatively transparent and mobile. Its transparency permits solar radiation to penetrate deeply, causing heat to be distributed throughout a much greater volume than in opaque soils. The mobility of water, both as horizontal and vertical currents, further redistributes heat and reduces its concentration per unit volume. Also evaporation, an enormous consumer of heat, is more pronounced over water than land and contributes additionally to slowing the rate at which large water bodies warm. For these and other reasons, water surfaces heat more slowly than land surfaces. However, eventually warmed, oceans and other large water bodies stand as vast reservoirs of heat and when land temperatures recede, they help ameliorate the air temperature of nearby coastal regions.

This physical difference is evidenced in the temperature regimes of places influenced by large water bodies. Where prevailing wind systems are conducive, the retarded heating and cooling rates natural to oceans serve to temper climatic extremes. Air temperatures associated with maritime influences are relatively cooler in summer and warmer in winter than temperatures modified by continental surfaces, and daily and seasonal ranges of temperature are moderated.

Unlike wind patterns in states along the Pacific Coast, winds over North Carolina work against maximizing the maritime effect. During the winter season, when the warm Gulf Stream might significantly modify temperatures across the state, the winds are basically offshore, confining the ocean's moderating influence to the coastal counties. Due to the dominance of westerly winds, most of North Carolina lies under the influence of continental air masses. Nevertheless, in the Coastal Plain, winter temperatures are warmer, and the summer's heat and high humidities are alleviated by the predominance of sea breezes. Precipitation totals are higher nearer the coast and the percentage falling as snow in the cold season is noticeably lower.

Positional Location Situated in the middle latitudes and in the extreme east of the North American continent, North Carolina is subject to other climatic controls that relate to this position and are periodically important. As do all states, North Carolina cyclically comes under the influence of moving cells of high and low pressure. High-pressure cells are masses of diverging air associated with fair weather conditions. Low-pressure areas originate in conflict zones between air masses having significantly different temperature and humidity characteristics and develop into cyclonic storm systems. These storm systems move quite rapidly across the nation and bring about changes in weather to areas over which they pass. During the winter when temperature contrasts are greatest, cyclonic storms are most numerous and affect North Carolina's weather every few days. However, in the summer, cyclonic activity is not an important feature of North Carolina's climate, as the pattern of cyclonic storm systems has shifted well to the north. Warm season precipitation usually results from thunderstorms that predominate at this time.

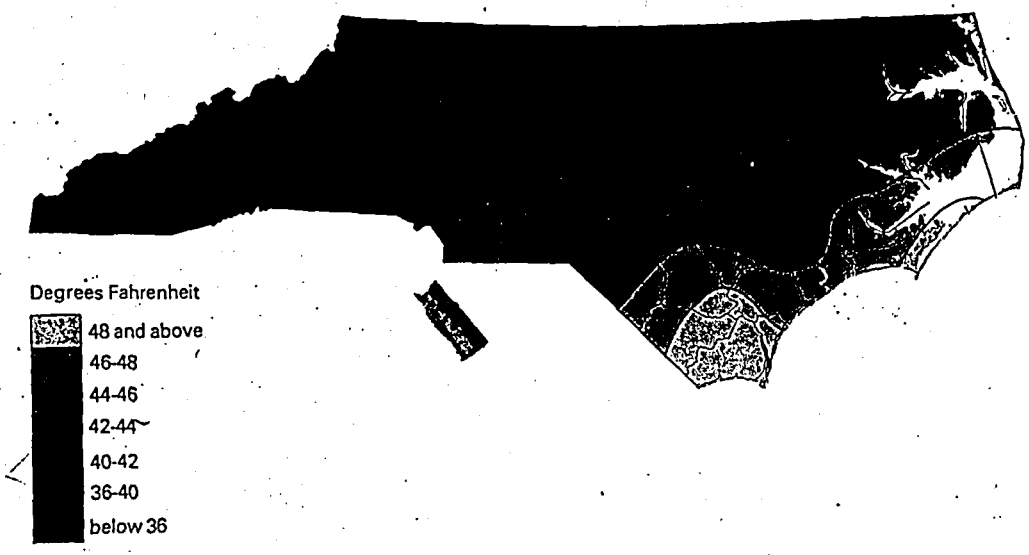
To the east of North Carolina well out over the Atlantic Ocean there exists a source region of high pressure called the Bermuda High. It is an enormous system of clockwise-circulating winds that varies seasonally and vacillates in position and size. During the summer, its western edge periodically covers the southeastern United States, and its influence is physiologically debilitating. Winds from the Bermuda High reach North Carolina from the south and southwest, and introduce high temperatures and humidities to the state. Daytime temperatures soar to near-record heights and both days and nights are uncomfortably sultry. When this source of hot, moist air affects the weather of the eastern United States—and the Bermuda High's influence can last for several weeks at a time—it is a period of high climatic stress for elderly and infirm people. Fortunately, the Bermuda High's effect is frequently interrupted by invasions of mild, dry air emanating from Canada.

North Carolina's Climate Type

North Carolina lies within a climatic region that can be typed as a *humid subtropical climate*. Corresponding in dimension to the southeastern states, this climate region is found on the eastern sides of all continents between the latitudes of twenty degrees and forty degrees. As the title implies, those areas or states within this climate region have short, mild winters, long, hot, and humid summers, and very pleasant transitional seasons. Precipitation is normally adequate for agriculture, with the warm season generally receiving the larger amounts. Except for two or three snowfalls each winter, precipitation is largely in the form of rainfall.

There is, however, considerable climatic variation within the state. In the mountains, annual and monthly mean temperatures are lower, precipitation extremes greater, and snowfalls heavier than in the rest of the state. Yet, everywhere the climate is marked by its temperateness. Temperatures seldom drop to zero in the winter, and only occasionally reach beyond 100° F. in the summer. Seasonality is sufficiently pronounced to cause contrasts in vegetation and provide other environmental variations for the residents of the state.

Figure 5.2. Average January Temperatures in N.C.



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

Figure 5.3. Mean Maximum Temperature in N.C.

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

Seasonal Changes in Climate

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

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

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

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

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

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

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

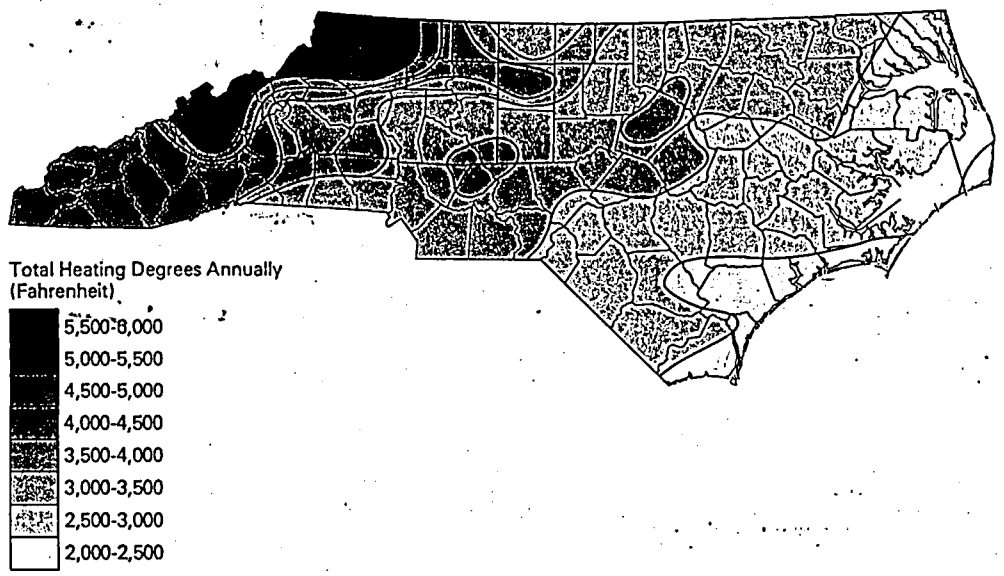
The moderating effect of the ocean becomes evident in Figure 5.3, where January mean minimum temperatures are shown. Isotherms on this map reflect characteristic nighttime temperatures. The pattern reveals that temperatures are milder along the coast and decrease inland fairly rapidly. Once again, the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

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

Figure 5.4. Mean Minimum Temperature in N.C.

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

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



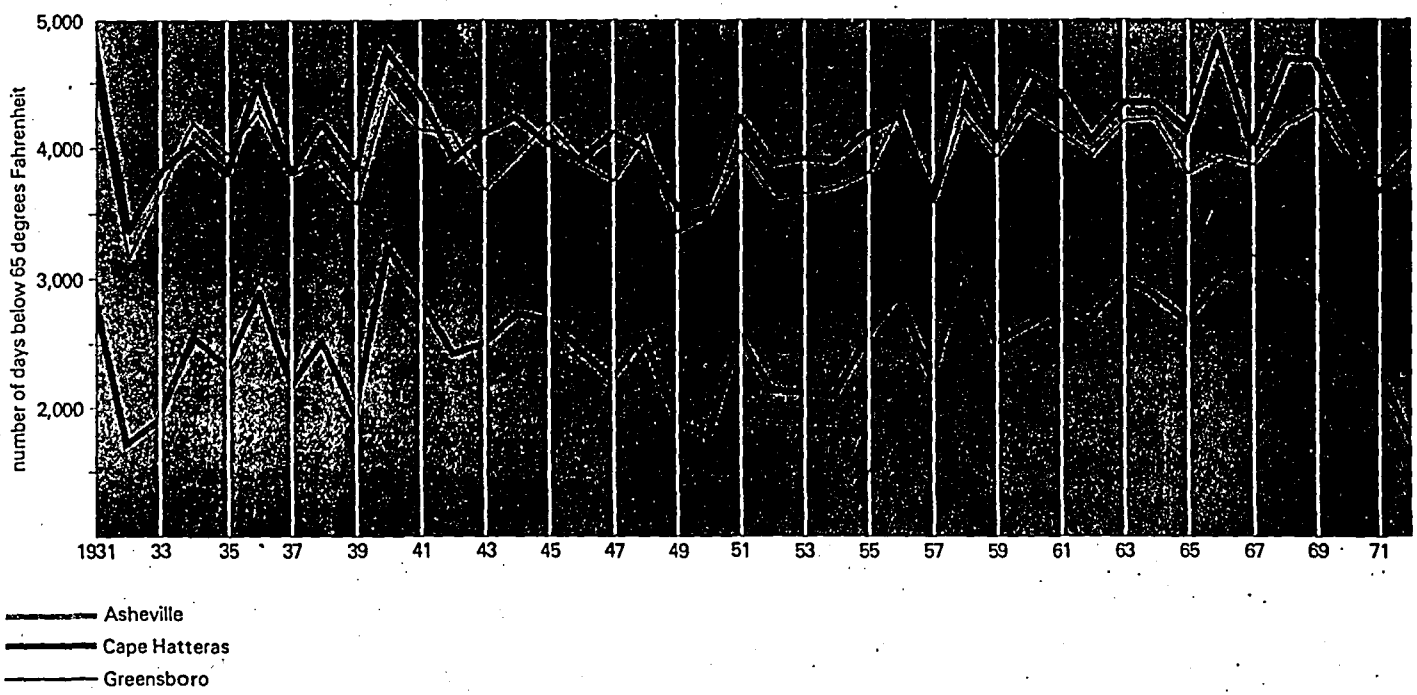
Source: U.S. Department of Commerce, *Weather and Climate in North Carolina*, 1972.

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

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

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

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



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

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

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

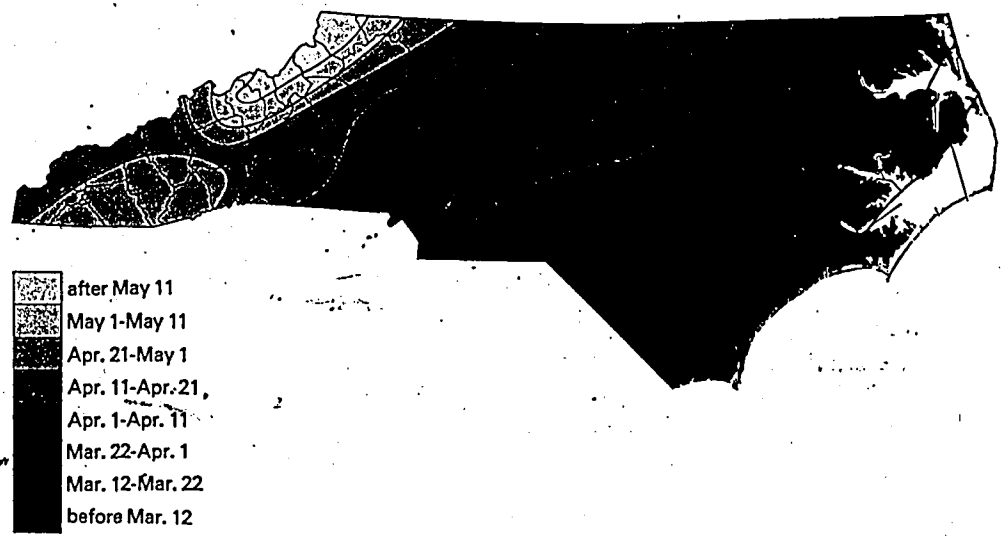
Mean temperatures range from the fifties in April to the seventies in June for all places save those at high elevations. The days are marked by cool nights and warm afternoons with relative humidities at optimal levels for human comfort. As the daylight period lengthens, sunshine percentages and totals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

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

Figure 5.7. Average Annual Snowfall in N.C.

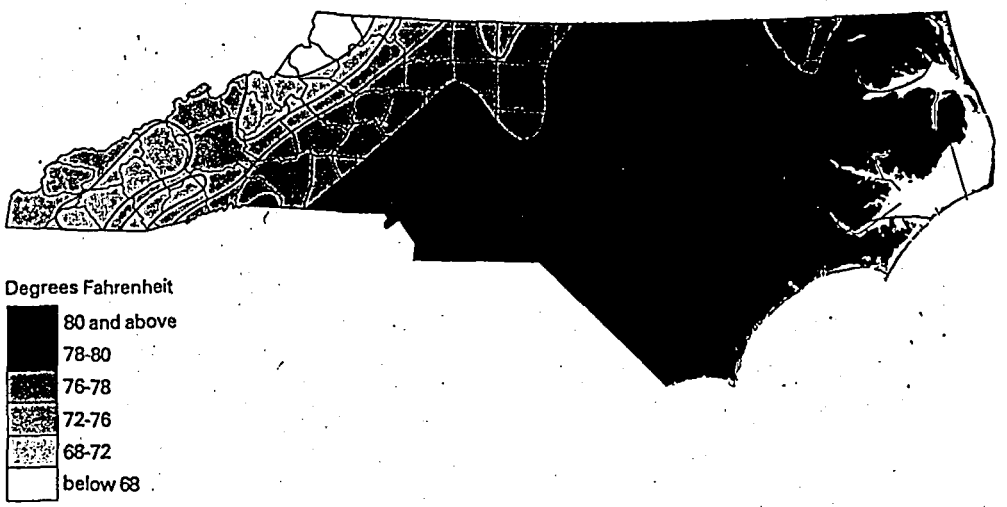
Source: U.S. Department of Commerce, *Climatological Summary*, 1966.

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



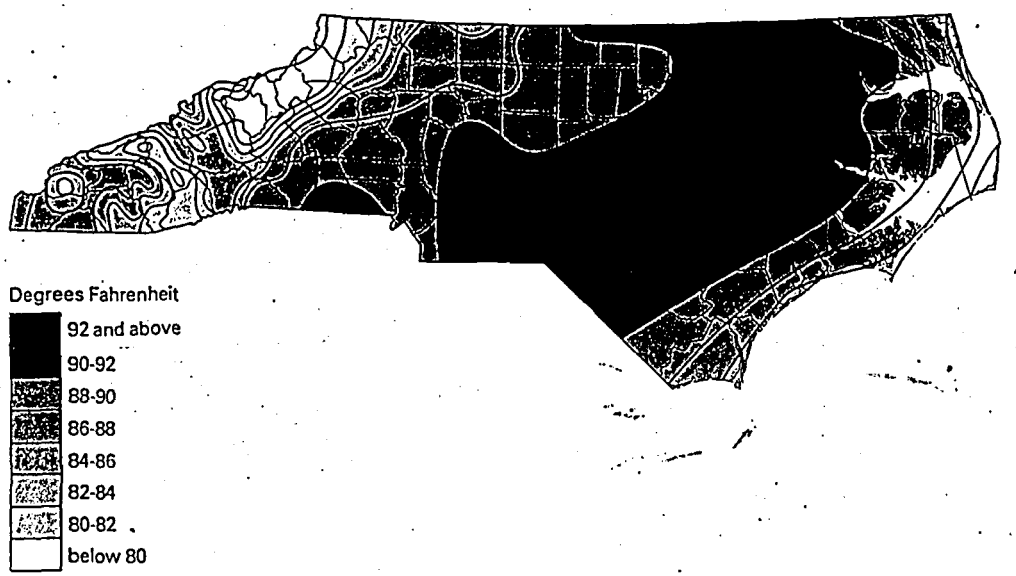
Source: U.S. Department of Commerce, *Weather and Climate in North Carolina*, 1972.

Figure 5.9. Average July Temperature in N.C.



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

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



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

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

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

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

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

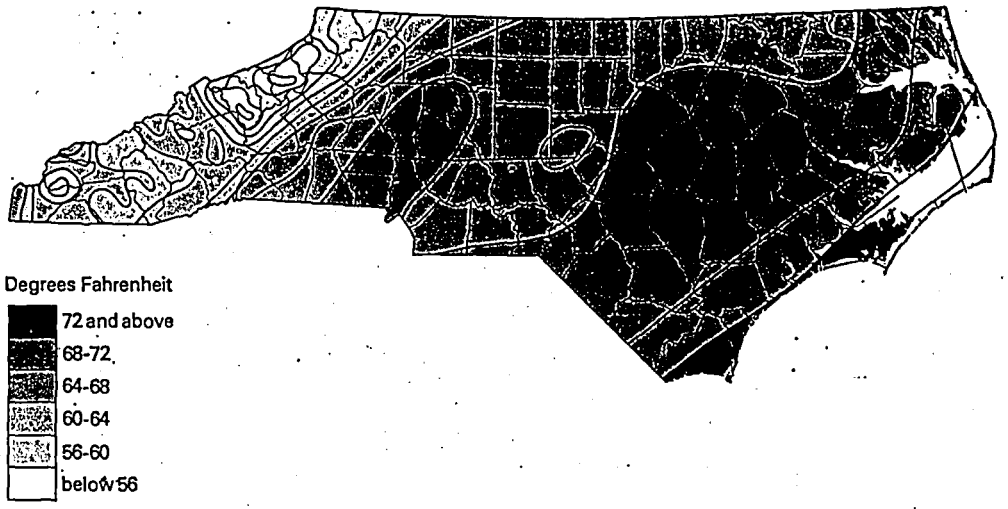
[redacted]e Mo[redacted]ns, t[redacted]ects [redacted]tude[redacted]ce m[redacted] temperature values sharply. The temperature gradient in July is even steeper than in January. East to west across Caldwell County, mean temperatures drop from 76° F. to 68° F. and Mount Mitchell remains the coolest site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

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

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

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

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

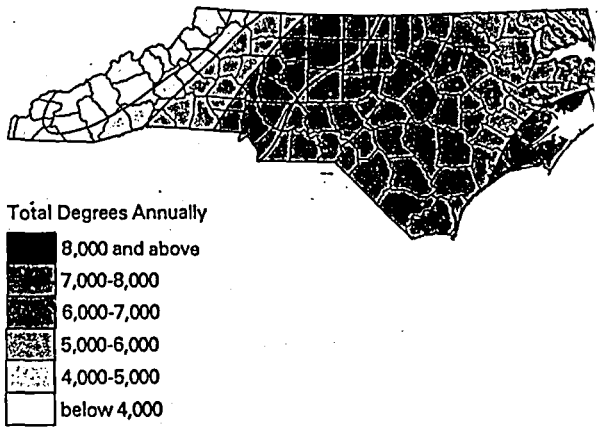


Source: U.S. Department of Commerce, *Weather and Climate in North Carolina*, 1972.

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

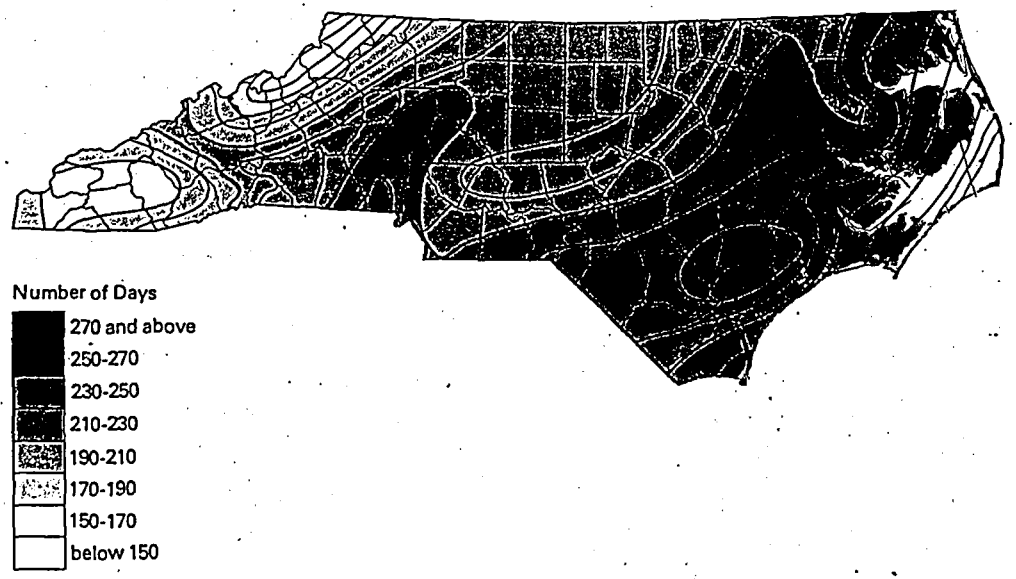
Although each plant has its own base temperature for seed germination and active growth, a mean daily temperature of 40° F. will represent the beginning of the growth period for most crops. To determine growing degree day units for example, a daily mean temperature of 50° F. will indicate ten growing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

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



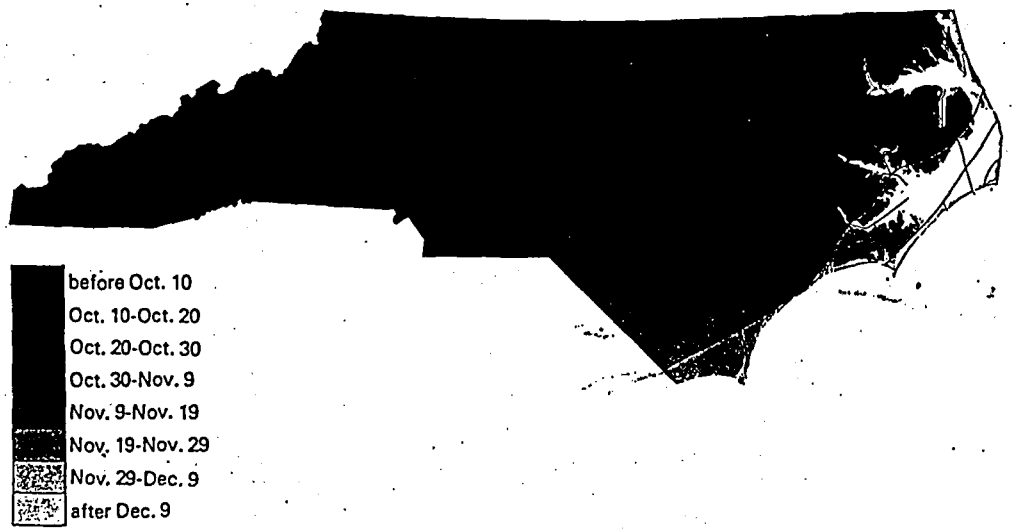
Source: U.S. Department of Commerce, *Climatological Summary*, 19

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



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

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



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

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

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

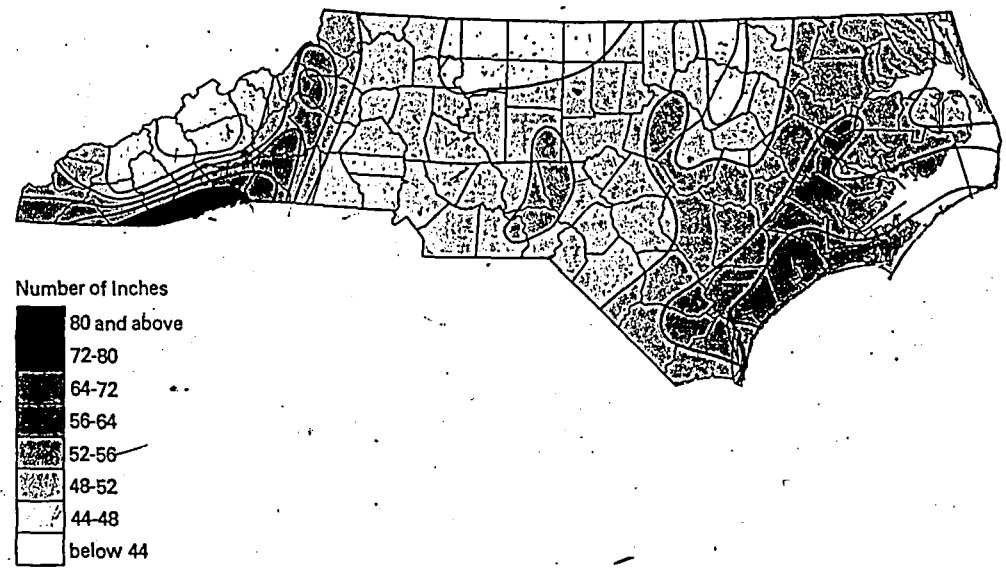
Average Length of the Freeze-Free Season Known also as the frost-free period and somewhat erroneously as the growing season, the freeze-free season refers to that segment of time between the mean date of the last day in the spring when a low temperature of 32° F. occurs, and the first day in fall of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

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

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

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

Figure 5.15. Average Annual Precipitation in N.C.



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

Annual Precipitation and Humidity

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

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

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

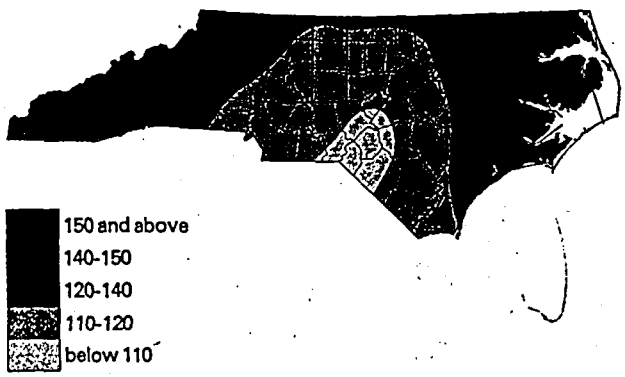
Although it is considered to be a wet state, North Carolina nevertheless has its occasional "bout with drought." Recently, the Piedmont and Inner Coastal Plain suffered through an especially severe drought. In 1968, negative rainfall departures amounting to as much as 26 inches were computed by individual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

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

Water Balance

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

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



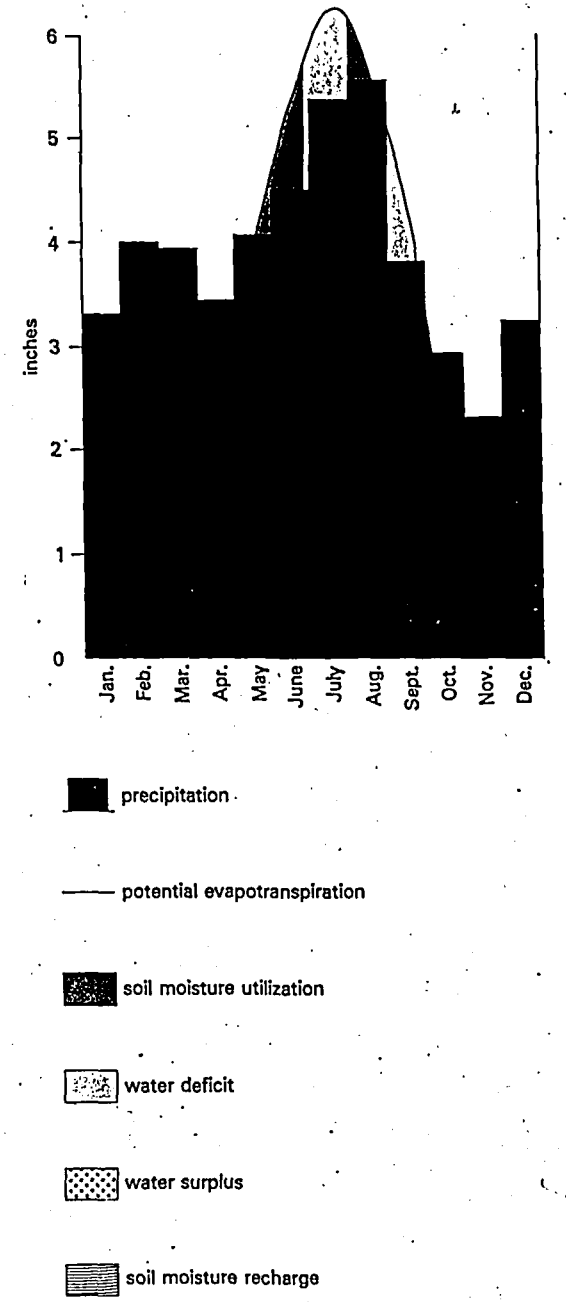
Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

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

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

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

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



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

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

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

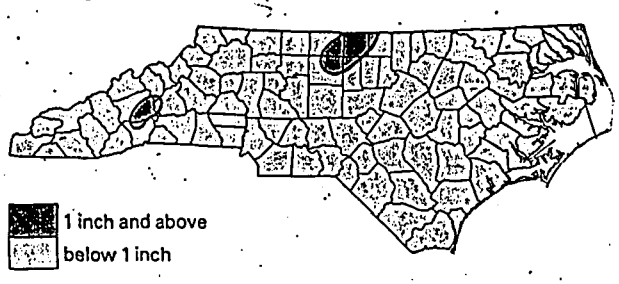
Mean annual evaporation for North Carolina is shown in Figure 5.20. Evaporation rates and totals are related to temperature, wind velocity, and relative humidity. Where temperatures are highest and humidities lowest, evaporation intensities will be greatest. Since temperatures throughout the Coastal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

Winds and Storms

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

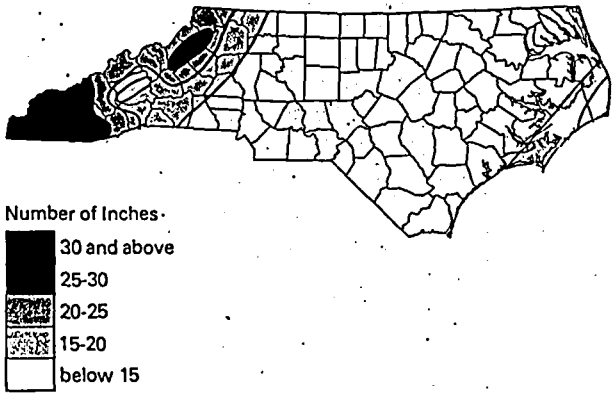
Although prevailing winds (winds that persist in blowing from one direction more so than any other) characterize given geographical areas, wind direction changes frequently. A northwesterly wind (coming from the northwest) will be, relatively speaking, a cooling and drying wind, whereas a southeasterly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

Figure 5.18. Water Balance Deficit in N.C.



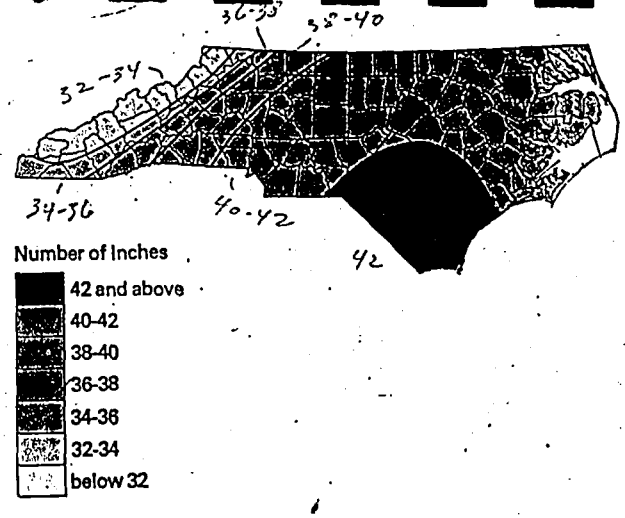
Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

Figure 5.19. Water Balance Surplus in N.C.



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

Figure 5.20. Mean Annual Evaporation in N.C.

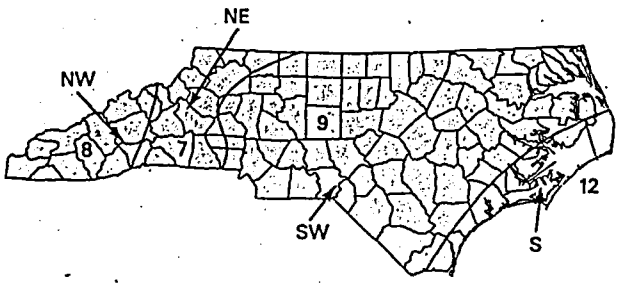


Source: U.S. Department of Commerce, *Climatic Summary of the U.S.*, 1972.

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

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

Figure 5.21. Prevailing Winds and Average 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.

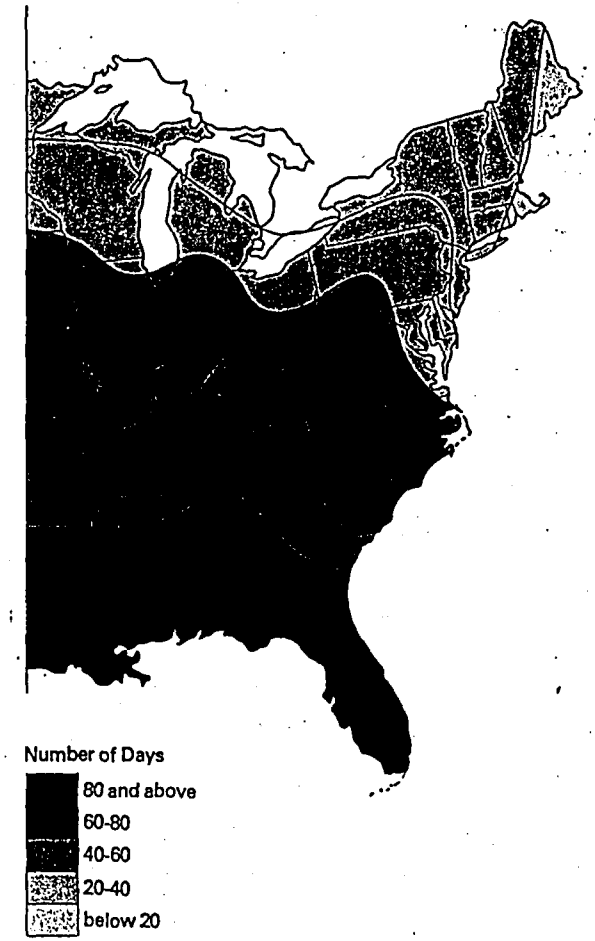
Wind speeds have been averaged for each zone of prevailing winds. Winds tend to diminish in speed westward from the coast where sea breezes and offshore storms contribute to velocities that average twelve miles per hour. Throughout the Inner Coastal Plain and the Piedmont, the mean wind speed is nine miles per hour, and in the western counties, representative wind speeds are seven and eight miles per hour. On a daily basis, wind velocities are lowest before dawn and highest around midafternoon. Seasonally, winter, with greater temperature and pressure contrasts, shows the most rapid air movement and summer is the time of lowest wind speeds.

Thunderstorms Thunderstorms are vertically developed storm systems that involve lightning and thunder. Produced by instability in the atmosphere, these storms are sustained by the conversion of water vapor into rain and hail, which causes the release of enormous amounts of energy. This energy results in vigorous updrafts of rapidly moving air. The intensity and turbulence of an individual thunderstorm is related to the degree of atmospheric instability and the supply of latent energy released by the condensing of water vapor. In structure, the typical thunderstorm is a collection of convective cells each averaging a mile or more in diameter. A cell is comprised of columns of rapidly rising air separated and counterbalanced by downdrafts of slower moving air. Associated with thunderstorms and their bulbous facade are heavy downpours of rain, hail, gusty and squally winds, and of course, lightning and thunder.

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

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

Figure 5.22. Average Number of Days with Thunderstorms



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

year, but as many as eleven in one year have been observed. North Carolina has experienced twelve especially disastrous hurricanes since 1900. Cape Hatteras, extending as it does into the ocean, is affected by hurricanes more than any other area of North Carolina (Figure 5.23). Its low-lying sandy surface is especially vulnerable to the combined effects of high winds, high tides, and flooding associated with these storms.

6. Physiography, Geology, and Mineral Resources

STEPHEN G. CONRAD
P. ALBERT CARPENTER III
WILLIAM F. WILSON

PHYSIOGRAPHY

North Carolina extends across three physiographic provinces that are generally present in the eastern part of the United States: the Coastal Plain, the Piedmont, and the Blue Ridge. These provinces and their major physiographic features are shown in Figure 6.1.

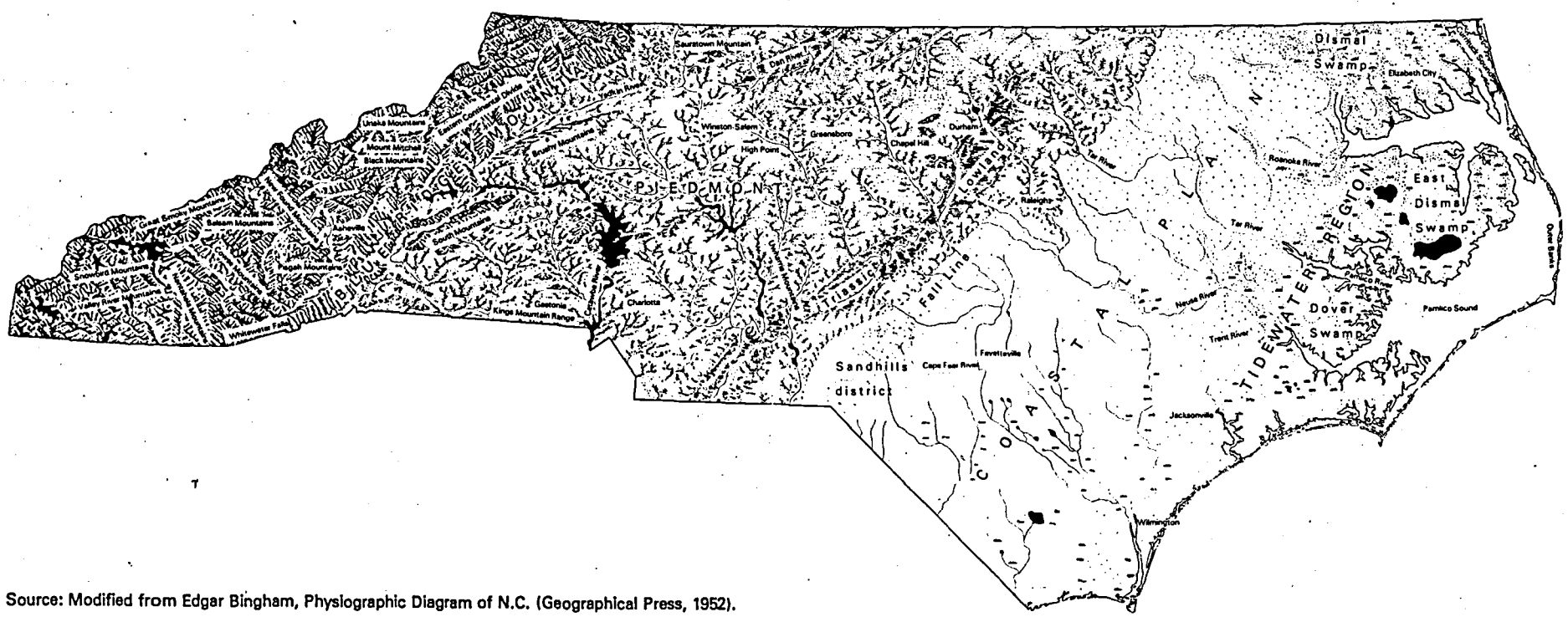
The Coastal Plain

The Coastal Plain is bounded on the east by the Atlantic Ocean and on the west by the higher lands of the Piedmont. The demarcation between the two provinces is the "fall line," or a zone where the soft, sedimentary rocks give way to the harder, crystalline rocks. The Coastal Plain includes about 45 percent of the area of the state and varies in width from 100 to 140 miles. It rises in elevation gradually from sea level at the coastline to nearly 500 feet above sea level in the sandhills district. Except near the edge of the Piedmont and at the major rivers, relief is slight, resulting in slow-flowing streams and poor drainage.

A geological controversy concerning the Coastal Plain province relates to the number, nature, and age of a series of coastal terraces that rise in a step-like manner from east to west. Ideally, each terrace should be separated by a scarp (steep slope) that marks the location of the shoreline at the time the terrace was formed. However, practically nowhere is there a complete sequence of terraces, for development of some of the younger terraces may have cut away some of the older ones.

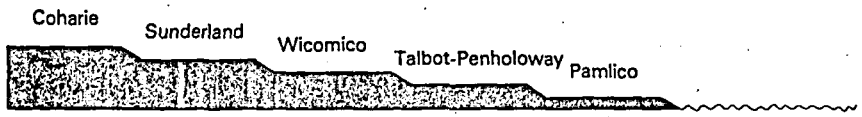
Most geologists who have studied these North Carolina terraces feel that they are marine in origin, having formed during high sea levels during interglacial or intraglacial time. Geologists recognize six terraces illustrated schematically in Figure 6.2. The scarps are low topographic features that are most easily recognized in the vicinity of major streams, such as near Fayetteville on the Cape Fear River, in the vicinity of Goldsboro on the Neuse River, and near Scotland Neck, in Halifax County, on the Roanoke River.

Figure 6.1. The Physiographic Regions of N.C.



Source: Modified from Edgar Bingham, Physiographic Diagram of N.C. (Geographical Press, 1952).

Figure 6.2. Schematic Illustration of N.C. Marine Terraces



The Coastal Plain can be divided into two regions in accordance with relative elevation and drainage. The Outer Coastal Plain, or Tidewater region, lies closer to the ocean, is extremely flat, averages less than twenty feet above sea level and contains large swamps and lakes indicative of poor drainage conditions. The Inner Coastal Plain lies farther inland, is higher in elevation, and is more dissected and better drained.

A series of shallow, elliptical depressions numbering in the thousands called "Carolina Bays," apparently because of the common occurrence in them of the evergreen bay tree, represent another interesting physiographic development in the Coastal Plain (Figure 6.3). There has also been considerable controversy as to the origin of these depressions, and even today geologists are not in agreement as to their origin.

The bays characteristically have sand rims, are located on sandy terraces, are nearly filled with peat, and are elongated in a northwest-southeast direction. They are most prominent in the southern part of the Coastal Plain.

Another significant physiographic development in the Coastal Plain is a chain of islands that extend along practically the entire coastline of the state, the "barrier islands," or as more commonly called, the Outer Banks (Figure 6.4). These islands are separated from the mainland by a fringe of salt marshes and lagoons. The islands are experiencing increasing development that is threatening their stability. Development schemes and dune stabilization have produced undesirable changes in the geomorphic and ecological processes that create and maintain these islands.

The Piedmont

The Piedmont province, lying between the Coastal Plain and the Blue Ridge Mountains, is bounded on the east by a fall line and on the west by the Blue Ridge scarp. The scarp is a prominent topographic feature generally thought to have resulted from displacement associated with faulting. In North Carolina the scarp varies in height from about 1,700 feet near the North Carolina-Virginia border to about 2,500 feet near Blowing Rock. The Piedmont is about equal in size with the Coastal Plain, occupying about 45 percent of the area of the state. Elevations range from 300 to 600 feet above sea level along the eastern border and gradually rise to the west to about 1,500 feet above sea level at the foot of the Blue Ridge scarp.

The Piedmont is an ancient erosion surface characterized by gently rolling hills with a few hundred feet of local relief. Standing above this surface are mountainous remnants of more erosion resistant rock, or monadnocks. These monadnocks are present throughout the Piedmont, but the more prominent ones are in the Uwharrie Mountains in Montgomery and Randolph counties, the Sauratown Mountains in Stokes and Surry counties, the Kings Mountain range in Cleveland and Gaston counties, the Brushy Mountains in Wilkes County, and the South Mountains in Burke and Rutherford counties.

The rolling topography with well-rounded hills and long low ridges, for which the Piedmont is noted, is the result of streams acting on rocks of unequal resistance. As shown by Figure 6.1., the northern part of the Piedmont is drained by the Dan River and its tributaries. The Tar, Neuse, and Cape Fear rivers drain that part of the Piedmont south of the Dan River drainage and east of the Yadkin River valley. The Yadkin, Catawba, and Broad rivers drain the southwestern half of the Piedmont.

The Blue Ridge Mountains

The Blue Ridge scarp rises abruptly 1,500 to 2,500 feet above the Piedmont to mark the division between the Piedmont and Blue Ridge provinces. In North Carolina, the Blue Ridge is about two hundred miles long and varies from fifteen to fifty miles wide. It contains an area of about six thousand square miles, or about 12 percent of the area of the state, and extends from the Blue Ridge scarp on the east into Tennessee on the west.

The Blue Ridge is a highly dissected mountain plateau bounded by two mountain chains (Figure 6.1). On the east are mountains that range from 3,000 to 4,000 feet in elevation, with a few peaks reaching almost 6,000 feet. The Unaka and Great Smoky Mountains are the western border and elevations range from 3,000 to 6,000 feet. Between the two bounding mountain chains are a number of cross ridges and broad intermontane valley floors that give the area its rugged mountain character.

The most prominent cross ridge is the Black Mountains, extending some fifteen miles from where it leaves the Blue Ridge Mountains and containing a dozen peaks that exceed 6,000 feet in elevation. Mount Mitchell is included in this group and has an elevation of 6,684 feet, the highest peak east of the Mississippi River. Other cross ridges from northeast to southwest are the Pisgah Mountains, New Found Mountains, Balsam Mountains, Cowee Mountains, Nantahala Mountains, Snowbird Mountains, and the Valley River Mountains.

The Blue Ridge in western North Carolina is the culminating region of the Appalachian mountain range and contains the greatest masses, the highest elevations, and the most rugged topography in the Appalachian Mountain System. Within the area are forty-three peaks that exceed 6,000 feet in elevation and eighty-two peaks that are between 5,000 and 6,000 feet.

Most of the rivers have an even gradient, but where some of them leave the Blue Ridge, spectacular waterfalls and cascades are present. The most notable of these are Toxaway Falls and Whitewater Falls in Transylvania and Jackson counties. The crest of the Blue Ridge Mountains marks the Eastern Continental Divide. Thus precipitation and streams to the west of this crest eventually drain into the Gulf of Mexico, while those streams on the east of this crest drain to the Atlantic Ocean.

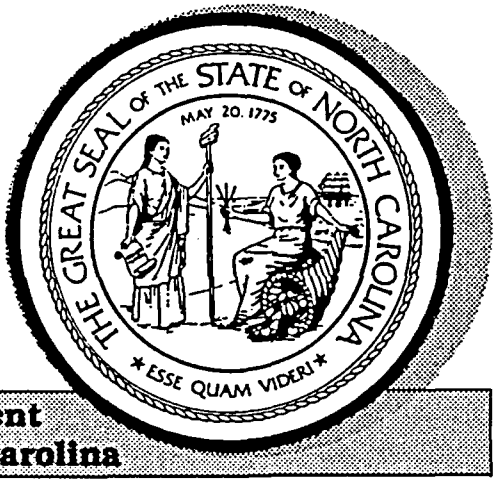
GEOLOGY

All major classes of rocks—*sedimentary, igneous,* and *metamorphic*—are common to North Carolina. Sedimentary rocks have their origin mostly as nearshore deposition of marine sediments to form such rocks as shale, sandstone, and limestone. They are largely derived by erosion of older rocks. The youngest rocks are at the top and the older rocks successively lower. The geological time scale, Table 6.1., gives the traditional terminology for rocks of varying ages. In the North Carolina Coastal Plain, surface rocks represent deposition during the Cenozoic era. They consist largely of loosely consolidated to unconsolidated sediments: clays, sands, gravels, limestones, and marls.

Ref. 12

STATE OF NORTH CAROLINA
DEPARTMENT OF
NATURAL RESOURCES AND
COMMUNITY DEVELOPMENT

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



Division of Environmental Management
Raleigh, North Carolina

Reprint from North Carolina Administrative Code: 15 NCAC 2B .0315
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

(1) Reading the Index Number. The index number appearing in the column so designated is an identification number assigned to each stream or segment of a stream, indicating the specific tributary progression between the main stem stream and the tributary stream.

(2) Cross-Referencing the Index Number. The inclusion of the index number in the schedule is to provide an adequate cross reference between the classification schedules and an alphabetic list of streams.

(f) Classification Date. The classification date indicates the date on which enforcement of the provisions of Section 143-215.1 of the General Statutes of North Carolina became effective with reference to the classification assigned to the various streams in North Carolina.

(g) Reference. Copies of the schedules of classifications adopted and assigned to the waters of the various river basins may be obtained at no charge by writing to:

Director
Division of Environmental Management
Department of Natural Resources
and Community Development
Post Office Box 27687
Raleigh, North Carolina 27611

(h) Places where the schedules may be inspected:

Division of State Library
Archives -- State Library Building
109 E. Jones Street
Raleigh, North Carolina.

(i) Unnamed Streams.

(1) Any stream which is not named in the schedule of stream classifications carries the same classification as that assigned to the stream segment to which it is tributary except:

(A) unnamed streams specifically described in the schedule of classifications; or

(B) unnamed freshwaters tributary to tidal saltwaters will be classified "C"; or

(C) after November 1, 1986, any newly created areas of tidal saltwater which are connected to Class SA waters by approved dredging projects will be classified "SC" unless case-by-case reclassification proceedings are conducted.

(2) The following river basins have different policies for unnamed streams entering other states or for specific areas of the basin:

Hiwassee River Basin (Rule .0302)
Little Tennessee River Basin and Savannah River
Drainage Area (Rule .0303)
French Broad River Basin (Rule .0304)
Watauga River Basin (Rule .0305)
Broad River Basin (Rule .0306)
New River Basin (Rule .0307)
Catawba River Basin (Rule .0308)
Yadkin-Pee Dee River Basin (Rule .0309)
Lumber River Basin (Rule .0310)
Roanoke River Basin (Rule .0313)
Tar-Pamlico River Basin (Rule .0316)
Pasquotank River Basin (Rule .0317)

History Note: Statutory Authority G.S. 143-214.1; 143-215.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. November 1, 1986; February 1, 1986; January 1, 1985;
September 9, 1979.

.0315 NEUSE RIVER BASIN

(a) Places where the schedule may be inspected:

(1) Clerk of Court:
Beaufort County
Carteret County
Craven County
Durham County
Franklin County
Granville County
Greene County
Johnston County
Jones County
Lenoir County
Nash County
Orange County
Pamlico County
Person County
Pitt County
Wake County
Wayne County
Wilson County

(2) North Carolina Department of Natural Resources and Community Development:

(A) Raleigh Regional Office
3800 Barrett Drive
Raleigh, North Carolina

(B) Washington Regional Office
1502 North Market Street
Washington, North Carolina

(C) Wilmington Regional Office
7225 Wrightsville Avenue
Wilmington, North Carolina

.0315 NEUSE RIVER BASIN

Name of Stream	Description	Class	Classification Date	Classification Index No.
Grape Creek	From souce to Core Creek	C Sw NSW	5/1/88	27-90-1
Mill Branch	From source to Core Creek	C Sw NSW	5/1/88	27-90-2
Turkey Quarter Creek	From source to Neuse River	C Sw NSW	5/1/88	27-91
Taylor Creek	From source to Neuse River	C Sw NSW	5/1/88	27-92
Greens Thoroughfare	From source to Neuse River	C Sw NSW	5/1/88	27-93
Dolly Gut	From source to Neuse River	C Sw NSW	5/1/88	27-94
Pinetree Creek	From source to Neuse River	C Sw NSW	5/1/88	27-95
NEUSE RIVER	From Streets Ferry to a line across Neuse River from Johnson Point to McCotter Point	SC Sw NSW	5/1/88	27-(96)
Swift Creek	From source to mouth of Bear Branch	C Sw NSW	5/1/88	27-97
Gum Swamp	From source to Swift Creek	C Sw NSW	5/1/88	27-97-1
Nobel Canal	From source to Swift Creek	C NSW	5/1/88	27-97-2
Horsepen Swamp	From source to Swift Creek	C Sw NSW	5/1/88	27-97-3
Fork Swamp	From source to Swift Creek	C Sw NSW	5/1/88	27-97-4
Clayroot Swamp	From source to Swift Creek	C Sw NSW	5/1/88	27-97-5
Thorofare Swamp	From souce to Clayroot Swamp	C Sw NSW	5/1/88	27-97-5-1
Indian Well Swamp	From source to Clayroot Swamp	C Sw NSW	5/1/88	27-97-5-2
Creeping Swamp	From source to Clayroot Swamp	C Sw NSW	5/1/88	27-97-5-3
Pollard Swamp	From source to Creeping Swamp	C Sw NSW	5/1/88	27-97-5-3-1
Palmetto Swamp	From source to Swift Creek	C Sw NSW	5/1/88	27-97-5-4
Fork Swamp	From source to Palmetto Swamp	C Sw NSW	5/1/88	27-97-5-4-1
Mauls Swamp	From source to Swift Creek	C Sw NSW	5/1/88	27-97-5-5
Swift Creek	From mouth of Bear Branch to Neuse River	SC Sw NSW	5/1/88	27-97-(6)
Bear Branch	From source to Swift Creek	C Sw NSW	5/1/88	27-97-7
Little Swift Creek	From source to Swift Creek	C Sw NSW	5/1/88	27-97-8
Busby Fork	From source to Little Swift Creek	C Sw NSW	5/1/88	27-97-8-1
Pine Tree Swamp	From source to Little Swift Creek	C Sw NSW	5/1/88	27-97-8-2
Fisher Swamp	From source to Little Swift Creek	C Sw NSW	5/1/88	27-97-8-3
Beaverdam Swamp	From source to Fisher Swamp	C Sw NSW	5/1/88	27-97-8-3-1
Bachelor Creek	From source to mouth in Neuse River located 3.2 miles more or less downstream from The Gut	C Sw NSW C Sw NSW	5/1/88 5/1/88	27-98
Hollis Branch	From source to Bachelor (Batchelder) Creek	C Sw NSW	5/1/88	27-98-1
Rollover Creek	From source to Bachelor (Batchelder) Creek	C Sw NSW	5/1/88	27-98-2
The Gut	From source to Bachelor (Batchelder) Creek	C Sw NSW	5/1/88	27-98-3
Renny Creek	From source to Neuse River	SC Sw NSW	5/1/88	27-99
Jack Smith Creek	From source to Neuse River	C Sw NSW	5/1/88	27-100
Trent River	From source to mouth of Deep Gully	C Sw NSW	5/1/88	27-101-(1)
Horse Branch	From source to Trent River	C Sw NSW	5/1/88	27-101-2
Beaverdam Swamp	From source to Trent River	C Sw NSW	5/1/88	27-101-3
Joshua Creek	From source to Trent River	C Sw NSW	5/1/88	27-101-4
Brickyard Branch	From source to Joshua Creek	C Sw NSW	5/1/88	27-101-4-1
Bearwell Branch	From source to Joshua Creek	C Sw NSW	5/1/88	27-101-4-2
Pat Branch	From source to Joshua Creek	C Sw NSW	5/1/88	27-101-4-3
Buck Branch	From source to Joshua Creek	C Sw NSW	5/1/88	27-101-4-4
Bull Branch	From source to Joshua Creek	C Sw NSW	5/1/88	27-101-4-5
Tuckahoe Creek	From source to Trent River	C Sw NSW	5/1/88	27-101-5

Ref. 13

Uncontrolled Hazardous Waste Site Ranking System

A Users Manual

Kris W. Barrett
S. Steven Chang
Stuart A. Haus
Andrew M. Platt

August 1982

MTR-82W111

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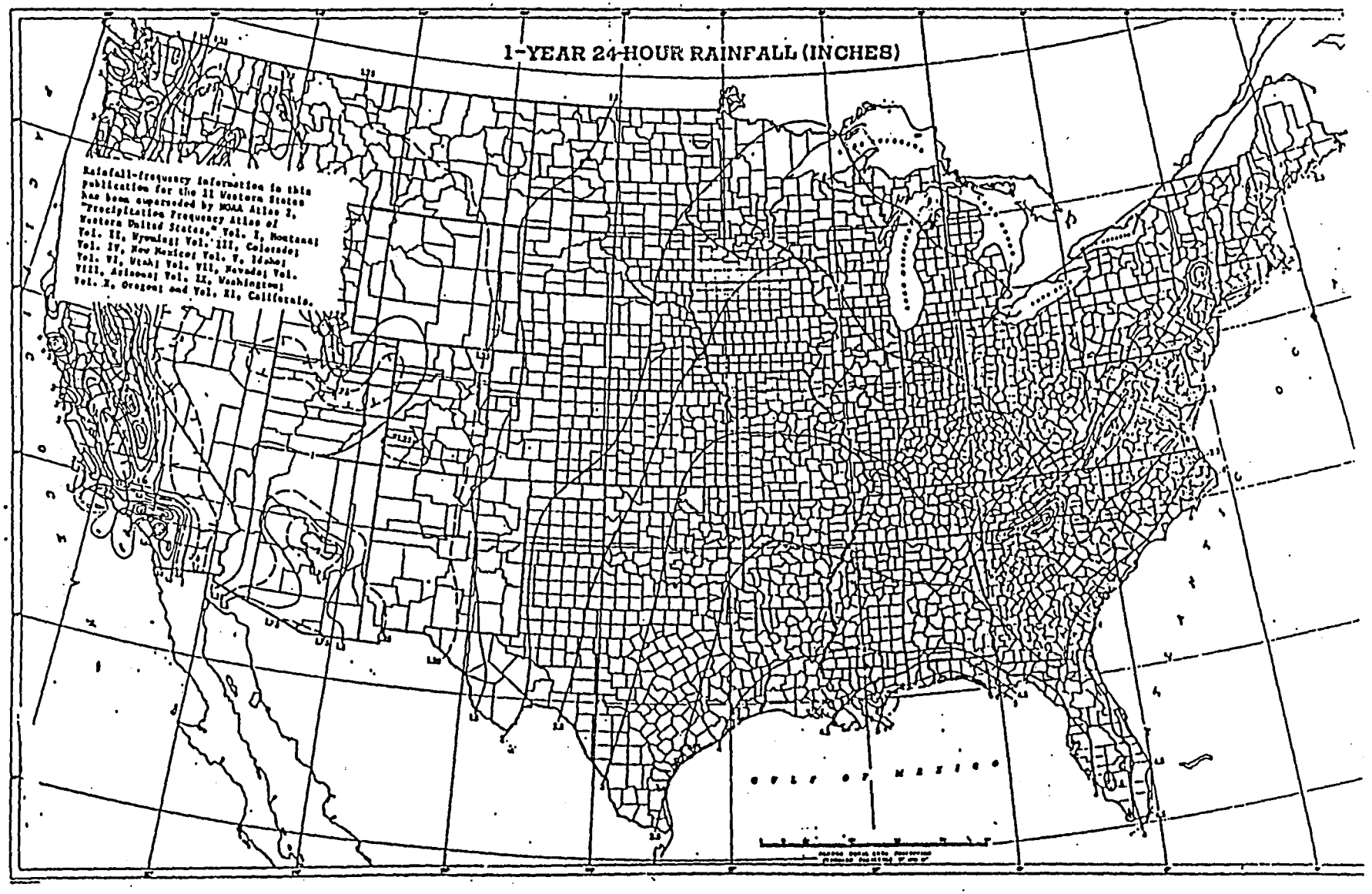
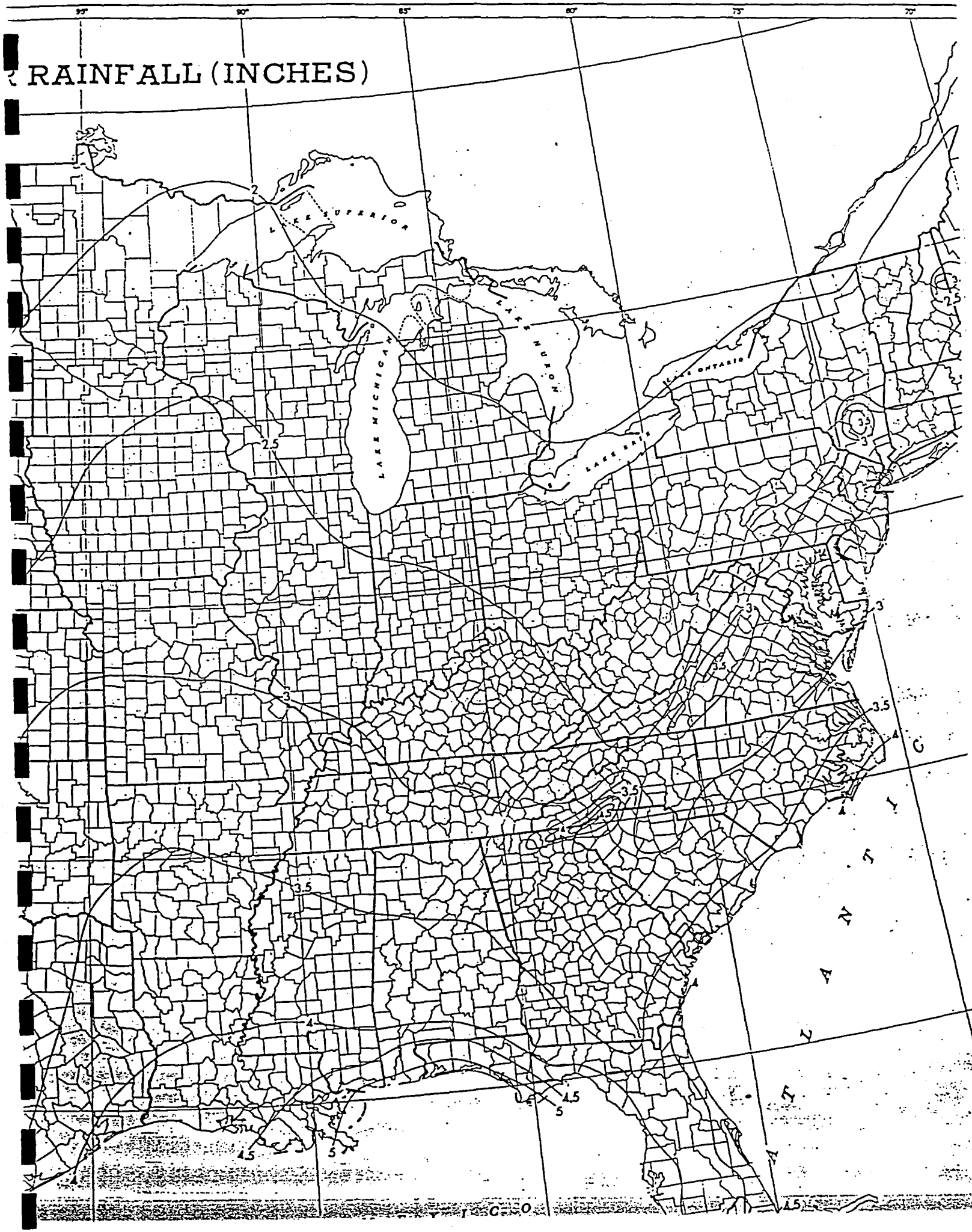

1-YEAR 24-HOUR RAINFALL (INCHES)
Rainfall-frequency information in this publication for the 11 Western States has been superseded by NOAA Atlas 2, "Precipitation Frequency Atlas of Western United States," Vol. I, Montana; Vol. II, Wyoming; Vol. III, Colorado; Vol. IV, New Mexico; Vol. V, Idaho; Vol. VI, Utah; Vol. VII, Nevada; Vol. VIII, Arizona; Vol. IX, Washington; Vol. X, Oregon; and Vol. XI, California.
GULF OF MEXICO

RAINFALL (INCHES)



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Ref. 14

Fifth Edition, 1984

North Carolina State Government

Statistical Abstract

North Carolina State Data Center

Research and Planning Services
Office of State Budget and Management

352
N8
B09
1984

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	31
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	535	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	5,600	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	2,192	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	2,001	30	3,203	6	18,948	6
Johnston	7,755	1,671	429	138	4,069	31	5,726	718	24,989	3
Jones	995	-	70	-	862	-	962	-	5,573	-
Lee	1,936	81	329	75	2,459	25	4,465	274	15,602	314
Lenoir	32,597	451	368	2,979	2,828	1,094	4,523	15	22,470	282
Lincoln	2,892	116	275	714	2,126	173	3,292	167	11,732	13
McDowell	2,645	185	179	1,042	1,690	392	2,698	230	12,728	44
Macon	3,282	16	263	-	2,016	-	3,091	-	16,300	-
Madison	3,444	1	160	14	1,165	7	1,442	2	7,027	2
Martin	3,523	3,738	93	18,647	863	7,719	1,039	1,093	5,528	12,789
Mecklenburg	20,607	3,335	3,503	3,631	24,745	813	36,601	5,707	156,662	1,758
Mitchell	1,591	124	106	52	780	13	745	520	4,161	1
Montgomery	1,949	355	190	36	1,465	31	3,339	13	9,172	23
Moore	4,418	97	265	71	2,464	46	4,295	60	18,219	9
Nash	5,322	559	594	1,203	4,373	323	8,567	309	35,371	30
New Hanover	4,042	4,675	1,080	36,483	5,411	13,157	10,379	8,344	40,872	855
Northampton	2,193	232	144	627	1,607	280	1,999	150	10,632	43
Onslow	8,007	39	485	48	4,326	10	7,447	-	35,360	-
Orange	6,169	90	336	1,194	2,929	615	4,846	57	28,470	31
Pamlico	995	-	91	-	773	-	1,635	-	6,356	-
Pasquotank	1,508	432	166	140	1,238	211	2,436	38	11,882	40
Pender	2,248	-	130	-	1,628	-	2,232	-	12,492	-
Perquimans	1,004	21	76	-	755	-	1,065	-	5,249	-
Person	4,221	15,859	195	73,710	1,533	34,504	2,968	593	11,446	1,923
Pitt	8,053	390	423	1,580	3,970	312	6,656	30	37,356	26
Polk	1,917	37	82	34	703	56	970	-	4,441	1
Randolph	11,786	83	627	64	3,543	31	9,203	377	27,791	-
Richmond	2,983	21	485	38	2,663	8	4,786	-	17,374	80
Robeson	9,120	452	621	6,434	5,365	2,634	8,985	631	41,534	154
Rockingham	10,052	34,193	586	7,270	4,726	3,390	8,993	251	36,540	199
Rowan	7,590	3,548	698	10,791	5,126	4,909	9,062	139	39,959	272
Rutherford	6,778	2,994	331	37,872	2,930	14,013	4,912	382	21,356	787
Sampson	5,988	101	349	705	3,321	136	4,839	95	23,036	11
Scotland	1,780	272	171	985	1,663	191	3,385	2,458	12,465	22
Stanly	3,915	1,288	321	2,307	2,745	385	3,764	130	17,428	11,436
Stokes	4,908	38,172	186	146,468	1,627	63,072	2,138	1,052	10,278	3,504
Surry	8,047	1,285	521	1,413	3,908	445	6,333	154	23,729	66
Swain	988	182	53	-	532	-	838	-	3,290	-
Transylvania	2,181	31	116	807	935	201	1,968	3	6,691	12
Tyrrell	674	3	70	-	627	-	1,139	-	4,752	-
Union	6,003	896	534	182	4,126	72	6,294	784	23,997	7
Vance	2,452	267	280	66	2,193	33	3,913	50	16,660	1
Wake	25,540	214	1,839	265	16,875	119	26,854	891	144,690	699
Warren	2,761	-	108	-	1,183	-	1,584	-	8,294	-
Washington	1,494	930	622	26	1,397	173	2,501	36	7,466	35
Watauga	4,143	47	176	985	1,509	140	2,268	33	11,054	9
Wayne	6,682	29,890	564	21,769	5,475	6,828	9,922	144	37,706	1,619
Wilkes	9,765	1,081	415	1,074	3,589	327	3,732	189	17,403	41
Wilson	4,374	202	539	86	4,449	18	8,416	16	30,285	1
Yadkin	3,292	10	189	18	1,718	4	2,171	-	11,255	1
Yancey	1,831	13	95	102	771	19	1,023	-	5,368	2

SOURCE: North Carolina Department of Natural Resources and Community Development, Division of Environmental Management.

3 December 1991

Ref. 15

TO: File

FROM: Jack Butler

SUBJECT: Population Distribution and Water Supply
Texfi, New Bern, North Carolina
NCD981928088

After identifying the areas served by Craven County Water and New Bern Water (including Trent Woods), a house count was performed on a USGS Topographic Map for areas within 4 miles of the Texfi New Bern site. In portions of New Bern and Trent Woods, where individual houses were not shown on the map, the percentage of the town included in the area of concern was estimated and this percentage was applied to the total population of the town as reported in the 1990 census. The total population of New Bern is 17,363 and of Trent Woods is 2,366. A factor of 2.64 persons per household, as reported in the 1990 census, was applied to the house count numbers to obtain population figures for rural areas. This data is summarized in the following table.

Table 1 - Population Distribution and Water Supply

1	2	3	4	5	6	7	8	9	10
0-¼	0	0	0	0	0	0	0	0	0
¼-½	2	5	19	50	0	0	0	0	55
½-1	2	5	50	132	2	347	0	0	484
1-2	24	63	38	100	5	868	0	0	1031
2-3	69	182	52	137	25	4341	30	710	5370
3-4	190	502	14	37	25	4341	40	946	5826

Columns Identification

1. Radius in miles.
2. Number of houses in areas not served by county or city water system.
3. Number of houses (column #2) times 2.64 people per house.
4. Number of houses shown on map in areas served by county or city water system.
5. Number of houses (column #4) times 2.64 people per house.
6. Percent of New Bern within radius.
7. Population of New Bern within radius (column #6 times 17,363).
8. Percent of Trent Woods within radius.
9. Population of Trent Woods within radius (column #8 times 2,366).
10. Total population within radius (sum of columns #3,5,7, and 9).

Ref. 16

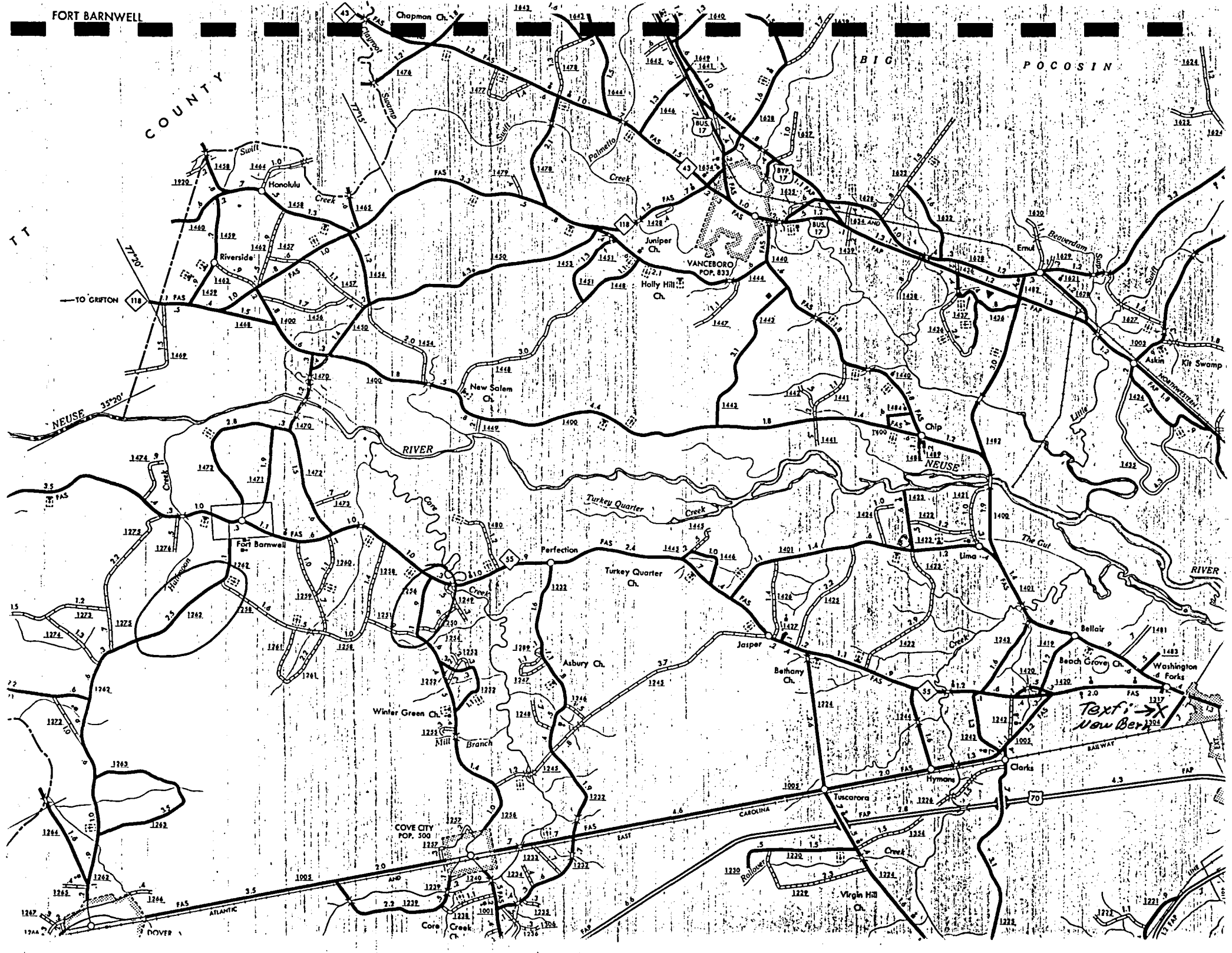
31 October 1991

TO: File

FROM: Jack Butler

SUBJECT: Craven County Water Service Source

Ms. Dee Lacasse, Craven County Water and Sewer, (919/636-6615), was contacted on this date to determine the source of water for the Craven County Water System. Ms. Lacasse reported that their water source was three wells, one on SR1262, and two on SR1256 (see attached map). All these wells are about 15 miles west of New Bern and more than 4 miles from the Texfi New Bern site.


FORT BARNWELL
COUNTY
BIG POCOSIN
Chapman Ch.
Clapboard Swamp
Swift Creek
Palmetto Creek
Honotulu
Riverside
TO GRIFTON
Juniper Ch.
VANCEBORO POP. 833
Holly Hill Ch.
Ernul
Beaverdam Swamp
Askin
Kit Swamp
New Salem Ch.
Chip
NEUSE RIVER
Little
Turkey Quarter Creek
Core Creek
Fort Barnwell
Harrington Creek
Perfection
Turkey Quarter Ch.
Lima
The Gut
Jasper
Bellair
Beach Grove Ch.
Washington Forks
Bethany Ch.
Asbury Ch.
Winter Green Ch.
Mill Branch
Clarks
Hymans
Tuscarora
Virgin Hill Ch.
Rollover Creek
COVE CITY POP. 500
Core Creek Ch.
DOVER
ATLANTIC AND EAST CAROLINA RAILWAY
NORTHWESTERN
Text → New Bern

Ref. 17

31 October 1991

TO: File

FROM: Jack Butler

SUBJECT: Water Service for Trent Woods

Ms. Tina Cannon, Trent Wood Town Clerk, (919/637-9810) was contacted on this date to determine the extent of water service in Trent Woods. Ms. Cannon reported that the City of New Bern has purchased and presently operates the former Trent Woods Water System. This system is presently available to all residents on Trent Woods, but an estimated 2 to 4 percent have maintained private wells. Ms. Cannon added that Trent Woods has approximately 800 residents.

JB/dk/1

Ref. 18

	Race: Total	White	Black	Am. Indian, Eskimo, and Aleut	Asian and Pacific Islander	Other race	Hispanic origin (of any race)	Not of Hispanic origin: White	Black	Other race	Housing units
Staley town	204	200	3	-	-	1	1	200	3	-	97
18 years and over	164	161	2	-	-	1	1	161	2	-	
Stallings town	2,132	1,857	236	35	1	3	14	1,846	236	30	778
18 years and over	1,594	1,421	147	22	1	3	7	1,417	147	23	
Stanfield town	517	510	-	-	-	7	12	505	-	-	209
18 years and over	387	385	-	-	-	2	7	380	-	-	
Stanley town	2,823	2,738	73	2	8	2	20	2,724	73	6	1,122
18 years and over	2,084	2,041	34	2	5	2	11	2,033	34	6	
Stanleyville CDP	4,779	4,196	549	8	24	2	18	4,185	545	31	2,212
18 years and over	3,752	3,347	379	7	17	2	17	3,336	376	23	
Stantonsburg town	782	491	291	-	-	-	-	491	291	-	334
18 years and over	611	409	202	-	-	-	-	409	202	-	
Star town	775	749	18	4	4	-	18	735	18	4	316
18 years and over	599	578	15	4	2	-	12	568	15	4	
Statesville city	17,567	11,057	6,280	36	118	76	164	10,998	6,252	153	7,916
18 years and over	13,472	9,223	4,106	27	71	45	107	9,179	4,088	98	
Steedman town	577	472	100	1	1	3	4	472	99	2	225
18 years and over	432	354	75	1	1	1	1	354	75	2	
Stem town	249	240	6	-	2	1	3	238	6	2	111
18 years and over	201	194	5	-	1	1	3	192	5	1	
Stokesdale town	2,134	1,932	169	4	1	28	31	1,929	169	5	823
18 years and over	1,640	1,487	131	3	1	18	20	1,485	131	4	
Stoneville town	1,109	866	228	1	-	14	15	863	228	3	477
18 years and over	861	686	165	1	-	9	8	685	165	3	
Stonewall town	279	200	78	1	-	-	5	195	78	1	133
18 years and over	223	162	60	1	-	-	4	158	60	1	
Stony Point CDP	1,286	1,263	20	-	-	3	10	1,256	20	-	520
18 years and over	1,004	982	19	-	-	3	9	976	19	-	
Stovall town	409	234	175	-	-	-	-	234	175	-	173
18 years and over	314	178	136	-	-	-	-	178	136	-	
Sugar Mountain village	132	132	-	-	-	-	-	132	-	-	1,090
18 years and over	113	113	-	-	-	-	-	113	-	-	
Summerfield CDP	2,051	1,922	104	17	5	3	17	1,909	104	21	793
18 years and over	1,513	1,422	78	9	3	1	13	1,411	78	11	
Sunset Beach town	311	311	-	-	-	-	4	307	-	-	1,066
18 years and over	268	268	-	-	-	-	2	266	-	-	
Surf City town	970	948	4	8	6	4	7	946	4	13	2,242
18 years and over	871	851	4	6	6	4	6	850	4	11	
Swannanoa CDP	3,538	3,386	127	12	11	2	22	3,364	124	23	1,458
18 years and over	2,628	2,566	50	5	6	1	16	2,553	44	11	
Swansboro town	1,165	1,103	38	7	15	2	14	1,096	35	17	586
18 years and over	913	877	18	5	12	1	9	873	18	13	
Swepsonville CDP	1,195	1,186	2	-	4	3	10	1,179	2	4	500
18 years and over	939	933	2	-	2	2	9	926	2	2	
Sylva town	1,809	1,699	85	20	3	2	6	1,695	85	23	899
18 years and over	1,499	1,411	70	14	2	2	5	1,408	70	16	
Tabor City town	2,330	1,606	713	11	-	-	5	1,605	709	11	1,026
18 years and over	1,755	1,252	498	5	-	-	4	1,251	495	5	
Tarboro town	11,037	7,479	3,483	14	45	16	49	7,442	3,480	66	4,520
18 years and over	8,280	5,876	2,350	11	29	14	41	5,847	2,347	45	
Tar heel town	115	115	-	-	-	-	-	115	-	-	46
18 years and over	82	82	-	-	-	-	-	82	-	-	
Taylorsville town	1,566	1,317	245	3	-	1	13	1,306	244	3	710
18 years and over	1,250	1,069	177	3	-	1	5	1,066	176	3	
Taylortown town	543	49	491	1	2	-	-	49	491	3	252
18 years and over	393	31	359	1	2	-	-	31	359	3	
Teachey town	244	105	139	-	-	-	1	104	139	-	113
18 years and over	178	84	94	-	-	-	1	83	94	-	
Thomasville city	15,915	11,357	4,420	72	26	40	96	11,302	4,410	107	6,928
18 years and over	12,113	8,958	3,070	47	17	21	68	8,920	3,063	62	
Toast CDP	2,125	1,811	307	2	1	4	9	1,806	307	3	857
18 years and over	1,701	1,456	240	2	-	3	6	1,453	240	3	
Topsail Beach town	346	344	1	1	-	-	2	342	1	1	998
18 years and over	314	312	1	1	-	-	2	310	1	1	
Trenton town	248	181	66	-	1	-	-	181	66	1	128
18 years and over	203	155	47	-	1	-	-	155	47	1	
Trent Woods town	2,366	2,360	-	1	5	-	9	2,352	-	5	919
18 years and over	1,813	1,808	-	-	5	-	7	1,801	-	5	
Trinity CDP	5,469	5,018	399	40	8	3	31	5,001	394	43	2,199
18 years and over	4,241	3,882	321	29	6	3	23	3,869	317	32	
Troutman town	1,493	1,091	395	4	3	-	1	1,090	395	7	578
18 years and over	1,084	846	232	3	3	-	1	845	232	6	

Note: The population counts set forth herein are subject to possible correction for undercount or overcount. The U.S. Department of Commerce is considering whether to correct these counts and will publish corrected counts, if any, not later than July 15, 1991.

	Total	Race: White	Race: Black	Race: Am. Indian, Eskimo, and Aleut	Race: Asian and Pacific Islander	Race: Other races	Hispanic origin (of any race)	Not of Hispanic origin: White	Not of Hispanic origin: Black	Not of Hispanic origin: Other races	Housing units
Navassa town	445	34	409	2	-	-	-	34	409	2	144
18 years and over	310	22	286	2	-	-	-	22	286	2	
Nease Forest CDP	1,110	1,042	39	-	24	5	20	1,035	34	21	409
18 years and over	788	744	20	-	20	4	14	738	19	17	
New Bern city	17,363	9,654	7,563	53	61	32	121	9,587	7,532	123	8,024
18 years and over	12,842	7,799	4,941	33	49	20	80	7,753	4,925	84	
New Hope CDP	5,694	4,837	735	10	80	32	102	4,769	727	96	2,354
18 years and over	4,522	3,919	521	9	53	20	67	3,878	516	61	
New Hope CDP	4,491	3,084	1,330	11	56	10	47	3,047	1,330	67	1,604
18 years and over	3,158	2,193	905	9	42	9	31	2,171	905	51	
Newland town	645	635	-	1	-	9	9	635	-	1	334
18 years and over	495	486	-	1	-	8	8	486	-	1	
New London town	414	385	21	4	-	4	4	385	21	4	167
18 years and over	310	292	14	3	-	1	1	292	14	3	
Newport town	2,516	2,089	334	18	41	34	61	2,067	329	59	920
18 years and over	1,917	1,581	277	14	27	18	38	1,566	274	39	
New River Station CDP	9,732	7,091	2,031	96	107	407	709	6,852	1,977	194	447
18 years and over	8,959	6,496	1,894	87	87	395	655	6,287	1,848	169	
Newton city	9,304	7,770	1,437	13	42	42	100	7,716	1,435	53	3,986
18 years and over	7,153	6,122	959	11	31	30	63	6,093	957	40	
Newton Grove town	511	375	125	-	-	11	13	375	123	-	214
18 years and over	391	300	85	-	-	6	8	300	83		
Norlina town	996	634	354	2	-	6	18	623	353	2	456
18 years and over	750	504	240	2	-	4	11	497	240	2	
Norman town	105	75	29	1	-	-	-	75	29	1	49
18 years and over	83	60	22	1	-	-	-	60	22	1	
North Hickory CDP	4,299	4,194	72	6	22	5	13	4,188	70	28	1,684
18 years and over	3,262	3,194	46	4	13	5	10	3,190	45	17	
Northlakes CDP	1,219	1,210	3	-	6	-	1	1,209	3	6	502
18 years and over	919	912	3	-	4	-	1	911	3	4	
North Wilkesboro town	3,384	2,799	574	3	4	4	9	2,794	574	7	1,607
18 years and over	2,588	2,220	357	3	4	4	9	2,215	357	7	
Norwood town	1,617	1,155	437	3	2	20	39	1,136	435	7	679
18 years and over	1,201	900	287	3	2	9	22	888	286	5	
Oakboro town	600	443	154	2	1	-	7	438	152	3	247
18 years and over	442	343	96	2	1	-	7	338	94	3	
Oak City town	389	202	181	3	2	1	4	202	180	3	172
18 years and over	299	165	128	3	2	1	4	165	127	3	
Ocean Isle Beach town	523	521	1	-	1	-	2	519	1	1	1,915
18 years and over	443	441	1	-	1	-	2	439	1	1	
Ogden CDP	3,228	3,145	56	16	7	4	23	3,127	56	22	1,319
18 years and over	2,400	2,337	40	13	6	4	16	2,326	40	18	
Old Fort town	720	603	116	-	1	-	-	603	116	1	352
18 years and over	564	478	85	-	1	-	-	478	85	1	
Oriental town	786	687	98	-	1	-	2	685	98	1	487
18 years and over	666	606	59	-	1	-	2	604	59	1	
Orrum town	103	60	43	-	-	-	-	60	43	-	45
18 years and over	73	49	24	-	-	-	-	49	24	-	
Oxford city	7,913	3,579	4,295	9	16	14	32	3,564	4,291	26	3,111
18 years and over	5,902	2,812	3,064	7	11	8	20	2,801	3,062	19	
Pantego town	171	143	27	1	-	-	2	143	25	1	86
18 years and over	137	112	24	1	-	-	1	112	23	1	
Parkton town	367	292	62	13	-	-	-	292	62	13	182
18 years and over	301	248	46	7	-	-	-	248	46	7	
Parkwood CDP	4,123	3,345	608	21	123	26	83	3,292	607	141	1,453
18 years and over	2,877	2,359	397	17	91	13	48	2,327	396	106	
Parmele town	321	38	282	1	-	-	-	38	282	1	129
18 years and over	235	34	200	1	-	-	-	34	200	1	
Patterson Springs town	690	682	2	5	-	1	12	671	2	5	305
18 years and over	509	503	2	3	-	1	6	498	2	3	
Peachland town	384	256	127	-	1	-	-	256	127	1	146
18 years and over	285	199	85	-	1	-	-	199	85	1	
Pembroke town	2,241	265	74	1,894	3	5	29	260	73	1,879	919
18 years and over	1,516	216	52	1,241	3	4	14	215	51	1,236	
Pikeville town	598	579	17	-	1	1	4	575	17	2	274
18 years and over	484	468	14	-	1	1	1	467	14	2	
Pilot Mountain town	1,181	1,046	130	1	-	4	6	1,043	130	2	574
18 years and over	954	86	91	1	-	1	3	858	91	2	
Pinebluff town	876	823	31	11	9	2	3	822	31	20	367
18 years and over	646	608	21	10	5	2	3	607	21	15	
Pinehurst town	5,103	4,995	89	1	14	4	24	4,978	88	13	3,326
18 years and over	4,691	4,602	77	1	9	2	20	4,586	76	9	

Note: The population counts set forth herein are subject to possible correction for undercount or overcount. The U.S. Department of Commerce is considering whether to correct these counts and will publish corrected counts, if any, not later than July 15, 1991.

Table 6. Household, Family, and Group Quarters Characteristics: 1990

[For definitions of terms and meanings of symbols, see text]

State County Place and [In Selected States] County Subdivision	Persons in households	All households	Family households: Total	Family households: Married-couple family	Family households: Female householder, no husband present	Nonfamily households: Total	Nonfamily households: Householder living alone: Total	Nonfamily households: Householder living alone: 65 years and over: Total	Nonfamily households: Householder living alone: 65 years and over: Female	Persons per— Household	Persons per— Family	Persons in group quarters: Total	Persons in group quarters: Institutionalized persons	Persons in group quarters: Other persons in group quarters
The State	6 404 167	2 517 026	1 812 053	1 424 206	309 876	704 973	596 959	228 384	182 329	2.54	3.03	224 470	83 400	141 070
COUNTY														
Alamance County	105 327	42 652	30 745	24 295	5 130	11 907	10 467	4 508	3 748	2.47	2.94	2 886	1 173	1 713
Alexander County	27 245	10 331	8 049	6 715	952	2 282	2 022	839	651	2.64	3.02	299	299	-
Alleghany County	9 381	3 894	2 829	2 471	303	1 065	990	539	433	2.41	2.88	209	193	16
Anson County	23 117	8 531	6 359	4 552	1 475	2 172	2 042	1 075	860	2.71	3.23	357	344	13
Ashe County	21 965	8 848	6 748	5 643	816	2 100	1 935	1 014	809	2.48	2.89	244	220	24
Avery County	13 918	5 520	4 162	3 500	480	1 358	1 229	549	420	2.52	2.95	649	320	329
Beaufort County	41 704	16 157	11 840	9 140	2 186	4 317	3 915	1 974	1 605	2.58	3.07	579	441	138
Bertie County	20 321	7 412	5 501	3 831	1 419	1 911	1 797	957	755	2.74	3.28	67	67	-
Bladen County	28 150	10 760	8 017	5 854	1 762	2 743	2 579	1 243	1 000	2.62	3.11	513	509	4
Brunswick County	50 497	20 069	15 291	12 636	2 031	4 778	4 227	1 640	1 194	2.52	2.91	488	307	181
Buncombe County	169 713	70 802	49 335	39 637	7 684	21 467	18 868	8 174	6 842	2.40	2.90	5 108	2 966	2 142
Burke County	73 281	29 184	21 711	17 462	3 148	7 473	6 589	2 706	2 228	2.51	2.93	2 463	2 410	53
Cabarrus County	97 255	37 515	28 367	23 279	3 972	9 148	8 038	3 509	2 971	2.59	3.02	1 680	1 223	457
Caldwell County	69 917	27 172	20 656	16 653	2 944	6 516	5 660	2 287	1 846	2.57	2.97	792	735	57
Camden County	5 875	2 180	1 682	1 365	225	488	437	234	169	2.69	3.11	29	-	29
Carteret County	51 554	21 238	15 276	12 681	2 021	5 962	5 061	1 901	1 431	2.43	2.88	1 002	750	252
Caswell County	20 053	7 468	5 781	4 454	1 024	1 687	1 593	727	573	2.69	3.13	640	624	16
Catawba County	116 357	45 700	33 773	27 418	4 841	11 927	10 270	3 844	3 115	2.55	2.99	2 025	1 134	891
Chatham County	38 315	15 293	11 227	9 115	1 605	4 066	3 445	1 412	1 141	2.51	2.95	444	377	67
Cherokee County	19 809	7 966	6 069	5 065	765	1 897	1 764	975	759	2.50	2.91	271	196	75
Chowan County	13 233	5 113	3 775	2 842	767	1 338	1 238	641	499	2.59	3.07	273	273	-
Clay County	7 150	2 928	2 177	1 894	203	751	699	418	314	2.44	2.90	5	4	1
Cleveland County	83 012	32 037	24 282	19 011	4 168	7 755	7 011	3 222	2 624	2.59	3.02	1 702	915	787
Columbus County	48 953	18 459	13 754	10 361	2 757	4 705	4 351	2 152	1 695	2.65	3.15	634	624	10
Craven County	78 014	29 542	22 481	18 189	3 511	7 061	6 121	2 436	1 930	2.64	3.07	3 599	811	2 788
Cumberland County	253 362	91 500	69 966	54 433	12 883	21 534	17 718	4 724	3 752	2.77	3.19	21 204	1 499	19 705
Currituck County	13 466	5 038	3 854	3 272	407	1 184	984	419	312	2.68	3.08	250	217	33
Dare County	22 542	9 349	6 425	5 498	682	2 924	2 264	714	522	2.41	2.88	204	140	64
Davidson County	125 358	48 944	37 176	30 410	5 120	11 768	10 262	4 189	3 319	2.56	2.96	1 319	1 277	42
Davie County	27 541	10 785	8 270	6 999	953	2 515	2 246	1 025	817	2.55	2.95	318	288	30
Duplin County	39 368	14 925	11 036	8 378	2 099	3 889	3 553	1 779	1 439	2.64	3.12	627	560	67
Durham County	173 310	72 237	45 965	33 614	10 321	26 312	20 930	5 553	4 471	2.40	2.99	8 525	2 175	6 350
Edgecombe County	55 856	20 319	15 065	10 000	4 293	5 234	4 703	2 124	1 717	2.75	3.25	702	657	45
Forsyth County	257 466	107 419	72 621	55 715	14 052	34 798	29 870	9 779	7 975	2.40	2.94	8 412	3 493	4 919
Franklin County	35 237	13 503	10 047	7 640	1 865	3 456	3 120	1 384	1 126	2.61	3.07	1 177	568	609
Gaston County	172 791	65 347	49 754	38 905	8 439	15 593	13 580	5 720	4 720	2.64	3.07	2 302	1 458	844
Gates County	9 232	3 352	2 593	2 040	404	759	705	394	288	2.75	3.19	103	102	1
Graham County	7 176	2 772	2 166	1 839	246	606	562	294	225	2.59	2.98	20	18	2
Granville County	35 191	13 134	9 883	7 501	1 857	3 251	2 889	1 236	978	2.68	3.13	3 154	3 079	75
Greene County	14 665	5 305	4 066	3 003	875	1 329	1 189	574	481	2.72	3.18	719	704	15
Guilford County	335 348	137 706	92 891	71 195	17 570	44 815	36 578	12 180	9 951	2.44	2.97	12 072	3 084	8 988
Halifax County	54 122	20 335	14 874	10 092	4 018	5 461	5 005	2 398	1 897	2.66	3.18	1 394	1 356	38
Harnett County	65 340	25 150	18 529	14 489	3 154	6 621	5 773	2 438	1 962	2.60	3.06	2 482	1 240	1 242
Haywood County	46 152	19 211	14 120	11 831	1 774	5 091	4 601	2 337	1 886	2.40	2.83	790	751	39
Henderson County	68 206	28 709	21 169	18 113	2 344	7 540	6 838	3 531	2 859	2.38	2.80	1 079	967	112
Hertford County	21 612	8 150	5 921	4 164	1 473	2 229	2 063	977	766	2.65	3.19	911	279	632
Hoke County	21 612	7 405	5 794	3 847	1 605	1 611	1 419	523	420	2.92	3.34	1 244	1 244	-
Hyde County	5 383	2 094	1 533	1 151	321	561	516	269	191	2.57	3.07	28	19	9
Iredell County	92 082	35 573	26 869	21 726	4 023	8 704	7 646	3 271	2 682	2.59	3.02	849	814	35
Jackson County	23 834	9 683	6 970	5 749	981	2 713	2 242	966	745	2.46	2.91	3 012	280	2 732
Johnston County	80 341	31 566	23 217	18 566	3 834	8 349	7 441	3 380	2 750	2.55	3.01	965	893	72
Jones County	9 412	3 492	2 639	2 034	482	853	774	406	311	2.70	3.17	2	2	-
Lee County	40 651	15 689	11 739	9 067	2 135	3 950	3 482	1 369	1 107	2.59	3.03	723	672	51
Lenoir County	55 652	21 938	15 611	11 131	3 798	6 327	5 706	2 580	2 073	2.54	3.06	1 622	1 559	63
Lincoln County	49 802	18 764	14 661	12 207	1 827	4 103	3 580	1 467	1 173	2.65	3.03	517	517	-
McDowell County	35 064	13 680	10 366	8 576	1 363	3 314	2 996	1 399	1 135	2.56	2.99	617	416	201
Macon County	22 992	9 834	7 235	6 236	773	2 599	2 368	1 307	1 021	2.34	2.76	507	233	274
Madison County	16 104	6 488	4 806	4 058	516	1 682	1 510	789	581	2.48	2.92	849	104	745
Martin County	24 813	9 317	6 900	5 067	1 518	2 417	2 213	1 100	906	2.66	3.17	265	257	8
Mecklenburg County	496 886	200 219	134 361	103 211	25 013	65 858	52 037	12 900	10 610	2.50	3.05	11 547	3 578	7 969
Mitchell County	14 288	5 779	4 420	3 777	479	1 359	1 265	669	539	2.47	2.88	145	130	15
Montgomery County	22 279	8 290	6 274	4 823	1 119	2 016	1 838	876	600	2.69	3.14	1 067	997	70
Moore County	58 010	23 827	17 483	14 312	2 473	6 344	5 662	2 744	2 201	2.43	2.87	1 003	970	33
Nash County	75 450	29 041	21 224	16 322	3 968	7 817	6 926	2 880	2 316	2.60	3.09	1 227	807	420
New Hanover County	118 999	48 139	32 400	24 723	6 383	15 739	12 434	4 372	3 512	2.43	2.95	3 295	1 321	1 964
Northampton County	20 055	7 591	5 644	3 958	1 436	1 947	1 816	968	704	2.64	3.13	743	742	1
Onslow County	115 274	40 658	32 971	28 037	3 843	7 687	6 271	1 752	1 364	2.84	3.16	34 564	954	33 610
Orange County	84 627	36 104	21 123	16 854	3 380	14 981	10 110	2 257	1 830	2.34	2.63	9 224	770	8 454
Pamlico County	11 247	4 523	3 382	2 717	547	1 141	1 055	528	410	2.49	2.95	125	112	13
Pasquotank County	29 884	11 384	8 326	6 356	1 681	3 058	2 725	1 342	1 065	2.63	3.13	1 414	383	1 031
Pender County	28 467	11 112	8 420	6 707	1 371	2 692	2 368	1 055	796	2.56	2.99	358	348	10
Perquimans County	10 303	3 988	3 038	2 444	468	950	862	443	342	2.58	3.02	144	144	-
Person County	29 830	11 423	8 570	6 607	1 547	2 853	2 808	1 209	994	2.61	3.07	350	304	46
Pitt County	122 400	40 421	26 434	19 369	5 857	14 057	10 412	3 104	2 511	2.53	3.12	5 524	946	4 578
Polk County	14 187	6 110	4 346	3 693	511	1 764	1 599	952	768	2.32	2.77	229	227	2
Randolph County	105 442	41 096	31 363	26 135	3 957	9 733	8 590	3 435	2 789	2.57	2.97	1 106	1 050	56
Richmond County	43 534	16 793	12 270	9 128	2 551	4 523	4 174	2 011	1 600	2.59	3.11	964	875	109
Robeson County	103 186	36 154	27 429	18 451	7 353	8 725	7 891	3 355	2 651	2.85	3.34	1 993	1 280	713
Rockingham County	85 242	33 446	24 671	19 351	4 193	8 775	7 956	3 669	2 982	2.55	3.22	822	781	41
Rowan County	107 079	42 512	31 055	25 100	4 618	11 457	10 236	4 748	3 815	2.52	2.99	3 523	2 405	1 118
Rutherford County	56 197	22 198	16 480	13 191	2 531	5 718	5 255	2 556	2 050	2.53	2.96	721	721	-
Sampson County	46 754	17 525	13 191	10 058	2 525	4 335	3 975	2 032	1 610	2.67	3.14	543	490	53
Scotland County	32 679	11 837	8 971	6 225	2 338	2 866	2 618	1 173	935	2.78	3.25	1 075	401	674
Stanly County	50 734	19 747	14 987	12 451	1 975	4 780	4 396	2 164	1 785	2.57	3.01	1 031	470	561
Stokes County	36 862	14 123	11 022	9 341	1 273	3 101	2 825	1 246	1 016	2.61	3.00	361	361	-
Surry County	60 950	24 252	18 252	15 253	2 341	6 000	5 474	2 732	2 256	2.51	2.94	754	650	104
Swain County	10 653	4 173	3 083	2 382	550	1 090	985	467	369	2.55	3.01	615	215	400
Transylvania County	24 283	9 924	7 496	6 442	797	2 428	2 224	1 131	912	2.45	2.86	1 237	178	1 059
Tyrrell County	3 852	1 471	1 078	810	213	393	359	208	148	2.62	3.13	4	4	-
Union County	82 633	29 307	23 530	19 607	3 063	5 777	5 018	2 148	1 735	2.82	3.18	1 578	455	1 123

TPS II [POSTSCRIPT] CPH137 CENSUS90 72580900 04/23/91 5:06 PM MACHINE: C DATA:CENSUS90*PH1TPSDAT37, 04/23/91 16:51:04 OUTPUT:ONSITE-PS196 PAGE: 106
TSF:CENSUS90*92, 04/23/91 16:51:23 UTF:CENSUS90*93 04/23/91 16:51:23 META:CENSUS90*PH1TABLES37, 04/23/91 17:02:14

Ref. 19

15 May 1991

TO: File

FROM: Jack Butler

SUBJECT: Texfi, New Bern
NCD981928088

The Natural Heritage Program office (Seventh Floor Archdale, 733-7701), was visited on this date to discuss the area of the subject site. Mr. Mike Schafale and Mr. Mike Weekly were very helpful in assisting our staff. A review of their files indicated that the alligator, a federally designated threatened species, has been sited in the Neuse River near New Bern approximately 5 or 6 miles downstream from the subject site. In addition, the Neuse River Floodplain and Bluff System, the Neuse River Sand Ridge, and the Duck Creek Sand Ridge are Priority Areas along the Neuse River within about 7 miles of the subject site. The Neuse River Floodplain and Bluff System is an area of Hog Island approximately 2 to 3 miles northeast of the subject site. The Neuse River Sand Ridge is an area on the northeast bank of the Neuse River approximately 3 miles northeast of the subject site. The Duck Creek Sand Ridge is a wetland south of Duck Creek and east of the Neuse River approximately 6.5 miles southeast of the subject site. These Priority Areas are considered unique geological and ecological areas.

JB/ds/9

Ref. 20

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 (2 C.)

WA 440 S29dp 1984 c.2

VNR VAN NOSTRAND REINHOLD COMPANY

New York

DICHLOROETHYLENE

CAS RN: 25323302 NIOSH #: KV 9250000
mf: $C_2H_2Cl_2$; mw: 96.94

TOXICITY DATA: 2	CODEN:
ihl-mus LCLo:76 gm/m3/2H	AEXPBL 83,235,18
ihl-gpg LCLo:155 gm/m3/1H	AEXPBL 83,235,18

THR: MOD ihl in mus and gpg.
Disaster Hazard: When heated to decomp it emits tox fumes of Cl^-.

1,1-DICHLOROETHYLENE

CAS RN: 75354 NIOSH #: KV 9275000
mf: $C_2H_2Cl_2$; mw: 96.94

Colorless volatile liquid. bp: 31.6°, lel = 7.3%, uel = 16.0%, fp: −122°, flash p: 0°F (OC), d: 1.213 @ 20°/4°, autoign. temp.: 1058°F.

SYNS:

CHLORURE DE VINYLIDENE (FRENCH)	1-1-DCE
	NCI-C54262
1,1-DICHLOROETHENE	VINYLIDENE DICHLORIDE

TOXICITY DATA: 3	CODEN:
orl-rat TDLo:200 mg/kg (6-15D preg)	TXAPA9 49,189,79
ihl-rat TCLo:80 ppm/7H (6-15D preg)	TXAPA9 49,189,79
ihl-rbt TCLo:160 ppm/7H (6-15D preg)	TXAPA9 49,189,79
mmo-sat 5 pph	MUREAV 57,141,78
mma-sat 3 pph/2H	MUREAV 58,183,78
ihl-rat TCLo:55 ppm/52W-I:ETA	JTEHD6 4,15,78
ihl-mus TCLo:55 ppm/6H/1Y-I:ETA	EVHPAZ 21,25,77
skn-mus TDLo:4840 mg/kg:NEO	JJIND8 63,1433,79
ihl-rat TC:55 ppm/1Y-I:ETA	EVHPAZ 21,25,77
ihl-mus TC:55 ppm/43W-I:ETA	JTEHD6 4,15,78
ihl-hmn TCLo:25 ppm:SYS	CHINAG 11,463,76
orl-rat LD50:200 mg/kg	DCTODJ 1,63,77
ihl-rat LCLo:10000 ppm/24H	EXMPA6 20,187,74
ihl-mus LC50:98 ppm/22H	JTEHD6 3(5-6),913,77
orl-dog LDLo:5750 mg/kg	QJPPAL 7,205,34
ivn-dog LDLo:225 mg/kg	QJPPAL 7,205,34
scu-rbt LDLo:3700 mg/kg	QJPPAL 7,205,34

Aquatic Toxicity Rating: TLm96:1000-100 ppm WQCHM* 3,-,74. Carcinogenic Determination: Animal Positive IARC** 19,439,79.
TLV: Air: 10 ppm DTLVS* 4,432,80. *Toxicology Review:* CTOXAO 8,633,75; CMTVAS 10(3),49,73; NTIS** ORNL/TIRC-77/3. Occupational Exposure to Vinyl Halides recm std: Air: TWA 1 ppm; CL 5 ppm/15M NTIS**. NTP Carcinogenesis Bioassay Completed as of December 1980. "NIOSH Manual of Analytical Methods" VOL 4 266*. NIOSH Current Intelligence Bulletin 28, 1978. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.
THR: An exper MUT, ETA, NEO, CARC. HIGH acute orl, ihl. See also vinyl chloride.
Fire Hazard: Highly dangerous, when exposed to heat or flame.
Explosion Hazard: Mod, in the form of gas, when exposed to heat or flame. Also can explode spontaneously; reacts violently with chlorosulfonic acid, HNO_3, oleum.
Disaster Hazard: Highly dangerous; see chlorides; can react vigorously with oxidizing materials.
To Fight Fire: Alcohol foam, CO_2, dry chemical.
Incomp: Air; chlorotri-fluoroethylene; ozone; perchloryl fluoride.

cis-DICHLOROETHYLENE

CAS RN: 156592 NIOSH #: KV 9420000
mf: $C_2H_2Cl_2$; mw: 96.94

Colorless liquid, pleasant odor. mp: −80.5°, bp: 59°, lel = 9.7%, uel = 12.8%, flash p: 39°F, d: 1.2743 @ 25°/4°, vap. press: 400 mm @ 41.0°, vap. d: 3.34.

SYNS:

1,2-DICHLOROETHYLENE	ACETYLENE DICHLORIDE

TOXICITY DATA: 1	CODEN:
ihl-mus LCLo:65000 mg/m3/2H	AHBAAM 116,131,36
ihl-cat LCLo:20000 mg/m3/6H	AHBAAM 116,131,36

Reported in EPA TSCA Inventory, 1980.
THR: LOW via oral route. In high conc it is irr and narcotic. Has produced liver and kidney injury in exper animals.
Fire Hazard: Dangerous, when exposed to heat or flame. Reacts violently with N_2O_4, KOH, Na, NaOH.
Spontaneous Heating: No.
Explosion Hazard: Mod, in the form of vapor when exposed to flame.
Disaster Hazard: Dangerous; see chlorides; can react vigorously with oxidizing materials.
To Fight Fire: Water spray, foam, CO_2, dry chemical.

cis, 1,2-DICHLOROETHYLENE

mf: $C_2H_2Cl_2$; mw: 96.94

Flash p: 42.8°F; lel = 3.3%; uel = 15%.

trans-1,2-DICHLOROETHYLENE

mf: $C_2H_2Cl_2$; mw: 96.94

Flash p: 35.6°F; lel = 9.7%; uel = 12.8%.
Can cause fire hazard.
Incomp: Alkalies; difluoromethylene dihypofluorite; nitrogen tetraoxide.

DICHLOROETHANE

CAS RN: 1300216 NIOSH #: KH 9800000
mf: $C_2H_4Cl_2$; mw: 98.96

Lel = 5.6%; uel = 11.4%.

TOXICITY DATA: 2	CODEN:
orl-rat LD50:1120 mg/kg	HYSAAV 32,349,67
orl-mus LD50:625 mg/kg	HYSAAV 32,349,67
ihl-mus LCLo:10 gm/m3	GISAAA 20(8),19,55
skn-rbt LD50:3890 mg/kg	UCDS** 3/23/70
ihl-rat TCLo:6000 ppm (6-15D preg) TER	TXAPA9 28,452,74
ihl-rat TCLo:6000 ppm (6-15D preg)	TXAPA9 28,452,74

THR: MOD orl in rat, mus; MOD skn in rbt.
Disaster Hazard: When heated to decomp it emits very tox fumes of Cl^-.

1,2-DICHLOROETHANE

mf: $C_2H_4Cl_2$; mw: 98.96

Lel = 6.2%; uel = 15.9%; flash p: 55.4°F.

Incomp: Dinitrogen tetraoxide; metals.
For further information see Vol. 1, No. 4 of *DPIM Report.*

METHANE DICHLORIDE

CAS RN: 75092 NIOSH #: PA 8050000
mf: CH_2Cl_2; mw: 84.93

Colorless volatile liquid. bp: 39.8°, lel = 15.5% in O_2, uel = 66.4% in O_2, fp: −96.7°, d: 1.326 @ 20°/4°, autoign. temp.: 1139°F, vap. press: 380 mm @ 22°, vap. d: 2.93.

SYNS:

CHLORURE DE METHYLENE (FRENCH)
DICHLOROMETHANE (DOT)
FREON 30
METHYLENE BICHLORIDE
METHYLENE CHLORIDE (DOT)
METHYLENE DICHLORIDE
METYLENU CHLOREK (POLISH)
NCI-C50102

TOXICITY DATA: 3	CODEN:
skn-rbt 810 mg/24H SEV	JETOAS 9,171,76
eye-rbt 162 mg MOD	JETOAS 9,171,76
eye-rbt 10 mg MLD	TXCYAC 6,173,76
eye-rbt 17500 mg/m3/10M	TXCYAC 6,173,76
mmo-sat 5700 ppm	MUREAV 56,245,78
mma-sat 5700 ppm	MUREAV 56,245,78
dni-hmn:fbr 5000 ppm/1H-C	MUREAV 81,203,81
dni-ham:lng 5000 ppm/1H-C	MUREAV 81,203,81
sce-ham:lng 5000 ppm/1H-C	MUREAV 81,203,81
ihl-rat TCLo:4500 ppm/24H (1-17D preg)	TXAPA9 52,29,80
ihl-rat TCLo:1250 ppm/7H (6-15D preg)	TXAPA9 32,84,75
ihl-mus TCLo:1250 ppm/7H (6-15D preg)	TXAPA9 32,84,75
ihl-rat TCLo:500 ppm/6H/2Y:ETA	TXAPA9 48,A185,79
ihl-hmn TCLo:500 ppm/1Y-I:CNS	ABHYAE 43,1123,68
ihl-hmn TCLo:500 ppm/8H:BLD	SCIEAS 176,295,72
orl-rat LD50:167 mg/kg	DOWSD* 1/26/76
ihl-rat LC50:88000 mg/m3/30M	FAVUAI 7,35,75
ihl-mus LC50:14400 ppm/7H	NIHBAZ 191,1,49
ipr-mus LD50:1500 mg/kg	TXAPA9 9,139,66
scu-mus LD50:6460 mg/kg	TXAPA9 4,354,62
orl-dog LDLo:3000 mg/kg	QJPPAL 7,205,34
ihl-dog LCLo:14108 ppm/7H	NIHBAZ 191,1,49
ipr-dog LDLo:950 mg/kg	TXAPA9 10,119,67
scu-dog LDLo:2700 mg/kg	QJPPAL 7,205,34
ivn-dog LDLo:200 mg/kg	QJPPAL 7,205,34
ihl-cat LCLo:43400 mg/m3/4.5H	AHBAAM 116,131,36
orl-rab LDLo:1900 mg/kg	HBTXAC 1,94,56
scu-rbt LDLo:2700 mg/kg	QJPPAL 7,205,34
ihl-gpg LCLo:5000 ppm/2H	FLCRAP 1,197,67

Aquatic Toxicity Rating: TLm96:1000-100 ppm WQCHM* 3,-,74. Carcinogenic Determination: Indefinite IARC** 20,449,79.

TLV: Air: 100 ppm DTLVS* 4,275,80. *Toxicology Review:* FAZMAE 18,365,74; 27ZTAP 3,94,69. OSHA Standard: Air: TWA 500 ppm; CL 1000; Pk 2000/5M/2H (SCP-J) FEREAC 39,23540,74. DOT-ORM-A, Label: None FEREAC 41,57018,76. Occupational Exposure to Methylene Chloride recm std: Air: TWA 75 ppm; Pk 500 ppm/15M NTIS**. Currently tested by NTP for Carcinogenesis by Standard Bioassay Protocol as of December 1980. "NIOSH Manual of Analytical Methods" Vol 1 127, Vol 3 S329. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.

THR: MUT data: A skn, eye irr. An exper ETA, ± CARC. A hmn CNS, BLD. HIGH orl, ivn; MOD ipr, orl, scu, ihl; LOW ihl, scu. See also chlorinated aliphatic hydrocarbons. Very dangerous to the eyes. Except for its property of inducing narcosis, it has very few other acute toxicity effects. Its narcotic powers are quite strong, and in view of its great volatility, care should be taken in its use. It will not form explosive mixtures with air at ordinary temp. However, it can be decomp by contact with hot surfaces and open flame, and it can then yield toxic fumes, which are irr and will thus give warning of their presence. It has been used as an anesthetic in Europe and is still used there for local anesthesia. Exper have shown that 25,000 ppm conc for 2 hr exposures were not lethal. Conc of 7,200 ppm after 8 min caused paresthesia of the extremities; after 16 min, acceleration of the pulse to 100; during the first 20 min, congestion in the head, a sense of heat and slight irr of the eyes. At a level of 2,300 ppm, there was no feeling of dizziness during 1-hr exposures, but nausea did occur after 30 min of exposure. The limit of perception by smell is set at 25-50 ppm conc. Can cause a dermatitis upon prolonged skin contact. A respirator for organic vapors and fumes should be worn to avoid excessive inhal. Used as a food additive permitted in food for human consumption.

Fire Hazard: Reacts violently with Li, NaK, potassium-*tert*-butoxide, (KOH + *n*-methyl-*n*-nitrosourea).

Explosion Hazard: None under ordinary conditions, but will form explosive mixtures in atmosphere having high oxygen content, in liquid O_2, N_2O_4, K, Na, NaK.

Disaster Hazard: Dangerous; when heated to decomp, emits highly tox fumes of phosgene.

1,1,1-TRICHLOROETHANE

CAS RN: 71556 NIOSH #: KJ 2975000
mf: $C_2H_3Cl_3$; mw: 133.40

Colorless liquid. bp: 74.1°, fp: −32.5°, flash p: none, d: 1.3376 @ 20°/4°, vap. press: 100 mm @ 20.0°. Insol in water; sol in acetone, benzene, carbon tetrachloride, methanol, ether.

SYNS:

CHLOROETHENE
CHLOROTHANE NU
CHLOROTHENE
METHYL CHLOROFORM
METHYLTRICHLOROMETHANE
NCI-c04626
1,1,1-TRICHLOORETHAAN (DUTCH)
1,1,1-TRICHLORAETHAN (GERMAN)
TRICHLORO-1,1,1-ETHANE (FRENCH)
ALPHA-TRICHLOROETHANE
1,1,1-TRICLOROETANO (ITALIAN)

TOXICITY DATA: 2-1	CODEN:
ihl-rat TCLo:2100 ppm/24H (14D pre/1-20D preg)	TOXID9 1,28,80
eye-man 450 ppm/8H	BJIMAG 28,286,71
skn-rbt 5 gm/12D-I MLD	AIHAAP 19,353,58
skn-rbt 500 mg/24H MOD	28ZPAK -,28,72
eye-rbt 100 mg MLD	AIHAAP 19,353,58
eye-rbt 2 mg/24H SEV	28ZPAK -,28,72
ihl-man LCLo:27 gm/m3/10M	JOCMA7 8,358,66
ihl-man TCLo:350 ppm:PSY	WEHSAL 10,82,73
orl-hmn TDLo:670 mg/kg:GIT	NTIS** PB257-185
ihl-hmn TCLo:920 ppm/70M:CNS	AIHAAP 19,353,58
orl-rat LD50:10300 mg/kg	NTIS** PB257-185
ihl-rat LCLo:1000 ppm	FMCHA2 -,D317,80
ipr-rat LD50:5100 mg/kg	NTIS** PB257-185
orl-mus LD50:11240 mg/kg	NTIS** PB257-185
ihl-mus LCLo:11000 ppm/2H	HBTXAC 5,72,59
ipr-mus LD50:4700 mg/kg	TXAPA9 13,287,68
orl-dog LD50:750 mg/kg	FMCHA2 -,D317,80
ipr-dog LD50:3100 mg/kg	TXAPA9 10,119,67
ivn-dog LDLo:95 mg/kg	HBTXAC 5,72,59
orl-rbt LD50:5660 mg/kg	AIHAAP 19,353,58
scu-rbt LDLo:500 mg/kg	HBTXAC 5,72,59
orl-gpg LD50:9470 mg/kg	AIHAAP 19,353,58

Aquatic Toxicity Rating: TLm96:100-10 ppm WQCHM* 3,-,74. Carcinogenic Determination: Indefinite IARC** 20,515,79.

TLV: Air: 350 ppm DTLVS* 4,269,80. *Toxicology Review:* FAZMAE 18,365,74; EATR** EB-TR-75047; AIHAAP 40,A46,79. OSHA Standard: Air: TWA 350 ppm (SCP-J) FEREAC 39,23540,74. DOT: ORM-A, Label: None FEREAC 41,57018,76. Occupational Exposure to 1,1,1-Trichloroethane recm std: Air: CL 350 ppm/15M NTIS**. NCI Carcinogenesis Bioassay Completed; Results Negative (NCITR* NCI-CG-TR-3,77). Currently Tested by NTP for Carcinogenesis by Standard Bioassay Protocol as of December 1980. "NIOSH Manual of Analytical Methods" VOL 1 127, VOL 3 S328. NIOSH Current Intelligence Bulletin 27, 1978. Reported in EPA TSCA Inventory, 1980. EPA TSCA 8(a) Preliminary Assessment Information Proposed Rule FERREAC 45,13646,80.

THR: In hmn it causes PSY, GIT, CNS effects. A MOD skn irr, a SEV eye irr in rbts. LOW orl, ipr, ihl in rat, mus. MOD orl, ipr dog; Narcotic in high conc. Causes a proarrhythmic activity which sensitizes the heart to epinephrine-induced arrhythmias. This sometimes will cause a cardiac arrest particularly when this material is massively inhaled as in drug abuse for euphoria. Reacts violently with N_2O_4, O_2, O_2 liquid, Na, NaOH, Na-K alloy.

Disaster Hazard: Dangerous; see chlorides.

For further information see Vol. 2, No. 1 of *DPIM Report.*

Appendix D

Site Inspection Form

OMB Approval Number: 2050-0095
Approved for Use Through: 1/92

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: NC	CERCLIS Number: NCD981928088
	CERCLIS Discovery Date: 03/10/87	

1. General Site Information

Name:		Street Address:			
Texfi New Bern		Bosch St. (SR 1317)			
City: New Bern	State: NC	Zip Code: 27864	County: Craven	Co. Code: 25	Cong. Dist: 01
Latitude: 35° 8' 16.0" Longitude: 77° 6' 36.0"	Approx. Area of Site: 174 acres		Status of Site: Active		

2. Owner/Operator Information

Owner:			Operator:		
Amital Spinning Corporation			Texfi Ind., Inc. (former operator)		
Street Address: Bosch Street			Street Address: P.O. Box 5407		
City: New Bern			City: New Bern		
State: NC	Zip Code: 27864	Telephone: (919)636-3435	State: NC	Zip Code: 27864	Telephone: (919)636-3435
Type of Ownership: Private			How Initially Identified: State/Local Program		

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: NC	CERCLIS Number: NCD981928088
	CERCLIS Discovery Date: 03/10/87	

3. Site Evaluator Information

Name of Evaluator:	Agency/Organization:	Date Prepared:
Jack Butler	NC Superfund Sect.	Dec. 1991

Street Address:	City:	State:
401 Oberlin Rd.	Raleigh	NC

Name of EPA or State Agency Contact:	Telephone:
Jack Butler (State)	(919)733-2801

Street Address:	City:	State:
P.O. Box 27687	Raleigh	NC

4. Site Disposition (for EPA use only)

Emergency Response/Removal Assessment Recommendation: No	CERCLIS Recommendation: Higher Priority SI	Signature: Jack Butler
Date: NA	Date: Dec. 1991	Name: Jack Butler Position: Environmental Engineer

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: NC	CERCLIS Number: NCD981928088
	CERCLIS Discovery Date: 03/10/87	

5. General Site Characteristics

Predominant Land Uses Within 1 Mile of Site:	Site Setting:	Years of Operation:
Industrial Residential Forest/Fields Agricultural	Rural	Beginning Year: 1972 Ending Year: 1991

Type of Site Operations:	
Manufacturing Other Manufacturing	Waste Generated: Onsite
	Waste Deposition Authorized By: Former Owner
	Waste Accessible to the Public: No
	Distance to Nearest Dwelling, School, or Workplace: 0 Feet

6. Waste Characteristics Information

Source Type	Quantity	Tier	General Types of Waste:
Contaminated soil	1.12e+02 lbs	C	Organics Solvents
			Physical State of Waste as Deposited: Liquid

Tier Legend
C = Constituent W = Wastestream
V = Volume A = Area

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: NC	CERCLIS Number: NCD981928088
	CERCLIS Discovery Date: 03/10/87	

7. Ground Water Pathway

Is Ground Water Used for Drinking Water Within 4 Miles:
Yes

Type of Ground Water Wells Within 4 Miles:
Private

Depth to Shallowest Aquifer:
8 Feet

Karst Terrain/Aquifer Present:
No

Is There a Suspected Release to Ground Water:
Yes

Have Primary Target Drinking Water Wells Been Identified: No

Nearest Designated Wellhead Protection Area:
None within 4 Miles

List Secondary Target Population Served by Ground Water Withdrawn From:

0 - 1/4 Mile	0
>1/4 - 1/2 Mile	5
>1/2 - 1 Mile	5
>1 - 2 Miles	63
>2 - 3 Miles	182
>3 - 4 Miles	502
Total	757

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: NC	CERCLIS Number: NCD981928088
	CERCLIS Discovery Date: 03/10/87	

8. Surface Water Pathway — Part 1 of 4

Type of Surface Water Draining Site and 15 Miles Downstream: Stream River	Shortest Overland Distance From Any Source to Surface Water: 7920 Feet 1.5 Miles
Is there a Suspected Release to Surface Water: No	Site is Located in: Annual - 10 yr floodplain

8. Surface Water Pathway — Part 2 of 4

Drinking Water Intakes Along the Surface Water Migration Path: Yes

Have Primary Target Drinking Water Intakes Been Identified: No

Secondary Target Drinking Water Intakes:

Name	Water Body/Flow(cfs)	Population Served
None	minimal stream/ <10	0
	Total Within 15 Miles:	0

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: NC	CERCLIS Number: NCD981928088
	CERCLIS Discovery Date: 03/10/87	

8. Surface Water Pathway — Part 3 of 4

Fisheries Located Along the Surface Water Migration Path: Yes

Have Primary Target Fisheries Been Identified: No

Secondary Target Fisheries:

Fishery Name	Water Body Type/Flow(cfs)
Neuse River	large river/ >10000

8. Surface Water Pathway — Part 4 of 4

Wetlands Located Along the Surface Water Migration Path? (y/n) Yes

Have Primary Target Wetlands Been Identified? (y/n) No

Secondary Target Wetlands:
None

Other Sensitive Environments Along the Surface Water Migration Path: Yes

Have Primary Target Sensitive Environments Been Identified: No

Secondary Target Sensitive Environments:

Water Body/Flow(cfs)	Sensitive Environment Type
large river/ >10000	Habitat used by Fed. des.species

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: NC	CERCLIS Number: NCD981928088
	CERCLIS Discovery Date: 03/10/87	

9. Soil Exposure Pathway

Are People Occupying Residences or Attending School or Daycare on or Within 200 Feet of Areas of Known or Suspected Contamination: No	Number of Workers Onsite: 101 - 1000

Have Terrestrial Sensitive Environments Been Identified on or Within 200 Feet of Areas of Known or Suspected Contamination: No

10. Air Pathway

Total Population on or Within:	
Onsite	225
0 - 1/4 Mile	0
>1/4 - 1/2 Mile	55
>1/2 - 1 Mile	484
>1 - 2 Miles	1031
>2 - 3 Miles	5370
>3 - 4 Miles	5826
Total	12991

Is There a Suspected Release to Air: No

Wetlands Located Within 4 Miles of the Site: Yes

Other Sensitive Environments Located Within 4 Miles of the Site: No

Sensitive Environments Within 1/2 Mile of the Site:

Distance	Sensitive Environment Type/Wetlands Area(acres)
>1/4 - 1/2	Wetlands (< 1 acre)

Appendix E

Site Safety Plan

SITE HEALTH AND SAFETY PLAN

A. General Information

Site Name Texfi New Bern ID # NCD 981 928 088

Location SR 1317 (Bosch Street), New Bern, Craven County, NC 28561-5407 Date November 26, 1990

Proposed Date of Investigation December 4, 1990

Date of Briefing December 3, 1990

Date of Debriefing December 5, 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	Jack Butler	team leader, sampling	Jack Butler
Team 1	Jerry Curry	sampling	Jerry Curry

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 ___ Solid ___ Sludge ___ Gas

Characteristics ___ Corrosive X Ignitable ___ Radioactive

X Volatile X Toxic ___ Reactive ___ Other

List Known or Suspected Hazards (physical, chemical biological or radioactive) on Site and their toxicological effects. Also, if known, list chemical amounts

HAZARD	WARNING PROPERTIES	TLV
Trichloroethylene	Odor Threshold = 0.2 - 400 ppm	50 ppm
Vinyl Chloride	OT = 260 ppm PEL=	1 ppm
Chloroethane	OT = 4.2 ppm	1,000 ppm
Methylene Chloride	OT=25-30ppm (can adapt to odor)	50 ppm
1,1-Dichloroethylene	OT = no data PEL=	1 ppm

HAZARD	WARNING PROPERTIES AND EFFECTS		TLV
1,1-Dichloroethane	OT = 120 ppm	PEL=	100 ppm
Chloroform	OT = 50 - 307 ppm	PEL=	2 ppm
1,2-Dichloroethane	OT = 100 ppm	PEL=	1 ppm
Tetrachloroethylene	OT = 4.68 - 50 ppm	PEL=	25 ppm
Toluene	OT = 0.17 - 40 ppm		100 ppm

ID # NCD 981 928 088

Facility Description: Size unknown Buildings yes

Disposal Methods Being Investigated Spills and/or discharges.

Unusual Features on Site (dike integrity, power lines, terrain, etc.):

none known

History of the Site: The site is currently a textile dyeing operation that has been leased by Texfi Ind., Inc. to Amital Spinning Corp. Texfi operated this facility as a polyester manufacturing operation from 1972 to 1980 when the facility was closed. Texfi opened this facility on previously unused land. Amital reopened this facility in 1987 and currently operates it. Texfi has maintained responsibility for the site. Groundwater contamination was discovered at the site in 1986.

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 background in the breathing zone, fill in that hole and evacuate that area. Tyvek suits (saranex in wet conditions) will be used while auguring. Steel toed hiking boots may be worn while conducting tour or sampling on gravel, asphalt, or vegetated soil, steel toed work boots will be worn while conducting tour or sampling barren soil or auguring.

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 981 928 088

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 groundwater and surface 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 981 928 088

Location of Nearest Phone: on-site: this is an operational facility

Hospital (Address and Phone Number)

Craven Regional Medical Center, 2000 Neuse Blvd., New Bern, NC 28561

(919) 633-8111 - Can handle chemically contaminated patients

Emergency Transportation Systems (Phone Numbers)

Fire 911

Ambulance 911

Rescue Squad 911

Emergency Route to Hospital Take the access road back to Route 55/70 and take a right and go into New Bern. Stay on this road, the hospital will be on the left about a mile after the intersection with Route 70/17.

PREVAILING WEATHER CONDITIONS AND FORECAST Rain in the morning, clearing in the afternoon with tempratures dropping into the 50s.

EQUIPMENT CHECKLIST

	Air purifying respirator	X	First Aid Kit
	Cartridges for respirator	X	3 gal. Deionized 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.077

TO BE COMPLETED BY PROJECT MANAGER

PROJECT MANAGER: Jack Butler PROJECT: Texfi New Bern

INVESTIGATION DATE: December 4, 1990

Materials Used (Please insert a number in the blank)

____	Air Purifying respirator cartridges	1	Gloves (nitrile)
____	Detector tubes	____	Gloves (cloth)
____	Eye Wash Units	____	Boot covers
____	First Aid Kit	1	Coveralls (tyvek)
____	Gloves (polyethylene)	____	Coveralls (saranex)
12	Gloves(PVC)	____	Auger Brushes

Respirator Worn By

Approximate Time in Respirator

Air Monitoring Data (Include Calibration Reading)

HNU:

OVA:

Explosimter:

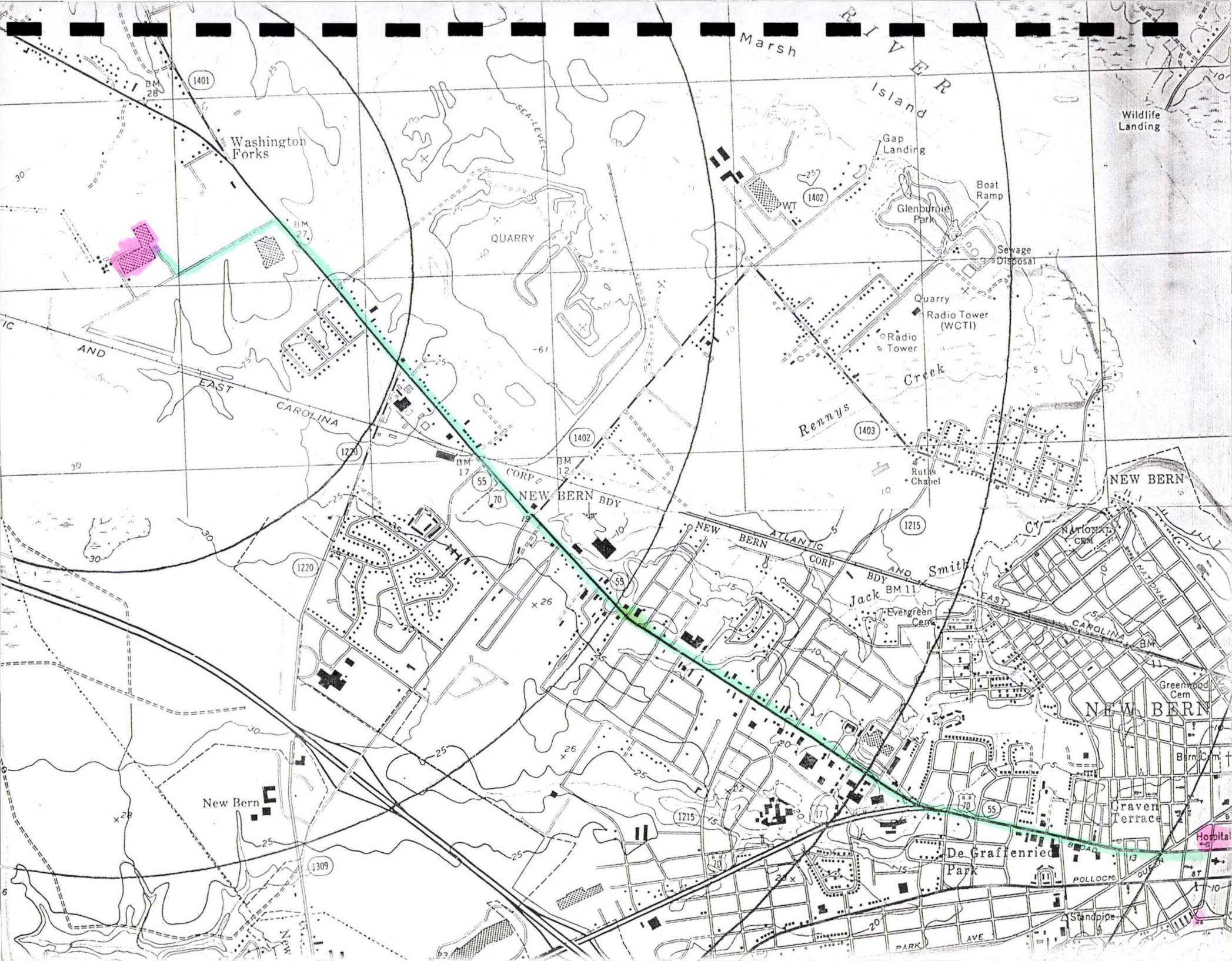
Radiation Meter:

If the maximum personal protective equipment as outlined in the Hazard Evaluation Section was not used, please justify:

Visitors Present	Organization Represented
James Lynch	Amitak Spenning

Jack Butler
Signature

DL/ds/Revised 11-88


Marsh
RIVER
Island
Wildlife Landing
Gap Landing
Boat Ramp
Glenburnie Park
Sewage Disposal
Quarry
Radio Tower (WCTI)
Radio Tower
Washington Forks
QUARRY
SEA-LEVEL
AND EAST CAROLINA
Rennys Creek
Ruths Chapel
NEW BERN
NEW BERN CORP BDY
ATLANTIC CORP BDY
Smith Jack
Evergreen Cem
NATIONAL CEM
Greenwood Cem
Bern Cem
Craven Terrace
Hospital
De Graffenried Park
POLLOCK
QUEEN
BROAD
Standpipe
PARK AVE
New Bern
1401
1402
1403
1220
1215
1309
55
70
58

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Trichloroethylene

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula C_2HCl_3	1
Natural Physical State at 25°C liquid	1
Vapor Pressure 58 mm Hg at 20°C	2
Melting Point -123 °F/°C Boiling Point 188 °F/°C	2
Flash Point (open or closed cup) 32 °C/°F	3
Solubility - H_2O 0.1%	2
Other Ether, alcohol, chloroform	1

Physical Features: (odor, color, etc.) Colorless liquid (unless dyed) with a sweet odor like chloroform 1P = 9.47 eV (2) OVA Relative Response = 70%

II. TOXICOLOGICAL DATA

Standards: 50 ppm (4) TLV 50 ppm (5) PEL potential human carcinogen(2) IDLH

Routes of Exposure: Inhalation, ingestion, skin and/or eye contact (2)

Acute/Chronic Symptoms: Acute: Headache, vertigo, visual disturbance, tremors, drowsiness, nausea, vomiting, eye irritation, dermititis, irregular heartbeat, skin irritation; chronic: carcinogenic (2)

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: Trichloreothylene

III. HAZARDOUS CHARACTERISTICS | Reference

A. Combustibility Yes X No ____ | 2

Toxic by-products _____ | _____

_____ | _____

B. Flammability LEL 12.5% UEL 90% | 3

C. Reactivity Hazard Incompatible with strong caustics: when acidic reacts with aluminum, chemically active metals, barium, lithium, sodium, magnesium, titanium. | 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, 11th Edition, 1989

(2) Pocket Guide to Chemical Hazards, NIOSH, 1987

(3) Chemical and Engineering News, December 12, 1988.

(4) Threshold Limit Values and Biological Exposure Indices for 1990-1991, ACGIH

(5) 29 CFR 1910.1000

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Vinyl Chloride

I. PHYSICAL/CHEMICAL PROPERTIES

	Refere
Chemical Formula $C_2 H_3 Cl$	1
Natural Physical State at 25°C gas	1,2
Vapor Pressure 2,580 mm Hg at 20°C	2
Melting Point -245 °F/°C Boiling Point 7 °F/°C	2
Flash Point (open or closed cup) -78 °C/°F	1,2
Solubility - H_2O "slight"	1,2
Other Soluble in alcohol, ether, carbon tetrachloride, and benzene.	1

Physical Features: (odor, color, etc.) Colorless gas; liquifies in a freezing mixture (1,2) IP = 9.995 eV HNU sensitivity with a 10.2 eV probe = 5

II. TOXICOLOGICAL DATA

Standards: 5 ppm (3) TLV 1 ppm (4) PEL confermed human carcinogen (2) IDLH

Routes of Exposure: Inhalation

Acute/Chronic Symptoms: Weakness, abdominal pain, GI bleeding, confermed carcinogen, blood problems, discoloration of the extremities. (2)

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: Vinyl Chloride

III. HAZARDOUS CHARACTERISTICS — Ref

A. Combustibility Yes X No ____ — 2

Toxic by-products Forms hydrogen chloride, phosgene, and carbon monoxide — 5

B. Flammability LEL 3.6% UEL 33% — 2

C. Reactivity Hazard no reaction with common materials — 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, 11th Edition, 1989.
2. NIOSH Pocket Guide to Chemical Hazards, 1987
3. Threshold Limit Values and Biological Exposure Indices for 1990-1991, ACGIH
4. CFR 1910.1017.
5. Chemical Hazard Response Information System, US Coast Guard, 1985.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Ethyl Chloride (Chloroethane)

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula C_2H_5Cl	1
Natural Physical State at 25°C liquid or gas	2
Vapor Pressure 1064 mm Hg at 20°C	2
Melting Point -218 °F/°C Boiling Point 54 °F/°C	2
Flash Point (open or closed cup) -58 °C/°F	2
Solubility - H_2O 0.6%	2
Other miscible with ether (1)	

Physical Features: (odor, color, etc.) colorless liquid or gas with a pungent, ether-like odor (2)

II. TOXICOLOGICAL DATA

Standards: 1,000ppm (3) TLV 1,000ppm (4) PEL 20,000ppm (2) IDLH

Routes of Exposure: Inhalation, Ingestion, Eye contact, Skin absorbtion

Acute/Chronic Symptoms: Stomach cramps, irregular heartbeat, cardiac arrest, liver and kidney damage, incoordination, inebriation

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: Ethyl chloride

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products _____

B. Flammability LEL 3.8% UEL 15.4% — 2

C. Reactivity Hazard incompatible with chemically active metals, sodium, potassium, calcium, and powered Al — 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, 11th Edition, 1989
2. NIOSH Pocket Guide to Chemical Hazards, 1987
3. Threshold Limit Values and Biological Exposure Indices for 1990-1991, ACGIH
4. 29 CFR 1910.1000

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Methylene Chloride

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula CH_2Cl_2	1
Natural Physical State at 25°C liquid	2
Vapor Pressure 350 mm Hg at 20°C	2
Melting Point -141 °F/°C Boiling Point 104 °F/°C	2
Flash Point (open or closed cup) ? °C/°F	2
Solubility - H_2O soluble in 50 parts water	1
Other misible with alcohols, ether, DMF	1

Physical Features: (odor, color, etc.) Colorless liquid with a chloroform-like odor (2) IP = 11.35 eV. Relative response on HNU = 9.4. OVA Relative Response = 100%

II. TOXICOLOGICAL DATA

suspect human carcinogen

Standards: 50 ppm(3) TLV 500 ppm(4) PEL _____ IDLH 3

Routes of Exposure: Inhalation, ingestion, eye contact, skin contact

Acute/Chronic Symptoms: Fatigue, weakness, sleepiness, light headedness, numb and tingling limbs, nausea, eye and skin irritation, vertigo, choking (2)

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: Methylene Chloride

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products ____

B. Flammability LEL 12% UEL 19% — 2

C. Reactivity Hazard incompatible with strong oxidizers and caustics, chemically active metals such as Al or Mg powders, sodium, potassium. — 2

D. Corrosivity Hazard yes/no pH: ____

Neutralizing agent: ____

E. Radioactive Hazard — Exposure Rate

Background	yes/no		
Alpha particles	yes/no		
Beta particles	yes/no		
Gamma radiation	yes/no		

IV. REFERENCES

(1) The Merck Index, 11th Edition, 1989

(2) Pocket Guide to Chemical Hazards, NIOSH, 1987

(3) Threshold Limit Values and Biological Exposure Indices for 1990-91, ACGIH

(4) 29 CFR 1910 1000

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: 1,1-Dichloroethene

I. PHYSICAL/CHEMICAL PROPERTIES

	Refere
Chemical Formula $C_2H_2Cl_2$	1
Natural Physical State at 25°C liquid	2
Vapor Pressure not pertinent mm Hg at 20°C	3
Melting Point -122.5 °F/°C Boiling Point 31.7 °F/°C	1
Flash Point (open or closed cup) 0 °C/°F	3
Solubility - H_2O 0.5% at 68.02 °F	3
Other organic solvents	1

Physical Features: (odor, color, etc.) Watery colorless liquid with sweet odor. (3)

II. TOXICOLOGICAL DATA

Standards: 5 ppm (4) TLV 1 ppm (5) PEL no data (3) IDLH

Routes of Exposure: Inhalation, Ingestion, Skin and/or eye contact

Acute/Chronic Symptoms: Vapor can cause dizziness and drunkenness; high levels cause anesthesia. Liquid irritates eyes and skin. (3)

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: 1,1-Dichloroethene

III. HAZARDOUS CHARACTERISTICS — Ref

A. Combustibility Yes X No ____ — 3

Toxic by-products Hydrogen chloride and phosgene are generated — 3

B. Flammability LEL 7.3% UEL 16.0% — 3

C. Reactivity Hazard react with copper and aluminum — 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, 11th Edition, 1989.
2. The Condensed Chemical Dictionary, Hawley, 11th, Edition, 1987.
3. Chemical Hazard Response Information System, US Coast Guard, 1985.
4. Threshold Limit Values and Biological Exposure Indices for 1990-1991, ACGIH.
5. CFR 1910.1000

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: 1,1 - dichloroethane

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula $C_2H_4Cl_2$	1
Natural Physical State at 25°C liquid	1
Vapor Pressure _____ mm Hg at 20°C	
Melting Point -98 °F/°C Boiling Point 57.3 °F/°C	1
Flash Point (open or closed cup) 57 °C/°F	2
Solubility - H_2O in about 200 parts water	1
Other miscible with alcohol	1

Physical Features: (odor, color, etc.) oily liquid, odor and taste as of chloroform (1) OVA Relative Response = 80%

II. TOXICOLOGICAL DATA

Standards: 200 ppm (3) TLV 100 ppm (4) PEL 4,000 ppm IDLH 2

Routes of Exposure: Inhalation, Eye Contact, Skin Contact, Ingestion

Acute/Chronic Symptoms: Salivation, sneezing, coughing, dizziness, nausea, vomiting, eye irritation, skin irritation, circulatory failure (2).

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: 1,1 - dichloroethane

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 2

Toxic by-products emits highly toxic fumes including phosgene — 2

B. Flammability LEL 5.6% UEL 11.4% — 2

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 Merck Index, 11th Edition, 1989.

(2) Chemical Hazard Response Information System, US Department of Transportation, 1987.

(3) Threshold Limit Values and Biological Exposure Indices, ACGIH, 1990-1991.

(4) 29 CFR 1910.1000.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Chloroform

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula $CHCl_3$	1
Natural Physical State at 25°C liquid	2
Vapor Pressure 160 mm Hg at 20°C	2
Melting Point -82 °F/°C Boiling Point 142 °F/°C	2
Flash Point (open or closed cup) -- °C/°F	2
Solubility - H_2O 1 ml dissolves in 200 ml H_2O at 25° C	1
Other miscible with alcohol, benzene, ether, petroleum ether, carbon tetrachloride, carbon disulfide, oils	1

Physical Features: (odor, color, etc.) colorless liquid with a pleasant, sweet odor IP = 11.42 eV (2) HNU sensitivity with 11.7 eV probe=6.0 OVA Relative Response=65%

II. TOXICOLOGICAL DATA

Standards: 10 ppm(3) TLV 2 ppm(4) PEL suspect human carcinogen IDLH 3

Routes of Exposure: Eye contact, skin contact, ingestion, inhalation (2)

Acute/Chronic Symptoms: Dizziness, mental dullness, nausea, headache, fatigue, anesthesia, eye and skin irritation, enlargement of the liver (2)

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: Chloroform

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes ___ No X ___ — 2

Toxic by-products _____

B. Flammability LEL _____ UEL _____

C. Reactivity Hazard incompatible with strong caustics, chemically active metals such as Al, Mg powder, Na, K — 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, 11th Edition, 1989

(2) The Pocket Guide to Chemical Hazards, NIOSH, 1987

(3) Threshold Limit Values and Biological Indices for 1990-91, ACGIH

(4) 29 CFR 1910.1000

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: 1,2-dichloroethane

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula $C_2H_4Cl_2$	1
Natural Physical State at 25°C liquid	2
Vapor Pressure 62 mm Hg at 20°C	2
Melting Point -32 °F/°C Boiling Point 183 °F/°C	2
Flash Point (open or closed cup) 55 °C/°F	2
Solubility - H_2O 0.8%	2
Other alcohol, chlorform, ether	1

Physical Features: (odor, color, etc.) clear liquid with a sweet odor like chlorofrom(2) 1P=11.12 eV, HNU sensitivity=12.9 with 11.7 eV probe.

II. TOXICOLOGICAL DATA REL = 1 ppm for 10 hour TWA (2)

Standards: 10 ppm(3) TLV 1 ppm(4) PEL suspect carcinogen IDLH 2

Routes of Exposure: Inhalation, Ingestion, Skin absorption, eye contact

Acute/Chronic Symptoms: Central nervous system depression, nausea, vomiting, dermititis, eye irritation, corneal opacity, suspect carcinogen(2).

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: 1,2-dichloroethane

III. HAZARDOUS CHARACTERISTICS | Reference

A. Combustibility Yes X No ____ | 1

Toxic by-products _____ | _____

_____ | _____

B. Flammability LEL 6.2% UEL 16% | 2

C. Reactivity Hazard strong oxidizers and caustics, chemically active metals such as aluminum or magnesium powder, sodium, potassium. | 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, 11th Edition, 1989.
2. NIOSH Pocket Guide to Chemical Hazards, 1987.
3. Threshold Limit Values and Biological Exposure Indices for 1990-1991.
4. 29 CFR 1910.1000.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Perchloroethylene

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula C_2Cl_4	1
Natural Physical State at 25°C liquid	2
Vapor Pressure 14 mm Hg at 20°C	2
Melting Point -8 °F/°C Boiling Point 250 °F/°C	2
Flash Point (open or closed cup) N/A °C/°F	2
Solubility - H_2O 0.015%	2
Other misc with alcohol, ether, chloroform, benzene	1

Physical Features: (odor, color, etc.) colorless liquid with an odor like ether or chloroform IP=9.32 eV (2) OVA Relative Response = 70%

II. TOXICOLOGICAL DATA

Standards: 50 ppm(3) TLV 25 ppm (4) PEL suspect human carcinogen IDLH 2

Routes of Exposure: Inhalation, Ingestion, Skin and/or Eye Contact (2)

Acute/Chronic Symptoms: Irritation of eyes, nose, and throat, nausea, flushed face and neck, vertigo, dizziness, incoordination, headache, carcinogen (2)

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: Perchloroethylene

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes ___ No X — 2

Toxic by-products _____

B. Flammability LEL none UEL none — 2

C. Reactivity Hazard Incompatible with strong oxidizers, chemically active metals, such as barium, lithium, and beryllium — 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, 11th Edition, 1989
2. NIOSH Pocket Guide to Chemical Hazards, 1987
3. Threshold Limit Values and Biological Exposure Indices for 1990-91, ACGIH.
4. CFR 1910.1000.

HAZARDOUS SUBSTANCE INFORMATION FORM

Chemical Name: Toluene (Methyl benzene, toluol)

I. PHYSICAL/CHEMICAL PROPERTIES

	Reference
Chemical Formula C7H8	1,2,3,4
Natural Physical State at 25°C liquid	1,2,3,4
Vapor Pressure 2 mm Hg at 20°C	4
Melting Point -95 °F/°C Boiling Point 110.6 °F/°C	1,3,4
Flash Point (open or closed cup) 40 °C/°F	1,2,3,4
Solubility - H_2O slightly soluble	1,3,4
Other miscible with alcohol, chloroform, ether, acetone, glacial acetic acid, carbon disulfide	1,3,4

Physical Features: (odor, color, etc.) colorless liquid with an aromatic odor, IP 8.82 eV, derived from coal tar oil or petroleum Relative response on HNU = 10

II. TOXICOLOGICAL DATA

Standards: 100 ppm (5) TLV 100 ppm (6) PEL 2000 ppm IDLH 4

Routes of Exposure: inhalation; ingestion, skin contact, eye contact

Acute/Chronic Symptoms: Narcotic in high concentrations, headache, lassitude, and nausea. Chronic: anemia and dermatitis.

First Aid: Inhalation: artificial respiration; Ingestion: get medical attention immediately; Eye contact: irrigate immediately; Skin contact: soap and water wash immediately

Chemical Name: Toluene

III. HAZARDOUS CHARACTERISTICS — Reference

A. Combustibility Yes X No ____ — 4

Toxic by-products _____

B. Flammability LEL 1.0% UEL 7.0% — 4

C. Reactivity Hazard strong oxidizers — 3

D. Corrosivity Hazard yes/no pH: _____

Neutralizing agent: _____

E. Radioactive Hazard — Exposure Rate

Background	yes/no		
Alpha particles	yes/no		
Beta particles	yes/no		
Gamma radiation	yes/no		

IV. REFERENCES

(1) The Merck Index, 11th Edition, 1989

(2) Documentation of the TLV, 4th Edition, 1980

(3) NIOSH Pocket Guide for Chemical Hazards, 1987

(4) NEPA, Protection Guide on Hazardous Materials, 8th Edition, 1984

(5) Threshold Limit Values and Biological Exposure Indices for 1990-1991.

(6) 1910.1000, 1989.