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PHASE II GROUNDWATER QUALITY ASSESSMENT
WILMINGTON, NORTH CAROLINA FACILITY

Southern Wood Piedmont Company
Spartanburg, South Carolina

NORTH CAROLINA
LICENSED
SOIL
SCIENTIST
GREGORY B. KUNTZ

ETE JOB NO. 530-06-503

FEBRUARY 26, 1993

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PHASE II GROUND WATER QUALITY ASSESSMENT
SOUTHERN WOOD PIEDMONT
WILMINGTON, NORTH CAROLINA FACILITY

1.0 BACKGROUND

The Southern Wood Piedmont (SWP) Wilmington, North Carolina facility is located within the city limits in an industrialized area adjacent to the eastern bank of the Cape Fear River (Figure 1). Access to the site may be achieved by traveling north on Highway 17 to Wilmington. Once in Wilmington, Front Street should be taken to the south until Greenfield Street is encountered. Greenfield Street deadends to the west onto the SWP facility.

The SWP facility is bounded to the north by Hess Fuel Tank Farms and to the south by Greenfield Creek. Immediately adjacent to Greenfield Creek, on the opposite bank, is the Pactank, Inc. Tank Farm. Residential areas are located to the east of the facility and the Cape Fear River is located to the west.

The facility is situated on approximately 50.92 acres. The southern 6.7 acres of the site is leased to SWP by the North Carolina Ports Authority and the northern 44.22 acres of the site by the City of Wilmington. Roughly 9.07 acres of the property is covered with water.

1.1 Site History

Wood preserving operations were conducted at the site between 1932 and 1983 by SWP and its predecessors. In 1932 the North State Company leased the property previously operated by Liberty Shipyards. Taylor Colquitt Company acquired the property in 1935 to treat pilings and poles with creosote. In 1964, Taylor Colquitt Company changed names to Taylor Piedmont. International Telephone & Telegraph (ITT) purchased Taylor Piedmont in 1969. Early in 1971, ITT changed the company name to Southern Wood Piedmont. Southern Wood Piedmont operated the wood preserving facility until 1983. At this time wood treating operations ceased and closure operations commenced at the facility.

The wood preservatives used during plant operations included creosote coal tar, pentachlorophenol (PCP), and copper, chromate, and arsenate (CCA). Creosote was used throughout wood preserving operations, whereas, CCA treatment was added by SWP in the early 1970's followed by pentachlorophenol in the late 1970's.

2.0 PREVIOUS SITE ACTIVITIES

2.1 Landfarm Operation

In voluntary cooperation with the North Carolina Department of Human Resources, Solid and Hazardous Waste Management Branch, SWP operated a landfarm to treat soil containing wood preserving constituents. Following the removal of the existing railroad spurs and plant buildings

at the facility, a 5-acre area was bermed for landfarm operations. The landfarm is located on a previous treated pole storage area where low levels of wood preservative residuals are present in the soil.

Soil stained with wood preserving constituents excavated from a covered sludge ditch, track areas, and the wood treating areas were landfarmed between 1984 and 1991. Landfarm treatment included the placement of influenced soil in 2-inch lifts on the landfarm. Each lift was treated by adding irrigation water, 10-10-10 fertilizer, and chicken and turkey manure to promote microbial growth and wood preserving constituent degradation.

2.2 Landfarm Ground Water Monitoring

In September, 1985, Law Environmental Services (LES) installed four ground water monitoring wells around the limits of the landfarm and designated these monitoring wells as MW-6 through MW-9. The soil boring logs from the LES report indicated that the site is underlain primarily by fine to medium sands with a peat located beneath the sand. Each well was installed to an approximate depth of 20 feet below land surface such that the upper portion of the screen bracketed the contact between the fine to medium upper sands and the underlying peat unit.

In order to evaluate the direction of ground water flow within the uppermost aquifer LES collected water table elevations from 8 of the existing monitoring wells and the Cape Fear River at the facility. Based on this data, interpreted by LES, ground water flow around the limits of the landfarm appeared to be northwest, west, and southwest toward the Cape Fear River.

Hydraulic conductivity testing was also conducted by LES on monitoring wells MW-6 through MW-9. Horizontal hydraulic conductivity values ranged from 3×10^{-5} cm/sec to 1×10^{-6} cm/sec, which is typical of silty sediments (the peat at the facility is comparable in hydraulic conductivity to silty sediments). Also, the average ground water flow velocity was evaluated to be 0.10 feet per year for the screened well interval.

Additional information on the ground water monitoring in the landfarm area can be found in the Law Environmental Services report entitled: MONITORING WELL INSTALLATIONS AND HYDROGEOLOGIC REPORT dated November 27, 1985.

2.3 Wood Storage Area Soil Sampling

Between February 26 and March 1, 1991, Geraghty & Miller, Inc. completed 92 soil borings and collected 48 soil samples from treated and non-treated wood storage areas at the facility. Each of the soil borings were completed to a depth of 18-inches below land surface and visually assessed for the degree of staining and odor. Randomly selected soil boring locations were sampled for select semi-volatile organic constituents and the metals, arsenic, chromium, and

copper at depth intervals of 0- to 6-inches and 12- to 18-inches below land surface. A summary of the results of this investigation can be found in the letter report submitted to SWP on June 17, 1992 entitled: WILMINGTON, NORTH CAROLINA SOIL SAMPLING INVESTIGATION.

2.4 Phase I Ground Water Quality Assessment

During February 1992, ETE, Inc. initiated field activities directed at characterizing the site hydrogeology and evaluating potential ground water degradation associated with past wood preserving activities at the site. Activities completed during the Phase I ground water quality assessment included monitoring well installation, visual soil quality, lithologic interpretation, ground water flow/tidal influence evaluation, and ground water sampling.

2.4.1 Monitoring Well Installation

ETE, Inc. installed 13 ground water monitoring wells within the upper aquifer at the facility during the Phase I ground water quality assessment. Five of these monitoring wells (B2, B3, B4, B5, and B6) were installed as temporary monitoring wells to aid in the ground water flow and quality interpretation. The remaining 8 monitoring wells (MW-10 through MW-17) were installed into the upper aquifer beneath the site. Monitoring well MW-14 bracketed the contact between the upper sand and the underlying peat, whereas, the other monitoring wells were installed to bracket the water table. The temporary monitoring wells were installed such that the base of the screen rested on top of the peat.

2.4.2 Visual Soil Quality

During installation of the monitoring wells, a record was maintained of visually stained sediments. Soils encountered in boreholes B2, B3, B5, B6, and MW-10 appear to have no visual wood preserving or diesel fuel staining.

Soil samples from boreholes B4, MW-11, MW-12, MW-13, and MW-14 were noted to have visual wood preserving constituent staining. Borehole B4 had visual creosote staining near the surface of the borehole and again near the bottom of the borehole. Boreholes MW-11 and MW-12 were observed to have visual wood preserving constituent staining from approximately 3 feet below land surface to the upper sand and peat contact. Visual wood preserving constituent staining was present only at the surface of borehole MW-13. Visual wood preserving constituent staining was encountered almost immediately upon initiation of drilling activities at MW-14 and continued to be observed below the upper sand and peat contact to a point approximately 14 feet below land surface.

Visual diesel staining was noted in soils from MW-15, MW-16, and MW-17 located in the southwestern portion of the site. Soils from borehole MW-15 were stained with diesel fuel near the surface of the borehole, but no visual diesel staining was noted beyond 5 feet below land surface. Borehole MW-16 yielded soils that were stained with diesel fuel from the surface to approximately 5 feet below land surface. From this point, no visual diesel staining was observed, only a strong diesel odor. Monitoring well MW-17 encountered diesel stained soils from the surface to the bottom of the borehole.

2.4.3 Lithologic Interpretation

Soil borings completed during the Phase I monitoring well installation activities indicated that the site is generally underlain by a brown-tan, to brown, fine to medium sand from the land surface to approximately 10 to 15 feet below land surface. A dark brown to black peat with varying amounts of wood and root fragments is encountered beneath the sand. Based on a single boring (MW-14), the peat unit appears to be approximately 10 to 11.5 feet thick. Underlying the peat is a brown-tan, medium to coarse sand. The thickness of this underlying sand and the depth to the next confining unit was not evaluated during the Phase I ground water quality assessment.

2.4.4 Ground Water Flow Directions

In order to characterize the ground water flow directions under tidal influences at the site, a 12 hour ground water elevation evaluation was conducted on April 1, 1992 utilizing all existing monitoring wells and 2 staff gauges that were located in the Cape Fear River and a drainage ditch. Water level measurements were taken every 2 hours from each monitoring well and the staff gauges.

The results of the ground water flow evaluation indicated that the tidal cycle did affect the ground water elevations in the monitoring wells located at the site. At times when the tide exceeded the mean sea level (the time interval when the tide is approaching and receding high tide) during the tidal cycle, ground water "stagnation lines" occurred near the bank of the Cape Fear River and the drainage ditch. This zone of stagnation is the result of the water moving from the river and drainage ditch into the aquifer material (recharge) being opposed by the water being discharged from the aquifer material towards the Cape Fear River and the drainage ditch. When the tide level is below mean sea level during the tidal cycle, the ground water flows in a radial pattern from the center of the site and discharges into the Cape Fear River and the drainage ditches. The tidal cycle appears to only slightly influence water levels in the center of the site.

2.4.5 Ground Water Quality

Ground water quality at the facility was evaluated by collecting ground water samples from all of the existing monitoring wells that did not contain free product. The monitoring wells were sampled on March 13, 1992 and were analyzed for site specific semi-volatiles, volatiles, and the metals chromium, copper, arsenic, and lead.

The organic plume appeared to be partially defined in the northern, eastern, and western portions of the site. However, the southern edge of the plume was not defined. The total organic concentrations were highest in temporary monitoring well B4 with a value of 28.222 mg/L (ppm). Monitoring wells MW-13 and MW-14 yielded the next highest concentrations with values of 6.335 mg/L and 6.268 mg/L, respectively. Low concentrations of organic constituents were also detected in monitoring wells MW-15, MW-16, MW-17, and temporary well B6. Free product was detected in monitoring wells MW-11 and MW-12.

Concentrations of metals were detected in all ground water samples before filtration. However, after filtration all metal concentrations were below detection limits, except for temporary well B5. Ground water from this well yielded a concentration of 0.006 mg/L for copper.

Further, more detailed information on the Phase I ground water quality assessment is presented in the ETE, Inc. report entitled: SOUTHERN WOOD PIEDMONT GROUNDWATER QUALITY ASSESSMENT - WILMINGTON NORTH CAROLINA FACILITY dated August 3, 1992.

3.0 PHASE II GROUND WATER QUALITY ASSESSMENT

Data collected during the Phase I ground water quality assessment was utilized by ETE, Inc. in the preparation of recommendations for a Phase II ground water quality assessment. The purpose of the Phase II ground water quality assessment is to further define the hydrogeology and ground water quality with respect to past wood preserving activities at the facility. Phase II ground water quality assessment activities included the abandonment of five temporary monitoring wells, installation of 12 monitoring wells, ground water flow evaluation, ground water sampling, soil sampling, slug testing, and the preparation of an aerial photograph and topographic map depicting the site. For a complete description of the Phase II ground water quality assessment proposed activities, please refer to the letter reported submitted to SWP entitled: RECOMMENDATIONS AND COST PROPOSAL FOR A PHASE II GROUND WATER QUALITY ASSESSMENT - SOUTHERN WOOD PIEDMONT COMPANY-WILMINGTON, NORTH CAROLINA dated August 10, 1992.

Because dense vegetation can decrease the effectiveness of the aerial photograph depicting the site, it was recommended that the flight be completed during the winter months of 1993 when

the deciduous vegetation is at a minimum. Therefore, the results of the aerial photograph and topographic map will not be included in this Phase II ground water quality assessment report. Rather, the results will be submitted as an addendum to this report following completion of the aerial reconnaissance. Presented below is ETE's summary of findings for the Phase II ground water quality assessment.

3.1 Temporary Monitoring Well Abandonment

Five temporary monitoring wells (B2, B3, B4, B5, and B6), installed as part of the Phase I ground water quality assessment activities, were abandoned by overreaming the monitoring wells to below the well depth. Subsequent to overreaming, the temporary monitoring well construction materials were removed from the borehole. The resultant borehole was then abandoned by pressure grouting the borehole with a cement/bentonite (6% bentonite) grout to land surface using the tremie pipe method. Please refer to Attachment A for the well abandonment records.

3.2 Monitoring Well Installation

Based on the data collected during the Phase I ground water quality assessment, it was determined that additional monitoring wells were necessary to properly define the horizontal and vertical extent of dissolved and free product plumes present beneath the facility. Twelve additional monitoring wells were installed between September 28 and October 8, 1992 as part of Phase II ground water quality assessment activities. Please refer to Figure 2 for the locations of the newly installed monitoring wells.

In order to better define the horizontal extent of the plume within the upper aquifer, ETE, Inc. installed 9 monitoring wells (MW-18 through MW-26) to monitor the upper aquifer. During Phase I ground water quality assessment monitoring well installation, heaving and flowing sands were encountered, hampering the collection of representative upper aquifer soil samples and evaluating the depth to the top of the peat. To ensure representative sample collection, the Phase II monitoring wells were installed using the mud rotary drilling technique. The borehole for the upper aquifer monitoring wells was advanced to the top of the peat. Borehole depths ranged from 10 to 18 feet below land surface.

ETE, Inc. also completed 3 monitoring wells (MW-8A, MW-11A, and MW-19A) into the lower aquifer at the site. These deep monitoring wells were used to evaluate the thickness of the peat, the nature of the aquifer materials underlying the peat, the presence of a lower confining layer, the ground water quality within the lower aquifer, and the lower aquifer ground water flow direction(s) and hydraulic gradients. Because the stratigraphy below the peat was unknown prior to the deep monitoring well installations, the first borehole (MW-8A; stratigraphic borehole) was installed in an assumed clean area located to the north of the documented contaminant plume within the upper aquifer.

During the deep monitoring well installations, a 10-inch diameter borehole was advanced into the underlying peat to an approximate depth of 20 feet below land surface using the mud rotary drilling technique. A 6-inch diameter PVC pit casing was then installed into the open borehole and a grout mixture of cement and bentonite was placed by the positive pressure tremie pipe method into the annular space around the pit casing. The grout mixture was allowed to cure a minimum of 24 hours.

Within the pit casing, a 3.875-inch diameter borehole was drilled by the mud rotary method to the next confining unit of at least five feet in thickness. Upon completion, the borehole was grouted with a cement and bentonite mixture by the positive pressure tremie pipe method to the depth of selected screen placement. The screen placement was selected based on visual observations and OVA screening. Because elevated OVA readings and slight odors were encountered within the lower aquifer immediately below the peat in borehole MW-8A, the top of the screen was placed such that the screened interval monitored the uppermost portion of the lower aquifer.

Except for monitoring well MW-18, both the upper aquifer and lower aquifer monitoring wells were constructed using 2-inch diameter, 10-foot sections of flush joint threaded PVC riser with a 5-foot section of continuous slot (0.010 inch) stainless steel well screen. However, MW-19, MW-22, and MW-26 were constructed of stainless steel riser and screen due to the presence of stained soils in these areas. All of the monitoring wells were installed in accordance with SWP specifications. For a complete description of the monitoring well installation protocol, refer to the previously referenced Phase II ground water quality assessment proposal submitted to SWP on August 10, 1992. A well construction summary table and boring logs illustrating the sediments encountered, OVA screening, visual observations, olfactory observations, and monitoring well construction is presented in Attachment B.

One of the proposed monitoring wells (MW-25) was installed within a wetland area. Because of the monitoring well location, it was necessary to contact the appropriate regulatory agencies including: the U.S. Army Corps of Engineers, the Division of Coastal Management of the North Carolina Department of Environmental Health and Natural Resources (NCDEHNR) and the Water Quality Planning Division of the North Carolina Division of Environmental Management of NCDEHNR.

Since the monitoring well installation did not require building of roads and structures that may have ponded or drained the wetland area, no formal permits from the regulatory agencies were required. However, notification to the respective regulatory agencies was required. Please refer to Attachment C for a copy of the letter from each regulatory agency granting authorization to install the monitoring well within the wetland area. The letter sent to the regulatory agencies stated that two monitoring wells were to be installed within the wetland area. Following site reconnaissance, it was determined that only one of the proposed monitoring wells was located

within the wetland area. In addition, because the monitoring well location could not be reached using a drilling rig, MW-25 was installed by the hand auger method utilizing the natural formation materials as a filter media.

3.3 Regional and Site Geologic Conditions

3.3.1 Regional Geology

The SWP Wilmington, North Carolina facility is situated on relatively flat-lying Cretaceous and younger sediments of the Coastal Plain physiographic province that extends from the "Fall Line" to the continental margin (Soller and Mills, 1991). Area lithology consists of sands indicative of Post-Miocene surficial deposits overlying sediments of the Upper Cretaceous Peedee Formation (Berry, 1949).

The surficial soils in the site area typically consist of 5 to 60 feet of fine sands. The sands are tan to white in well-drained upland areas, while they are brown to black and contain several feet of organics in low lying or poorly-drained areas. The soils have been eroded and redeposited many times, resulting in buried stream channels, swamps and marsh areas, often containing soft organic silts, clays, and peat (Berry, 1949).

Beneath the surficial soil are sediments of the Peedee Formation that typically range from 650 to 700 feet in thickness. The Peedee soils generally consist of dense to very dense sand with zones of cemented sands and impure limestones. The sands have a characteristic salt and pepper appearance and the Peedee Formation is considered a major aquifer in this area (Blevins and Bradbourne, 1985).

3.3.2 Site Geology

The site is generally underlain by a very loose to loose, brown, fine to medium sand with a trace of coarse sand and small pebbles to a depth of 7 to 16 feet below land surface (Photograph A). This unit, for the purpose of this report, will be termed the upper sand. Encountered in every boring beneath the upper sand is a 13 to 15 feet thick, very loose, dark brown to black clayey peat to peaty clay with varying amounts of wood and root fragments (Photograph B). The maximum depth below land surface in which the peat was observed was 27.5 feet in monitoring well MW-11A. This unit will be termed the peat. The contact between the upper sand and the underlying peat is sharp (Photograph C). Underlying the peat is a 14 to 18 feet thick, very loose to loose, light brown to brown, medium to coarse sand (Photograph D). This unit has a sharp contact with the overlying peat and was observed to occur to a maximum depth of 44 feet below land surface at monitoring well MW-11A. For this report this lower sandy unit will be termed the lower sand. Present in the 3 deep monitoring well borings beneath the lower sand is a 2.5 to 4 feet thick, firm, tight, olive gray silty clay with 5 to 10% phosphate and glauconite grains

(Photograph E). The contact between the lower sand and the top of the clay is also sharp (Photograph F). Beneath the clay is a very dense, light gray sandy shell mold limestone and sand with alternating cemented shell molds and friable silt to large pebble sand laminae (Photograph G). The thickness of this limestone unit is currently unknown but, based on geologic literature, is estimated to be on the order of 650 to 700 feet in thickness. Please refer to the fence diagram portrayed as Figure 3 that graphically shows the geologic units encountered beneath the site.

Dr. Victor A. Zullo of the University of North Carolina Geology Department located in Wilmington, North Carolina was contacted on November 9, 1992, to discuss the most likely depositional and age history of the units encountered beneath the SWP facility. In order of decreasing age (decreasing depth), the limestone unit encountered may be the top portion of the middle to upper Peedee Formation (65 millon years before present) and has been named the Scotts Hill Member. These sandy limestones are shelfal deposits and contain a large fauna that is usually dominated by pelecypods. In these limestones, the aragonitic shelled mollusc have either been replaced by calcite or, when dissolved, occur as external molds. The locally occurring olive gray clay that caps the limestone at the SWP site is marine in origin and is also most likely part of the upper Peedee Formation (Sohl and Owens, 1991). The Eocene Castle Hayne Limestone is commonly present on top of the Peedee Formation in the North Carolina coastal plain, however in the Wilmington vicinity of the Cape Fear River, the Castle Hayne Formation is missing (Harris and Zullo, 1991). The lower sand at the site is most likely a Pleistocene (10,000 years before present) fluvial deposit occurring as a point bar, cut-off meander or an old oxbow lake sequence. The peat at the site probably occurred as the result of filling an oxbow lake with marsh and swamp type sediments. As a result, the peat at the SWP facility is probably regionally discontinuous in its lateral extent, even though it appears to be continuous beneath the entire SWP facility (Zullo, verbal communication, 1992). The upper sand appears to have been deposited as aeolian sand dunes during the Holocene (Soller and Mills, 1991).

3.4 Site Hydrogeology

3.4.1 Aquifers and Confining Units

Based on the borehole data collected to date, it appears that 3 aquifers and 2 confining units have been encountered beneath the SWP facility. The upper sand (upper aquifer) beneath the SWP facility is under water table conditions and should be termed an unconfined "water table" aquifer. This aquifer is not likely to be considered a major source for ground water users except for minor local uses. The upper aquifer at the site appears to be bounded on all sides by ground water discharge boundaries as illustrated by the upper aquifer water table flow map to be discussed later in this section. The ground water discharge boundaries include: the Cape Fear River to the west, the drainage ditches located along the north and east property boundaries, and

Greenfield Creek along the southern property boundary at the facility. Ground water within the upper aquifer migrating from the center of the SWP facility should discharge into these boundaries rather than migrating beyond their locations.

The peat is located beneath the upper aquifer. This unit consists of silt and clay with varying amounts of wood and root fragments. The nature of the materials making up the peat suggest that this unit should be termed a leaky confining unit that separates the upper and lower aquifers at the facility. Visual observation of the peat indicates that it is water saturated throughout its entire thickness, thereby demonstrating a hydraulic connection between the upper and lower aquifers.

The lower aquifer at the facility consists of a permeable sand material that should, at the SWP facility, be termed a semi-confined aquifer. This lower aquifer is also probably considered a minor source of ground water in this area, except, for minor local uses. Evidence that the lower aquifer is semi-confined relative to the upper aquifer is elucidated by the fact that: the peat is completely water saturated, the difference in direction of ground water flow within the lower aquifer relative to the upper aquifer, and by the differences in the elevation head (vertical hydraulic gradient) of the ground water in the upper and lower aquifers at the facility. The ground water flow direction within the lower aquifer appears to be controlled by the Cape Fear River at the facility, in that, the ground water within the lower aquifer is migrating towards and discharging into the Cape Fear River. Conversations with the local Corps of Engineers indicated that the Cape Fear River is dredged to the top of the limestone in the vicinity of Wilmington. This dredging of the river to the top of the limestone indicates that the lower aquifer is in complete hydraulic interconnection with the Cape Fear River. The vertical hydraulic gradients, as will be discussed later in this section, indicate that the upper and lower aquifers are to a small degree hydraulically connected.

Beneath the lower aquifer at the facility is an olive gray silty clay of marine origin. This clay is only 2.5 to 4 feet thick, but on visual observation, appeared to be tight and dry. Other than the visual observation, no hydraulic parameters were collected during the Phase II ground water quality assessment activities that would give evidence that this unit is not a confining layer at the facility.

The third and lowermost aquifer encountered beneath the SWP facility is the Peedee Limestone Formation. The unit is a confined aquifer and is a major source of ground water in this area. No direct hydraulic measurements were collected from this unit during the Phase II ground water quality assessment. However, the regional ground water flow directions are most probably towards the Atlantic Ocean with local deviation in flow direction towards the Cape Fear River, especially in the locations in which this aquifer is hydraulically connected to the Cape Fear River through dredging operations.

3.4.2 Ground Water Flow Directions

ETE, Inc. collected ground water levels from all the monitoring wells and staff gauges at the facility on October 15, 1992. All of the water level measurements were collected within a 1 hour period when the tide was approaching low tide conditions. By collecting the water levels at low tide, the resultant ground water flow map will illustrate the time interval when the ground water is discharging to the Cape Fear River and the drainage ditches at the facility. The time (high tide) when ground water stagnation lines develop in the upper aquifer at the facility will not be portrayed by these ground water level measurements.

The collected water level measurements were used to develop a water table surface map for the upper aquifer present beneath the facility (Figure 4). The data used to construct the water table map was collected by measuring the depth to water from the top of casing in all monitoring wells screened in the upper aquifer and the staff gauges that exist at the site. The top of casing was surveyed by a registered land surveyor to within 0.01 feet mean sea level (MSL). The depth to water in each well is subtracted from the top of casing elevation at each respective well to yield the elevation of the water table at that location.

As illustrated by the upper aquifer water table map, a water table high exists beneath the center of the site. From this high point, ground water appears to flow to the east and north towards the drainage ditches, to the south towards Greenfield Creek, and to the west towards the Cape Fear River. Local curvatures in the ground water isoelevation lines of the upper aquifer attest to the control exerted on the ground water flow within the upper aquifer by the discharge boundaries including the drainage ditches, creeks, and the Cape Fear River.

An average horizontal hydraulic gradient of the upper aquifer, based on the water table flow map isoelevation lines is 0.0015 ft/ft. A horizontal hydraulic gradient for the leaky confining peat can also be measured by using monitoring wells MW-6, MW-7, MW-8, and MW-9 because they are screen almost completely within the peat. The horizontal hydraulic gradient for the peat was evaluated to be 0.0013 ft/ft.

A potentiometric surface map was also constructed for the lower aquifer beneath the facility (Figure 5) using the same principals as discussed for the upper aquifer. Because only three monitoring points exist within the lower aquifer at the facility, the method of triangulation as described by Heath (1987) was used to evaluate the direction of ground water flow and the horizontal hydraulic gradient within the lower aquifer. The ground water flow direction within the lower aquifer appears to be to the northwest with a horizontal hydraulic gradient of 0.0002 ft/ft.

In addition, the vertical hydraulic gradients between the upper and lower aquifers were evaluated by comparing the ground water elevations in the three well clusters at the facility. The three

wells clusters are MW-8 and MW-8A, MW-11 and MW-11A, and MW-19 and MW-19A (Figure 6). The vertical hydraulic gradient can be calculated by dividing the difference in elevation head in each well in the well cluster by the difference in the mid-point elevation of the well screens. Using this evaluation technique, it appears that a upward vertical hydraulic gradient of 0.021 ft/ft exists at the MW-8 well cluster and downward vertical hydraulic gradients of 0.012 ft/ft and 0.002 ft/ft exist at MW-11 and MW-19 well clusters, respectively.

Using generally accepted principals in the study of hydrogeology, downward vertical hydraulic gradients exist in areas of recharge to the ground water system and upward vertical hydraulic gradients exist in areas of discharge from the ground water system. Evidence that the upper and lower aquifers at the SWP facility tend to behave as a locally isolated ground water system controlled by the drainage ditches, creeks and the Cape Fear River is illustrated by the vertical hydraulic gradients. In the area of recharge, as illustrated by the concentric water table high on the upper aquifer water table flow map, the vertical hydraulic gradient at well clusters MW-11 and MW-19 is downward (recharge). In the area of discharge to the Cape Fear River, the vertical hydraulic gradient is upward at monitoring well cluster MW-8 (discharge). Therefore, the downward vertical hydraulic gradients at the SWP facility suggest that recharge by precipitation enters the subsurface near the center of the site and migrates as ground water to the area of discharge and upward vertical hydraulic gradients near the Cape Fear River and the drainage ditches.

3.4.3 Hydraulic Conductivity and Seepage Velocity

ETE, Inc. completed a total of 15 in-situ recovery (slug) tests on selected monitoring wells within the upper aquifer, peat, and lower aquifer at the facility. The purpose of these recovery tests is to evaluate the hydraulic conductivity and seepage velocity of the aquifers underlying the site. Prior to performing the recovery test, the static water level in the well to be tested was measured and recorded. The well was then drawn down as much as possible by use of a centrifugal pump. At frequent, predetermined time intervals, the water level in the well and the respective elapsed time from the beginning of the test was measured and recorded. This procedure was continued until the water level recovered to approximately 90% of the original static water level.

Eleven monitoring wells were recovery tested to evaluate the average horizontal hydraulic conductivity across the screened interval within the upper aquifer at the facility. In order to arrive at the hydraulic conductivity, the elapsed time since initiation of the recovery test was plotted on semi-log paper versus the observed drawdown. This data was then utilized to solve for the hydraulic conductivity in an unconfined aquifer using the method demonstrated by Bouwer and Rice (1976). The plotting of the semi-log graphs and the hydraulic conductivity calculations were performed utilizing the aquifer test design and analysis computer software package AQTESOLV™ (1991). The horizontal hydraulic conductivity within the upper aquifer

ranged from 4.71 x 10^{-6} ft/sec in MW-17 to 1.20 x 10^{-5} ft/sec in MW-22. The average horizontal hydraulic conductivity measured in the upper aquifer is 1.66 x 10^{-5} ft/sec which is typical for clean fine grained sands (Heath, 1987).

Utilizing the ground water flow velocity equation known as Darcy's Law and adding the porosity term to the equation to arrive at the seepage velocity as described by Heath (1987), it was determined that the seepage velocity within the upper aquifer ranged from 0.89 ft/year in MW-17 to 4.60 ft/year for MW-19. The average seepage velocity for the tested wells within the upper aquifer is 2.64 ft/year. Please refer to Attachment D for a table summarizing the results of the recovery tests, the calculations and solution methodology of the Bouwer and Rice method, and for the semi-log graphs comparing drawdown versus time.

A recovery test was also conducted on MW-8 which is screened almost entirely within the peat. This test was completed and solved using the same methodology as the upper unconfined aquifer presented above. The calculated horizontal hydraulic conductivity within the peat is 1.05 x 10^{-6} ft/sec with a seepage velocity of 0.08 ft/year. This hydraulic conductivity is typical of silty sediments (Heath, 1987).

The three lower aquifer monitoring wells were also tested for recovery utilizing the same field procedures as those for the upper aquifer. However, because the lower aquifer is confined, the hydraulic conductivity value was determined using the Cooper, et. al. (1967) method. The Cooper et. al. method involves plotting the ratio of the initial head in the aquifer with the observed drawdown on a semi-log plot versus time since initiation of the recovery test. The horizontal hydraulic conductivity across the screened interval for the lower aquifer ranged between 8.48 x 10^{-5} ft/sec for MW-8A to 2.15 x 10^{-4} ft/sec for MW-19A. The average horizontal hydraulic conductivity for the lower aquifer is 1.33 x 10^{-4} ft/sec which is typical of clean medium sand (Heath, 1987).

The seepage velocity of the lower aquifer ranged between 1.78 ft/year to 4.52 ft/year with an average seepage velocity of 2.79 ft/year. Please refer to Attachment D for a table summarizing the results of the recovery tests, the calculations, assumptions and solution methodology of the Cooper, et. al. method, and for the semi-log graphs comparing head ratio versus time.

All water exiting the wells during slug testing was containerized and disposed of properly.

3.5 Soil Quality

During installation of the monitoring wells, close attention was given to the condition of the soils encountered. The soil observations were made by collecting split-spoon soil samples continuously from land surface to the bottom of the borehole in the upper aquifer monitoring wells. The soils in the lower aquifer monitoring well boreholes were observed by collecting

split-spoon soil samples continuously from land surface to the bottom of the peat, followed by five foot intervals below the peat to the bottom of the borehole. Soil observations included visual staining of the soil, odor, total organic vapor screening (OVA), and laboratory soil sampling.

3.5.1 Visual and Olfactory Soil Quality

Due to the coloring and odoriferous properties of wood preserving constituents, field experience on similar sites has shown that visual staining and strong odor are most often observed in source areas and in areas where free product has migrated through the subsurface. Furthermore, noticeable wood preserving constituent odors that are present, but are not associated with visual staining of the sediments, most commonly occur in areas where dissolved concentrations of wood preserving constituents are present in the soil and ground water and usually represent the mid-reaches of the plume. Field experience has also shown that the leading edges of the plumes, while still having laboratory detectable concentrations of wood preserving constituents may not contain odors. In light of past field experiences, important deductions can be made based on the visual and olfactory observations during the advancement of the borehole.

A review of past site activities immediately lead to the location of potential areas in which contaminants may have entered the subsurface. The potential areas in which contaminants may have entered the subsurface include: the creosote treatment area, CCA treatment area, old covered sludge ditch, large storage tank area, and the diesel storage tank area. Based solely on visual and olfactory observations from soil borings completed during the Phase I and II ground water quality assessment, the potential contaminant entry areas can be grouped into three main source areas (Figure 7). The first source area will be called the wood treatment source area, which includes the creosote treatment area, CCA treatment area and the old covered sludge ditch. The contaminants from these areas appear to have coalesced and are following the same migration pathways in the subsurface. The second source area is the large storage tank area; contaminants from this area are separated from the other areas and appear to be following a different migration pathway. The third source area is the diesel storage tank areas. This source can be separated by its location on the site, but mostly due to the physical behavior of the contaminants in the subsurface. The diesel contaminants are less dense than water and tend to float when present as free product. In addition, the dissolved phase associated with diesel does not tend to display a large degree of vertical movement into the subsurface. Wood preserving constituents are more dense than water and are therefore more likely to more downward into the subsurface.

For ease in discussion, the visual and olfactory observations will be addressed simultaneously with the assumption that if visual staining is present, strong odors are also present. In addition, as in the previous paragraphs, the observations will be addressed by source areas and will include observations made during the Phase I and Phase II ground water quality assessments.

The wood treatment source area is demarked by monitoring wells MW-11, MW-12 and MW-14 (Figures 8 and 9). Visual staining of the soils was observed in these monitoring wells from 3 feet below land surface to the top of the peat (13 feet below land surface) at MW-11 and to 8 feet below the top of the peat in MW-14 (16 feet below land surface). Migration of free product from the source area is observed in monitoring wells MW-12, MW-19, and MW-26. In these monitoring wells, the visual staining is observed to first occur at greater depths in the borehole suggesting that the contaminants were not introduced into the subsurface at these locations, but instead migrated to these areas. Visual staining is observed in MW-12 at a depth of 8 feet below land surface and is present to the top of the peat (14.5 feet below land surface). At MW-26, visual staining first occurs at a depth of 10 feet below land surface and is present to a depth of 1 foot below the top of the peat (17 feet below land surface). At MW-19, visual staining is present only within a 6-inch layer on top of the peat (11.5 to 12 feet below land surface). As the distance from the source area is increased, no visual staining was observed but faint odors were detected in MW-20, MW-23, and MW-24. Odors were present near land surface at MW-20 and MW-23 suggesting that these odors are from surface activities, such as drippage from treated wood storage, not from the migration of contaminants within the subsurface. Monitoring wells MW-20 and MW-24 detected odors towards the bottom of the borehole near the top of the peat. This location of the odor suggests that they are associated with plume migration within the subsurface.

The second source area is the large storage tank area. In this area creosote and pentachlorophenol were stored for use in the wood preserving operations. Indications that this area is a source are present in monitoring wells MW-13 and MW-22. Monitoring well MW-13 had visually stained soils from 3 feet below land surface to a depth of 8 feet below land surface. The soils were stained in monitoring well MW-22 from 3 feet below land surface to a depth of 9 feet below land surface. In both of these monitoring wells the visual staining did not extend to the top of the peat. However, strong odors are present at these locations to the top of the peat. Based on visual observations, it appears that the contaminants are moving from MW-13 towards MW-22 and the Cape Fear River.

The diesel tank source areas are indicated by monitoring wells MW-15, MW-16, and MW-17. At MW-16 and MW-17, diesel stained soils were observed from the surface to a depth of 5 feet below land surface with a diesel odor occurring to the top of the peat. In the vicinity of MW-15, diesel stained soils were observed to a depth of 5 feet below land surface. Diesel odors were also observed near the surface in monitoring well MW-22 suggesting lateral movement of the dissolved diesel plume within the subsurface. During the Phase I ground water quality assessment, MW-17 was described as having diesel stained soils near the top of the borehole and again at the bottom of the borehole with no staining in the mid-portion of the borehole. Based on fluid dynamics this situation is unlikely to occur. Therefore, it is not certain at this time that diesel stained soils exist to the top of the peat at MW-17.

A very slight diesel odor was also observed within the sediments during the advancement of monitoring well MW-18. This odor is most likely not associated with on-site activities and may be contributed to an off-site source.

Within the lower aquifer at the site, a very slight odor was observed in monitoring wells MW-8A and MW-11A. In both of the monitoring wells, the odor was observed near the top of the aquifer and was not present at the bottom of the aquifer. Based on the ground water flow direction within the lower aquifer and an absence of an odor in MW-19A, it is likely that the dissolved contaminants are entering the lower aquifer near MW-11A and flowing with the ground water towards MW-8A.

3.5.2 Total Organic Vapor Analysis

Total organic vapor measurements were also collected during the advancement of the boreholes at the site using a Photovac organic vapor analyzer (OVA). OVA's are designed to provide the field hydrogeologist with real-time measurements to aid in making decisions in the field. As the name applies, the measurement is the total organic vapors present in the soil. Situations do arise when naturally occurring organic vapors may be present in soils, such as, methane from the decay of plants, that can result in false-positive detections. Furthermore, the constituents of interest need to be readily volatile to be detected by the OVA. Wood preserving constituents as a whole are not volatile, however, wood preserving constituents including, naphthalene, benzene, toluene, xylene, and ethyl benzene are readily detectable by the OVA. Other factors can influence the measurements when using an OVA such as, temperature, humidity, wind, and the length of time that the sample as been in the sealed container. With these considerations, it is obvious that the OVA readings obtained in the field should be utilized as a screening mechanism and in the evaluation into which sediment intervals are likely to contain contaminants.

The OVA measurements at the site were collected by taking a soil sample from each split-spoon and placing it in a zip lock plastic bag. Upon temperature equalization, the soil samples were screened with the OVA. The OVA measurement collected from the soil samples is provided on the boring logs presented in Attachment B. In short, the OVA readings correspond with and reinforce the visual and olfactory observations previously discussed and also correspond with the laboratory results to be discussed in the following sections.

3.5.3 Soil Sampling

On October 12 and 13, 1992, ETE Inc. collected 9 soil samples in the vicinity of the on-site tributary creek and along the north bank of Greenfield Creek. These soil samples were sent to the laboratory for analysis, but, were held past the approved holding time prior to analysis. Therefore, the original soil sample locations were resampled on December 9 and 14, 1992

(Figure 10). Soil samples were collected along the bank of the on-site drainage ditch (SS-4 through SS-7) and along the bank of the tributary creek to Greenfield Creek near the intersection of Front and Greenfield streets (SS-3) and along the east bank adjacent to the Optimist Park (SS-2). In addition, soil samples were collected along the north bank of Greenfield Creek (SS-1) upstream from the on-site tributary creek and downstream from the on-site tributary creek adjacent to the mouth of the Cape Fear River (SS-9). During the resampling event, two additional soil samples (SS-10 and SS-11) were collected along the on-site north bank of Greenfield Creek in location between SS-1 and SS-9. The soil samples were collected to augment the previous soil samples collected on-site by Geraghty & Miller in 1991.

The soil samples were collected utilizing a clean stainless steel hand auger advanced into the sediment along the bank of the drainage ditch and tidal creeks. The sample was removed from the hand auger with a clean stainless steel spoon and placed in clean sample containers provided by the laboratory. The hand auger borings were conducted at low tide so that the borings could be completed within the creekbed. Each boring was advanced to an approximate depth of 2 feet below land surface. The deepest sample retrieved from each borehole was sent to Heritage Laboratories, Inc. for analysis of the Wilmington site-specific constituents (Attachment E).

The hand auger was decontaminated between each soil sample by scrubbing the auger bucket and auger stem with a LIQUI-NOX™ and distilled water mixture followed by rinsing with distilled water. All soil excavated during completion of the soil borings was containerized in an approved roll-off container and disposed of properly. The horizontal location of the borehole was determined by a land surveyor.

The sediments encountered in each borehole ranged from a dark brown to black silt/peat to gray and tan coarse sand with silt and peat. Visual and olfactory observations that were noted included an organic decay odor at SS-2, visually stained sediments at SS-5, SS-6, and SS-7 and the presence of a diesel odor and sheen on the ground water that percolated into the open borehole at SS-9. Please refer to the soil sample collection summary sheets located in Attachment E of this report.

The soil samples were analyzed by the laboratory for the metals: arsenic, chromium, copper, and lead (Attachment E). These constituents were selected to evaluate potential soil contamination from the CCA wood treatment facility and from the storage of diesel (lead) at the site. Arsenic concentrations ranged between ND (below laboratory detection) and 5.2 mg/kg. The highest levels of arsenic detected were present at off-site locations SS-1 at 3.5 mg/kg, SS-2 at 5.2 mg/kg, and on-site locations SS-4 at 3.6 mg/kg, SS-5 at 1.5 mg/kg, and SS-7 at 2.3 mg/kg. Concentrations of chromium ranged between 1.3 mg/kg and 14.0 mg/kg. Once again, the higher detected levels of chromium occurred at off-site locations SS-1 at 5.5 mg/kg, SS-2 at 14.0 mg/kg and at on-site locations SS-4 at 11.0 mg/kg and SS-7 at 9.2 mg/kg. The same pattern was also observed in the laboratory results for copper and lead. The highest detected

copper and lead concentrations, respectively, occurred at off-site locations SS-1 at 6.1 and 14.0 mg/kg, SS-2 at 46.0 and 290.0 mg/kg, SS-3 at 8.0 and 61.0 mg/kg, and at on-site location SS-4 at 14.0 and 25.0 mg/kg. The two highest lead concentrations, 290 and 61 mg/kg occurred only at off-site locations. The highest lead concentration on-site occurred at location SS-4 at 25.0 mg/kg.

The CCA and diesel source locations at the site are located roughly 400 to 600 feet northwest of soil sample locations SS-5 and SS-6. In all cases, the lowest metal concentrations on-site occurred at soil sample locations SS-5 and SS-6, which are the closest soil sample locations to the source area. Because the highest laboratory detected metal concentrations occurred off-site and at on-site locations that are a considerable distance from the on-site sources, these laboratory detected values most probably represent naturally occurring background levels for the site vicinity and not levels that could be contributed to on-site activities. The on-site soil sampling by Geraghty & Miller in 1991 also suggested that the on-site metal concentrations most probably represented background levels for metals.

The collected soil samples were also analyzed by Heritage Laboratories, Inc. for semi-volatile and volatile organics. Please refer to the site-specific soil sample list located in Attachment E for a listing of the semi-volatile and volatile constituents that were analyzed by the laboratory. From the entire list of constituents analyzed, only a fraction of the constituents were detected. The semi-volatile organics that were detected in the soil include: acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, carbazole, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-Cd)pyrene, naphthalene, and phenanthrene (13 out of 23 constituents were detected). The volatile organics that were detected in the soil include: dichloromethane, ethyl benzene, M/P xylene, O-xylene, and toluene (5 out 30 constituents were detected). Dichloromethane was utilized by the laboratory as the solvent in the extraction process for the soils. Therefore, it is suspect that the dichloromethane was introduced by the laboratory and is not present at the site.

For simplification in the discussion of the detected concentration levels for each soil sample, the detected organics at each soil sample location were added together to arrive at a total organic concentration value. This value will be used in the following discussion. Please refer to the soil sample summary table presented in Attachment E for a summary of the total organic concentration value detected at each soil sample location. The lowest total organic concentrations occurred at locations SS-2, SS-3, SS-8 and SS-11 with concentrations of 3.25, ND, 1.0, and ND mg/kg, respectively. Moderate values occurred at soil sample locations SS-1 at 9.936 mg/kg and SS-4 at 17.691 mg/kg. High detected concentrations of total organics occurred at SS-5 at 167.0724 mg/kg, SS-6 at 150.4248, SS-7 at 203.259 mg/kg, and SS-9 at 357.3546 mg/kg. The highest concentration of total organics occurred at SS-10 with a concentration of 6110.008 mg/kg. The total organic concentration at SS-10 is suspect for two reasons. First, the visual and olfactory observations made during the collection of the sample

did not indicate the presence of organics and second, the analytical result is an order of magnitude higher than soil samples in which visual and olfactory observations were apparent.

As demonstrated by the list of detected constituents, wood-preserving activities may have contributed to the observed organics in the soil. The on-site source of wood-preserving constituents is located roughly 400 feet northwest of soil sample location SS-5 and SS-6. As discussed above, high concentrations of detected organics occurred at these locations. Further from the source, the concentrations of organic wood-preserving constituents have decreased considerably at SS-1, SS-2, SS-3, SS-4, and SS-8. The soil samples along Greenfield creek (SS-1, SS-9, and SS-10) also had detectable organic concentration levels, both upstream and downstream from the on-site tributary creek. The detection along Greenfield Creek may suggest that additional off-site sources of these compounds are present.

3.6 Ground Water Quality

On October 13 through 16, 1992, ETE Inc. collected 21 ground water samples from the existing monitoring wells at the facility. Ground water samples were not collected from monitoring wells MW-11, MW-12, and MW-26 because visual free product was observed in these monitoring wells.

The representative ground water samples were collected from all monitoring wells utilizing a clean dedicated bailer to evacuate three well volumes of ground water from the well. The pH, conductivity, and temperature of the ground water were recorded and the ground water sample placed into respective sterilized ground water sample containers for each well. The containers were labeled according to owner, site name, well number, date, time, pH, conductivity, temperature, and type of analysis to be performed. The collected samples were kept cool by placing the samples immediately into a cooler chilled to 4°C with ice. The samples were then shipped Federal Express overnight to EMS Heritage Laboratories, Inc. for analysis. The ground water samples were analyzed for the Wilmington site-specific constituent list (Attachment F) as maintained by SWP. Standard ground water sampling protocol was followed as documented in the report entitled: SAMPLING AND ANALYSIS PLAN FOR GROUND WATER MONITORING - SOUTHERN WOOD PIEDMONT. Please refer to the ground water sample collection summary sheets located in Attachment F of this report for a listing of water level, well depth, sample appearance, volume purged, temperature, conductivity, pH, the presence of separate phase fluids and additional observations made during this ground water sampling event for each monitoring well at the facility. The thickness of separate phase oil, if present, was measured using an oil/water interface probe. All purge water was containerized in an approved roll-off container and disposed of properly.

The ground water samples were analyzed by the laboratory for dissolved and total metals including: arsenic, chromium, copper, and lead (Attachment F). These constituents were

selected to evaluate potential ground water contamination from the CCA storage and CCA treatment area and from the storage of diesel (lead) at the facility. The samples were analyzed prior to filtration (total metals) and then again after filtration (dissolved metals).

After filtration, all dissolved metal concentrations were listed below detection limits, except for monitoring wells MW-15, MW-17, and MW-22. Ground water from these wells yielded a dissolved arsenic concentration of 0.023, 0.0057, and 0.013 mg/L, respectively. Please refer to Figure 11 for the upper aquifer dissolved arsenic isoconcentration map for the facility. No dissolved metals were detected in the lower aquifer at the facility.

Total metal concentrations (not filtered) were detected in many of the monitoring wells in the upper and lower aquifers at the facility. Total arsenic concentrations within the upper aquifer ranged between ND and 0.11 mg/L. The highest level of total arsenic detected was present at MW-15 in close proximity to the CCA storage and treatment area. A total arsenic concentration of 0.005 mg/L was also detected in MW-19A screened within the lower aquifer at the facility.

Concentrations of total chromium ranged between ND and 0.67 mg/L. The two highest detected levels of chromium occurred along the northern property boundary at MW-18 (0.67 mg/L) and in the vicinity of the large storage tank area at MW-22 (0.2 mg/L). Total chromium concentrations of 0.012 mg/L at MW-11A and 0.011 mg/L at MW-19A were detected within the lower aquifer at the facility.

Total copper concentrations within the upper aquifer ranged between ND and 0.061 mg/L. The highest areas of detected levels of copper occurred along the northern property boundary at MW-18 (0.51 mg/L) and in the vicinity of the large storage tank area at MW-13 (0.061 mg/L), the CCA treatment area at MW-17 (0.054 mg/L), and the covered sludge ditch at MW-14 (0.059 mg/L). Total copper concentrations were not detected within the lower aquifer at the facility.

Total lead was also detected in the monitoring wells at the facility. Total lead concentrations within the upper aquifer ranged between ND and 0.12 mg/L. The highest level of total lead detected was present at MW-13, in close proximity to the large storage tank area. Total lead concentrations of 0.0095 mg/L at MW-11A and 0.011 mg/L at MW-19A were detected within the lower aquifer at the facility.

The collected ground water samples were also analyzed by Heritage Laboratories, Inc. for semi-volatile and volatile organics. Please refer to the site-specific ground water sample list located in Attachment F for a listing of the semi-volatile and volatile constituents that were analyzed by the laboratory. From the entire list of constituents analyzed, only a small fraction of the constituents were detected. The semi-volatile organics that were detected within the upper aquifer ground water include: acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, chrysene, 2,4-dimethylphenol, fluoranthene, indeno(1,2,3-

Cd)pyrene, naphthalene, and phenanthrene (12 out of 23 constituents were detected). The semi-volatile organics that were detected within the lower aquifer ground water include: acenaphthene, anthracene, carbazole, fluoranthene, and phenanthrene (5 out of 23 constituents were detected). The volatile organics that were detected within both the upper and lower aquifer include: benzene, chloroform, dichloromethane, ethyl benzene, M/P xylene, O-xylene, and toluene (7 out 30 constituents were detected). Dichloromethane was utilized by the laboratory as the solvent in the extraction process for the samples. Therefore, it is suspect that the dichloromethane was introduced by the laboratory and is not present at the site. In addition, chloroform was detected in monitoring wells MW-8A, MW-19A, MW-21, and MW-22. Chloroform is not commonly associated with wood preserving facilities. The City of Wilmington for many years in the past discharged untreated sanitary sewer water to the Cape Fear River. Two of the old sanitary sewer discharge pipes traverse in an east-west direction across the site. One of the old sanitary sewer discharge pipes is located in the vicinity of MW-8A and MW-21 and is most likely the source of chloroform that has been detected in these wells. The second sanitary sewer pipe is located near the Optimist Park and traverses the site immediately to the south of the wetland area.

For simplification in the discussion of the detected organic concentration levels for each ground water sample, the detected organics at each location were added together to arrive at a total organic concentration value. This value was used to produce the upper aquifer total organics isoconcentration map shown in Figure 12 and the lower aquifer total organics isoconcentration map depicted in Figure 13. In addition, please refer to the ground water sample summary tables presented in Attachment F.

The areas of free product and areas of greatest total dissolved organics concentration occurred in close relation to the source areas (large storage tank area, diesel storage tank area, and the wood treatment area). As demonstrated by the greater concentration of organics in the source areas, relative to the rest of the site, and by the list of detected constituents, wood-preserving activities most likely contributed to the observed organics in the ground water.

The highest detected concentration of total dissolved organics occurred at MW-13, MW-14 and MW-22, with concentrations of total organics of 8.130, 8.973, and 13.358 mg/L, respectively. Free product was present in MW-11, MW-12, and MW-26. It appears that an east-west trending band of dissolved and free phase organics occur along the southern City of Wilmington property boundary between the Cape Fear River to the west and the drainage ditch and creek to the east.

The dissolved organics from the wood treatment area and the covered sludge ditch most likely migrated to the east with the ground water flow towards the drainage ditch and the creek. Once the dissolved organics approached the area where the stagnation line occurs in the ground water flow (near the drainage ditch and creek), the dissolved organics appear to have been smeared in a north and south direction parallel to the drainage ditch and the creek as evidenced by

detection of low levels of dissolved organics in MW-20, MW-21, MW-24, and MW-25. This smearing of the dissolved organics along the ground water stagnation line in the upper aquifer is likely caused by tidal fluctuations forcing the ground water to move into and out of the upper aquifer sands. Any dissolved constituents that may have entered the surface water within the drainage ditch and creek can be moved both upstream with the high tide and downstream with the low tide. During the high tide, the surface water in the drainage ditch and creeks moves into the subsurface as ground water because of the higher head in the surface water body relative to the ground water head in the subsurface. This migration of surface water into and out of the subsurface most likely caused the smearing of the dissolved organics plume both upstream and downstream along the drainage ditch and the creek.

The dissolved organics in the vicinity of the diesel storage tank area and the large storage tank area appear to move to the west towards the Cape Fear River with the ground water flow direction. Large scale smearing of the contaminants along the ground water stagnation line parallel to the Cape Fear River does not appear to have occurred based on the data collected to date. Further data collection may be necessary to evaluate potential smearing of the dissolved organic constituents along the ground water stagnation line adjacent to the Cape Fear River.

The upper aquifer dissolved organic plume appears to be partially defined in the northwest, north, northeast and southwest portions of the site. However, the southeast portion of the site and the areas on-site and off-site to the east of the drainage ditch and creek are not well defined.

The dissolved organic plume also appears to have migrated vertically through the peat and into the lower aquifer in the vicinity of MW-11A beneath the wood treatment area. Once the dissolved organic plume entered the lower aquifer it appears to have migrated within the upper section of the lower aquifer in the direction of ground water flow towards the Cape Fear River. More data is needed in the lower aquifer to further define the vertical and lateral extent of the dissolved plume.

4.0 SUBSURFACE WOOD PRESERVING CONSTITUENT MIGRATION

Wood preserving constituents (creosote/coal tar) are considered to be dense non-aqueous phase liquids (DNAPLS). Wood preserving constituents, as a whole, are slightly heavier than water, have a high viscosity, and a low dissolved phase mobility (Cherry, 1992). Because wood preserving constituents are heavier than water, gravity and interfacial tension between the DNAPL and ground water plays an important role in the migration of the DNAPL. The DNAPL will continue to migrate vertically downward in the subsurface until it intercepts a barrier to its vertical migration. The barrier to migration could be a fine grained layer or a clay or any material in which the pore spaces are smaller than that of the host material. If the barrier is flat lying, the DNAPL will begin to pool and spread laterally on this barrier until a critical pool height is encountered. The critical pool height is the height of the DNAPL pool required to

exceed the entry pressure (capillary pore pressure and interfacial tension) within the pores of the material restricting the movement of the DNAPL. Once this critical pool height is reached, the DNAPL will then begin to flow through the original barrier to flow (Kueper, 1992). Once the entrance pressure is achieved and flow through the barrier has begun, the reduced interfacial tension can allow the entire free product pool to drain leaving only residual DNAPL behind. If the barrier encountered is sloping, the DNAPL will most likely flow by gravity downslope until another barrier to flow is encountered causing the DNAPL to pool. This can continue until the required entry pressure cannot be meet or until the free product is reduced to residual concentrations.

As the DNAPL is migrating through porous media, residual DNAPL is left behind the trailing edge of the moving DNAPL body due to snap-off and by-passing mechanisms. It can be expected that 20 percent of the DNAPL body will be left behind as residual during free phase migration. After a certain distance of migration, the free phase will be reduced to just residual concentrations (Kueper, 1992).

At the SWP Wilmington, North Carolina facility it appears that the concepts presented above exist. The wood preserving constituents within the subsurface at the facility seem to have migrated vertically in a bell shaped pattern to the top of the peat unit (Figures 8 and 9). Once the free product encountered the peat, it has begun to migrate down the dip of the peat as indicated between MW-11 and MW-19, MW-11 and MW-14, and MW-11 and MW-26 (Figure 14; SURFER™). The fine-grained nature and the sloping surface of the peat appears to prevent downward infiltration by preventing large pools of free product to accumulate, thereby, inhibiting downward infiltration of free product into the peat at these locations (Photographs H and I). However, in the area between MW-14 and MW-26, the surface of the peat rises and staining is observed within the peat. At this location, it is hypothesized that the free product migrating from the source area near MW-11 moved towards MW-14 until this rise in the peat surface was encountered. At the rise in the peat surface, the free product pooled until the critical pool height was reached allowing the free product to migrate into the peat. Once in the peat, the free product preferentially migrated horizontally until it encountered the area in the vicinity of MW-26. At this location the rise in the peat at MW-14 has changed to a low at MW-26.

Additional evidence in favor of this migration scenario is the presence of residual staining of the sediments and free product within the monitoring wells. Abundant visual staining and residual DNAPL was observed in the sediments in the vicinity of MW-11 and MW-14. However, only traces of free product have entered the monitoring wells at these locations. At MW-26, stained soils were also observed and roughly 3.5 inches of free product moved into the well under natural gradients within days after well installation. The lack of measurable free product near the source wells and measurable free product in wells a good distance from the source may

indicate that the free product has migrated from the source leaving only residual product behind and the free product pool has migrated to at least MW-26 at the facility.

As previously discussed, the free product beneath MW-13 and MW-22 has not reached the top of the peat. In this location, it appears that the migration of the free product is being controlled by the direction of ground water flow and the steeper hydraulic gradient (0.025 ft/ft) in this area close to the bank of the Cape Fear River.

5.0 REFERENCES

AQTESOLV™, 1991, Aquifer Test Design and Analysis Compute Software: Geraghty & Miller, Inc. Environmental Services, Modeling Group, Version 1.1R4, p. 134.

Berry, W. E., 1949, Geologic Map Coastal Plain - North Carolina: United States Geologic Survey.

Blevins, S. E. and Bradbourne, J. T., 1985, Hydrogeologic Report SWP, Law Environmental, Kennesaw, GA. p. 3-4.

Bouwer, H. and Rice, R.C., 1976, A Slug Test Method for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells: Water Resources Research, V. 12, No. 3, p. 423-428.

Cherry, J.A., 1992, Site Characterization and Remediation of Dense, Immiscible Phase Liquid Contaminants (DNAPLS) in Porous and Fractured Media: Lecture Notes, Short Course Waterloo Centre for Groundwater Research, November 2-5, Chicago, Illinois.

Cooper, H.H., Bredehoeft, J.D, and Papadopulos, S.S., 1967, Response of a Finite-Diameter Well to an Instantaneous Charge of Water: Water Resources Research, V. 3, No. 1, p. 263-269.

Harris, W.B. and Zullo V. A., 1991, Eocene and Oligocene Stratigraphy of the Outer Coastal Plain: The Geology of the Carolinas, University of Tennessee Press/Knoxville, p. 290-308.

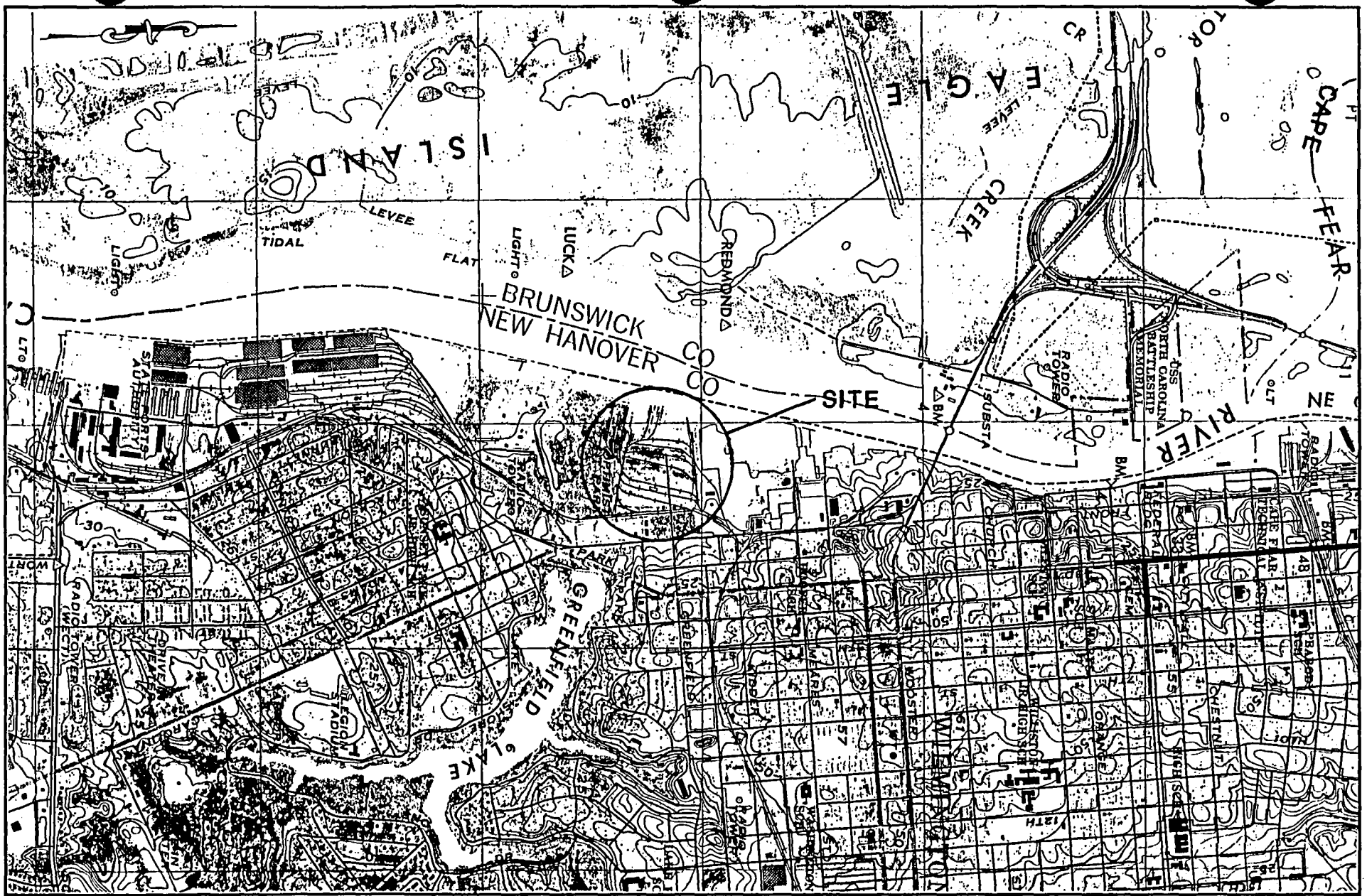
Heath, R.C., 1987, Basic Ground-Water Hydrology: United States Geological Survey Water-Supply Paper 2220, p. 84.

Sohl, N.F. and Owens, J. P., 1991, Cretaceous Stratigraphy of the Carolina Coastal Plain: The Geology of the Carolinas, University of Tennessee Press/Knoxville, p. 290-308.

Kueper, B.H., 1992, Site Characterization and Remediation of Dense, Immiscible Phase Liquid Contaminants (DNAPLS) in Porous and Fractured Media: Lecture Notes, Short Course Waterloo Centre for Groundwater Research, November 2-5, Chicago, Illinois.

Soller, D.R. and Mills, H.H., 1991, Surficial Geology and Geomorphology: The Geology of the Carolinas, The University of Tennessee Press/Knoxville, p. 290-308.

SURFER™, 1990, Golden Software, Inc., Golden, Colorado



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Air•Water•Soil
TECHNOLOGY

ETE Division
ViroGroup, Inc.
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Lexington, SC 29072
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FAX 803-957-3845
Watts 1-800-786-0654

SCALE	1:24,000
DRAWN BY	CAB
CHECKED BY	GBK
DATE	2/11/94

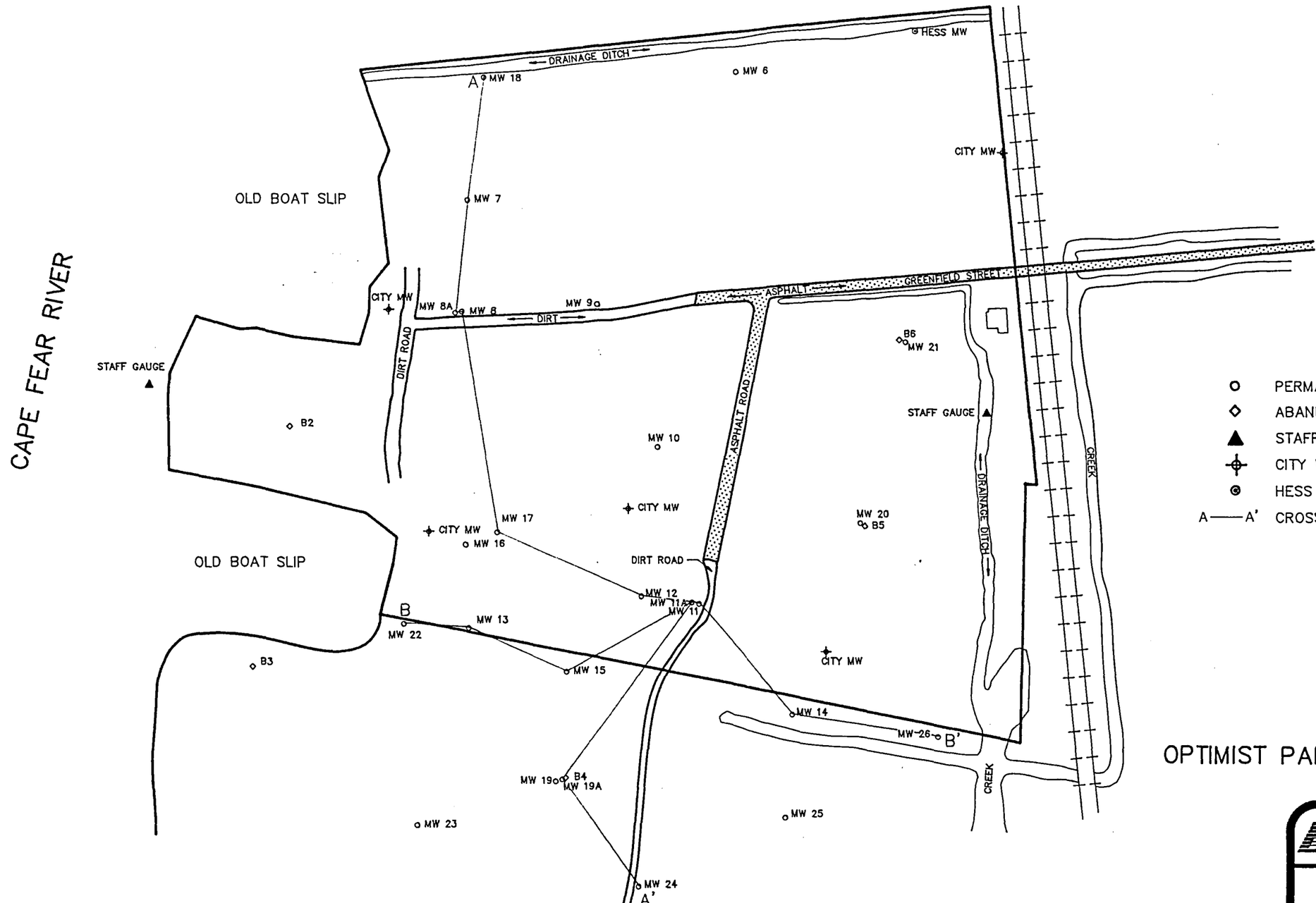
SITE LOCATION MAP
SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

FIGURE NO. 1

CADD NO. G:5301501

PROJECT NO. 12-53015.00

NO.	REVISION	DATE	BY



LEGEND

- ○ PERMANENT MONITORING WELLS (24)
- ◇ ABANDONED MONITORING WELLS (5)
- ▲ STAFF GAUGE (2)
- ✦ CITY WELLS (5)
- ⊙ HESS WELLS (1)
- A——A' CROSS-SECTION LOCATION LINE

OPTIMIST PARK

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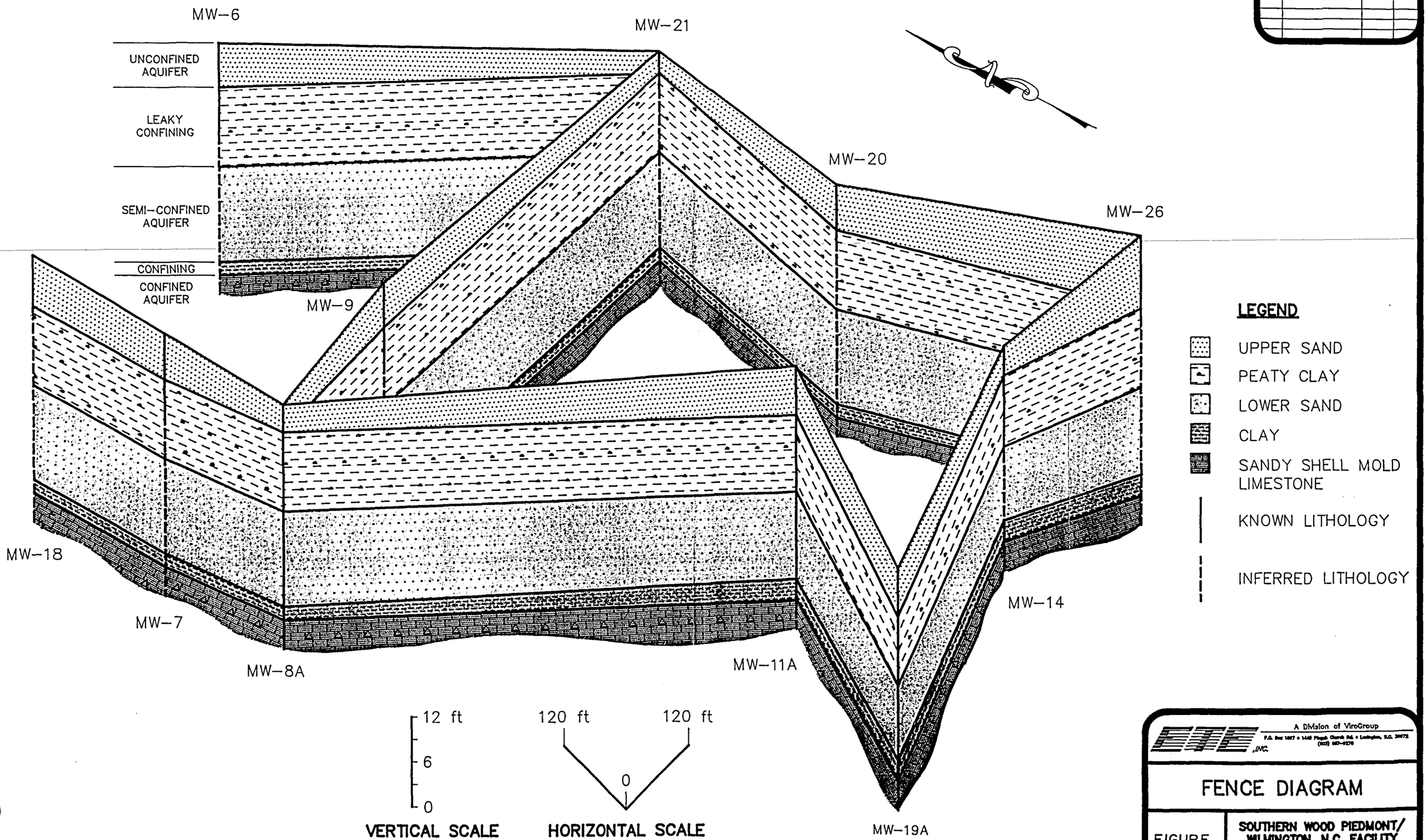
SITE MAP

FIGURE 2

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY:	JKB	DATE:	11/6/92
DESIGNED BY:	GBK	CADD NO:	53050304
APPROVED BY:	AMW	PROJECT NO:	530-06-503
SCALE:	1"=200'	SHEET NO.	OF

NO.	REVISION	DATE	BY



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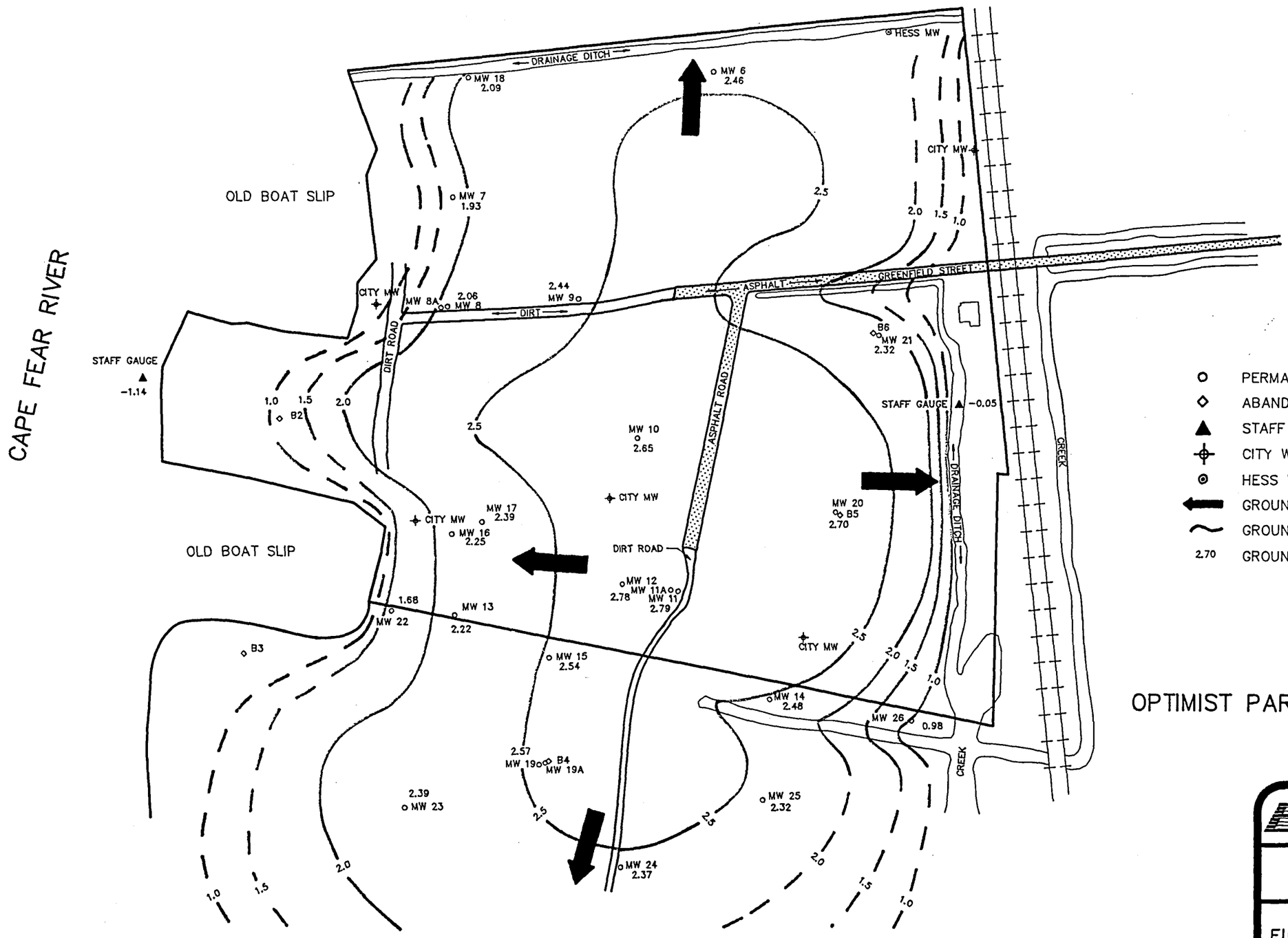
FENCE DIAGRAM

FIGURE 3

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY:	JKB	DATE:	10/29/92
DESIGNED BY:	GBK	CADD NO:	53050303
APPROVED BY:	AMW	PROJECT NO:	530-06-503
SCALE:	AS SHOWN	SHEET NO.	OF

NO.	REVISION	DATE	BY



LEGEND

- ○ PERMANENT MONITORING WELLS (24)
- ◇ ABANDONED MONITORING WELLS (5)
- ▲ STAFF GAUGE (2)
- ✦ CITY WELLS (5)
- ⊙ HESS WELLS (1)
- GROUNDWATER FLOW DIRECTION
- GROUNDWATER ISOELEVATION LINE
- 2.70 GROUNDWATER ELEVATION

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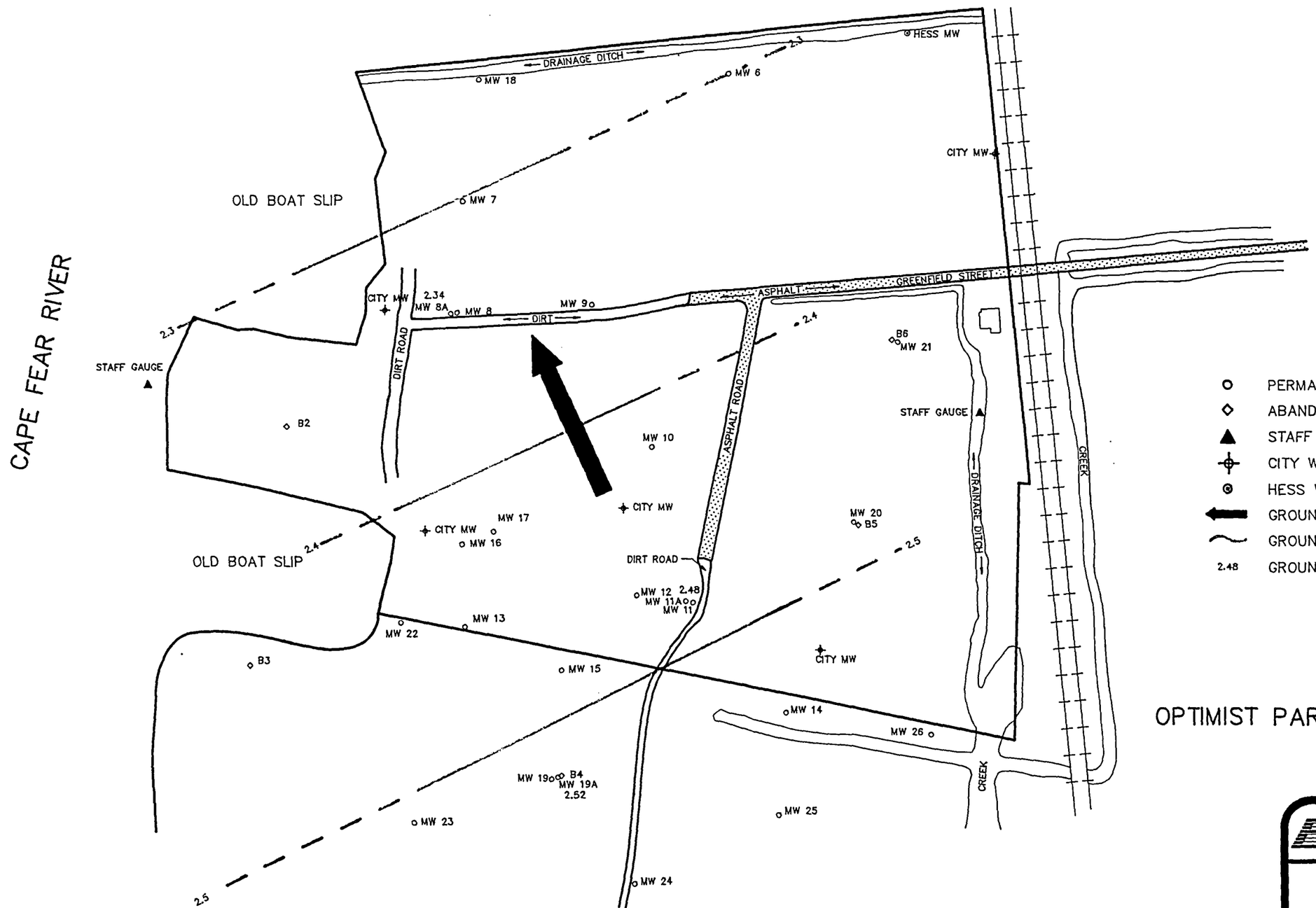
UPPER AQUIFER WATER TABLE MAP

FIGURE 4

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY:	JKB	DATE:	11/8/92
DESIGNED BY:	GBK	CADD NO:	53050304
APPROVED BY:	AMW	PROJECT NO:	530-06-503
SCALE:	1"=200'	SHEET NO.	OF

NO.	REVISION	DATE	BY



LEGEND

- PERMANENT MONITORING WELLS (24)
- ABANDONED MONITORING WELLS (5)
- STAFF GAUGE (2)
- CITY WELLS (5)
- HESS WELLS (1)
- GROUNDWATER FLOW DIRECTION
- GROUNDWATER ISOELEVATION LINE
- 2.48 GROUNDWATER ELEVATION

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LOWER AQUIFER POTENTIOMETRIC MAP

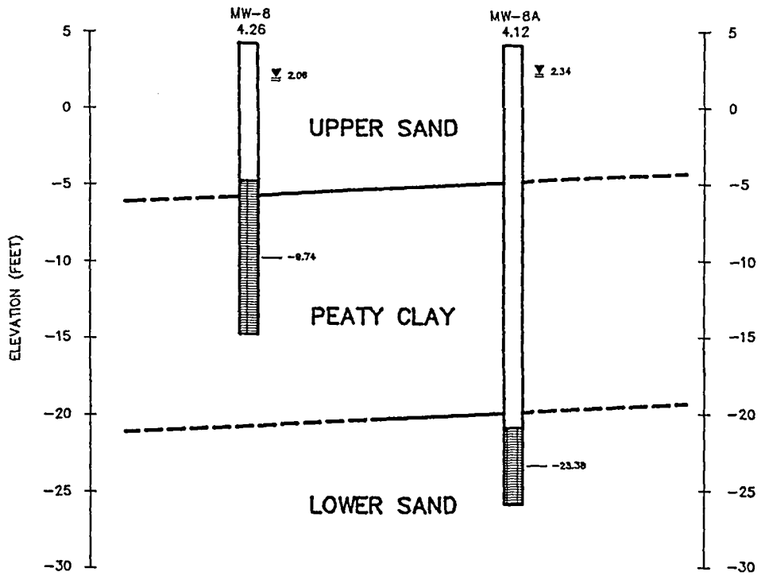
FIGURE 5

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY:	JKB	DATE:	11/6/92
DESIGNED BY:	GBK	CADD NO:	53050304
APPROVED BY:	AMW	PROJECT NO:	530-08-503
SCALE:	1"=200'	SHEET NO.	OF

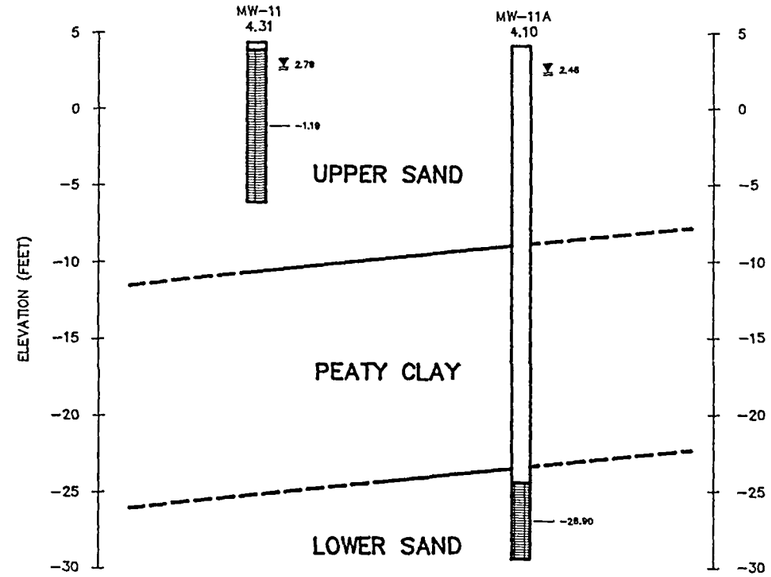
NO.	REVISION	DATE	BY

MW–8 AND MW–8A



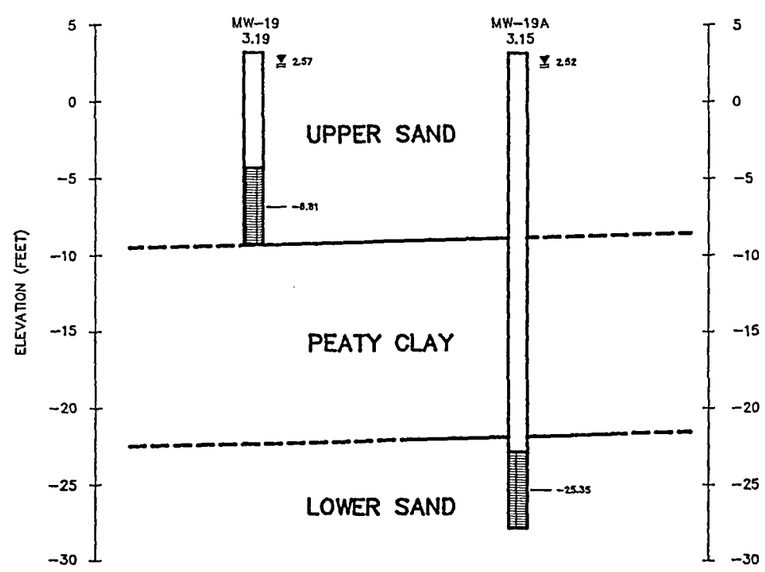
$$\frac{2.34 - 2.06}{(-23.38) - (-9.74)} = \text{UPWARD } 0.021 \text{ ft/ft}$$

MW–11 AND MW–11A



$$\frac{2.79 - 2.48}{(-1.19) - (-26.90)} = \text{DOWNWARD } 0.012 \text{ ft/ft}$$

MW–19 AND MW–19A



$$\frac{2.57 - 2.52}{(-6.81) - (-25.35)} = \text{DOWNWARD } 0.002 \text{ ft/ft}$$

LEGEND

SCREEN

WATER LEVEL

–23.38 MID–SCREEN ELEVATION

SCALE

VERTICAL: 1" = 10'

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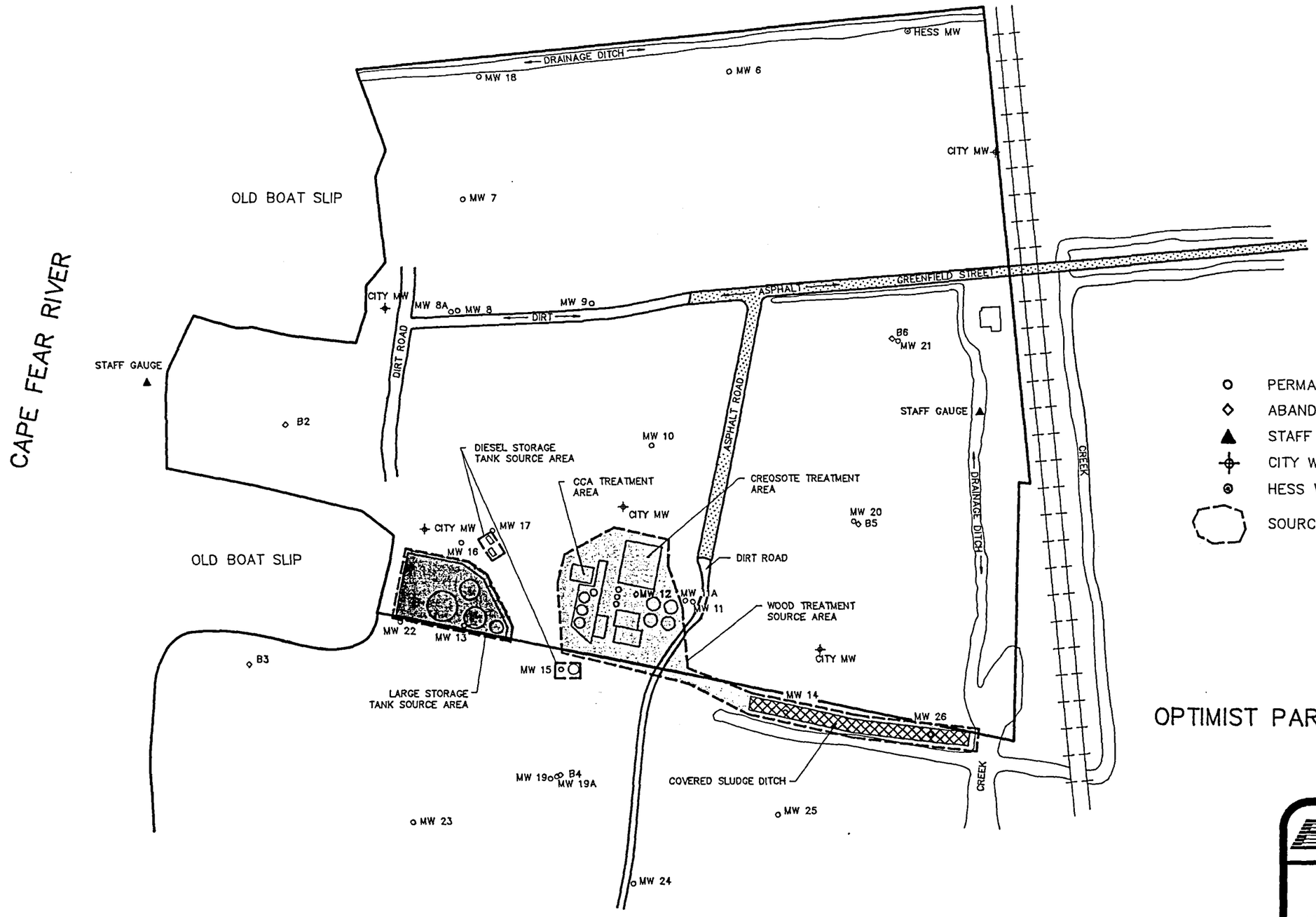
VERTICAL HYDRAULIC GRADIENTS

FIGURE 6

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY:	JKB	DATE:	1/18/93
DESIGNED BY:	GBK	CADD NO:	53050309
APPROVED BY:	AMW	PROJECT NO:	530–06–503
SCALE:	AS SHOWN	SHEET NO.	OF

NO.	REVISION	DATE	BY



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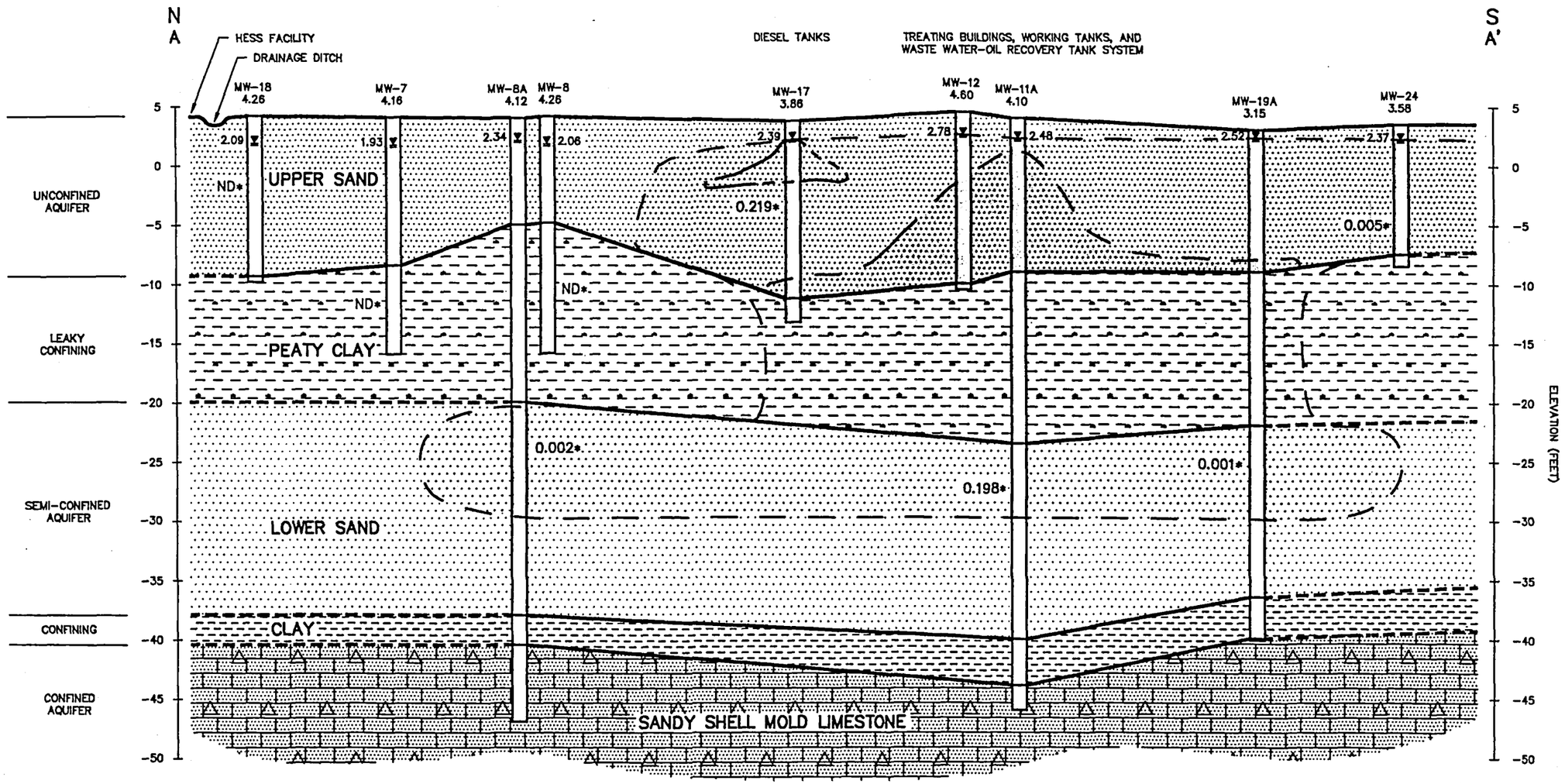
SOURCE AREA LOCATION MAP

FIGURE 7

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY	JKB	DATE	1/18/93
DESIGNED BY	GBK	CADD NO.	53050311
APPROVED BY	AMW	PROJECT NO.	530-08-503
SCALE	1"=200'	SHEET NO.	OF

NO.	REVISION	DATE	BY



LEGEND

- UPPER SAND
- PEATY CLAY
- LOWER SAND
- CLAY
- SANDY SHELL MOLD LIMESTONE
- CREOSOTE STAINED SOILS
- DIESEL STAINED SOILS
- TOTAL DISSOLVED ORGANICS PLUME
- 2.37 ▼ WATER LEVEL
- 0.198* TOTAL DISSOLVED ORGANICS (ppm)

SCALE

HORIZONTAL: 1" = 200'
VERTICAL: 1" = 10'

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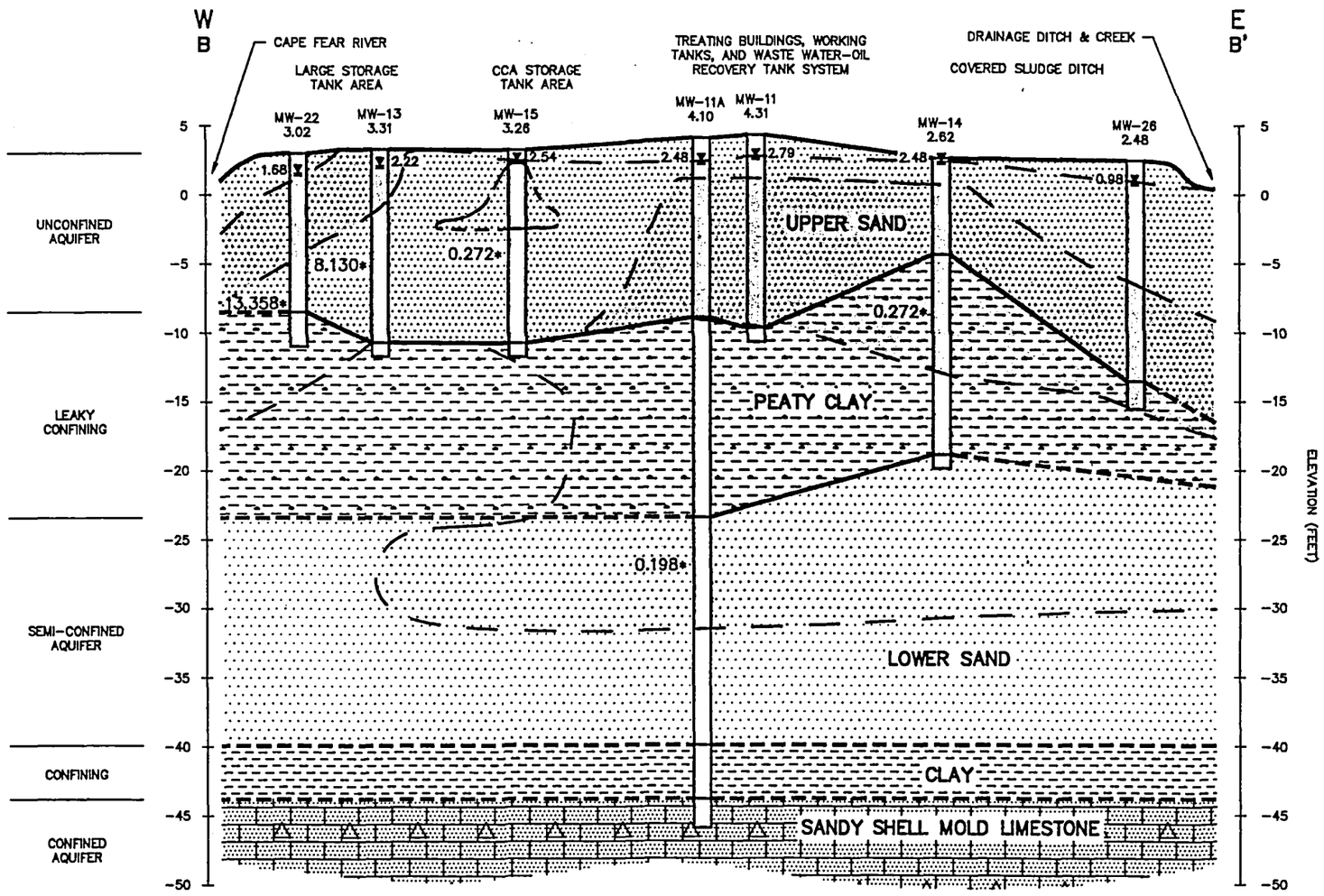
HYDROGEOLOGIC CROSS-SECTION A – A'

FIGURE 8

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY	JKB	DATE	1/18/93
DESIGNED BY	GBK	DWG NO.	53050308
APPROVED BY	AMW	PROJECT NO.	530-08-503
SCALE	AS SHOWN	SHEET NO.	OF

NO.	REVISION	DATE	BY



LEGEND

- UPPER SAND
- PEATY CLAY
- LOWER SAND
- CLAY
- SANDY SHELL MOLD LIMESTONE
- CREOSOTE STAINED SOILS
- DIESEL STAINED SOILS
- TOTAL DISSOLVED ORGANICS PLUME
- 0.98 ▼ WATER LEVEL
- 0.198* TOTAL DISSOLVED ORGANICS (ppm)

SCALE

HORIZONTAL: 1" = 200'
VERTICAL: 1" = 10'

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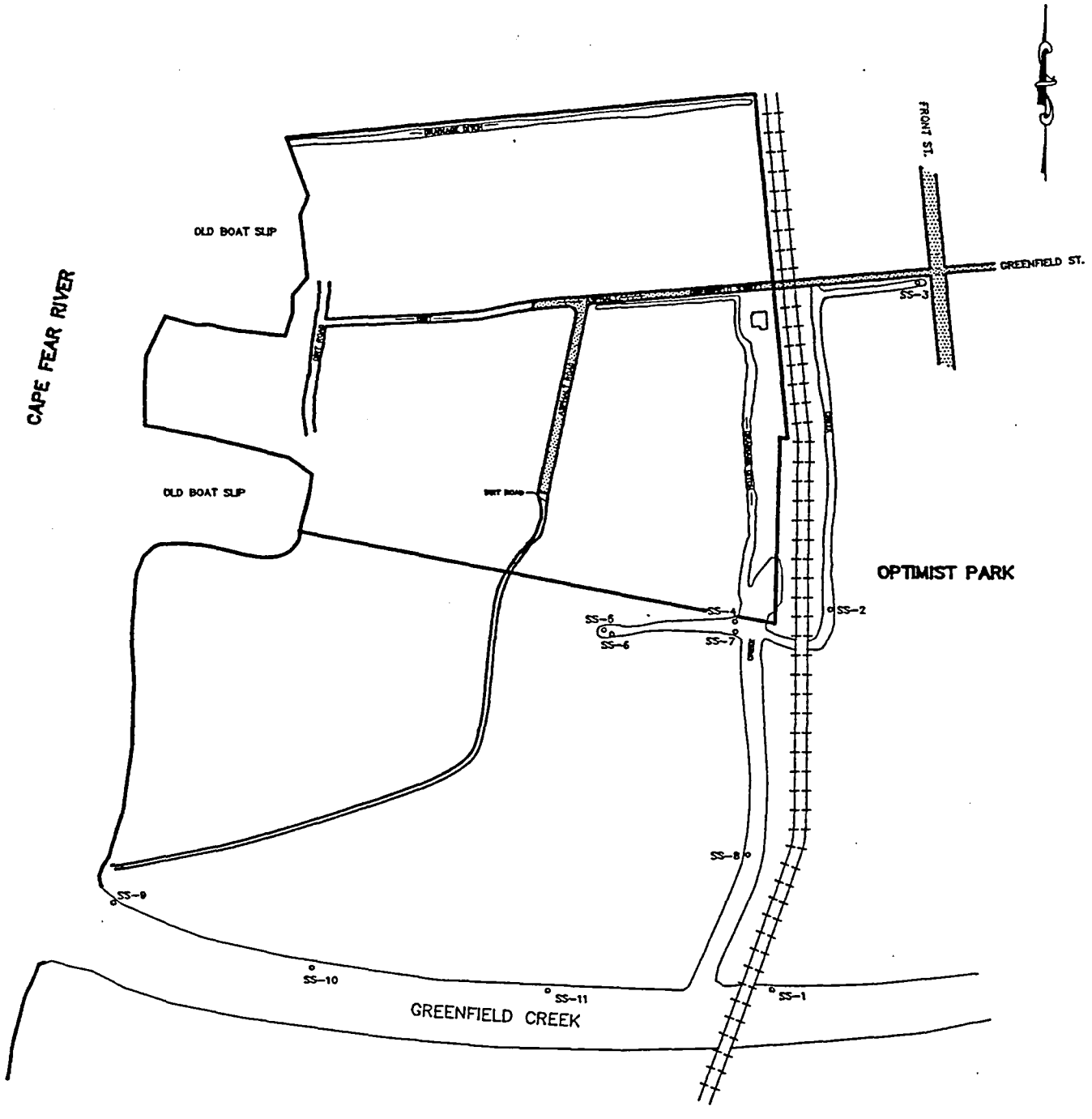
HYDROGEOLOGIC CROSS-SECTION B – B'

FIGURE 9

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY	JKB	DATE	1/18/93
DESIGNED BY	GBK	CADD NO.	53050307
APPROVED BY	AMW	PROJECT NO.	530-08-503
SCALE	AS SHOWN	SHEET NO.	OF



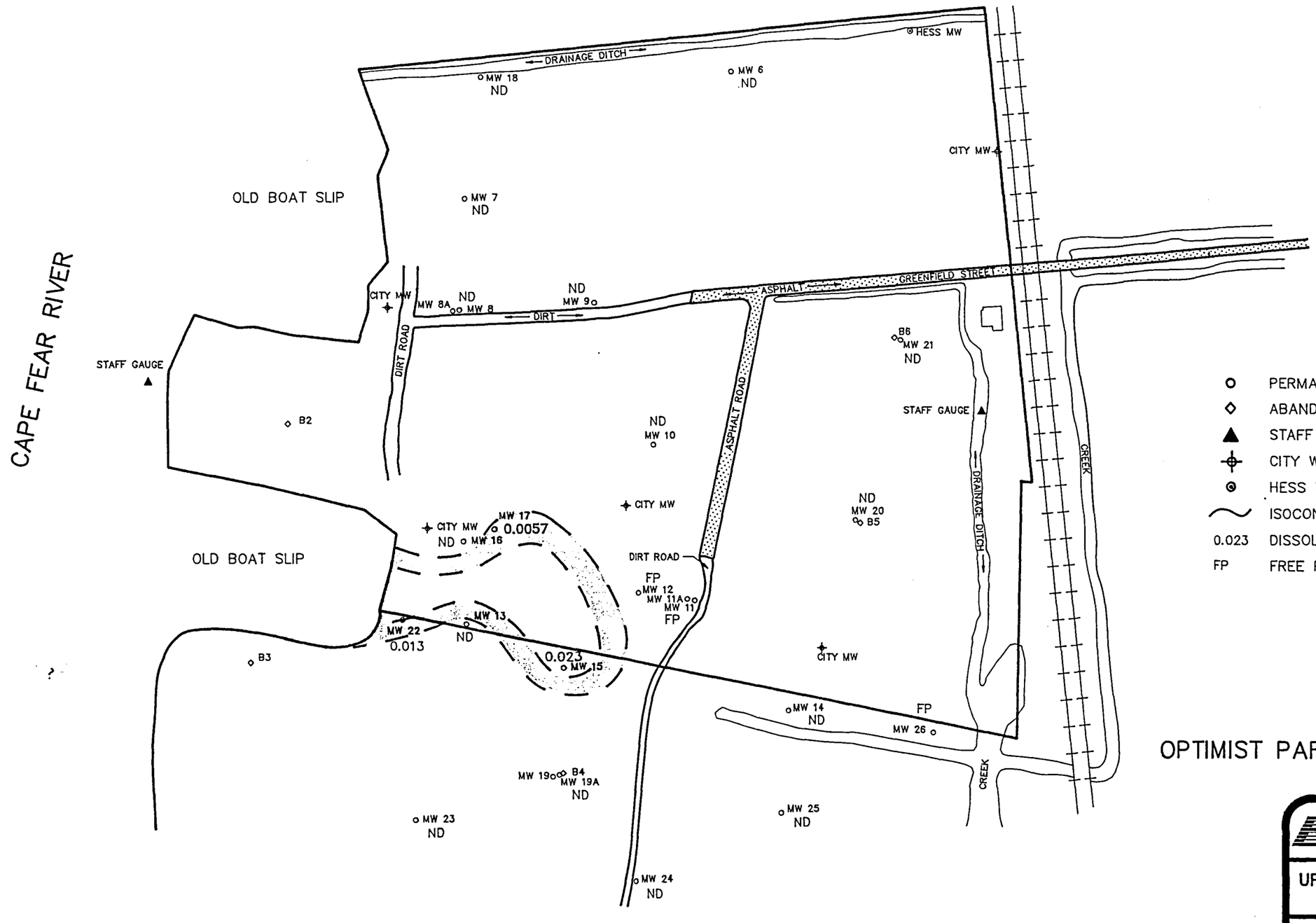
NOTE: SOIL SAMPLE LOCATIONS TO SCALE
CREEK, ROADS, AND RAILROAD N.T.S.

LEGEND

• SOIL SAMPLE LOCATION

ETE, Inc. A Division of VecGroup P.O. Box 1987 • 1445 Pleasant Church Rd. • Lexington, S.C. 29072 (803) 957-6270	SCALE 1"=400'	SOIL SAMPLE LOCATION MAP SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY	FIGURE 10
	DRAWN BY JKB		CADD NO. 53050310
	CHECKED BY GBK		PROJECT NO. 530-06-503
	DATE 1/18/93		

NO.	REVISION	DATE	BY



LEGEND

- ○ PERMANENT MONITORING WELLS (24)
- ◇ ABANDONED MONITORING WELLS (5)
- ▲ STAFF GAUGE (2)
- ✦ CITY WELLS (5)
- ⊙ HESS WELLS (1)
- ~ ISOCONCENTRATION LINE
- 0.023 DISSOLVED ARSENIC CONCENTRATION (ppm)
- FP FREE PRODUCT IN WELL

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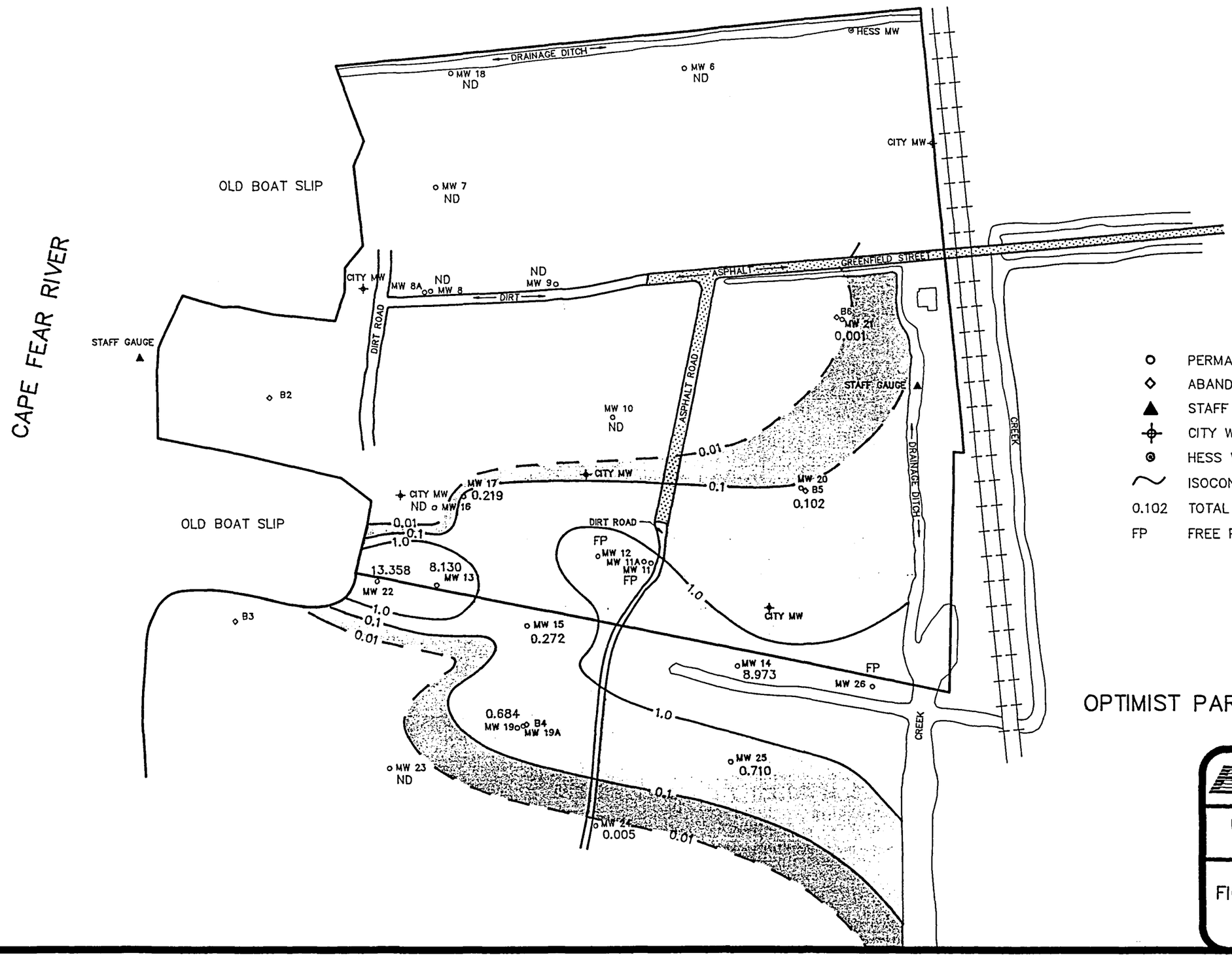
UPPER AQUIFER DISSOLVED ARSENIC ISOCONCENTRATION MAP

FIGURE 11

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY:	JKB	DATE:	11/6/92
DESIGNED BY:	GBK	CADD No:	53050304
APPROVED BY:	AMW	PROJECT No:	530-06-503
SCALE:	1"=200'	SHEET No:	OF

NO.	REVISION	DATE	BY



LEGEND

- ○ PERMANENT MONITORING WELLS (24)
- ◇ ABANDONED MONITORING WELLS (5)
- ▲ STAFF GAUGE (2)
- ⊕ CITY WELLS (5)
- ⊙ HESS WELLS (1)
- ~ ISOCONCENTRATION LINE
- 0.102 TOTAL ORGANIC CONCENTRATION (ppm)
- FP FREE PRODUCT IN WELL

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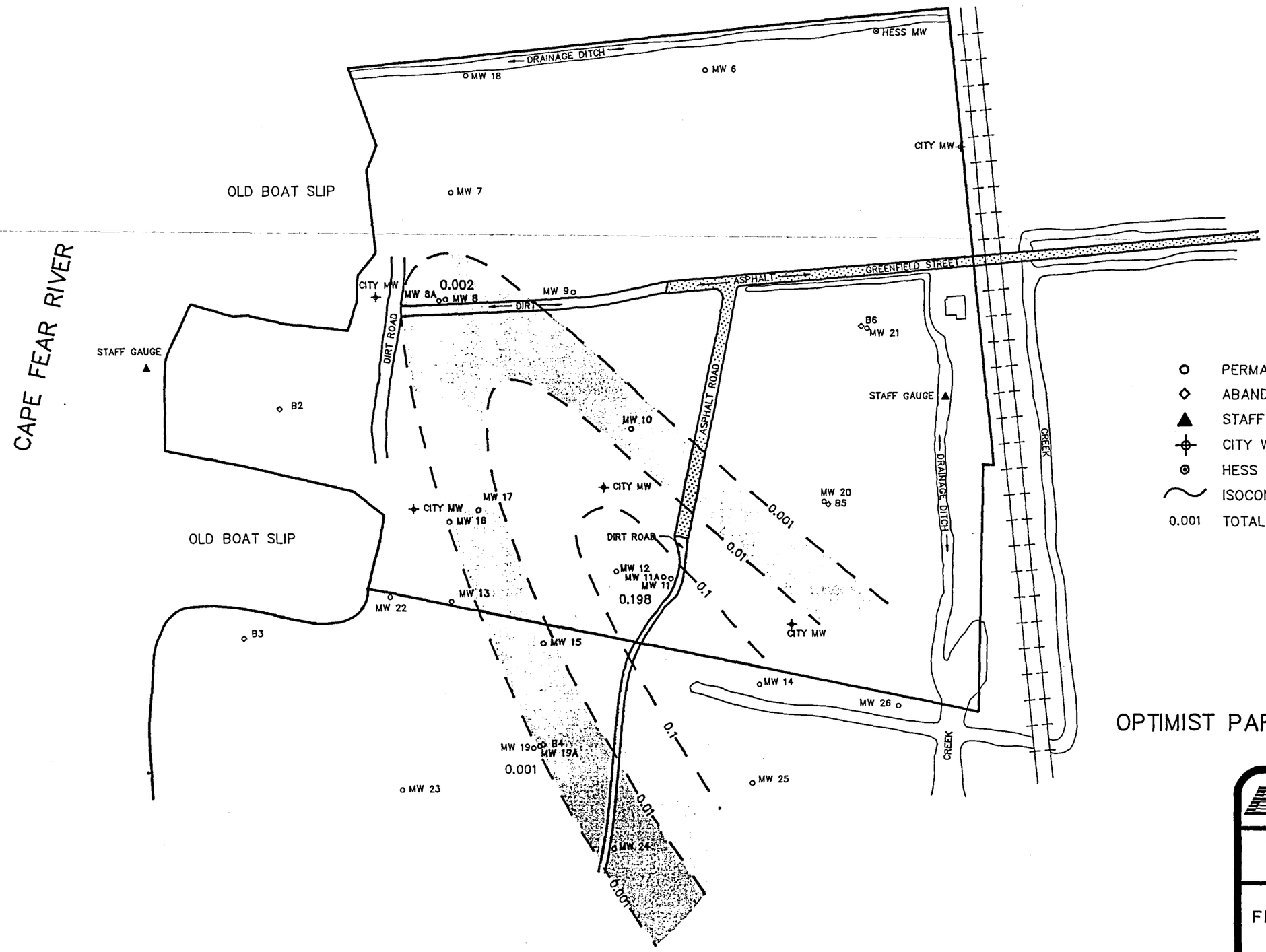
UPPER AQUIFER TOTAL ORGANIC ISOCONCENTRATION MAP

FIGURE 12

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY	JKB	DATE	1/18/93
DESIGNED BY	GBK	CADD NO.	53050304
APPROVED BY	AMW	PROJECT NO.	530-06-503
SCALE	1"=200'	SHEET NO.	OF

NO.	REVISION	DATE	BY



LEGEND

- ○ PERMANENT MONITORING WELLS (24)
- ◇ ABANDONED MONITORING WELLS (5)
- ▲ STAFF GAUGE (2)
- ✦ CITY WELLS (5)
- ⊙ HESS WELLS (1)
- ~ ISOCONCENTRATION LINE
- 0.001 TOTAL ORGANIC CONCENTRATION (ppm)

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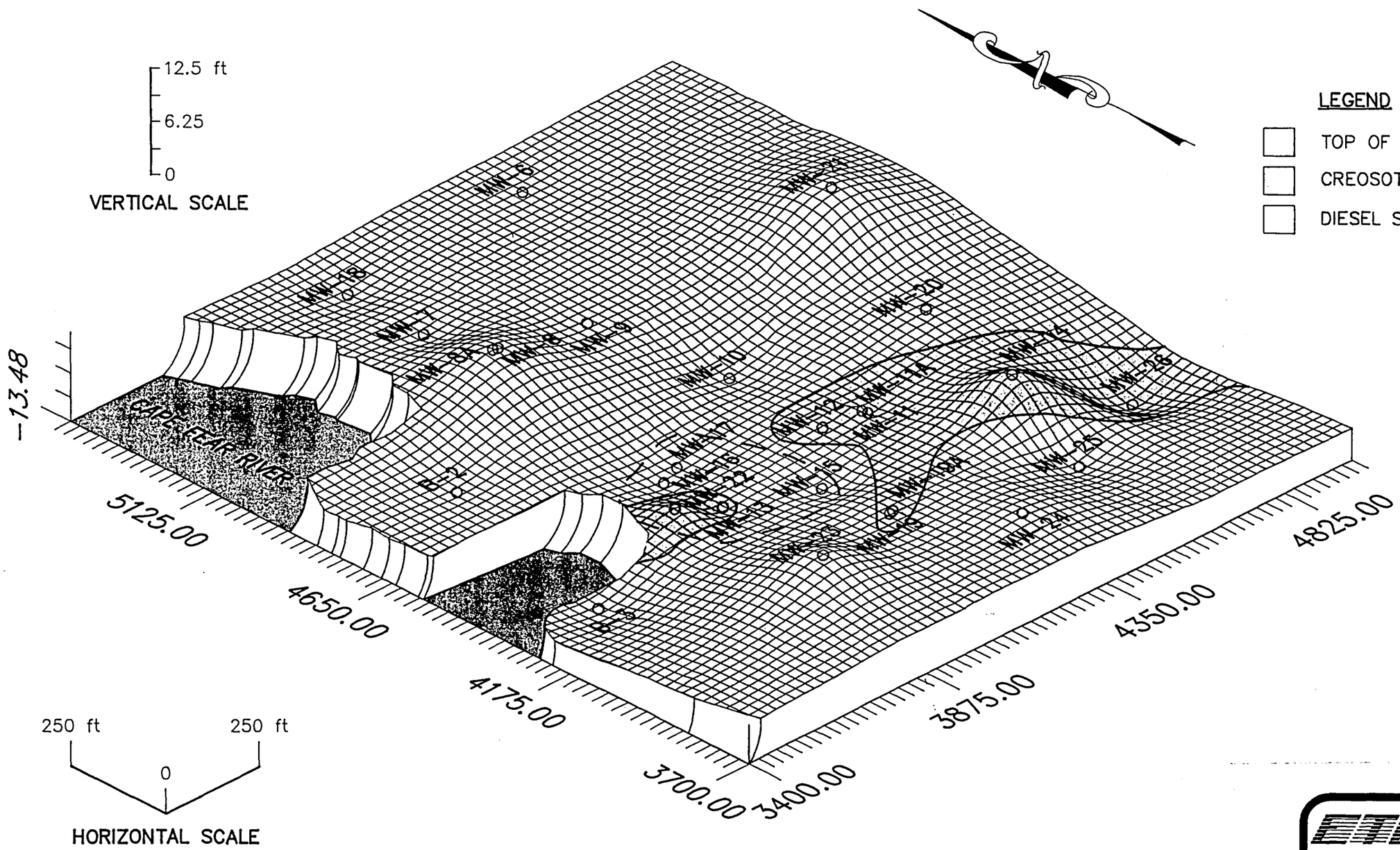
LOWER AQUIFER TOTAL ORGANIC ISOCONCENTRATION MAP

FIGURE 13

SOUTHERN WOOD PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY:	JKB	DATE:	11/6/92
DESIGNED BY:	GBK	CADD NO:	53050304
APPROVED BY:	AMW	PROJECT NO:	530-06-503
SCALE:	1"=200'	SHEET NO:	OF

NO.	REVISION	DATE	BY



NOTE: VERTICAL EXAGGERATION = 20:1

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THREE-DIMENSIONAL VIEW OF TOP OF PEATY CLAY

FIGURE 14

SOUTHERN WOOD-PIEDMONT/ WILMINGTON, N.C. FACILITY

DRAWN BY:	JKB	DATE:	11/2/92
DESIGNED BY:	GBK	CADD NO:	53050306
APPROVED BY:	AMW	PROJECT NO:	530-06-503
SCALE:	AS SHOWN	SHEET NO.	OF

FORM# AB350

WELL ABANDONMENT RECORD

, Inc.
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(803) 957-6270

1. WELL LOCATION: (Show a sketch of well loaction.)

Nearest Town: Wilmington, N.C.

(Road, Community, Subdivision, Lot No.)

ABANDONMENT DATE 9/28/92

County: New Hanover

Quadrangle Name: Wilmington

Well No. B-2

2. OWNER: SWP

3. ADDRESS: Foot of Greenfield Street

4. TOPOGRAPHY: draw, slope, hilltop, valley, flat. Flat

5. USE OF WELL: Monitoring DATE: 9/28/92

6. TOTAL DEPTH: 13' DIAMETER: 2"

7. CASING AND SCREEN REMOVED:

	FEET	DIAMETER
PIT CASING:		
WELL CASING:	8'	2" Riser PVC
WELL SCREEN:	5'	2" #10 Slot PVC

8. SEALING MATERIAL

Neat Cement

bags of cement: 3

gals. of water: 18

Sand Cement

bags of cement:

yds. of sand:

gals. of water:

Other

Type material:

Amount:

9. EXPLAIN METHOD OF GROUT PLACEMENT:

Over-ream & tremie

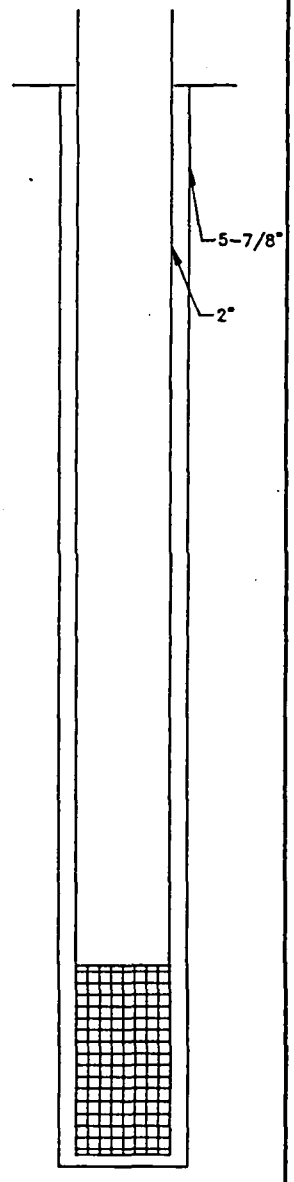
I do hereby certify that this well abandonment record is true and exact.

Signature

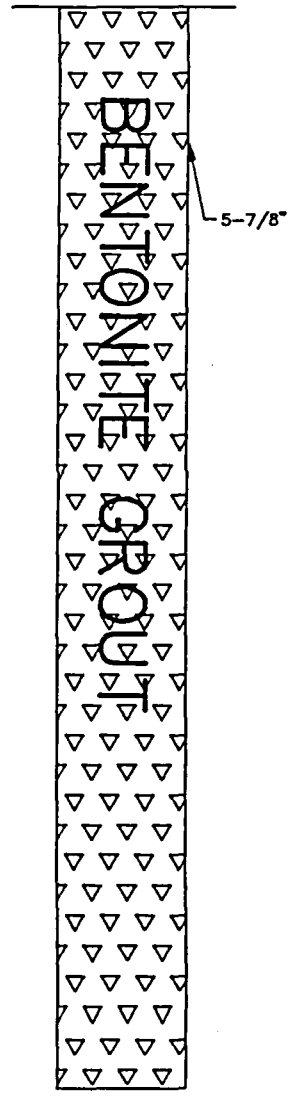
License No. Date

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, diameter and construction details prior to and subsequent to abandonment.

BEFORE



AFTER



, Inc.
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(803) 957-6270

FORM# AB350

WELL ABANDONMENT RECORD

1. WELL LOCATION: (Show a sketch of well loaction.)

Nearest Town: Wilmington, N.C.

(Road, Community, Subdivision, Lot No.)

ABANDONMENT DATE 9/28/92

County: New Hanover

Quadrangle Name: Wilmington

Well No. B-3

2. OWNER: SWP

3. ADDRESS: Foot of Greenfield Street

4. TOPOGRAPHY: draw, slope, hilltop, valley, flat. Flat

5. USE OF WELL: Temp. Monitoring DATE: 9/28/92

6. TOTAL DEPTH: 16' DIAMETER: 2"

7. CASING AND SCREEN REMOVED:

	FEET	DIAMETER
PIT CASING:		
WELL CASING:	8'	2" Riser PVC
WELL SCREEN:	5'	2" #10 Slot PVC

8. SEALING MATERIAL

Neat Cement

bags of cement: 4

gals. of water: 24

Sand Cement

bags of cement:

yds. of sand:

gals. of water:

Other

Type material:

Amount:

9. EXPLAIN METHOD OF GROUT PLACEMENT:

Over-ream & tremie

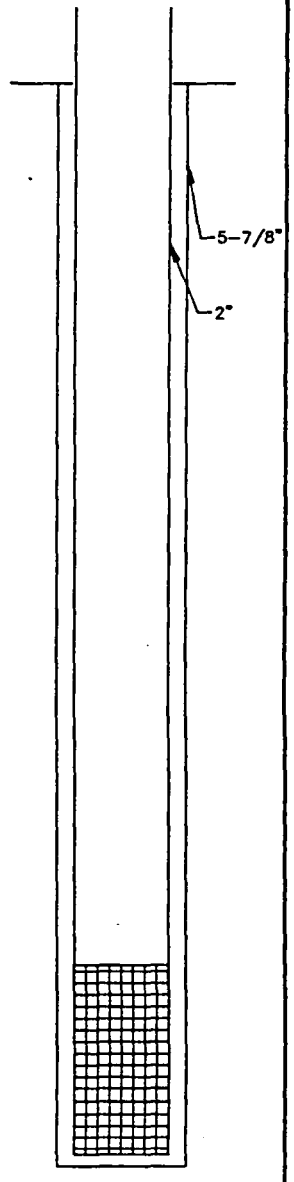
I do hereby certify that this well abandonment record is true and exact.

Signature

License No. Date

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, diameter and construction details prior to and subsequent to abandonment.

BEFORE



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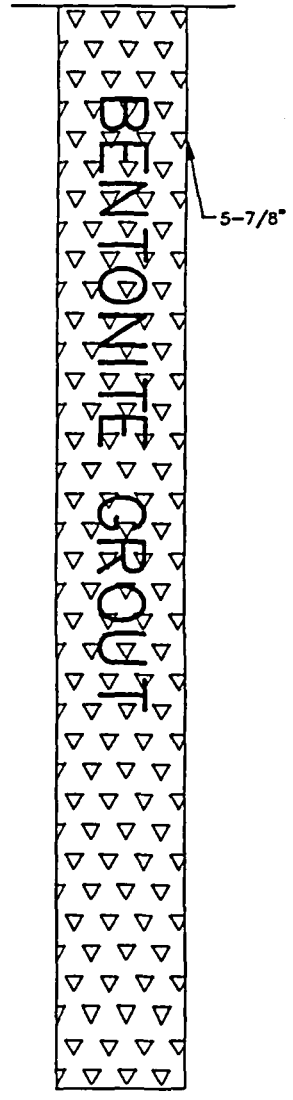


FORM# AB350

WELL ABANDONMENT RECORD

, Inc.
A Division of ViroGroup
P.O. Box 1867 • 1445 Pisgah Church Rd. • Lexington, S.C. 29072
(803) 957-6270

1. WELL LOCATION: (Show a sketch of well loaction.)

Nearest Town: Wilmington, N.C.

(Road, Community, Subdivision, Lot No.)

ABANDONMENT DATE 9/28/92

County: New Hanover

Quadrangle Name: Wilmington

Well No. B-4

2. OWNER: SWP

3. ADDRESS: Foot of Greenfield Street

4. TOPOGRAPHY: draw, slope, hilltop, valley, flat. Flat

5. USE OF WELL: Monitoring DATE: 9/28/92

6. TOTAL DEPTH: 14' DIAMETER: 2"

7. CASING AND SCREEN REMOVED:

	FEET	DIAMETER
PIT CASING:		
WELL CASING:	9'	2" Riser PVC
WELL SCREEN:	5'	2" #10 Slot PVC

8. SEALING MATERIAL

Neat Cement

bags of cement: 3

gals. of water: 18

Sand Cement

bags of cement:

yds. of sand:

gals. of water:

Other

Type material:

Amount:

9. EXPLAIN METHOD OF GROUT PLACEMENT:

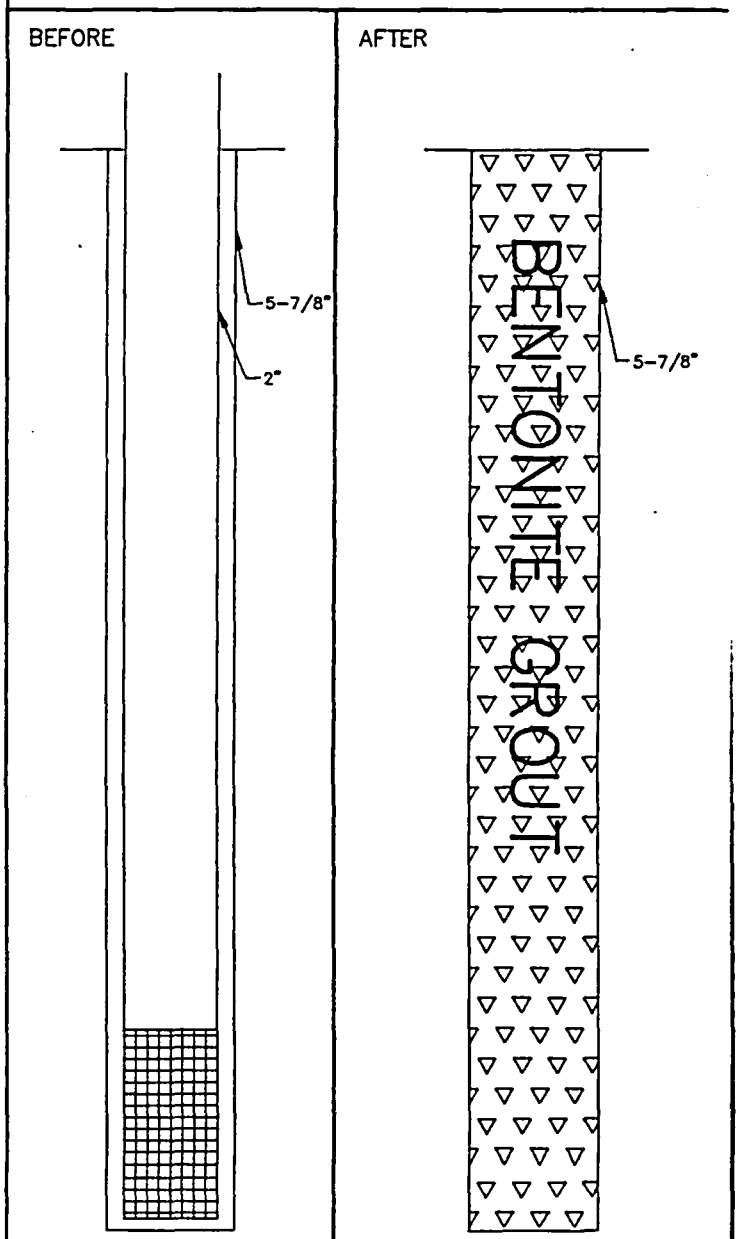
Over-ream & tremie

I do hereby certify that this well abandonment record is true and exact.

Signature

License No. Date

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, diameter and construction details prior to and subsequent to abandonment.



, Inc.
A Division of ViroGroup
P.O. Box 1867 • 1445 Pisgah Church Rd. • Lexington, S.C. 29072
(803) 957-6270

FORM# AB350

WELL ABANDONMENT RECORD

1. WELL LOCATION: (Show a sketch of well loaction.)

ABANDONMENT DATE 9/28/92

Nearest Town: Wilmington, N.C.

(Road, Community, Subdivision, Lot No.)

County: New Hanover

Quadrangle Name: Wilmington

Well No. B-5

2. OWNER: SWP

3. ADDRESS: Foot of Greenfield Street

4. TOPOGRAPHY: draw, slope, hilltop, valley, flat. Flat

5. USE OF WELL: Monitoring DATE: 9/28/92

6. TOTAL DEPTH: 12' DIAMETER: 2"

7. CASING AND SCREEN REMOVED:

	FEET	DIAMETER
PIT CASING:		
WELL CASING:	7'	2" Riser PVC
WELL SCREEN:	5'	2" #10 Slot PVC

8. SEALING MATERIAL

Neat Cement

bags of cement: 3

gals. of water: 18

Sand Cement

bags of cement:

yds. of sand:

gals. of water:

Other

Type material:

Amount:

9. EXPLAIN METHOD OF GROUT PLACEMENT:

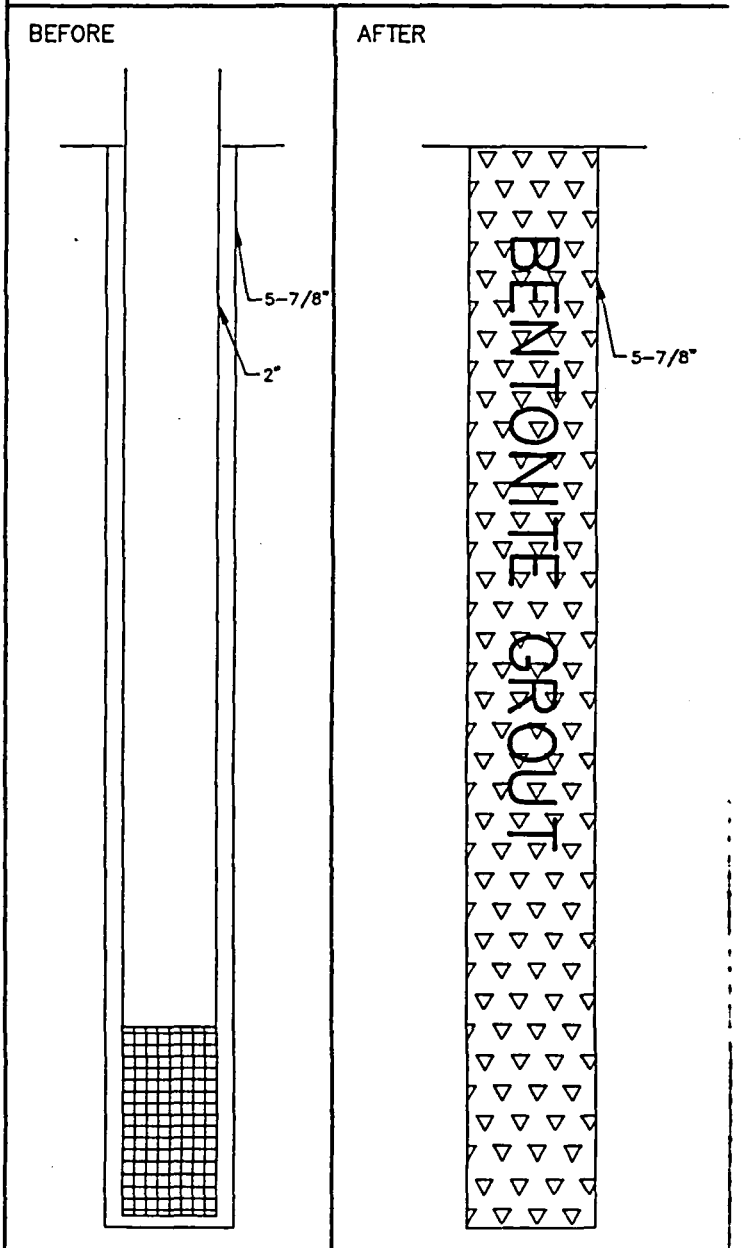
Over-ream & tremie

I do hereby certify that this well abandonment record is true and exact.

Signature

License No. Date

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, diameter and construction details prior to and subsequent to abandonment.



FORM# AB350

WELL ABANDONMENT RECORD

, Inc.
A Division of ViroGroup
P.O. Box 1867 • 1445 Pisgah Church Rd. • Lexington, S.C. 29072
(803) 957-6270

1. WELL LOCATION: (Show a sketch of well loaction.)

ABANDONMENT DATE 9/28/92

Nearest Town: Wilmington, N.C.

(Road, Community, Subdivision, Lot No.)

County: New Hanover

Quadrangle Name: Wilmington

Well No. B-6

2. OWNER: SWP

3. ADDRESS: Foot of Greenfield Street

4. TOPOGRAPHY: draw, slope, hilltop, valley, flat. Flat

5. USE OF WELL: Monitoring DATE: 9/28/92

6. TOTAL DEPTH: 10' DIAMETER: 2"

7. CASING AND SCREEN REMOVED:

	FEET	DIAMETER
PIT CASING:		
WELL CASING:	5'	2" Riser PVC
WELL SCREEN:	5'	2" #10 Slot PVC

8. SEALING MATERIAL

Neat Cement

bags of cement: 3

gals. of water: 18

Sand Cement

bags of cement:

yds. of sand:

gals. of water:

Other

Type material:

Amount:

9. EXPLAIN METHOD OF GROUT PLACEMENT:

Over-ream & tremie

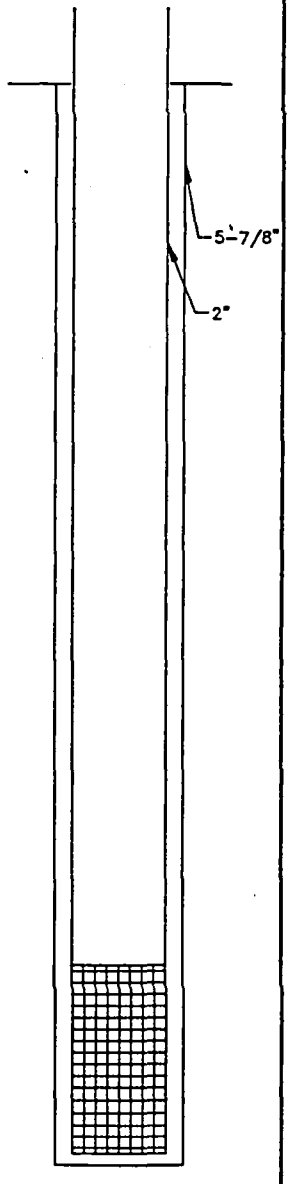
I do hereby certify that this well abandonment record is true and exact.

Signature

License No. Date

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, diameter and construction details prior to and subsequent to abandonment.

BEFORE



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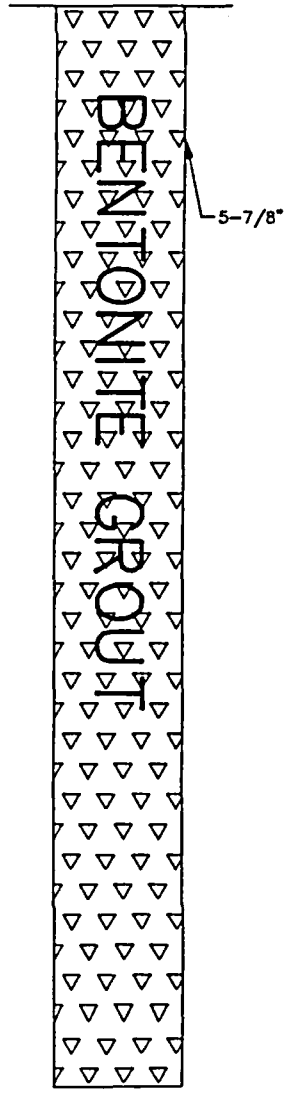


Well Log Database Table

WELL LOG DATABASE
SOUTHERN WOOD PIEDMONT - WILMINGTON, NORTH CAROLINA FACILITY

Plant	Well	Inst Date	Boring Term	Surface Elev	Riser Elev	Bottom Elev	Well Depth	Riser Depth
WIL	MW-6	09/05/85	20.00	3.40	5.07	-16.38	19.78	21.45
WIL	MW-7	09/06/85	19.80	3.87	6.03	-15.65	19.52	21.68
WIL	MW-8	09/09/85	19.20	4.16	6.80	-14.86	19.02	21.66
WIL	MW-8A	10/01/92	51.00	4.12	6.43	-26.63	30.75	33.06
WIL	MW-9	09/10/85	19.40	4.26	6.43	-14.96	19.22	21.39
WIL	MW-10	02/18/92	13.00	3.63	7.41	-6.87	10.50	14.28
WIL	MW-11	02/18/92	13.00	4.31	8.02	-6.19	10.50	14.21
WIL	MW-11A	10/01/92	50.00	4.10	6.38	-29.79	33.89	36.17
WIL	MW-12	02/18/92	12.00	4.60	8.22	-5.90	10.50	14.12
WIL	MW-13	02/18/92	12.00	3.31	6.97	-7.19	10.50	14.16
WIL	MW-14	02/19/92	22.00	2.62	6.30	-13.38	16.0	19.68
WIL	MW-15	02/19/92	13.00	3.26	7.07	-7.24	10.50	14.31
WIL	MW-16	02/19/92	13.00	3.88	7.69	-6.62	10.50	14.31
WIL	MW-17	02/19/92	15.00	3.86	7.65	-6.64	10.50	14.29
WIL	MW-18	10/07/92	14.00	4.26	6.61	-6.87	11.13	13.48
WIL	MW-19	10/06/92	14.00	3.19	5.44	-9.68	12.87	15.12
WIL	MW-19A	10/02/92	43.17	3.15	5.25	-28.02	31.17	33.27
WIL	MW-20	10/07/92	14.00	3.17	5.44	-9.13	12.30	14.57
WIL	MW-21	10/07/92	10.00	3.17	5.34	-3.62	6.79	8.96
WIL	MW-22	10/07/92	14.00	3.02	5.26	-8.09	11.11	13.35
WIL	MW-23	10/08/92	12.00	2.67	4.96	-6.39	9.06	11.35
WIL	MW-24	10/05/92	12.00	3.58	5.79	-8.02	11.60	13.81
WIL	MW-25	10/08/92	13.00	1.78	4.96	-10.27	12.05	15.23
WIL	MW-26	10/05/92	18.00	2.48	4.91	-15.14	17.62	20.05

Boring Logs

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. B-2

PROJECT: SOUTHERN WOOD PIEDMONNT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-19-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-19-92	

WELL CONSTRUCTION	DEPTH FEET	SAMPLE: URBLAST	No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
	0						
CLAY / PLUG	5		1	SS		Medium to coarse brown SAND	Water saturated OVA = 0.0
SAND PACK / SAND PACK	10		2	SS		Same as above	No visual contamination OVA = 0.0
	15		3	SS		Brown to black PEAT with root fragments	No visual contamination OVA = 2.0
	20						
	25						
	30						
	35						
	40						
	45						
	50						

H:530501B2

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. B-3

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-20-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-20-92	

WELL CONSTRUCTION: CLAY; PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE NO.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0					
5	1	SS		Fine to medium brown SAND with small wood fragments at 4.5 feet	Water saturated OVA = 3.1
10	2	SS		Same as above	No visual contamination OVA = 0.9
15	3	SS		Dark brown to black PEAT with wood fragments	No visual contamination OVA = 0.8
20					
25					
30					
35					
40					
45					
50					

H:530501B3

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. B-4

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-20-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-20-92	

WELL CONSTRUCTION	DEPTH FEET	SAMPLE: LITHOLOGY	SAMPLE: No.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	CLASSIFICATION	REMARKS
	0						Visual creosote at top of hole
			1	SS		Fine to medium brown SAND with wood fragments	No visual contamination OVA = 1.7
CLAY	5						
SAND PACK / PLUG			2	SS		Same as above	No visual contamination OVA = 5.1
SAND PACK	10						
			3	SS			Visual creosote in sand above PEAT OVA = 98.9
	15					Dark brown to black PEAT with wood fragments	
	20						
	25						
	30						
	35						
	40						
	45						
	50						

H:530501B4

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. B-5

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-20-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-20-92	

WELL CONSTRUCTION	DEPTH FEET	SAMPLE: LITHOLOGY	No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
CLAY; PLUG; SAND PACK; SAND PACK	0		1	SS		Fine to medium brown SAND	Water saturated No visual contamiation OVA = 54.3
	5		2	SS		Same as above	OVA = 21.7
	10		3	SS		Dark black to brown PEAT with wood fragments	No visual contamination OVA = 3.9
	15						
	20						
	25						
	30						
	35						
	40						
	45						
	50						

H:530501B5

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. B-6

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-20-923	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-20-92	

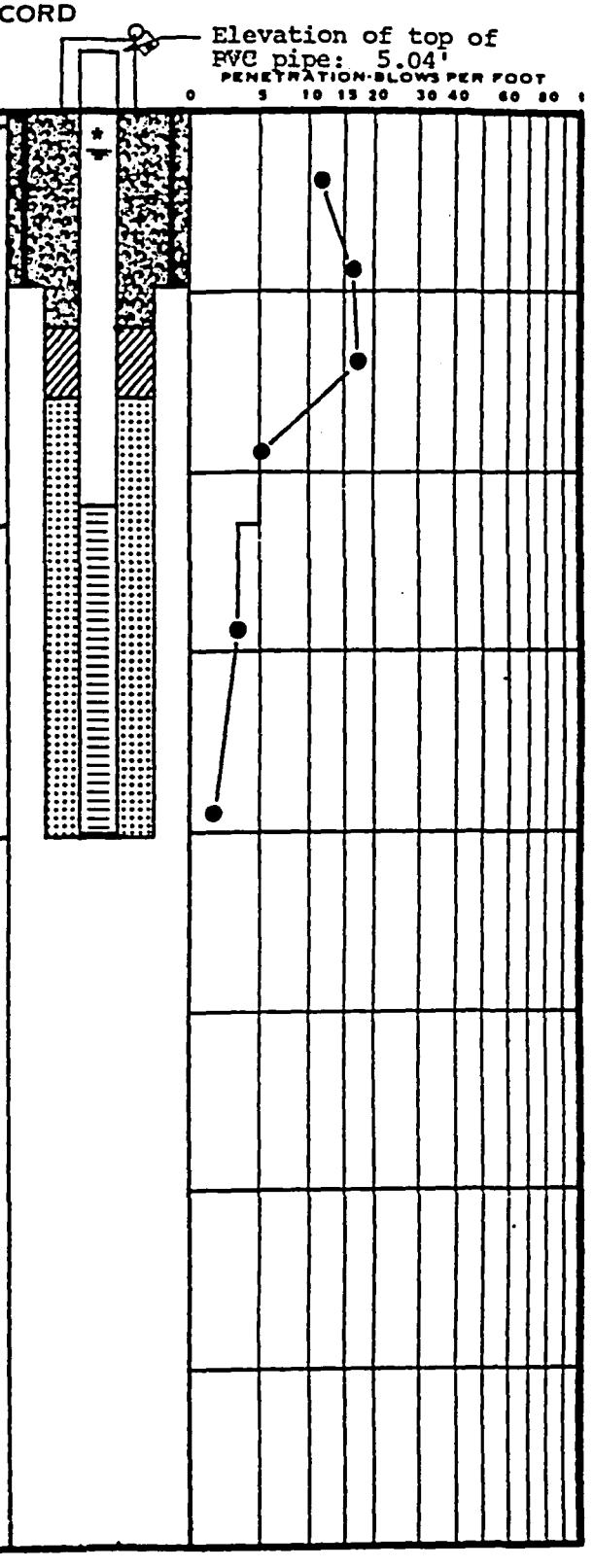
WELL CONSTRUCTION	DEPTH FEET	SAMPLE: LITHOLOGY	No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
CLAY; PLUG; SAND PACK; SAND PACK	0						
			1	SS		Fine to mdedium brown SAND	Water saturated No visual contamination OVA = 1.7
	5						
			2	SS		Dark brown to black PEAT with wood fragments	OVA = 1.0
	10						
	15						
	20						
	25						
	30						
	35						
	40						
	45						
	50						

H:530501B6

TEST BORING RECORD

Elevation of top of PVC pipe: 5.04'

ELEV.	DEPTH FEET	DESCRIPTION
3.46	0.0	
	0.5	FILL: Dark brown and black CINDERS and silty fine to medium SAND
-1.54		Firm to loose dark to light brownish-gray/grayish-brown fine to medium SAND with traces of silt
-6.54		
	11.5	
-11.54		Soft to very soft dark brown PEAT and ORGANIC SILT with wood and root fragments
-16.54	20.0	BORING TERMINATED
-21.54		



REMARKS:

* Water level on 9-19-85

1) Wash drilled with 10-inch wing bit using a bentonite and potable water drilling fluid mixture to 4.8 feet; Wash drilled with 5 7/8-inch rotary bit using a bentonite and potable water drilling fluid mixture from 4.8 to 20.0 feet

2) Well developed on 9-10-85

DRILLED BY L.S.
LOGGED BY J.T.B.
CHECKED BY C.A.S.

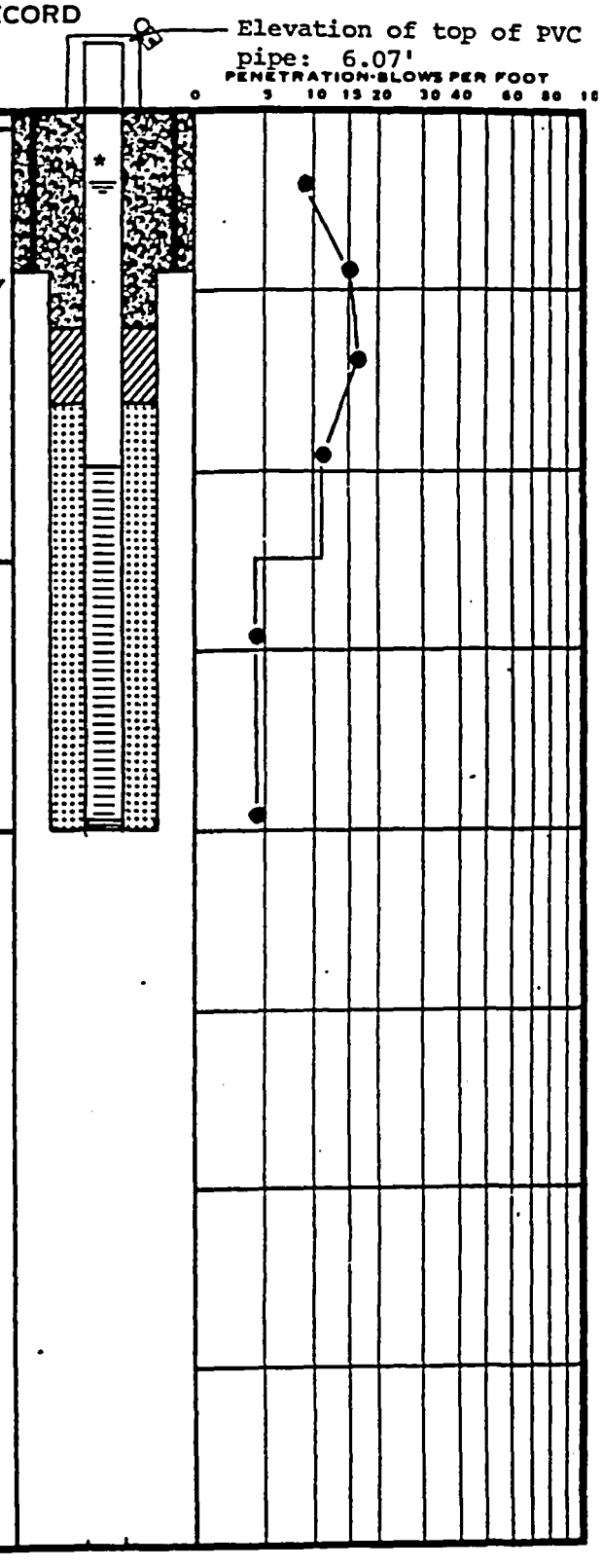
BORING NUMBER MW-6
DATE STARTED 9-4-85
DATE COMPLETED 9-5-85
JOB NUMBER HA-5276

SWP - Wilmington

TEST BORING RECORD

Elevation of top of PVC pipe: 6.07'

ELEV.	DEPTH FEET	DESCRIPTION
4.16	0.0	FILL: Brown slightly silty fine SAND with cinders
	0.5	
-0.84		Loose to firm brown slightly silty fine to medium SAND to fine to medium SAND with traces of silt
-5.84		
	12.5	
-10.84		Soft to firm dark brown PEAT and ORGANIC SILT with wood and root fragments becoming predominantly wood in last sample
-15.84	20.0	BORING TERMINATED
-20.84		



REMARKS:

* Water level on 9-19-85

1) Wash drilled with 10-inch wing bit using a bentonite and potable water drilling fluid mixture to 4.5 feet;wash drilled with 5 7/8-inch roller bit using a bentonite and potable water drilling fluid mixture from 4.5 to 20.0 feet

2) Well developed on 9-11-85

DRILLED BY L.S.
LOGGED BY J.T.B.
CHECKED BY C.A.S.

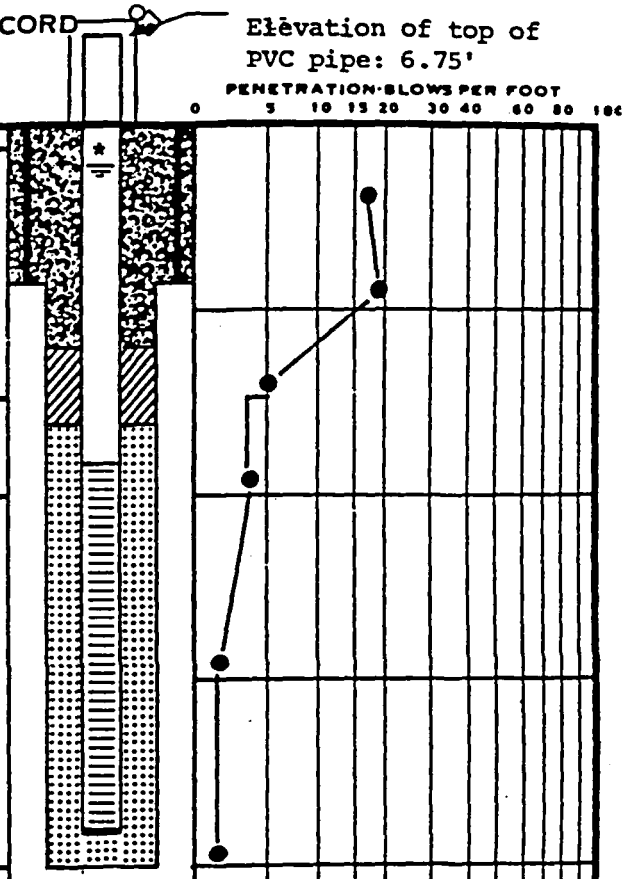
BORING NUMBER MW-7
DATE STARTED 9-4-85
DATE COMPLETED 9-6-85
JOB NUMBER HA-5276

SWP - Wilmington

TEST BORING RECORD

Elevation of top of PVC pipe: 6.75'

ELEV.	DEPTH FEET	DESCRIPTION
4.26	0.7	FILL: Dark brown silty fine SAND with occasional coarse sand
-0.74		Firm to loose dark brown to grayish-brown and brown slightly silty fine to medium SAND with traces of coarse sand
	7.4	Buried log from 7.4 to 10.0 feet
-5.74	10.0	Very soft to soft dark brown PEAT and ORGANIC SILT with wood and root fragments
-10.74		
-15.74	20.0	BORING TERMINATED
-20.74		



REMARKS:

* Water level on 9-19-85

1) Wash drilled with 10-inch wing bit using a bentonite and potable water drilling fluid mixture to 4.5 feet; wash drilled with 5 7/8-inch roller bit using a bentonite and potable water drilling fluid mixture from 4.5 to 20.0 feet

2) Well developed on 9-11-85

DRILLED BY L.S.
LOGGED BY J.T.B.
CHECKED BY C.A.S.

BORING NUMBER MW-8
DATE STARTED 9-4-84
DATE COMPLETED 9-9-85
JOB NUMBER HA-5276

SWP - Wilmington

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-8A

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON		SHEET NO. 1 OF 1	
CLIENT: CHUCK DAVIS	DATE FINISHED 10-1-92	JOB NO. 530-06-503	
BORING CONTRACTOR: ETE	DRILLER T. COPPIN	ELEVATION 4.12	
RIG USED ATV MUD ROTARY	INSPECTOR G.KUNTZ	DATE STARTED 9-28-92	

WELL CONSTRUCTION: GROUT; 6" PVC CASING; 2" PVC CASING; 6" PVC CASING; GROUT; CLAY; PLUG; SAND PACK; SAND PACK

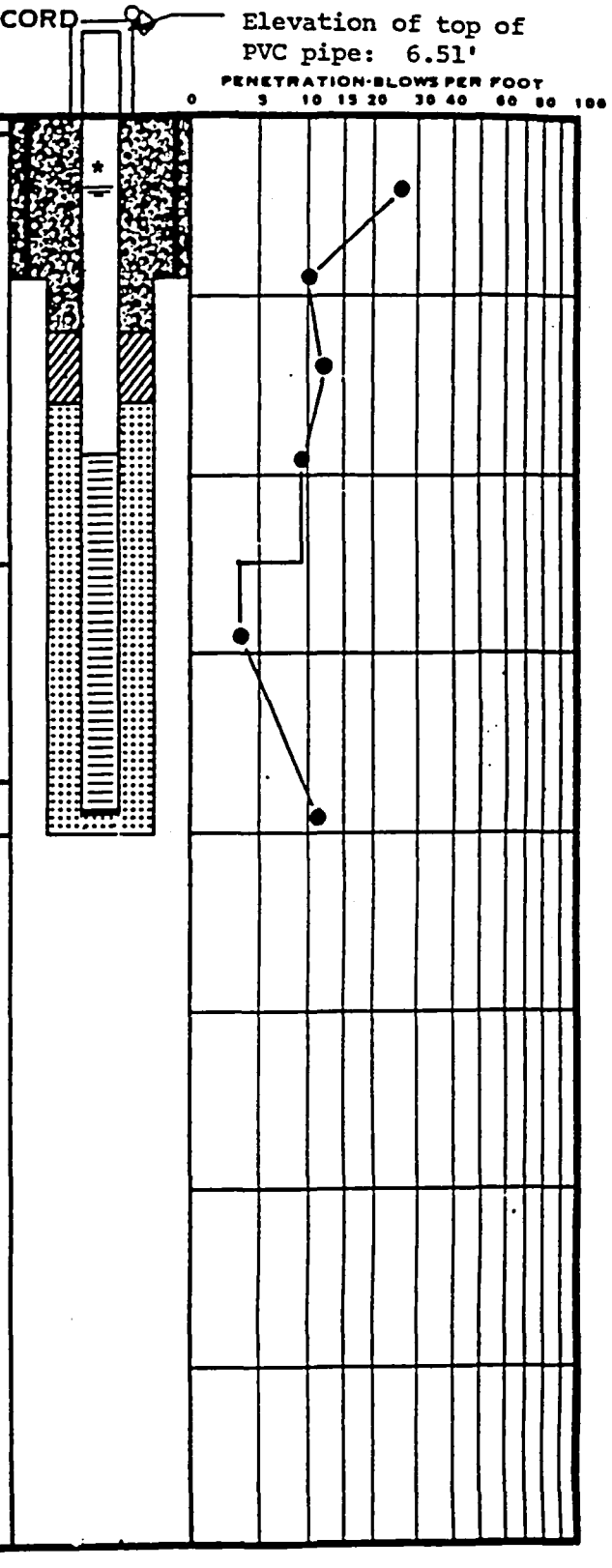
DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	7-6 / 6-11	Loose, yellowish brown SAND, fine to coarse, 5% clay	16" recovery No odor OVA = 114 ppm
	2	SS	5-10 / 18-16	Firm, brownish gray SAND, fine to coarse	18" recovery No odor OVA = 38.1 ppm
5	3	SS	14-15 / 16-20	Firm, brownish black organic rich silty SAND, silt to medium, 10% small pebble, 5% clay, 5% organics	8" recovery No odor OVA = 25.6 ppm
	4	SS	2-3 / 4-4	Very loose, brown SAND, fine to coarse	8" recovery No odor OVA = 38.6 ppm
10	5	SS	1-1 / 1-1	Very loose, same to 9 feet, then dark brown CLAY, trace coarse to small pebble, 10% wood	12" recovery No odor OVA = 32.7 ppm
	6	SS	1-1 / 1-1	Very loose, same as above	8" recovery No odor OVA = 28.4 ppm
	7	SS	1-1 / 1-2	Very loose, dark brown peaty CLAY, 30% wood	14" recovery No odor OVA = 25.7 ppm
15	8	SS	1-1 / 1-1	Very loose, same as above, 40% wood	12" recovery No odor OVA = 20.8 ppm
	9	SS	1-1 / 1-1	Very loose, dark brown peaty CLAY, 50% wood	10" recovery No odor OVA = 6.0 ppm
	10	SS	1-1 / 6-2	Loose, dark brown clayey PEAT, 35% clay	18" recovery No odor OVA = 14.3 ppm
20	11	SS	1-0 / 1-1	Very loose, same as above	12" recovery No odor OVA = 3.9 ppm
	12	SS	1-1 / 1-1	Very loose, PEAT, large wood chunk blocked shoe	2" recovery No odor OVA = 7.3 ppm
25	13	SS	1-5 / 7-8	Loose, brown SAND, fine to coarse, well sorted coarse	10" recovery Very slight odor OVA = 78.6 ppm
	14	SS	6-7 / 6-6	Loose, same as above	18" recovery Very slight odor OVA = 99.2 ppm
30	15	SS	1-0 / 4-5	Very loose, brown SAND, fine to coarse, moderately sorted medium, trace granule, 2% phosphate	16" recovery No odor OVA = 53.7 ppm
35	16	SS	6-4 / 3-3	Very loose, brown SAND, well sorted medium, 2% phosphate	10" recovery No odor OVA = 42.6 ppm
40	17	SS	2-2 / 1-1	Very loose, brown SAND, fine to coarse, poorly sorted, 10% granule to medium pebble, 2% phosphate, trace lignite	12" recovery No odor OVA = 9.5 ppm
	18	SS	12-22 / 36-50	Dense, olive gray CLAY to 44.5 feet with 5% phosphate and glauconite then light gray sandy shell mold LIMESTONE and SAND, alternating cemented shell molds and friable sand laminae, silt to large pebble	24" recovery No odor OVA = 2.5 ppm
45					24" recovery No odor OVA = 1.1 ppm
50	19	SS	15-35 / 48-15	Dense, same as above	TD = 51 feet

H:530MW8A

TEST BORING RECORD

Elevation of top of PVC pipe: 6.51'

ELEV.	DEPTH FEET	DESCRIPTION
4.46	0.0	
	0.5	FILL: Dark brown silty fine SAND with occasional coarse sand
-0.54		Very firm to loose gray to grayish-brown fine to medium SAND with traces of silt
-5.54		
	12.5	
-10.54		Soft dark brown PEAT and ORGANIC SILT with root and wood fragments
	18.5	
-15.54	20.0	Buried log from 18.5 to 20.0 feet
		BORING TERMINATED
-20.54		



REMARKS:

* Water level on 9-19-85

1) Wash drilled with 10-inch wing bit using a bentonite and potable water drilling fluid mixture to 4.5 feet; wash drilled with 5 7/8-inch roller bit using a bentonite and potable water drilling fluid mixture from 4.5 to 20.0 feet
2) Well developed on 9-11-85

DRILLED BY L.S.
LOGGED BY J.T.B.
CHECKED BY C.A.S.

BORING NUMBER MW-9
DATE STARTED 9-5-85
DATE COMPLETED 9-10-85
JOB NUMBER HA-5276

SWP - Wilmington

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-10

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-18-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-18-92	

WELL CONSTRUCTION: CLAY; PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE No.	SAMPLE TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	06-10 / 10-15	Black – tan fine to meduium SAND	Saturated with water OVA = 0.0
5	2	SS	04-26 / 50	Tan fine to medium SAND	Saturated with water; OVA = 0.0
10	3	SS		Tan fine to medium SAND in upper portion of spoon; Dark brown to black PEAT at bottom of spoon	Boring terminated at 13.0 ft. OVA = 0.0
15					
20					
25					
30					
35					
40					
45					
50					

H:53050110

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
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TEST BORING LOG

BORING NO. MW-11

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-18-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-18-92	

WELL CONSTRUCTION: CLAY; SAND PACK; PLUG; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0					
	1	SS		Hit concrete and other buried debris	
5	2	SS	10-05 05-05	Brown-tan fine to medium SAND	Saturated with Creosote from 5 to 7 feet: OVA = 34.
	3	SS	02-02 02-01	Brown-tan fine to medium SAND	Saturated with Creosote OVA = 38.1
10					
	4	SS		Brown-tan fine to medium SAND in upper spoon; Encountered a dark brown to black PEAT with roots at 15.0'	Sand unit saturated with Creosote; OVA = 69.8
15					
20					
25					
30					
35					
40					
45					
50					

H:53050111

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
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HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-11A

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON		SHEET NO. 1 OF 1	
CLIENT: CHUCK DAVIS	DATE FINISHED 10-1-92	JOB NO. 530-06-503	
BORING CONTRACTOR: ETE	DRILLER T. COPPIN	ELEVATION 4.10	
RIG USED ATV MUD ROTARY	INSPECTOR G. KUNTZ	DATE STARTED 9-29-92	

WELL CONSTRUCTION: GROUT; 6" PVC CASING; 2" PVC CASING; 6" PVC CASING; GROUT; CLAY; PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	8-8 10-24	Loose, brown SAND, fine to coarse, well sorted medium	18" recovery No odor OVA = 124 ppm
	2	SS	7-7 10-22	Loose, brown SAND, fine to coarse, 5% wood. At 3 feet visually stained soil.	12" recovery Strong odor OVA = 877
5	3	SS	2-1 1-1	Very loose, brown SAND, fine to coarse, 5% wood, 2" dark brown CLAY layer at 5 feet. Visually stained soil.	8" recovery Strong odor OVA = 89.1 ppm
	4	SS	6-8 1-1	Very loose, brown SAND, fine to coarse, trace wood, 8-inch dark brown peaty CLAY lense at 6 feet. Visually stained soil.	24" recovery Strong odor OVA = 153 ppm
10	5	SS	4-4 5-7	Loose, brown SAND, fine to coarse, 5% wood, visually stained soils to 8.5' then 1/4" seams of stained soil	24" recovery Strong odor OVA = 113 ppm
	6	SS	2-4 5-4	Very loose, brown SAND, fine to coarse. Visually stained soils.	12" recovery Strong odor OVA = 186 ppm
	7	SS	2-2 3-2	Very loose, same as above to 13 feet, then dark brown peaty CLAY, 30% wood. Visually stained soils in sands, no visual staining in peaty clay.	10" recovery Strong odor OVA = 131
15	8	SS	2-3 2-3	Very loose, dark brown PEAT, 20% clay	24" recovery Strong odor OVA = 66.2 ppm
	9	SS	2-4 2-3	Very loose, brownish black peaty CLAY, 30% peat	10" recovery Strong odor OVA = 98.1 ppm
	10	SS	2-2 3-2	Very loose, same as above, 40% wood	16" recovery Strong odor OVA = 113 ppm
20	11	SS	50	Grout	3" recovery
	12	SS	6-2 3-2	Very loose, brownish black peaty CLAY, 25% wood	4" recovery Moderate odor OVA = 112 ppm
25	13	SS	0-0 0-0	Very loose, same as above	24" recovery No odor OVA = 17.3 ppm
	14	SS	2-2 4-6	Very loose, same to 27.5 feet, then dark brown SAND, fine to coarse, well sorted medium	24" recovery Very slight odor OVA = 34.3 ppm
	15	SS	3-4 7-8	Loose, same as above, 10% wood	12" recovery Very slight odor OVA = 26.9 ppm
30					
	16	SS	5-8 7-14	Loose, light brown SAND, very fine to medium, well sorted fine, 2% phosphate	12" recovery No odor OVA = 18.6 ppm
35					
	17	SS	4-8 8-12	Loose, brown SAND, fine to granule, poorly sorted, 5% small pebble, 2% phosphate	12" recovery No odor OVA = 12.8 ppm
40					
	18	SS	25-22 20-28	Firm, brown SAND, fine to granule to 44 feet, then olive gray CLAY, 5% phosphate and glauconite, tight and dry	24" recovery No odor OVA = 7.2 ppm
45					
	19	SS	48-26 50+	Dense, lt gray shell mold LIMESTONE and SAND, alternating lenses of indurated cemented shell molds and friable sand, silt to very coarse, 10% granule	14" recovery No odor OVA = 10.8 ppm TD = 50 feet
50					

H:530MW11A

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
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HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-12

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-18-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-18-92	

WELL CONSTRUCTION: CLAY; PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE: LITHOLOGY	SAMPLE: NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	CLASSIFICATION	REMARKS
0						
5		1	SS	19-14 06-07	Brown-tan fine to medium well sorted SAND	No visual Creosote OVA = 13.3
10		2	SS	03-05 10-18	Same as above except Sand is saturated with Creosote	OVA = 72.7
		3	SS	08-11 19-28	Same as above	OVA = 45.1
15					Organic rich dark brown to black PEAT with roots	
20						
25						
30						
35						
40						
45						
50						

H:53050112

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TEST BORING LOG

BORING NO. MW-13

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-18-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-18-92	

WELL CONSTRUCTION: CLAY; PLUG; SAND PACK; SAND PACK

DEPTH FEET	LITHOLOGY	SAMPLE No.	SAMPLE TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0						
5		1	SS	03-01 01-0	Brown-tan fine to medium SAND	Visual Creosote encountered in borehole immediately upon drilling OVA = 102.0
10		2	SS	05-07 12	Same as above	No visual Creosote; OVA = 47.8
15		3	SS		Dark brown to balck organic rich PEAT	No visual Creosote OVA = 3.0
20						
25						
30						
35						
40						
45						
50						

H:53050113

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TEST BORING LOG

BORING NO. MW-14

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-19-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-19-92	

WELL CONSTRUCTION: CLAY; PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	2-5 / 6-5	Dark brown-black Fill material	OVA = 0.0
	2	SS	9-5 / 4-3	Brown-tan fine to medium SAND	Visual Creosote OVA = 0.0
5	3	SS	2-2 / 4-3	Same as above	Visual Creosote OVA = 19.3
	4	SS	3-3 / 4-10	Same as above	Visual Creosote OVA = 34.7
	5	SS		Black-brown organic rich PEAT with roots	Visual Creosote OVA = 27.1
10	6	SS		Same as above with large wood fragments throughout	Visual Creosote OVA = 9.6
	7	SS		Black PEAT with brown-orange wood fragment at end of spoon	Visual Creosote OVA = 25.3
15	8	SS		Black-brown PEAT with root fragments	Visual Creosote OVA = 19.4
	9	SS		No sample retrieved	
	10	SS		Black-brown PEAT with root fragments	No visual Creosote OVA = 8.0
20	11	SS		Black-brown PEAT to approximately 21.5 ft bgs; Brown-tan medium to coarse SAND below peat	No visual Creosote OVA = 5.2
25					
30					
35					
40					
45					
50					

H:53050114

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TEST BORING LOG

BORING NO. MW-15

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 2	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-19-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-19-92	

WELL CONSTRUCTION: CLAY; SAND PACK; PLUG; SAND PACK

DEPTH FEET	SAMPLE NO.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0					
5	1	SS	1-1 / 4-4	Fine to medium, loose to very loose brown SAND	Visual oil; diesel fuel odor OVA = 58.3
10	2	SS		Fine to medium, brown SAND	No visual oil; OVA = 15.6
15	3	SS		Fine to medium, brown SAND in upper spoon; Dark brown to black PEAT with root fragments in lower part of spoon	No visual oil OVA = 5.4
20					
25					
30					
35					
40					
45					
50					

H:53050115

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HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-16

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-19-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-19-92	

WELL CONSTRUCTION	DEPTH FEET	SAMPLE: LITHOLOGY	SAMPLE: No.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	CLASSIFICATION	REMARKS
CLAY / PLUG; SAND PACK / SAND PACK	0						
	5		1	SS		Fine to medium, brown SAND	Saturated with diesel fuel OVA = 104
	10		2	SS		Medium tan to brown SAND with some wood fragments	Little odor OVA = 42.6
						Same as above	Slight diesel odor OVA = 32.5
	15		3	SS		Dark brown to black PEAT contact at 15.0 ft.	
	20						
	25						
	30						
	35						
	40						
	45						
	50						

H:53050116

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
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HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-17

PROJECT: SOUTHERN WOOD PIEDMONT – WILMINGTON, NC		SHEET NO. 1 OF 1	
CLIENT: SOUTHERN WOOD PIEDMONT	DATE FINISHED 2-19-92	JOB NO. 530-06-501	
BORING CONTRACTOR: ETE	DRILLER C. AARON	ELEVATION	
RIG USED MOBILE B-57	INSPECTOR K. ANDERSON	DATE STARTED 2-19-92	

WELL CONSTRUCTION: CLAY PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0					
5	1	SS	10-2 / 2-2	Fine to medium brown SAND with wood fragment at bottom of spoon	Saturated with diesel fuel: OVA = 118
10	2	SS	2-2 / 2-2	Wood fragments in upper portion of spoon with a fine to medium brown SAND in bottom of spoon	Diesel fuel odor OVA = 57.1
	3	SS		Fine to medium brown SAND	Saturated with diesel fuel; OVA = 72.3
15	4	SS		Dark Brown PEAT with root fragments	No visual oil OVA = 39.1
20					
25					
30					
35					
40					
45					
50					

H:53050117

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
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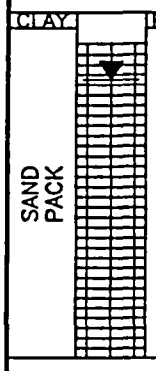
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-18

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON			SHEET NO. 1 OF 1
CLIENT: CHUCK DAVIS	DATE FINISHED	10-7-92	JOB NO. 530-06-503
BORING CONTRACTOR: ETE	DRILLER	T. COPPIN	ELEVATION 4.26
RIG USED ATV MUD ROTARY	INSPECTOR	G. KUNTZ	DATE STARTED 10-6-92

WELL CONSTRUCTION



DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	0-0 0-0	Very loose, brown SAND, fine to medium, 5% coarse to granule	14" recovery No odor OVA = 30 ppm
	2	SS	4-4 10-13	Loose, brown SAND, fine to coarse, 5% granule, poorly sorted	18" recovery Slight diesel odor OVA = 35.3 ppm
5	3	SS	3-2 3-2	Very loose, brown SAND, fine to coarse, coarse dominant, 20% very coarse	14" recovery No odor OVA = 27.9 ppm
	4	SS	4-5 6-7	Loose, same as above, 35% very coarse to granule, 2% small pebble	18" recovery Slight diesel odor OVA = 20.6 ppm
10	5	SS	6-12 12-10	Firm, brown pebbly SAND, fine to coarse, 30% granule to small pebble	12" recovery No odor OVA = 9.9 ppm
	6	SS	4-6 5-11	Loose, brown SAND, fine to coarse, medium dominant	18" recovery No odor OVA = 6.6 ppm
	7	SS	6-8 10-9	Loose, brown pebbly SAND, very fine to coarse, 30% granule to small pebble to 13.5 feet, then dark brown clayey PEAT, 30% clay	24" recovery No odor OVA = 5.1 ppm TD = 14 feet
15					
20					
25					
30					
35					
40					
45					
50					

H:530MW18

ETE	ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC. CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS HYDROGEOLOGIC SERVICES	TEST BORING LOG BORING NO. MW-19A

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON			SHEET NO. 1 OF 1
CLIENT: CHUCK DAVIS	DATE FINISHED	10-2-92	JOB NO. 530-06-503
BORING CONTRACTOR: ETE	DRILLER	T. COPPIN	ELEVATION 3.15
RIG USED ATV MUD ROTARY	INSPECTOR	G. KUNTZ	DATE STARTED 9-30-92

WELL CONSTRUCTION: GROUT; 6" PVC CASING; 2" PVC CASING; 6" PVC CASING; GROUT; CLAY; PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	3-2 2-3	Very loose, brown SAND, fine to coarse	16" recovery No odor OVA = 214 ppm
	2	SS	8-7 6-8	Loose, brown pebbly SAND, fine to coarse, 25% small pebble	8" recovery No odor OVA = 290 ppm
5	3	SS	4-5 6-8	No recovery	
	4	SS	6-8 8-9	Loose, brown SAND, fine to coarse, 5% wood	16" recovery No odor OVA = 89.5 ppm
	5	SS	4-4 3-1	Very loose, same as above	12" recovery Slight odor OVA = 183 ppm
10	6	SS	5-4 3-1	Very loose, same as above to 11.5 feet, then 1-inch dark brown clay lense followed by same sand to 12 feet	18" recovery Visual creosote 11.5' to 12' OVA = 210 ppm
	7	SS	1-1 1-2	Very loose, brownish black clayey PEAT, 25% clay	18" recovery Moderate odor OVA = 42.3 ppm
15	8	SS	1-1 1-1	Very loose, brownish black peaty CLAY, 30% peat	24" recovery No odor OVA = 19.0 ppm
	9	SS	1-1 1-1	Very loose, same as above, 50% wood	18" recovery No odor OVA = 10.1 ppm
	10	SS	1-2 1-0	Same as above	14" recovery No odor OVA = 8.6 ppm
20	11	SS	5-1 1-2		No recovery
	12	SS	0-0 2-3	Very loose, dark brown peaty CLAY, 30% wood	12" recovery No odor OVA = 11.9 ppm
25	13	SS	1-2 2-4	Very loose, same as above to 25 feet, then brown SAND, fine to coarse, poorly sorted	24" recovery No odor OVA = 8.6 ppm
30	14	SS	6-9 7-7	Loose, light brown SAND, fine to coarse, well sorted medium	12" recovery No odor OVA = 9.8 ppm
35	15	SS	5-3 3-2	Very loose, brown SAND, fine to granule, moderately sorted medium, 2% phosphate	12" recovery No odor OVA = 4.6 ppm
40	16	SS	0-0 12-16	Firm, olive gray CLAY, 5% phosphate and glauconite, tight and dry	24" recovery No odor OVA = 4.9 ppm
	17	SS	8-27 27-26	Firm, same as above, 10% phosphate and glauconite	24" recovery No odor OVA = 5.2 ppm
	18	SS	65	Very dense, light gray sandy shell mold LIMESTONE, 35% sand	2" recovery No odor OVA = 3.1 ppm TD = 43 feet 2 inches
45					
50					

H:530MW19A

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
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HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-20

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON		SHEET NO. 1 OF 1	
CLIENT: CHUCK DAVIS	DATE FINISHED 10-7-92	JOB NO. 530-06-503	
BORING CONTRACTOR: ETE	DRILLER T. COPPIN	ELEVATION 3.17	
RIG USED ATV MUD ROTARY	INSPECTOR G. KUNTZ	DATE STARTED 10-7-92	

WELL CONSTRUCTION: GROUT; CLAY; SAND PACK; 2" PVC CASING; GROUT; PLUG; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	1-0	Very loose, black clayey PEAT to 1 foot then brown SAND, fine to coarse	18" recovery
			0-0		Slight odor
					OVA = 120 ppm
	2	SS	5-5	Loose, brown SAND, fine to coarse, poorly sorted	24" recovery
			7-11		Very slight odor
					OVA = 66.0 ppm
5	3	SS	0-0	Very loose, same as above	18" recovery
			5-5		Very slight odor
					OVA = 106 ppm
	4	SS	5-5	Loose, same as above	18" recovery
			5-6		No odor
					OVA = 43.5 ppm
	5	SS	4-2	Very loose, brown SAND, very fine to medium, 10% coarse, 1/4" dark gray clay lense at 10 feet	14" recovery
			1-2		No odor
					OVA = 57.1 ppm
10	6	SS	1-0	Very loose, brownish gray silty SAND, silt to medium, 35% silt, 10% clay, 1-inch dark gray lense at 11.5 feet	20" recovery
			1-2		No odor
					OVA = 9.8 ppm
	7	SS	1-2	Very loose, brownish black peaty CLAY, 25% wood	24" recovery
			1-2		Very slight odor
					OVA = 15.7 ppm
					TD = 14 feet
15					
20					
25					
30					
35					
40					
45					
50					

H:530MW20

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
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HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-21

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON		SHEET NO. 1 OF 1	
CLIENT: CHUCK DAVIS	DATE FINISHED 10-7-92	JOB NO. 530-06-503	
BORING CONTRACTOR: ETE	DRILLER T. COPPIN	ELEVATION 3.17	
RIG USED ATV MUD ROTARY	INSPECTOR G. KUNTZ	DATE STARTED 10-7-92	

WELL CONSTRUCTION: CLAY; 2" PVC; PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	1-1 / 1-1	Very loose, brownish black clayey PEAT to 6", then brown SAND, fine to coarse	18" recovery No odor OVA = 43.2 ppm
	2	SS	5-3 / 6-8	Loose, brown SAND, fine to coarse, coarse dominant	18" recovery No odor OVA = 86.6 ppm
5	3	SS	4-2 / 2-2	Very loose, brown SAND, fine to coarse, medium dominant	12" recovery No odor OVA = 52.6 ppm
	4	SS	1-3 / 7-8	Loose, same to 7', then 4" dark gray clay lense, then peaty CLAY, 30% wood	24" recovery No odor OVA = 20.6 ppm
	5	SS	1-1 / 0-1	Very loose, brownish black peaty CLAY, 30% wood	24" recovery No odor OVA = 10.8 ppm TD= 10 feet
10					
15					
20					
25					
30					
35					
40					
45					
50					

H:530MW21

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
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HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-22

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINTON		SHEET NO. 1 OF 1	
CLIENT: CHUCK DAVIS	DATE FINISHED 10-7-92	JOB NO. 530-06-503	
BORING CONTRACTOR: ETE	DRILLER T. COPPIN	ELEVATION 3.02	
RIG USED ATV MUD ROTARY	INSPECTOR G. KUNTZ	DATE STARTED 10-7-92	

WELL CONSTRUCTION: GROUT; CLAY; SAND PACK; 2" STAINLESS STEEL; GROUT; PLUG; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	5-4	Loose, black organic rich SAND, silt to coarse, 20% clay, 15% plant and wood material to 1.5', then brown SAND	18" recovery Slight diesel odor OVA = 109 ppm
			6-5		
	2	SS	5-6	Loose, brown SAND, fine to coarse	24" recovery Creosote stained soil at 3' OVA = 87.7 ppm
			6-4		
5	3	SS	4-2	Very loose, same as above	14" recovery Creosote stained soils OVA = 107 ppm
			4-3		
	4	SS	4-2	Loose, brown SAND, fine to coarse, well sorted medium	24" recovery Creosote stained soils OVA = 157 ppm
			6-9		
	5	SS	4-3	Very loose, same as above	20" recovery Creosote stained soils to 9' OVA = 75.6 ppm
			4-4		
10	6	SS	2-3	Loose, brown SAND, fine to coarse, poorly sorted, few 1/2" dark brown clay lenses at 11.5'	18" recovery Moderate odor OVA = 84.7 ppm
			6-7		
	7	SS	1-1	Very loose, brownish black clayey PEAT, 35% clay	24" recovery Slight creosote odor OVA = 25.5 ppm TD = 14 feet
			1-2		
15					
20					
25					
30					
35					
40					
45					
50					

H:530MW22

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-23

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON			SHEET NO. 1 OF 1
CLIENT: CHUCK DAVIS	DATE FINISHED	10-8-92	JOB NO. 530-06-503
BORING CONTRACTOR: ETE	DRILLER	T. COPPIN	ELEVATION 2.67
RIG USED ATV MUD ROTARY	INSPECTOR	G. KUNTZ	DATE STARTED 10-8-92

WELL CONSTRUCTION: GROUT, CLAY, 2" PVC, SAND PACK, GROUT, PLUG, SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	2-50	Very loose, brownish black PEAT to 6", then brown SAND, fine to coarse, 5% granule, wood fragment blocked shoe	8" recovery Very slight odor OVA = 12.2 ppm
	2	SS	0-2 1-0	Very loose, brownish gray SAND, silt to coarse, 20% clay	12" recovery No odor OVA = 12.7 ppm
5	3	SS	2-4 3-4	Very loose, brownish gray CLAY to 5', then brown SAND, fine to coarse, well sorted coarse	20" recovery No odor OVA = 14.6 ppm
	4	SS	3-4 4-4	Very loose, same as above	24" recovery No odor OVA = 16.2 ppm
	5	SS	1-1 1-1	Very loose, same as above to 9', then PEAT, 20% clay	14" recovery No odor OVA = 16.2 ppm
10	6	SS	2-2 2-2	Very loose, brownish black clayey PEAT, 35% clay	18" recovery No odor OVA =13.4 ppm TD = 12 feet
15					
20					
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35					
40					
45					
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H:530MW23

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-24

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON		SHEET NO. 1 OF 1	
CLIENT: CHUCK DAVIS	DATE FINISHED 10-5-92	JOB NO. 530-06-503	
BORING CONTRACTOR: ETE	DRILLER T. COPPIN	ELEVATION 3.58	
RIG USED ATV MUD ROTARY	INSPECTOR G. KUNTZ	DATE STARTED 10-5-92	

WELL CONSTRUCTION: GROUT; 2" PVC; GROUT; CLAY; PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	6-8, 8-7	Loose, dark brown with black SAND, silt to coarse, 10% clay, 10% organics; 2% small pebble	18" recovery; No odor; OVA = 36.2 ppm
	2	SS	7-9, 7-9	Loose, light brown SAND, fine to coarse, 5% clay, trace small pebble	18" recovery; No odor; OVA = 47.1 ppm
5	3	SS	5-6, 4-3	Very loose, light grayish brown SAND, very fine to medium, 5% heavy minerals	12" recovery; No odor; OVA = 52.9 ppm
	4	SS	3-3, 3-2	Very loose, brown SAND, fine to coarse	12" recovery; Very slight odor; OVA = 105 ppm
	5	SS	4-2, 2-1	Very loose, same as above	6" recovery; Very slight odor; OVA = 71.3 ppm
10	6	SS	4-3, 2-3	Very loose, same as above to 11.5 feet, then brownish black clayey PEAT, 35% clay	18" recovery; Very slight odor; OVA = 104 ppm; TD = 12 feet
15					
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H:530MW24

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-25

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON		SHEET NO. 1 OF 1	
CLIENT: CHUCK DAVIS	DATE FINISHED 10-8-92	JOB NO. 530-06-503	
BORING CONTRACTOR: ETE	DRILLER J. MASSEY	ELEVATION 1.78	
RIG USED HAND AUGER	INSPECTOR G. KUNTZ	DATE STARTED 10-8-92	

WELL CONSTRUCTION

CLAY | 2" PVC CASING | PLUG

NATURAL PACK | NATURAL PACK

DEPTH FEET	SAMPLE: LITHOLOGY	No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0		1	HA		Borehole was hand augered because well location is within a wetland area. Representative samples were not obtained during the augering process because the loose nature of the sediments prevented sample retrival. Sediments encountered are believed to be marsh mud to 2 feet, then loose brown sand to 13 feet, then the peat unit was encountered. The well was hand pushed to 13 feet using a well point and was constructed using a natural filter pack.	
5						
10						
15						
20						
25						
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H:530MW25

ENVIRONMENTAL TECHNOLOGY ENGINEERING, INC.
CONSULTING ENGINEERS, SURVEYORS AND HYDROGEOLOGISTS
HYDROGEOLOGIC SERVICES

TEST BORING LOG

BORING NO. MW-26

PROJECT: SOUTHERN WOOD PIEDMONT-WILMINGTON		SHEET NO. 1 OF 1	
CLIENT: CHUCK DAVIS	DATE FINISHED 10-5-92	JOB NO. 530-06-503	
BORING CONTRACTOR: ETE	DRILLER T. COPPIN	ELEVATION 2.48	
RIG USED ATV MUD ROTARY	INSPECTOR G. KUNTZ	DATE STARTED 10-5-92	

WELL CONSTRUCTION: GROUT; 2" STAINLESS STEEL; GROUT; CLAY; PLUG; SAND PACK; SAND PACK

DEPTH FEET	SAMPLE No.	TYPE	BLOWS PER 6"	CLASSIFICATION	REMARKS
0	1	SS	7-6 / 6-5	Loose, brown SAND, fine to coarse, poorly sorted	18" recovery No odor OVA = 13.5 ppm
	2	SS	7-6 / 6-6	Loose, brown SAND, silt to coarse, well sorted medium	18" recovery No odor OVA = 14.6 ppm
5	3	SS	3-3 / 2-3	Very loose, brown SAND, very fine to coarse, poorly sorted	8" recovery No odor OVA = 14.7 ppm
	4	SS	1-1 / 0-1	Very loose, same as above	10" recovery Very slight odor OVA = 15.1 ppm
	5	SS	1-1 / 6-7	Loose, same as above	14" recovery Creosote stained soil OVA = 140 ppm
10	6	SS	4-4 / 7-8	Loose, same as above	16" recovery Creosote stained soil OVA = 206 ppm
	7	SS	3-7 / 50	Loose, dark brown SAND, medium to coarse, 10% wood, wood blocked shoe	14" recovery Creosote stained soil OVA = 236 ppm
15	8	SS	2-1 / 1-1	Very loose, no recovery, pebble blocked shoe	Creosote stained soils
	9	SS	6-7 / 9-8	Loose, dark blackish brown clayey PEAT grading to peaty CLAY, interval between 16' and 17' visually stained with creosote, no staining below 17'	18" recovery Strong odor OVA = 110 ppm TD = 18 feet
20					
25					
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35					
40					
45					
50					

H:530MW26

WETLAND WELL INSTALLATION AUTHORIZATION LETTERS

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1890
WILMINGTON, NORTH CAROLINA 28402-1890

IN REPLY REFER TO

November 4, 1992

Regulatory Branch

Action ID. 199300253 and Nationwide Permit No. 5 (Scientific Measurement Devices)

North Carolina State Ports Authority
c/o Environmental Technology Engineering, Inc.
Attn: Mr. Gregory B. Kuntz
Post Office Box 1867
Lexington, South Carolina 29072

Dear Mr. Kuntz:

Thank you for your inquiry of September 22, 1992, regarding your plans to install two monitoring wells within a wetland area adjacent to the Cape Fear River, at the foot of Greenfield Street in Wilmington, New Hanover County, North Carolina.

For the purposes of the U.S. Army Corps of Engineers' Regulatory Program, Title 33, Code of Federal Regulations (CFR), Part 330.6, published in the Federal Register on November 22, 1991, lists nationwide permits (NWP). Authorization, pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act, was provided for staff gages, tide gages, water recording devices, water quality testing and improvement devices, and similar scientific structures.

Your work is authorized by this NWP provided it is accomplished in strict accordance with the enclosed conditions and provided you receive a Section 401 water quality certification from the North Carolina Division of Environmental Management and, in the coastal area, a consistency determination from the North Carolina Division of Coastal Management. You should contact Mr. John Dorney, telephone (919) 733-1786, regarding water quality certification, and Mr. Steve Benton, telephone (919) 733-2293, regarding consistency determination. This NWP does not relieve you of the responsibility to obtain other required State or local approval.

This verification will be valid for 2 years from the date of this letter unless the NWP authorization is modified, reissued, or revoked. Also, this verification will remain valid for the 2 years if, during that period, the NWP authorization is reissued without modification or the activity complies with any subsequent modification of the NWP authorization. If during the 2 years, the NWP authorization expires or is suspended or revoked, or is modified, such

that the activity would no longer comply with the terms and conditions of the NWP, activities which have commenced (i.e., are under construction) or are under contract to commence in reliance upon the NWP will remain authorized provided the activity is completed within 12 months of the date of the NWP's expiration, modification or revocation, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend, or revoke the authorization.

Questions or comments may be addressed to Mr. Jeff Richter, Wilmington Field Office, Regulatory Branch, telephone (919) 251-4636.

Sincerely,

G. Wayne Wright
Chief, Regulatory Branch

Enclosure

Copies Furnished (without enclosure):

Mr. John Parker
North Carolina Department of
Environment, Health and
Natural Resources
Post Office Box 27687
Raleigh, North Carolina 27611-7687

Mr. John Dorney
Water Quality Section
Division of Environmental Management
North Carolina Department of
Environment, Health and
Natural Resources
Post Office Box 27687
Raleigh, North Carolina 27611-7687

Mr. Bob Stroud
Acting Office Manager
Wilmington Regional Office
North Carolina Division of
Coastal Management
127 Cardinal Drive Extension
Wilmington, North Carolina 28405-3845

GENERAL CONDITIONS

1. **Navigation.** No activity may cause more than a minimal adverse effect on navigation.

2. **Proper Maintenance.** Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.

3. **Erosion and Siltation Controls.** Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills must be permanently stabilized at the earliest practicable date.

4. **Aquatic Life Movements.** No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species which normally migrate through the area, unless the activity's primary purpose is to impound water.

5. **Equipment.** Heavy equipment working in wetlands must be placed on mats or other measures must be taken to minimize soil disturbance.

6. **Regional and Case-by-case Conditions.** The activity must comply with any regional conditions which may have been added by the Division Engineer and any case specific conditions added by the Corps.

7. **Wild and Scenic Rivers.** No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designated by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status. Information on Wild and Scenic Rivers may be obtained from the National Park Service and the U.S. Forest Service.

8. **Tribal Rights.** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

9. **Water Quality Certification.** In certain states, an individual state water quality certification must be obtained or waived.

10. **Coastal Zone Management.** In certain states, an individual state coastal zone management consistency concurrence must be obtained or waived.

11. **Endangered Species.** No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species. Non-Federal permittees shall notify the District Engineer if any listed species or critical habitat might

be affected or is in the vicinity of the project and shall not begin work on the activity until notified by the District Engineer that the requirements of the Endangered Species Act have been satisfied and that the activity is authorized. Information on the location of threatened and endangered species can be obtained from the U.S. Fish and Wildlife Service and National Marine Fisheries Service.

12. **Historic Properties.** No activity which may affect Historic Properties listed, or eligible for listing, in the National Register of Historic Places is authorized, until the District Engineer has complied with the provisions of 33 CFR 325, Appendix C. The prospective permittee must notify the District Engineer if the authorized activity may affect any historic properties listed, determined to be eligible, or which the prospective permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the District Engineer that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office and the National Register of Historic Places (see 33 CFR 330.4(g)).

13. **Notification** (for discharges between 10 and 25 cubic yards).

a. Where required by the terms of the NWP, the prospective permittee must notify the District Engineer as early as possible and shall not begin the activity:

(1) until notified by the District Engineer that the activity may proceed under the NWP with any special conditions imposed by the District or Division Engineer; or

(2) if notified by the District or Division Engineer that an individual permit is required; or

(3) Unless 30 days have passed from the District Engineer's receipt of the notification and the prospective permittee has not received notice from the District or Division Engineer. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

b. The notification must be in writing and include the following information and any required fees:

(1) Name, address and telephone number of the prospective permittee;

(2) Location of the proposed project;

(3) Brief description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permit(s) or individual permit(s) used or intended to be used to authorize any part of the proposed project or related activity;

(4) Where required by the terms of the NWP, a delineation of affected special aquatic sites, including wetlands; and

(5) A statement that the prospective permittee has contacted;

(a) The USFWS/NMFS regarding the presence of any Federally listed (or proposed for listing) endangered or threatened species or critical habitat in the permit area that may be affected by the proposed project; and any available information provided by those agencies. (The prospective permittee may contact Corps District Offices for USFWS/NMFS agency contacts and list of critical habitat.)

(b) The SHPO regarding the presence of any historic properties in the permit area that may be affected by the proposed project; and the available information, if any provided by that agency.

14. **Water Supply Intakes.** No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is repair of the public water supply intake structures or adjacent bank stabilization.

15. **Shellfish Production.** No discharge of dredged or fill material may occur in areas of concentrated shellfish production, unless the discharge is directly related to a shellfish harvest activity authorized by nationwide permit.

16. **Suitable Material.** No discharge of dredged or fill material may consist of unsuitable material (e.g., trash, debris, car bodies, etc.) and material discharged must be free from toxic pollutants in toxic amounts.

17. **Mitigation.** Discharges of dredged or fill material into waters of the United States must be minimized or avoided to the maximum extent practicable at the project site (i.e., on-site), unless the District Engineer has approved a compensation mitigation plan for the specific regulated activity.

18. **Spawning Areas.** Discharges in spawning areas during spawning seasons must be avoided to the maximum extent practicable.

19. **Obstructions of High Flows.** To the maximum extent practicable, discharges must not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to impound waters).

20. **Adverse Impacts from Impoundments.** If the discharge creates an impoundment of water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow shall be minimized to the maximum extent practicable.

21. **Waterfowl Breeding Areas.** Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

22. **Removal of Temporary Fills.** Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

NOTES:

1. Qualification for and issuance of a nationwide permit does not relieve the applicant of the need to obtain any other required State or local permits.

2. Should all or part of a proposed activity be located within an Area of Environmental Concern (AEC) as designated by the North Carolina Coastal Resources Commission, a CAMA permit is required from the North Carolina Division of Coastal Management. Should an activity within or potentially affecting an AEC be proposed by a Federal agency, a consistency determination pursuant to 15 CFR 930 must be provided to the North Carolina Division of Coastal Management at least 90 days before the onset of the proposed activity.

REGIONAL CONDITION

1. All weirs and flumes authorized by this nationwide permit must be removed immediately upon the completion of their intended use. Weirs and flumes are not allowed in areas identified by the North Carolina Division of Marine Fisheries and/or the North Carolina Wildlife Resources Commission as anadromous fish spawning areas.

STATE CONSISTENCY CONDITION

1. All weirs and flumes authorized by this nationwide permit must be removed immediately upon the completion of their intended use. This permit is not available for weirs and flumes in areas identified by the North Carolina Division of Marine Fisheries and/or the North Carolina Wildlife Resources Commission as anadromous fish spawning areas.

GENERAL CERTIFICATION CONDITIONS

1. These activities do not require written concurrence from the North Carolina Division of Environmental Management as long as they comply with all conditions of this General Certification.

2. Established sediment and erosion control practices will be utilized to prevent violations of the appropriate turbidity water quality standard (50 NTU's in streams and rivers not designated as trout waters by the North Carolina Division of Environmental Management, 25 NTU's in all saltwater classes and all lakes and reservoirs and 10 NTU's in trout waters).

3. Measures shall be taken to prevent live or fresh concrete from coming into contact with waters of the State until the concrete has hardened.

4. Additional site-specific conditions may be added to this Certification in order to ensure compliance with all applicable water quality and effluent standards.

5. Concurrence from the North Carolina Division of Environmental Management that this Certification applies to an individual project shall expire three years from the date of the cover letter from the North Carolina Division of Environmental Management.

State of North Carolina
Department of Environment, Health, and Natural Resources
Wilmington Regional Office

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

Bob Jamieson
Regional Manager

November 24, 1992

Gregory B. Kuntz
ETE Incorporation
P.O. Box 1867
1445 Pisgah Church Rd.
Lexington, South Carolina 29072

Dear Mr. Kuntz,

I am writing to you regarding the information sent to me concerning the proposed monitoring wells to be placed in the Greenfield Lake vicinity of Wilmington, North Carolina. These wells as you have proposed them require no permit from our Division. Constructed as described, and at the stated location, no authorization is needed. However, this does not relieve you from the responsibility of obtaining any other required federal, state or local permits. The project appears to be in the jurisdiction of the U. S. Army Corps of Engineers, and as such may need their authorization.

If I can be of any further help, please feel free to call.

Sincerely,

T. Barrett

T. Barrett

cc: Bob Stroud
Ann Hines, LPO
Jeff Richter, COE

127 Cardinal Drive Extension, Wilmington, N.C. 28405-3845 • Telephone 919-395-3900 • Fax 919-350-2004

An Equal Opportunity Affirmative Action Employer

State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Environmental Management
512 North Salisbury Street • Raleigh, North Carolina 27604

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

A. Preston Howard, Jr., P.E.
Acting Director

November 23, 1992

Mr. Gregory Kuntz
ETE, Inc.
P.O. Box 1867
1445 Pisgah Church Road
Lexington, S.C. 29702

Dear Mr. Kuntz:

RE: Inquiry about the need for 401 Certification for wetland monitoring well installation

On 9 November 1992, you wrote inquiring whether a 401 Water Quality Certification is needed for the installation of monitoring wells in wetlands for the purpose of wetland delineations. In many instances there would be no discharge of fill material and therefore no 404/401 action. In other instances, the COE has issued Nationwide Permit No. 5 (Scientific Measuring Devices) for this activity. On 21 January 1992, the Division of Environmental Management issued Certification Number 2745 for NW Permit # 5 (attached). As long as these conditions are followed, no written notification is required to DEM and no written approval is required from DEM. Therefore, we have no objection to the installation of wetland monitoring wells for the purpose of determining wetland delineations.

I hope that this letter answers your concerns. Please call me at 919-733-1786 if you have any questions.

Sincerely,

John R. Dorney
Wetlands and Technical Review Group

well.ltr
cc: Ron Ferrell
Wilmington DEM Regional Office
Wilmington District Office Corps of Engineers

GENERAL CERTIFICATION
FOR PROJECTS ELIGIBLE FOR CORPS OF ENGINEERS NATIONWIDE PERMIT NUMBERS 3 (MAINTENANCE), 4 (FISH AND WILDLIFE HARVESTING DEVICES AND ACTIVITIES), 5 (SCIENTIFIC MEASUREMENT DEVICES), 7 (OUTFALL STRUCTURES), 13 (BANK STABILIZATION FOR PROJECTS LESS THAN 500 FEET IN LENGTH), 14 (ROAD CROSSINGS FOR PROJECTS a) IMPACTING WATERS ONLY AND b) SUBJECT TO SEPA OR NEPA), 18 (MINOR DISCHARGES FOR PROJECTS WITH LESS THAN 10 CUBIC YARDS OF FILL IN WATERS OR WETLANDS), 20 (OIL SPILL CLEANUP), 22 (REMOVAL OF VESSELS), 23 (CATEGORICAL EXCLUSIONS), 25 (STRUCTURAL DISCHARGE), 26 (HEADWATERS AND ISOLATED WETLANDS WITH LESS THAN OR EQUAL TO ONE-THIRD ACRE FILL OF WATERS OR WETLANDS), 27 (WETLAND RESTORATION ACTIVITIES), 32 (COMPLETED ENFORCEMENT ACTIONS), 36 (BOAT RAMPS [IN NONWETLAND SITES]), AND 37 (EMERGENCY WATERSHED PROTECTION)

This General Certification is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Environmental Management Regulations in 15 NCAC 2H, Section .0500 and 15 NCAC 2B .0109 and .0201 for the discharge of fill material to waters and wetland areas which are waters of the United States as described in 33 CFR 330 Appendix A (B) (3, 4, 5, 20, 22, 27, 32, 36, and 37) of the Corps of Engineers regulations. This Certification replaces Certification Number 2663.

The State of North Carolina certifies that the specified category of activity will not violate Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Conditions of Certification:

1. These activities do not require written concurrence from the Division of Environmental Management as long as they comply with all conditions of this General Certification.
2. The use of Nationwide 23 (Categorical Exclusions) requires written notification to DEM of the extent of impact to waters and wetlands;
3. That established sediment and erosion control practices are utilized to prevent violations of the appropriate turbidity water quality standard (50 NTUs in streams and rivers not designated as trout by DEM; 25 NTUs in all saltwater classes, and all lakes and reservoirs; and 10 NTUs in trout waters);
4. Measures shall be taken to prevent live or fresh concrete from coming into contact with waters of the state until the concrete has hardened;
5. The use of Nationwide 13 shall minimize fill in significant wetlands and waters.
6. This Certification shall expire when the appropriate Nationwide Permit is reissued, expires or is modified.

Non-compliance with or violation of the conditions herein set forth by a specific fill project shall result in revocation of

this Certification for the project.

This is the 30st day of July, 1992

DIVISION OF ENVIRONMENTAL MANAGEMENT

By

A. Preston Howard, Jr. P.E.
Acting Director

Certification # 2745
gencerta.nor
jrd/gc

Hydraulic Conductivity and Seepage Velocity Summary Table

HYDRAULIC CONDUCTIVITY AND GROUND WATER SEEPAGE VELOCITY SUMMARY TABLE
SOUTHERN WOOD PIEDMONT - WILMINGTON, NORTH CAROLINA FACILITY

Unit	Well Number	Material	Hydraulic Conductivity (ft/sec)	Hydraulic Gradient (ft/ft)	Porosity (%)	Seepage Velocity (ft/year)
Upper Sand	MW-10	Fine to Coarse	1.99×10^{-5}	0.0015	0.30	3.13
Upper Sand	MW-16	Fine to Medium	6.14×10^{-6}	0.0015	0.25	1.16
Upper Sand	MW-17	Fine to Medium	4.71×10^{-6}	0.0015	0.25	0.89
Upper Sand	MW-18	Fine to Coarse	2.76×10^{-5}	0.0015	0.30	4.35
Upper Sand	MW-19	Fine to Coarse	2.92×10^{-5}	0.0015	0.30	4.60
Upper Sand	MW-20	Fine to Coarse	2.46×10^{-5}	0.0015	0.25	3.88
Upper Sand	MW-21	Fine to Coarse	1.39×10^{-5}	0.0015	0.30	2.19
Upper Sand	MW-22	Fine to Coarse	1.20×10^{-5}	0.0015	0.30	1.89
Upper Sand	MW-23	Fine to Coarse	1.78×10^{-5}	0.0015	0.30	2.80
Upper Sand	MW-24	Fine to Coarse	9.65×10^{-6}	0.0015	0.30	1.52
Upper Sand	MW-26	Fine to Coarse	1.69×10^{-5}	0.0015	0.30	2.66
Peat	MW-8	Clay & Wood	1.05×10^{-6}	0.0013	0.50	0.08
Lower Sand	MW-8A	Fine to Coarse	8.48×10^{-5}	0.0002	0.30	1.78
Lower Sand	MW-11A	Fine to Coarse	9.82×10^{-5}	0.0002	0.30	2.06
Lower Sand	MW-19A	Fine to Coarse	2.15×10^{-4}	0.0002	0.30	4.52

Slug Test Methods and Assumptions

SLUG TEST METHOD FOR UNCONFINED AQUIFERS

REFERENCE: Bouwer, H. and R. C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

SOLUTION:

$$\ln s_o - \ln s_t = \frac{2 K L t}{r_c^2 \ln(r_e/r_w)}$$

where:

s_o = initial drawdown in well due to instantaneous removal of water from well [L]

s_t = drawdown in well at time t [L]

L = length of well screen [L]

r_c = radius of well casing [L]

$\ln(r_e/r_w)$ = empirical "shape factor" determined from tables provided in Bouwer and Rice (1976)

r_e = equivalent radius over which head loss occurs [L]

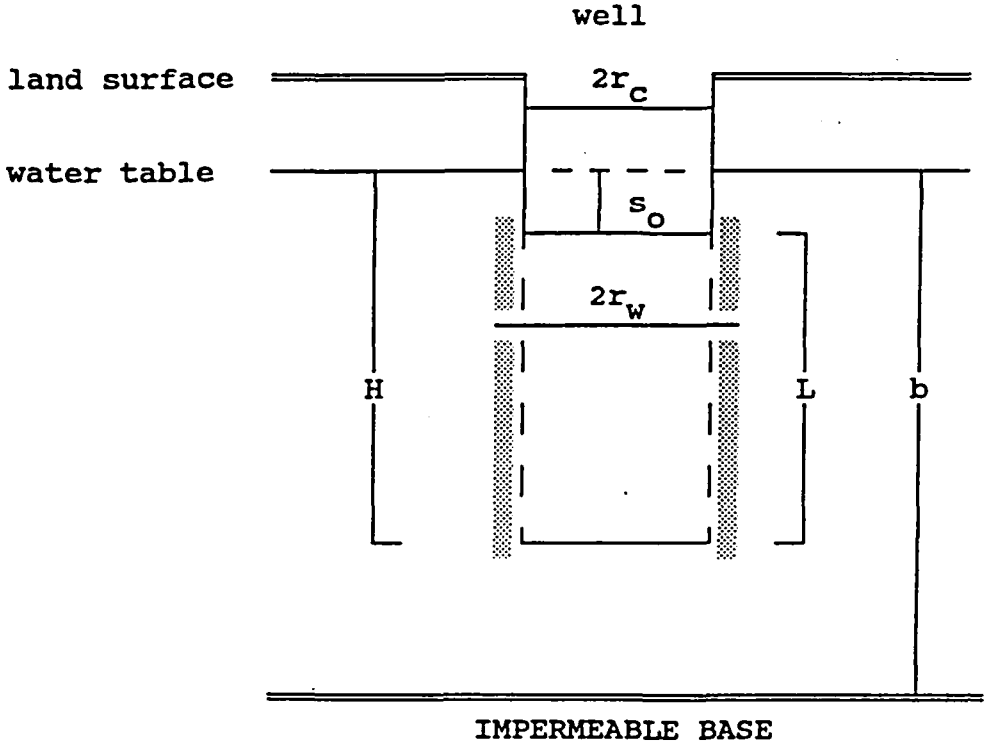
r_w = radius of well (including gravel pack) [L]

H = static height of water in well [L]

b = saturated thickness of aquifer

SLUG TEST METHOD FOR UNCONFINED AQUIFERS
(continued)

DEFINITION OF TERMS:



SLUG TEST FOR CONFINED AQUIFERS

REFERENCE: Cooper, H. H., J. D. Bredehoeft, and S. S. Papadopulos, response of a finite-diameter well to an instantaneous charge of water, Water Resources Research, vol. 3, no. 1, pp. 263-269.

ASSUMPTIONS:
- aquifer has infinite areal extent
- aquifer is homogeneous, isotropic, and of uniform thickness
- aquifer potentiometric surface is initially horizontal
- a volume of water, V, is injected into or discharged from the well instantaneously
- pumping well is fully penetrating
- flow to pumping well is horizontal
- aquifer is confined
- flow is unsteady
- water is released instantaneously from storage with decline of hydraulic head
- diameter of pumping well is very small so that storage in the well can be neglected

SOLUTION:

Integral solution for dimensionless drawdown in well:

$$H/H_0 = \frac{8\alpha}{\pi^2} \int_0^\infty \frac{e^{-\beta u^2/\alpha}}{u \cdot \{[uJ_0(u)-2\alpha J_1(u)]^2 + [uY_0-2\alpha Y_1(u)]^2\}} \, du$$

Laplace solution for response in well:

$$\bar{h} = \frac{r_w \, S \, H_0 \, K_0(rq)}{T \, q \, [r_w q \, K_0(r_w q) + 2\alpha \, K_1(r_w q)]}$$

$$q = (pS/T)^{1/2}$$

p = Laplace transform variable

where:

H = head in well at time t [L]

H_0 = initial head in well well due to slug injection or extraction [L]

α = $r_w^2 S/r_c^2$ [dimensionless]

SLUG TEST FOR CONFINED AQUIFERS
(continued)

r_w = effective radius of well [L]

r_c = internal radius of well casing [L]

β = Tt/r_c^2

J_0 = Bessel function of first kind, zero order

J_1 = Bessel function of first kind, first order

Y_0 = Bessel function of second kind, zero order

Y_1 = Bessel function of second kind, first order

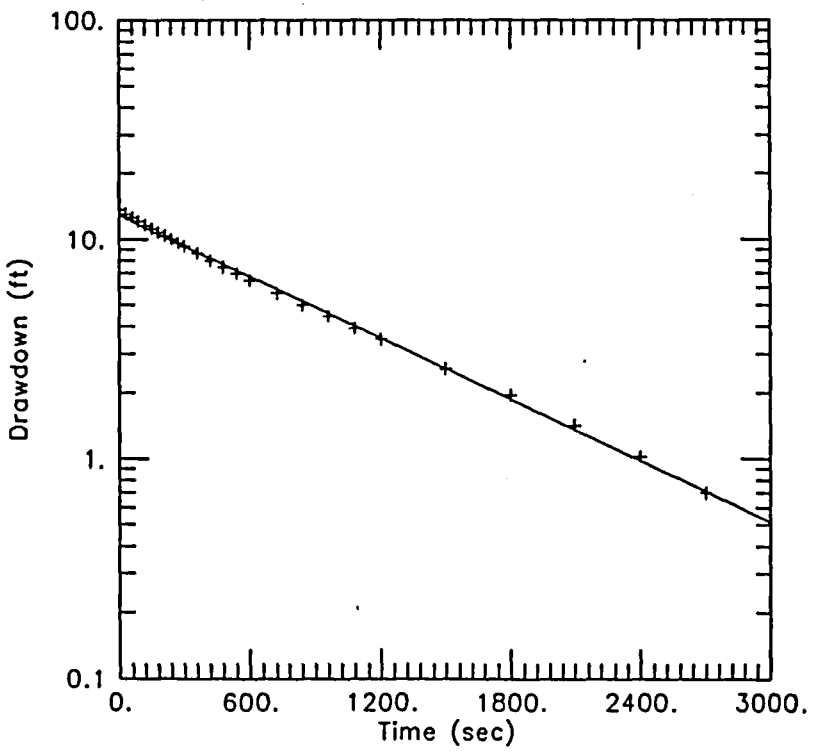
K_0 = modified Bessel function of second kind, zero order

K_1 = modified Bessel function of second kind, first order

Slug Test Data Plots and Calculations

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-8



DATA SET:
F:\530\06503\SLUGMW8.DAT
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

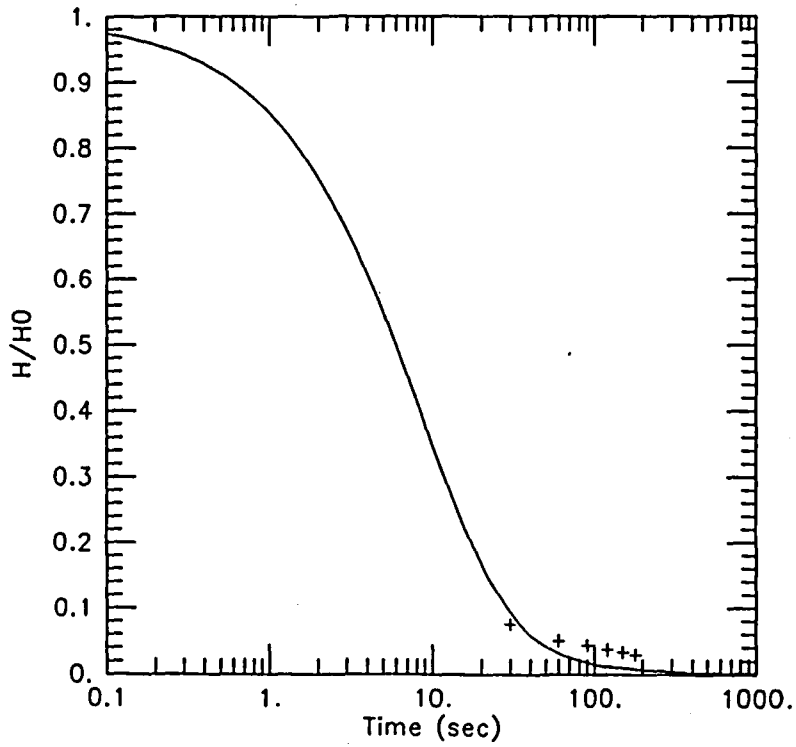
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 1.0484E-06 ft/sec
y0 = 12.83 ft

TEST DATA:
H0 = 13.6 ft
rc = 0.083 ft
rw = 0.25 ft
L = 10. ft
b = 16.24 ft
H = 15.26 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-8A



DATA SET:
F:\530\065031SLUGMW8A.DAT
10/22/92

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

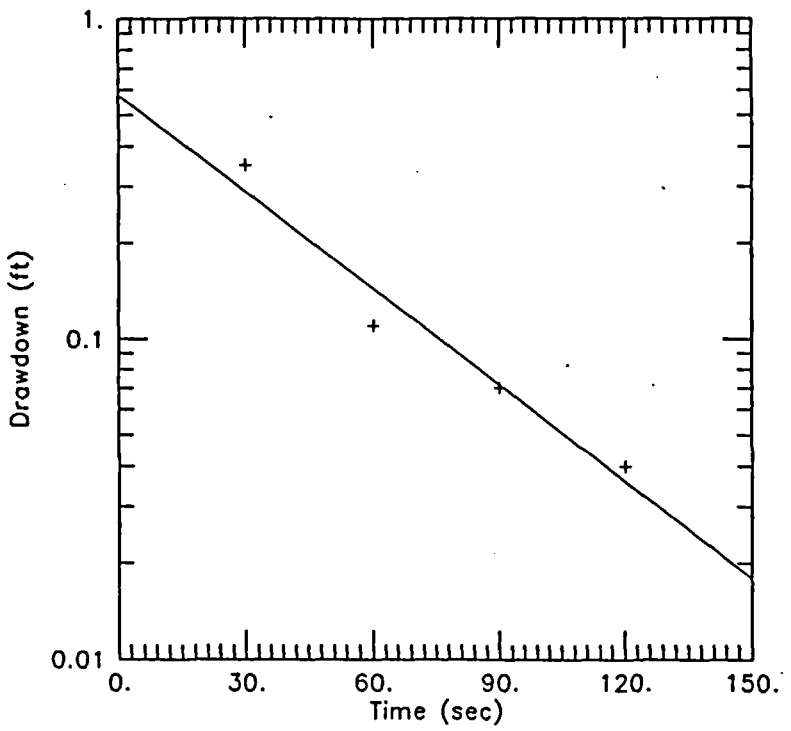
TEST DATE:
OCTOBER 7, 1992

ESTIMATED PARAMETERS:
T = 0.001527 ft^2/sec
S = 0.0001

TEST DATA:
H0 = 2.78 ft
rc = 0.083 ft
rw = 0.25 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-10



DATA SET:
F:\530\06503\SLUGMW10.DAT
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

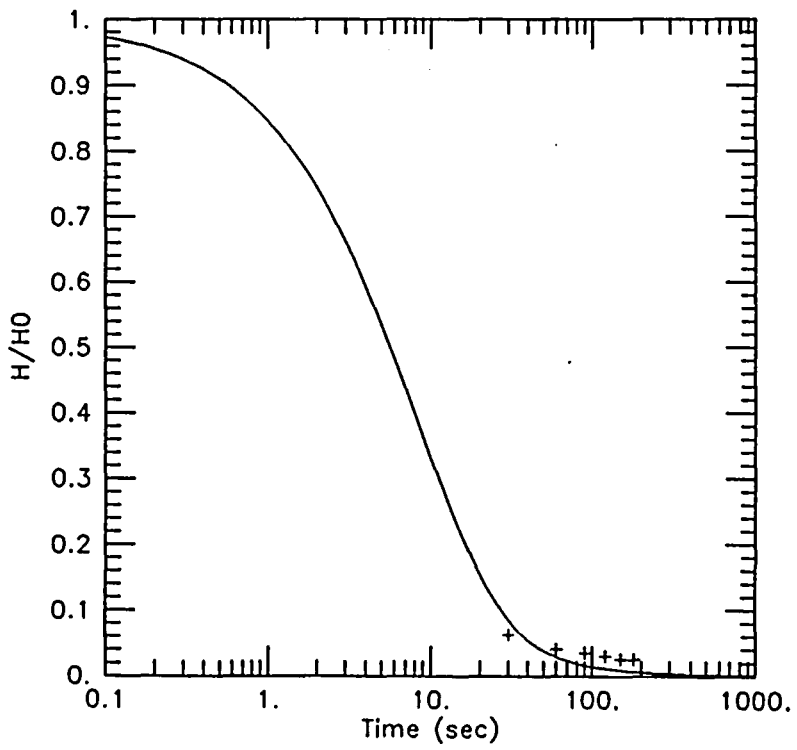
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 1.9949E-05 ft/sec
y0 = 0.5804 ft

TEST DATA:
H0 = 1.14 ft
rc = 0.083 ft
rw = 0.25 ft
L = 10. ft
b = 13.72 ft
H = 9.72 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-11A



DATA SET:
F:\530\06503\SLUGM11A.DAT
10/22/92

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

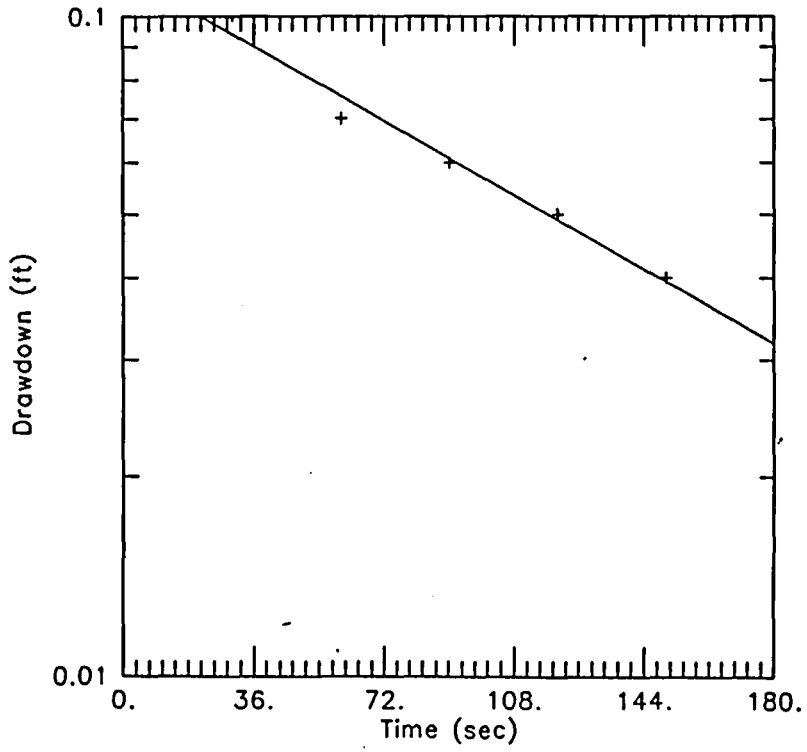
TEST DATE:
OCTOBER 7, 1992

ESTIMATED PARAMETERS:
T = 0.001621 ft^2/sec
S = 0.0001

TEST DATA:
H0 = 4. ft
rc = 0.083 ft
rw = 0.25 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-16



DATA SET:
F:\530\065031\SLUGMW16.DAT
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

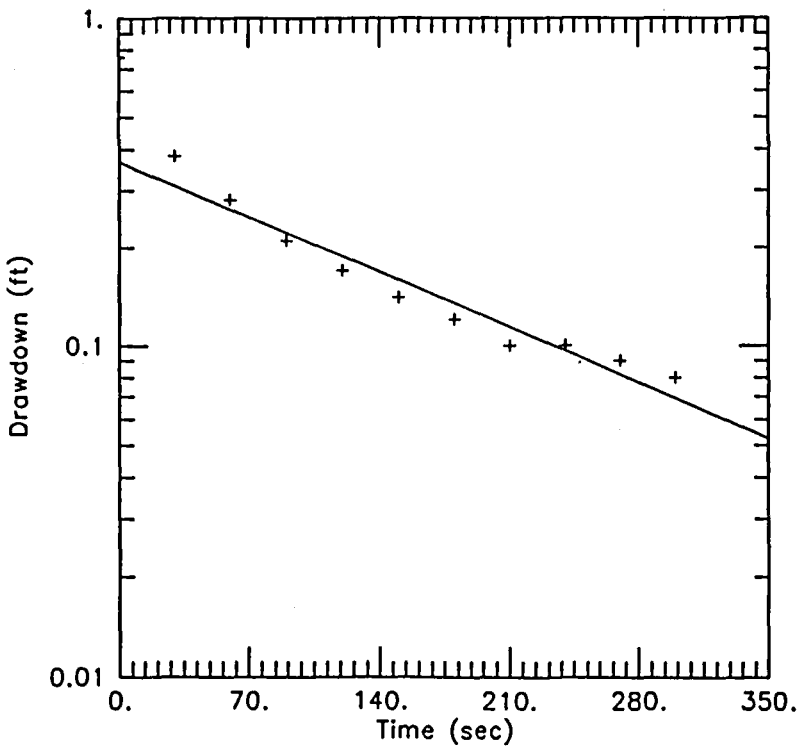
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 6.137E-06 ft/sec
y0 = 0.1168 ft

TEST DATA:
H0 = 0.76 ft
rc = 0.083 ft
rw = 0.25 ft
L = 10. ft
b = 13.77 ft
H = 9.27 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-17



DATA SET:
F:\530\06503\SLUGMW17.DAT
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

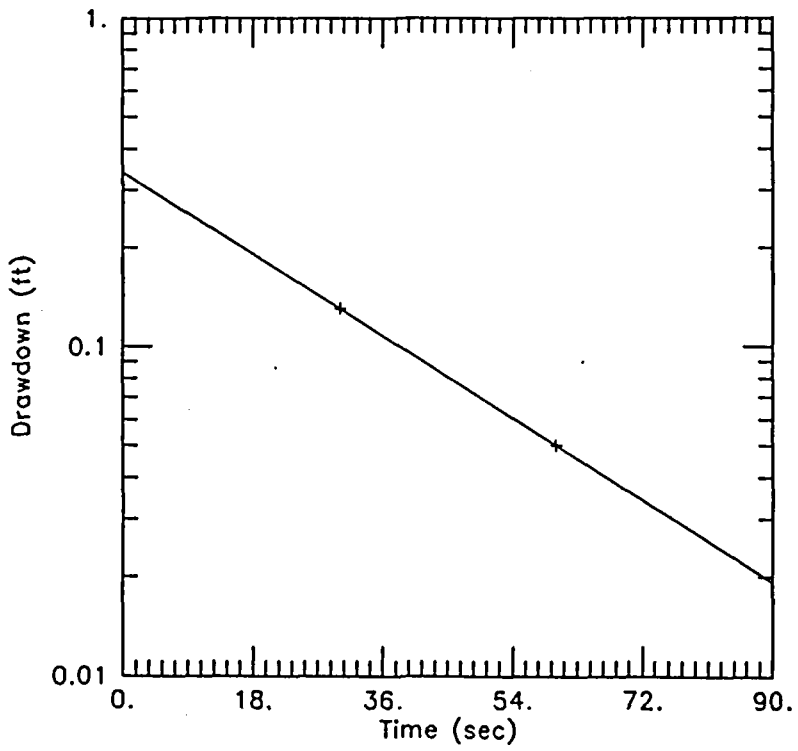
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 4.7057E-06 ft/sec
y0 = 0.3658 ft

TEST DATA:
H0 = 0.76 ft
rc = 0.083 ft
rw = 0.25 ft
L = 10. ft
b = 13.8 ft
H = 9.3 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-18



DATA SET:
F:\530\06503\SLUGMW18.DAT
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

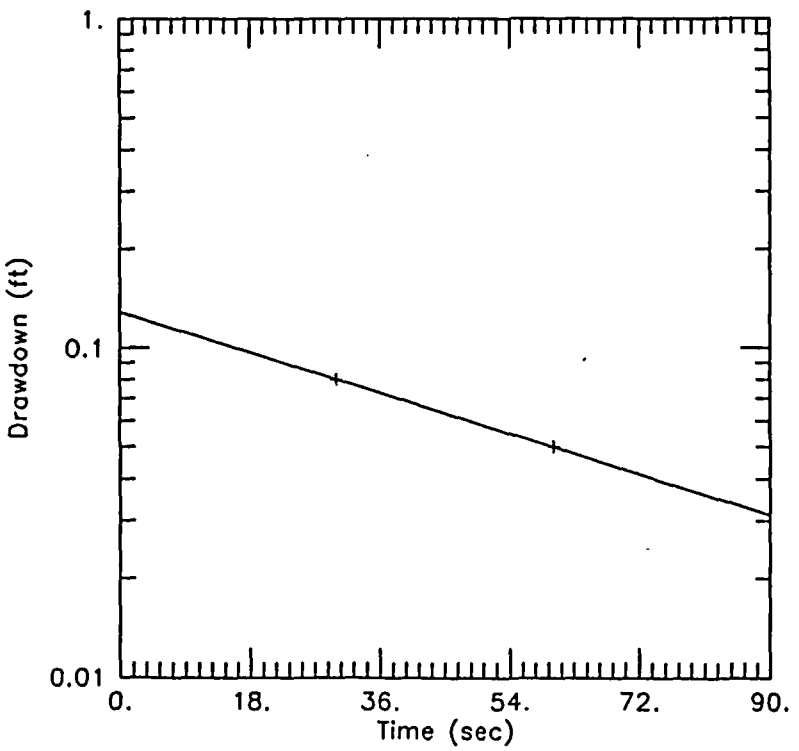
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 2.759E-05 ft/sec
y0 = 0.338 ft

TEST DATA:
H0 = 0.6 ft
rc = 0.083 ft
rw = 0.25 ft
L = 10. ft
b = 11.75 ft
H = 9.38 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-19



DATA SET:
F:\530\06503\SLUGMW19.DAT
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

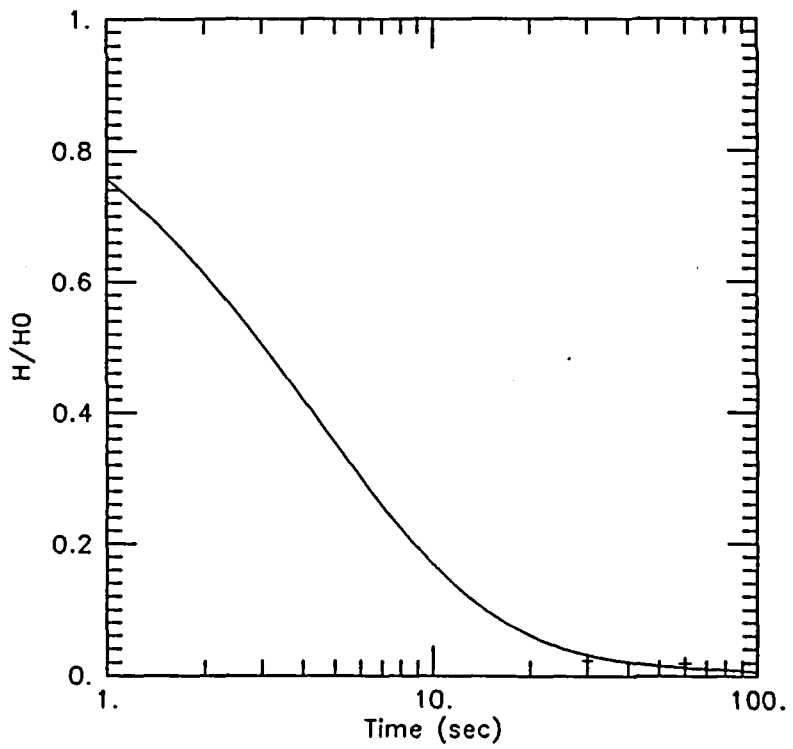
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 2.9194E-05 ft/sec
y0 = 0.128 ft

TEST DATA:
H0 = 1.15 ft
rc = 0.083 ft
rw = 0.25 ft
L = 5. ft
b = 11.6 ft
H = 11.6 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-19A



DATA SET:
F:\530\06503\SLUGM19A.DAT
10/22/92

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

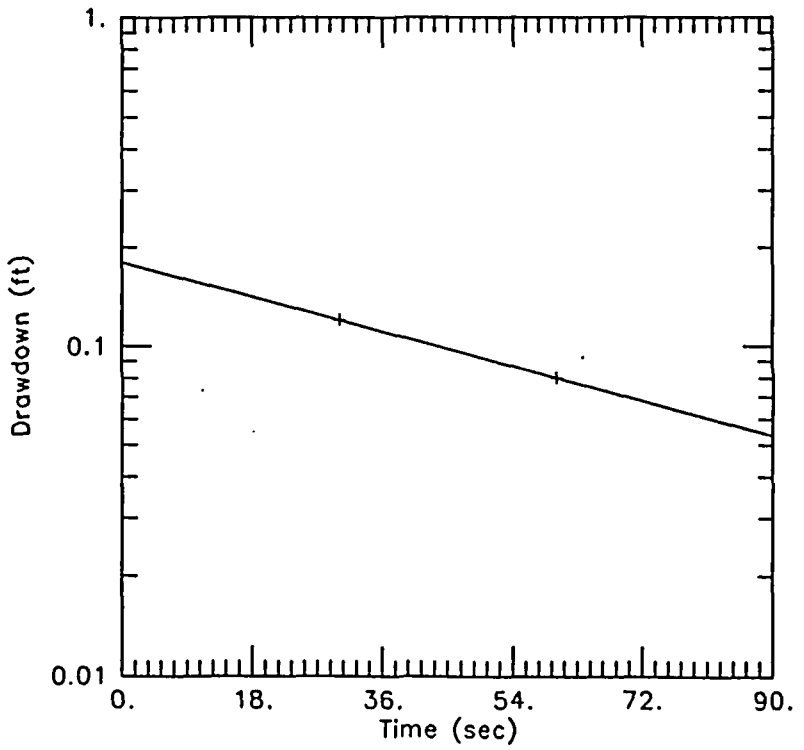
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
T = 0.003015 ft^2/sec
S = 0.0001

TEST DATA:
H0 = 2.64 ft
rc = 0.083 ft
rw = 0.25 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-20



DATA SET:
f:\530\06503\slugmw20.dat
10/26/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

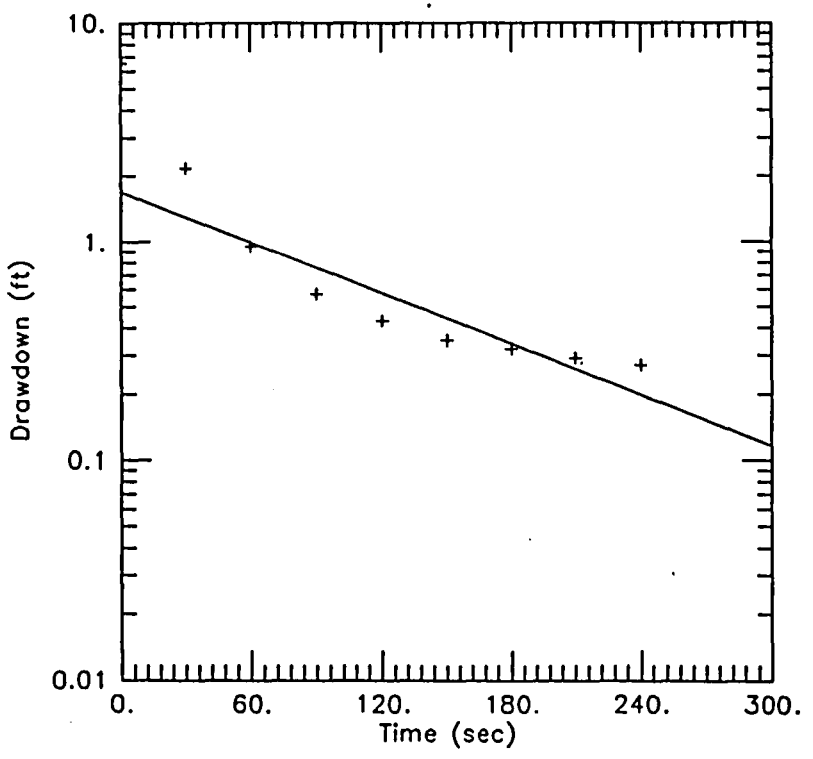
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 2.4576E-05 ft/sec
y0 = 0.18 ft

TEST DATA:
H0 = 2.93 ft
rc = 0.083 ft
rw = 0.25 ft
L = 5. ft
b = 10.3 ft
H = 10.3 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-21



DATA SET:
F:\530\06503\SLUGMW21.DAT
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

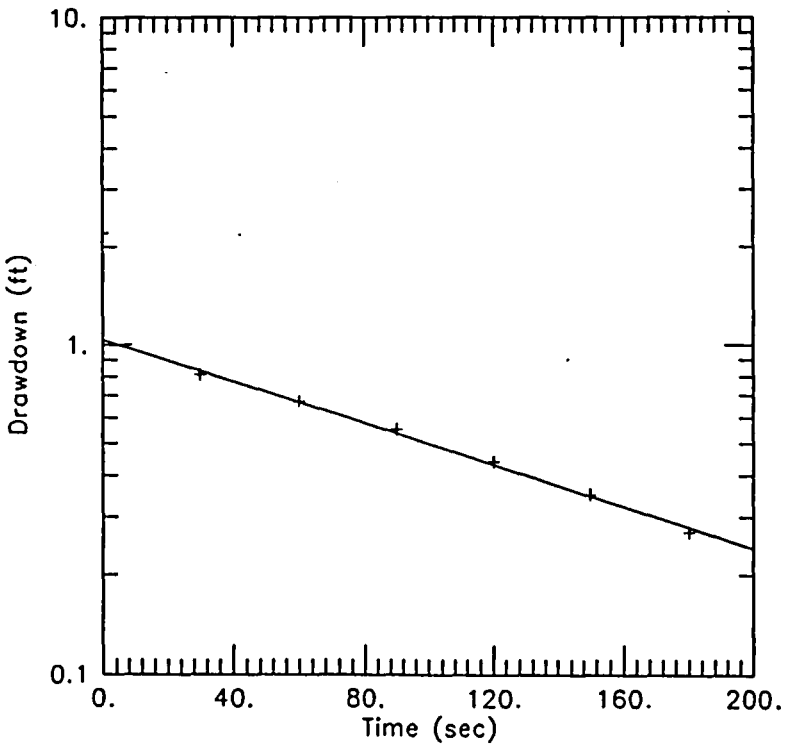
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 1.389E-05 ft/sec
y0 = 1.692 ft

TEST DATA:
H0 = 6.55 ft
rc = 0.083 ft
rw = 0.25 ft
L = 5. ft
b = 6.72 ft
H = 6.51 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-22



DATA SET:
f:\530\06503\slugmw22.dat
10/26/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

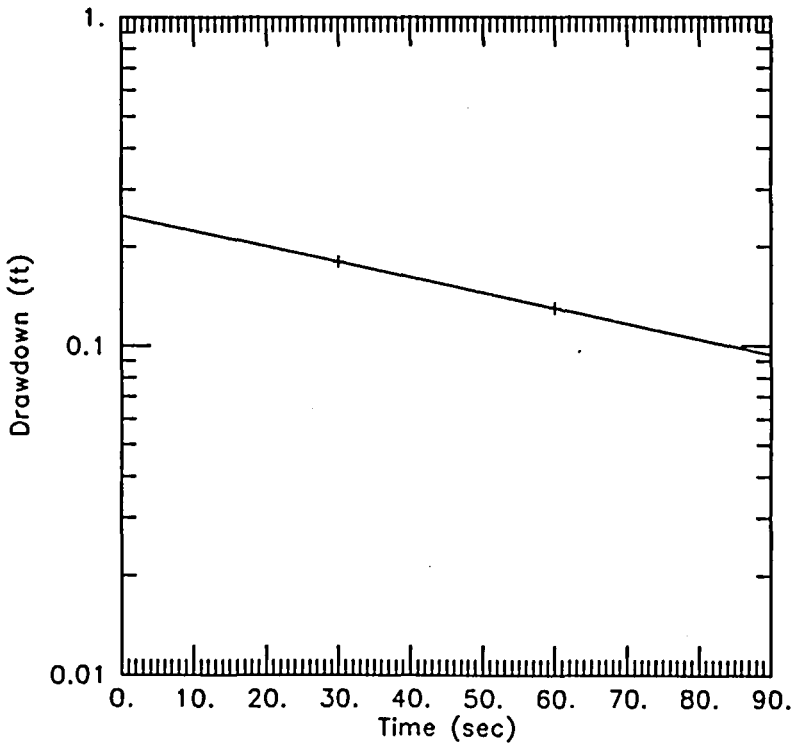
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 1.1981E-05 ft/sec
y0 = 1.036 ft

TEST DATA:
H0 = 2.2 ft
rc = 0.083 ft
rw = 0.25 ft
L = 5. ft
b = 11.29 ft
H = 10.55 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-23



DATA SET:
F:\530\06503\SLUGMW23.DAT
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

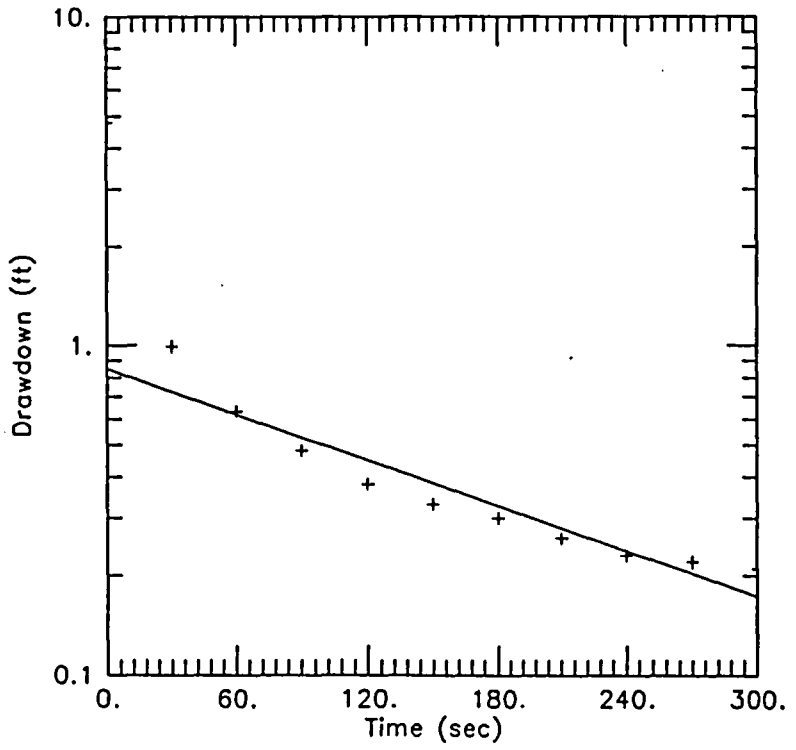
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 1.7793E-05 ft/sec
y0 = 0.2492 ft

TEST DATA:
H0 = 1.24 ft
rc = 0.083 ft
rw = 0.25 ft
L = 5. ft
b = 8.98 ft
H = 8.69 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-24



DATA SET:
F:\530\065031\SLUGMW24.DAT
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

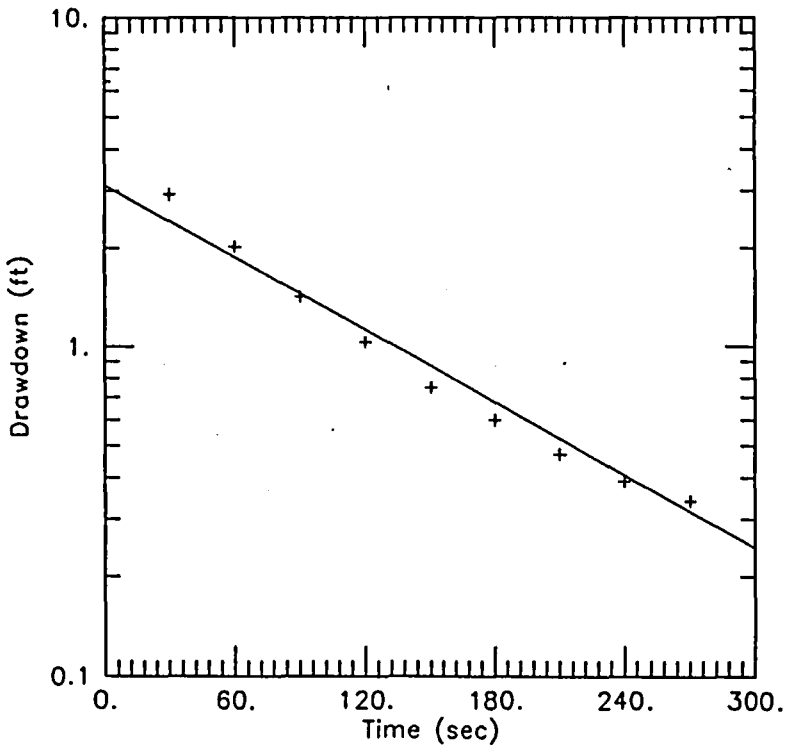
TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 9.654E-06 ft/sec
y0 = 0.8493 ft

TEST DATA:
H0 = 4.78 ft
rc = 0.083 ft
rw = 0.25 ft
L = 5. ft
b = 10.39 ft
H = 10.39 ft

SOUTHERN WOOD PIEDMONT	Client: CHUCK DAVIS
Project No.: 530-06-503	Location: WILMINGTON, NORTH CAROLINA

MW-26



DATA SET:
f:\530\06503\slugmw26.dat
10/22/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
OCTOBER 1992

ESTIMATED PARAMETERS:
K = 1.6883E-05 ft/sec
y0 = 3.119 ft

TEST DATA:
H0 = 6.42 ft
rc = 0.083 ft
rw = 0.25 ft
L = 5. ft
b = 16.35 ft
H = 16.35 ft

Site-Specific Soil Sample List

SITE-SPECIFIC SOIL SAMPLE LIST
SOUTHERN WOOD PIEDMONT FACILITY
WILMINGTON, NORTH CAROLINA

METALS

Arsenic
Copper
Chromium
Lead

SEMI-VOLATILES

Acenaphthene
Benzo(a)anthracene
Benzo(b)fluoranthene
Bis(2-chloroethyl)ether
4-chloro-3-methylphenol
Chrysene
2,4-dimethylphenol
Fluoranthene
Naphthalene
Phenanthrene
Tetrachlorophenol
2,4,6-trichlorophenol
Anthracene
Benzo(a)pyrene
Benzo(k)fluoranthene
Carbazole
2-chlorophenol
Dibenzo(a,h)anthracene
2,4-dinitrophenol
Indeno(1,2,3-cd)pyrene
Pentachlorophenol
Phenol
2,4,5-trichlorophenol

VOLATILES

Benzene
Bromomethane
Chlorobenzene
2-chloroethylvinylether
Chloromethane
Dibromochloromethane
Dichlorodifluoromethane
1,2-dichloroethane
Dichloromethane
Ethyl benzene
M/P-Xylene
O-Xylene
Toluene
1,1,1-trichloroethane
Trichloroethene
Bromodichloromethane
Carbon Tetrachloride
Chloroethane
Chloroform
Cis-1,3-dichloropropene
1,2-dibromomethane (Edb)
1,1-dichloroethane
1,1-dichloroethene
1,2-dichloropropane
Fluorotrichloromethane
Methyl-T-Butyl Ether (Mtbe)
1,1,2,2-tetrachloroethane
Trans-1,2-dichloroethene
1,1,2-trichloroethane
Vinyl Chloride

Soil Sample Summary Table

SOIL SAMPLE SUMMARY
SOUTHERN WOOD PIEDMONT FACILITY
WILMINGTON, NORTH CAROLINA

SAMPLE NUMBER	METALS (mg/kg)				TOTAL SEMI-VOLATILE ORGANICS (mg/kg)	TOTAL VOLATILE ORGANICS (mg/kg)	TOTAL VOLATILE ORGANICS CORRECTED FOR DICHLOROMETHANE* (mg/kg)	TOTAL ORGANICS (mg/kg)
	ARSENIC	CHROMIUM	COPPER	LEAD				
SS-1	3.5	5.5	6.1	14.0	9.93	0.03	0.006	9.936
SS-2	5.2	14.0	46.0	290.0	3.25	0.0064	ND	3.25
SS-3	ND	2.1	8.0	61.0	ND	0.015	ND	ND
SS-4	3.6	11.0	14.0	25.0	17.69	0.018	0.001	17.691
SS-5	1.5	5.2	2.4	3.4	167.07	0.0144	0.0024	167.0724
SS-6	ND	3.1	2.8	3.1	150.42	0.0188	0.0048	150.4248
SS-7	2.3	9.2	5.1	6.3	202.94	0.378	0.319	203.259
SS-8	ND	4.2	1.9	2.3	1.00	0.007	ND	1.0
SS-9	ND	4.1	4.4	6.9	357.34	0.0346	0.0146	357.3546
SS-10	ND	2.6	3.9	6.2	6110.00	0.008	ND	6110.008
SS-11	ND	1.3	1.0	1.9	ND	0.0068	ND	ND

ND Below Laboratory Detection Limit

* Dichloromethane was detected in all the soil samples analyzed. Because dichloromethane is used as the solvent in the extraction process for the soils, it is suspect, in that it may have been introduced to the soil in the laboratory.

Soil Sample Parameters Summary Tables

SOIL SAMPLE PARAMETER SUMMARY TABLE
METALS
SOUTHERN WOOD PIEDMONT FACILITY
WILMINGTON, NORTH CAROLINA

	SS-1		SS-2		SS-3		SS-4		SS-5		SS-6		SS-7		SS-8		SS-9		SS-10		SS-11	
METALS	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL
Arsenic	3.5	1.2	5.2	1.2	ND	1.2	3.6	1.2	1.5	1.2	ND	1.2	2.3	1.2	ND	1.2	ND	1.2	ND	1.2	ND	1.2
Chromium	5.5	0.75	14	0.75	2.1	0.75	11	0.75	5.2	0.75	3.1	0.75	9.2	0.75	4.2	0.75	4.1	0.75	2.6	0.75	1.3	0.75
Copper	6.1	0.75	46	0.75	8	0.75	14	0.75	2.4	0.75	2.8	0.75	5.1	0.75	1.9	0.75	4.4	0.75	3.9	0.75	1.9	0.75
Lead	14	5	290	5	61	5	25	5	3.4	1.2	3.1	1.1	6.3	5	2.3	1.2	6.9	5	6.2	5	1.9	5

R*: Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/kg.

SOIL SAMPLE PARAMETER SUMMARY TABLE
SEMI-VOLATILES
SOUTHERN WOOD PIEDMONT FACILITY
WILMINGTON, NORTH CAROLINA

	SS-1		SS-2		SS-3		SS-4		SS-5		SS-6		SS-7		SS-8		SS-9		SS-10		SS-11	
SEMI-VOLATILES	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL
Acenaphthene	0.51	0.33	ND	0.33	ND	0.33	0.59	0.33	4.4	0.33	2.9	0.33	44	0.33	1.0	0.33	32	0.66	ND	0.33	ND	0.33
Anthracene	ND	0.33	ND	0.33	ND	0.33	ND	0.33	45	0.33	36	0.33	10	0.33	ND	0.33	49	0.66	ND	0.33	ND	0.33
Benz(a)Anthracene	1.1	0.33	0.54	0.33	ND	0.33	1.1	0.33	5.8	0.33	7.4	0.33	3.2	0.33	ND	0.33	26	0.66	730	0.33	ND	0.33
Benzo(a)Pyrene	0.42	0.33	ND	0.33	ND	0.33	2.0	0.33	3.1	0.33	1.9	0.33	0.64	0.33	ND	0.33	9	0.66	680	0.33	ND	0.33
Benzo(b)Fluoranthene	ND	0.33	0.75	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	15	0.33	1800	0.33	ND	0.33
Benzo(k)Fluoranthene	1.5	0.33	ND	0.33	ND	0.33	4.9	0.33	3.8	0.33	3.6	0.33	1.2	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
Bis(2-Chloroethyl)Ether	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
Carbazole	ND	0.33	ND	0.33	ND	0.33	ND	0.33	18	0.33	4.4	0.33	17	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
4-Chloro-3-Methylphenol	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
2-Chlorophenol	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
Chrysene	1.1	0.33	0.53	0.33	ND	0.33	1.6	0.33	4.5	0.33	5.5	0.33	1.9	0.33	ND	0.33	22	0.33	920	0.33	ND	0.33
Dibenz(a,h)Anthracene	ND	0.33	ND	0.33	ND	0.33	3.7	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	0.94	0.33	ND	0.33	ND	0.33
2,4-Dimethylphenol	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
2,4-Dinitrophenol	ND	1.60	ND	1.60	ND	1.60	ND	1.60	ND	1.60	ND	1.60	ND	1.60	ND	0.33	ND	0.33	ND	1.60	ND	1.60
Fluoranthene	3.8	0.33	0.87	0.33	ND	0.33	1.8	0.33	38	0.33	52	0.33	26	0.33	ND	0.33	130	0.66	1300	0.33	ND	0.33
Indeno(1,2,3-Cd)Pyrene	ND	0.33	ND	0.33	ND	0.33	2.0	0.33	0.67	0.33	0.72	0.33	ND	0.33	ND	0.33	3.4	0.33	680	0.33	ND	0.33
Naphthalene	ND	0.33	ND	0.33	ND	0.33	ND	0.33	1.8	0.33	ND	0.33	44	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
Pentachlorophenol	ND	1.60	ND	1.60	ND	1.60	ND	1.60	ND	1.60	ND	1.60	ND	1.60	ND	0.33	ND	0.33	ND	1.60	ND	1.60
Phenanthrene	1.5	0.33	0.56	0.33	ND	0.33	ND	0.33	42	0.33	36	0.33	55	0.33	ND	0.33	70	0.66	ND	0.33	ND	0.33
Phenol	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
Tetrachlorophenol	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
2,4,5-Trichlorophenol	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33
2,4,6-Trichlorophenol	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33	ND	0.33

R*: Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/kg.

SOIL SAMPLE PARAMETER SUMMARY TABLE-VOLATILES
SOUTHERN WOOD PIEDMONT FACILITY-WILMINGTON, NORTH CAROLINA

	SS-1		SS-2		SS-3		SS-4		SS-5		SS-6		SS-7		SS-8		SS-9		SS-10		SS-11	
VOLATILES	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL
Benzene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Bromodichloromethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Bromomethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.025	ND	0.005	ND	0.005
Carbon Tetrachloride	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Chlorobenzene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Chloroethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.025	ND	0.005	ND	0.005
2-Chloroethylvinylether	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Chloroform	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Chloromethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.025	ND	0.005	ND	0.005
Cis-1,3-Dichloropropene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Dibromochloromethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
1,2-Dibromoethane (Edb)	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.025	ND	0.005	ND	0.005
Dichlorodifluoromethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.025	ND	0.005	ND	0.005
1,1-Dichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
1,2-Dichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
1,1-Dichloroethene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Dichloromethane	0.024	0.001	0.0064	0.001	0.015	0.001	0.017	0.001	0.012	0.001	0.014	0.001	0.059	0.001	0.007	0.001	0.020	0.005	0.008	0.001	0.0068	0.001
1,2-Dichloropropane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Ethyl Benzene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.15	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Fluorotrichloromethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.025	ND	0.005	ND	0.005
M/P-Xylene	0.0025	0.001	ND	0.001	ND	0.001	0.001	0.001	0.0011	0.001	0.0014	0.001	0.084	0.001	ND	0.001	0.0071	0.005	ND	0.001	ND	0.001
Methyl-T-Butyl Ether (Mtbe)	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.025	ND	0.005	ND	0.005
O-Xylene	0.0011	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.069	0.001	ND	0.001	0.0075	0.005	ND	0.001	ND	0.001
1,1,2,2-Tetrachloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Toluene	0.0024	0.001	ND	0.001	ND	0.001	ND	0.001	0.0013	0.001	0.0034	0.001	0.016	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Trans-1,2-Dichloroethene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
1,1,1-Trichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
1,1,2-Trichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Trichloroethene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.005	ND	0.001	ND	0.001
Vinyl Chloride	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.025	ND	0.005	ND	0.005

R*: Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/kg.

Soil Sample Collection Summary Sheets

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/09/92

Sampled By: Kuntz Time: 14:00

Sampling Point Identification: SS-1 #10782

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Brownish Black Clay and Silt, 25% Organics

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/09/92

Sampled By: Kuntz Time: 14:45

Sampling Point Identification: SS-2 #10783

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Dark Black Sandy Silty Peat; Slight Organic Odor

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

ETE, Inc.

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/09/92

Sampled By: Kuntz Time: 15:15

Sampling Point Identification: SS-3 #10784

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Blackish Brown Sand, 15% Silt, Trace Organics

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/09/92

Sampled By: Kuntz Time: 16:00

Sampling Point Identification: SS-4 #10785

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Blackish Gray Clay and Peat

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/09/92

Sampled By: Kuntz Time: 17:30

Sampling Point Identification: SS-5 #10786

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Gray Sand, 10% Small to Large Pebbles, 10% Clay; Creosote Stained

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/09/92

Sampled By: Kuntz Time: 18:15

Sampling Point Identification: SS-6 #10787

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Gray Sand, 15% Small to Large Pebble, 10% Clay, Creosote Stained

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/09/92

Sampled By: Kuntz Time: 16:30

Sampling Point Identification: SS-7 #10788

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Brown Peaty Clay, 30% Peat, Creosote Stained

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/14/92

Sampled By: Kuntz Time: 07:30

Sampling Point Identification: SS-8 #10789

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Dark Brown and Black Clay and Peat

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/14/92

Sampled By: Kuntz Time: 09:00

Sampling Point Identification: SS-9 #10790

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Brown Sand, 20% Clay, Strong Diesel Odor and Sheen

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/14/92

Sampled By: Kuntz Time: 09:45

Sampling Point Identification: SS-10 #10791

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Brown Sand 5% Clay

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

ETE, Inc.

P O BOX 1867
1445 Pisgah Church Rd.
Lexington SC 29072
(803) 957-6270

SAMPLE COLLECTION SUMMARY SHEET

Project Number: 530-06-506 Date: 12/14/92

Sampled By: Kuntz Time: 10:30

Sampling Point Identification: SS-11 #10792

Site Name/City/County: SWP-Wilmington

Weather Conditions: Clear 50°

Sample Type: Soil

Sampling Method: Stainless spoon and stainless steel hand auger

Splits/Spikes/Duplicates:

Sampling Containers:(Number/Size/Type) 1/500ml/G;2/250ml/G

Appearance of Sample: Brown Sand

Reason for Sampling: Phase II Assessment Soil Resample

Lab Performing Analysis: EMS Heritage

Respiratory Protection: None

Personnel Present: Kuntz

Soil Sample Laboratory Results and Chain-of-Custody

MAS
G. Kurtz

CASE SUMMARY

Client : Southern Wood Piedmont
Project : Wilmington

Date: 1/5/93

SWP SAMPLE ID	HERITAGE SAMPLE NUMBER	DATE SAMPLED
SS-1	B118583	12/9/92
SS-2	B118584	12/9/92
SS-3	B118585	12/9/92
SS-4	B117586	12/9/92
SS-5	B118587	12/9/92
SS-6	B118588	12/9/92
SS-7	B118589	12/9/92
SS-8	B118673	12/14/92
SS-9	B118674	12/14/92
SS-10	B118675	12/14/92
SS-11	B118676	12/14/92

RECEIVED
JAN 0 6 1993
ENVIRONMENTAL AFFAIRS

		SS-6 B118588 09-DEC-92			SS-7 B118589 09-DEC-92			SS-8 B118673 14-DEC-92			SS-9 B118674 14-DEC-92			SS-10 B118675 14-DEC-92		
Semi-volatiles	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Acenaphthene	83-32-9	2.9	0.33	mg/kg	**44	0.33	mg/kg	1.0	0.33	mg/kg	***32	0.66	mg/kg	BDL	0.33	mg/kg
Anthracene	120-12-7	*36	0.33	mg/kg	**10	0.33	mg/kg	BDL	0.33	mg/kg	***49	0.66	mg/kg	BDL	0.33	mg/kg
Benz(A)Anthracene	56-55-3	*7.4	0.33	mg/kg	3.2	0.33	mg/kg	BDL	0.33	mg/kg	***26	0.66	mg/kg	730	0.33	mg/kg
Benzo(A)Pyrene	50-32-8	1.9	0.33	mg/kg	0.64	0.33	mg/kg	BDL	0.33	mg/kg	**9.0	0.66	mg/kg	680	0.33	mg/kg
Benzo(B)Fluoranthene	205-99-2	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	***15	0.33	mg/kg	1800	0.33	mg/kg
Benzo(K)Fluoranthene	207-08-9	3.6	0.33	mg/kg	1.2	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
Bis(2-Chloroethyl)Ether	111-44-4	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	***	0.33	mg/kg	BDL	0.33	mg/kg
Carbazole	86-74-8	4.4	0.33	mg/kg	**17	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
4-Chloro-3-Methylphenol	59-50-7	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
2-Chlorophenol	95-57-8	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
Chrysene	218-01-9	5.5	0.33	mg/kg	1.9	0.33	mg/kg	BDL	0.33	mg/kg	***22	0.66	mg/kg	920	0.33	mg/kg
Dibenz(A,H)Anthracene	53-70-3	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	0.94	0.33	mg/kg	BDL	0.33	mg/kg
2,4-Dimethylphenol	105-67-9	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
2,4-Dinitrophenol	25550-58-7	BDL	1.6	mg/kg	BDL	1.6	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	1.6	mg/kg
Fluoranthene	206-44-0	*52	0.33	mg/kg	**26	0.33	mg/kg	BDL	0.33	mg/kg	***130	0.66	mg/kg	1300	0.33	mg/kg
Indeno(1,2,3-Cd)Pyrene	193-39-5	0.72	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	3.4	0.33	mg/kg	680	0.33	mg/kg
Naphthalene	91-20-3	BDL	0.33	mg/kg	**44	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
Pentachlorophenol	87-86-5	BDL	1.6	mg/kg	BDL	1.6	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	1.6	mg/kg
Phenanthrene	85-01-8	*36	0.33	mg/kg	**55	0.33	mg/kg	BDL	0.33	mg/kg	***70	0.66	mg/kg	BDL	0.33	mg/kg
Phenol	108-95-2	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
Tetrachlorophenol	25167-83-3	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
2,4,5-Trichlorophenol	95-95-4	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
2,4,6-Trichlorophenol	88-06-2	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		SS-11 B118676 14-DEC-92				
Semi-volatiles	CAS Number	Result	DL	Units		
Acenaphthene	83-32-9	BDL	0.33	mg/kg		
Anthracene	120-12-7	BDL	0.33	mg/kg		
Benz(A)Anthracene	56-55-3	BDL	0.33	mg/kg		
Benzo(A)Pyrene	50-32-8	BDL	0.33	mg/kg		
Benzo(B)Fluoranthene	205-99-2	BDL	0.33	mg/kg		
Benzo(K)Fluoranthene	207-08-9	BDL	0.33	mg/kg		
Bis(2-Chloroethyl)Ether	111-44-4	BDL	0.33	mg/kg		
Carbazole	86-74-8	BDL	0.33	mg/kg		
4-Chloro-3-Methylphenol	59-50-7	BDL	0.33	mg/kg		
2-Chlorophenol	95-57-8	BDL	0.33	mg/kg		
Chrysene	218-01-9	BDL	0.33	mg/kg		
Dibenz(A,H)Anthracene	53-70-3	BDL	0.33	mg/kg		
2,4-Dimethylphenol	105-67-9	BDL	0.33	mg/kg		
2,4-Dinitrophenol	25550-58-7	BDL	1.6	mg/kg		
Fluoranthene	206-44-0	BDL	0.33	mg/kg		
Indeno(1,2,3-Cd)Pyrene	193-39-5	BDL	0.33	mg/kg		
Naphthalene	91-20-3	BDL	0.33	mg/kg		
Pentachlorophenol	87-86-5	BDL	1.6	mg/kg		
Phenanthrene	85-01-8	BDL	0.33	mg/kg		
Phenol	108-95-2	BDL	0.33	mg/kg		
Tetrachlorophenol	25167-83-3	BDL	0.33	mg/kg		
2,4,5-Trichlorophenol	95-95-4	BDL	0.33	mg/kg		
2,4,6-Trichlorophenol	88-06-2	BDL	0.33	mg/kg		

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

Heritage Laboratories, Inc -- Parameter Summary Report
SWP Wilmington Project

		SS-1 B118583 09-DEC-92			SS-2 B118584 09-DEC-92			SS-3 B118585 09-DEC-92			SS-4 B118586 09-DEC-92			SS-5 B118587 09-DEC-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	3.5		1.2mg/kg	5.2		1.2mg/kg	BDL		1.2mg/kg	3.6		1.2mg/kg	1.5		1.2mg/kg
Chromium	7440-47-32	5.5		0.75mg/kg	14		0.75mg/kg	2.1		0.75mg/kg	11		0.75mg/kg	5.2		0.75mg/kg
Copper	7440-50-8	6.1		0.75mg/kg	46		0.75mg/kg	8.0		0.75mg/kg	14		0.75mg/kg	2.4		0.75mg/kg
Lead	7439-92-1	14		5mg/kg	290		5mg/kg	61		5.0mg/kg	25		5.0mg/kg	3.4		1.2mg/kg

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		SS-6 B118588 09-DEC-92			SS-7 B118589 09-DEC-92			SS-8 B118673 14-DEC-92			SS-9 B118674 14-DEC-92			SS-10 B118675 14-DEC-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL		1.2mg/kg	2.3		1.2mg/kg	BDL		1.2mg/kg	BDL		1.2mg/kg	BDL		1.2mg/kg
Chromium	7440-47-32	3.1		0.75mg/kg	9.2		0.75mg/kg	4.2		0.75mg/kg	4.1		0.75mg/kg	2.6		0.75mg/kg
Copper	7440-50-8	2.8		0.75mg/kg	5.1		0.75mg/kg	1.9		0.75mg/kg	4.4		0.75mg/kg	3.9		0.75mg/kg
Lead	7439-92-1	3.1		1.1mg/kg	6.3		5.0mg/kg	2.3		1.2mg/kg	6.9		5.0mg/kg	6.2		5.0mg/kg

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		SS-11 B118676 14-DEC-92					
Metals	CAS Number	Result	DL	Units			
Arsenic	7440-38-2	BDL		1.2mg/kg			
Chromium	7440-47-32	1.3		0.75mg/kg			
Copper	7440-50-8	1.0		0.75mg/kg			
Lead	7439-92-1	1.9		1.2mg/kg			

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

Heritage Laboratories, Inc -- Parameter Summary Report
SWP Wilmington Project

		SS-1 B118583 09-DEC-92			SS-2 B118584 09-DEC-92			SS-3 B118585 09-DEC-92			SS-4 B118586 09-DEC-92			SS-5 B118587 09-DEC-92		
General Organics	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Benzene	71-43-2	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Bromodichloromethane	75-27-4	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Bromomethane	74-83-9	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg
Carbon Tetrachloride	56-23-5	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Chlorobenzene	108-90-7	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Chloroethane	75-00-3	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg
2-Chloroethylvinylether	110-75-8	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Chloroform	67-66-3	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Chloromethane	74-87-3	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg
Cis-1,3-Dichloropropene	10061-01-5	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Dibromochloromethane	124-48-1	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
1,2-Dibromoethane (Edb)	106-93-4	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg
Dichlorodifluoromethane	75-71-8	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg
1,1-Dichloroethane	75-34-3	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
1,2-Dichloroethane	107-06-2	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
1,1-Dichloroethene	75-35-4	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Dichloromethane	75-09-2	0.024	0.001	mg/kg	0.0064	0.001	mg/kg	0.015	0.001	mg/kg	0.017	0.001	mg/kg	0.012	0.001	mg/kg
1,2-Dichloropropane	78-87-5	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Ethyl Benzene	100-41-4	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Fluorotrichloromethane	75-69-4	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg
M/P-Xylene	NA	0.0025	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	0.0010	0.001	mg/kg	0.0011	0.001	mg/kg
Methyl-T-Butyl Ether (Mtbe)	1634-04-4	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg
O-Xylene	95-47-6	0.0011	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
1,1,2,2-Tetrachloroethane	79-34-5	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Toluene	108-88-3	0.0024	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	0.0013	0.001	mg/kg
Trans-1,2-Dichloroethene	156-60-5	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
1,1,1-Trichloroethane	78-92-2	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
1,1,2-Trichloroethane	79-00-5	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Trichloroethene	79-01-6	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg	BDL	0.001	mg/kg
Vinyl Chloride	75-01-4	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg	BDL	0.005	mg/kg

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		SS-6 B118588 09-DEC-92			SS-7 B118589 09-DEC-92			SS-8 B118673 14-DEC-92			SS-9 B118674 14-DEC-92			SS-10 B118675 14-DEC-92		
General Organics	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Benzene	71-43-2	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Bromodichloromethane	75-27-4	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Bromomethane	74-83-9	BDL	0.005	mg/kg	BDL	0.050	mg/kg	BDL	0.005	mg/kg	BDL	0.025	mg/kg	BDL	0.005	mg/kg
Carbon Tetrachloride	56-23-5	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Chlorobenzene	108-90-7	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Chloroethane	75-00-3	BDL	0.005	mg/kg	BDL	0.050	mg/kg	BDL	0.005	mg/kg	BDL	0.025	mg/kg	BDL	0.005	mg/kg
2-Chloroethylvinylether	110-75-8	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Chloroform	67-66-3	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Chloromethane	74-87-3	BDL	0.005	mg/kg	BDL	0.050	mg/kg	BDL	0.005	mg/kg	BDL	0.025	mg/kg	BDL	0.005	mg/kg
Cis-1,3-Dichloropropene	10061-01-5	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Dibromochloromethane	124-48-1	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
1,2-Dibromoethane (Edb)	106-93-4	BDL	0.005	mg/kg	BDL	0.050	mg/kg	BDL	0.005	mg/kg	BDL	0.025	mg/kg	BDL	0.005	mg/kg
Dichlorodifluoromethane	75-71-8	BDL	0.005	mg/kg	BDL	0.050	mg/kg	BDL	0.005	mg/kg	BDL	0.025	mg/kg	BDL	0.005	mg/kg
1,1-Dichloroethane	75-34-3	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
1,2-Dichloroethane	107-06-2	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
1,1-Dichloroethene	75-35-4	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Dichloromethane	75-09-2	0.014	0.001	mg/kg	0.059	0.010	mg/kg	0.0070	0.001	mg/kg	0.020	0.005	mg/kg	0.0080	0.001	mg/kg
1,2-Dichloropropane	78-87-5	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Ethyl Benzene	100-41-4	BDL	0.001	mg/kg	0.15	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Fluorotrichloromethane	75-69-4	BDL	0.005	mg/kg	BDL	0.050	mg/kg	BDL	0.005	mg/kg	BDL	0.025	mg/kg	BDL	0.005	mg/kg
M/P-Xylene	NA	0.0014	0.001	mg/kg	0.084	0.010	mg/kg	BDL	0.001	mg/kg	0.0071	0.005	mg/kg	BDL	0.001	mg/kg
Methyl-T-Butyl Ether (Mtbe)	1634-04-4	BDL	0.005	mg/kg	BDL	0.050	mg/kg	BDL	0.005	mg/kg	BDL	0.025	mg/kg	BDL	0.005	mg/kg
O-Xylene	95-47-6	BDL	0.001	mg/kg	0.069	0.010	mg/kg	BDL	0.001	mg/kg	0.0075	0.005	mg/kg	BDL	0.001	mg/kg
1,1,2,2-Tetrachloroethane	79-34-5	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Toluene	108-88-3	0.0034	0.001	mg/kg	0.016	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Trans-1,2-Dichloroethene	156-60-5	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
1,1,1-Trichloroethane	78-92-2	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
1,1,2-Trichloroethane	79-00-5	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Trichloroethene	79-01-6	BDL	0.001	mg/kg	BDL	0.010	mg/kg	BDL	0.001	mg/kg	BDL	0.005	mg/kg	BDL	0.001	mg/kg
Vinyl Chloride	75-01-4	BDL	0.005	mg/kg	BDL	0.050	mg/kg	BDL	0.005	mg/kg	BDL	0.025	mg/kg	BDL	0.005	mg/kg

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		SS-11 B118676 14-DEC-92					
General Organics	CAS Number	Result	DL	Units			
Benzene	71-43-2	BDL	0.001	mg/kg			
Bromodichloromethane	75-27-4	BDL	0.001	mg/kg			
Bromomethane	74-83-9	BDL	0.005	mg/kg			
Carbon Tetrachloride	56-23-5	BDL	0.001	mg/kg			
Chlorobenzene	108-90-7	BDL	0.001	mg/kg			
Chloroethane	75-00-3	BDL	0.005	mg/kg			
2-Chloroethylvinylether	110-75-8	BDL	0.001	mg/kg			
Chloroform	67-66-3	BDL	0.001	mg/kg			
Chloromethane	74-87-3	BDL	0.005	mg/kg			
Cis-1,3-Dichloropropene	10061-01-5	BDL	0.001	mg/kg			
Dibromochloromethane	124-48-1	BDL	0.001	mg/kg			
1,2-Dibromoethane (Edb)	106-93-4	BDL	0.005	mg/kg			
Dichlorodifluoromethane	75-71-8	BDL	0.005	mg/kg			
1,1-Dichloroethane	75-34-3	BDL	0.001	mg/kg			
1,2-Dichloroethane	107-06-2	BDL	0.001	mg/kg			
1,1-Dichloroethene	75-35-4	BDL	0.001	mg/kg			
Dichloromethane	75-09-2	0.0068	0.001	mg/kg			
1,2-Dichloropropane	78-87-5	BDL	0.001	mg/kg			
Ethyl Benzene	100-41-4	BDL	0.001	mg/kg			
Fluorotrichloromethane	75-69-4	BDL	0.005	mg/kg			
M/P-Xylene	NA	BDL	0.001	mg/kg			
Methyl-T-Butyl Ether (Mtbe)	1634-04-4	BDL	0.005	mg/kg			
O-Xylene	95-47-6	BDL	0.001	mg/kg			
1,1,2,2-Tetrachloroethane	79-34-5	BDL	0.001	mg/kg			
Toluene	108-88-3	BDL	0.001	mg/kg			
Trans-1,2-Dichloroethene	156-60-5	BDL	0.001	mg/kg			
1,1,1-Trichloroethane	78-92-2	BDL	0.001	mg/kg			
1,1,2-Trichloroethane	79-00-5	BDL	0.001	mg/kg			
Trichloroethene	79-01-6	BDL	0.001	mg/kg			
Vinyl Chloride	75-01-4	BDL	0.005	mg/kg			

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	11-DEC-92	2024	B118583
	Complete	PO Number	
	04-JAN-93	530-06-501	
	Printed	Sampled	
	05-JAN-93	09-DEC-92 14:00	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-1
LOG #: 10782

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.11		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	5.5	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 16-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	6.1	0.75	mg/kg

LEAD FAA SW846-7420

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M116.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
LEAD	14	5	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.0		Grams
FINAL WEIGHT OR VOLUME	50		mL

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ENVIRONMENTAL AFFAIRS

 (continued on next page)

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	3.5	1.2	mg/kg

Note: Analysis performed by 3 point MSA

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 16-DEC-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/kg
CHLOROMETHANE	BDL	0.005	mg/kg
VINYL CHLORIDE	BDL	0.005	mg/kg
BROMOMETHANE	BDL	0.005	mg/kg
CHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/kg
1,1-DICHLOROETHENE	BDL	0.001	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.024	0.001	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/kg
1,1-DICHLOROETHANE	BDL	0.001	mg/kg
CHLOROFORM	BDL	0.001	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/kg
CARBON TETRACHLORIDE	BDL	0.001	mg/kg
BENZENE	BDL	0.001	mg/kg
1,2-DICHLOROETHANE	BDL	0.001	mg/kg
TRICHLOROETHENE	BDL	0.001	mg/kg
1,2-DICHLOROPROPANE	BDL	0.001	mg/kg
BROMODICHLOROMETHANE	BDL	0.001	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/kg
TOLUENE	0.002	0.001	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.001	mg/kg
CHLOROBENZENE	BDL	0.001	mg/kg
ETHYLBENZENE	BDL	0.001	mg/kg
M/P-XYLENE	0.002	0.001	mg/kg
O-XYLENE	0.001	0.001	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/kg

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 11-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.00		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 28-DEC-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	0.51	0.33	mg/kg
ANTHRACENE	BDL	0.33	mg/kg
BENZ(A)ANTHRACENE	1.1	0.33	mg/kg
BENZO(A)PYRENE	0.42	0.33	mg/kg
BENZO(B)FLUORANTHENE	BDL	0.33	mg/kg
BENZO(K)FLUORANTHENE	1.5	0.33	mg/kg

 (continued on next page)

HERITAGE LABORATORIES, INC. Lab Sample ID: B118583

Parameter	Result	Det. Limit	Units
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	BDL	0.33	mg/kg
CHRYSENE	1.1	0.33	mg/kg
DIBENZ(A,H)ANTHRACENE	BDL	0.33	mg/kg
FLUORANTHENE	3.8	0.33	mg/kg
INDENO(1,2,3-CD)PYRENE	BDL	0.33	mg/kg
NAPHTHALENE	BDL	0.33	mg/kg
PHENANTHRENE	1.5	0.33	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	54		% Rec
PHENOL-D5	57		% Rec
NITROBENZENE-D5	78		% Rec
2-FLUOROBIPHENYL	101		% Rec
2,4,6-TRIBROMOPHENOL	59		% Rec
TERPHENYL-D14	106		% Rec

Sample reanalyzed with no improvement in internal standard areas.

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16791.

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Quality Assurance Officer: Chelsmith MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	11-DEC-92	2024	B118584
	Complete	PO Number	
	04-JAN-93	530-06-501	
	Printed	Sampled	
	05-JAN-93	09-DEC-92 14:45	

Report To

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P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-2
LOG #: 10783

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.10		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	14	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 16-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	46	0.75	mg/kg

LEAD FAA SW846-7420

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M116.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
LEAD	290	5	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.09		Grams
FINAL WEIGHT OR VOLUME	50		mL

 (continued on next page)

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	5.2	1.2	mg/kg

Note: Analysis performed by 3 point MSA

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 16-DEC-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/kg
CHLOROMETHANE	BDL	0.005	mg/kg
VINYL CHLORIDE	BDL	0.005	mg/kg
BROMOMETHANE	BDL	0.005	mg/kg
CHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/kg
1,1-DICHLOROETHENE	BDL	0.001	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.006	0.001	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/kg
1,1-DICHLOROETHANE	BDL	0.001	mg/kg
CHLOROFORM	BDL	0.001	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/kg
CARBON TETRACHLORIDE	BDL	0.001	mg/kg
BENZENE	BDL	0.001	mg/kg
1,2-DICHLOROETHANE	BDL	0.001	mg/kg
TRICHLOROETHENE	BDL	0.001	mg/kg
1,2-DICHLOROPROPANE	BDL	0.001	mg/kg
BROMODICHLOROMETHANE	BDL	0.001	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/kg
TOLUENE	BDL	0.001	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.001	mg/kg
CHLOROBENZENE	BDL	0.001	mg/kg
ETHYLBENZENE	BDL	0.001	mg/kg
M/P-XYLENE	BDL	0.001	mg/kg
O-XYLENE	BDL	0.001	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/kg

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 11-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.00		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 28-DEC-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.33	mg/kg
ANTHRACENE	BDL	0.33	mg/kg
BENZ(A)ANTHRACENE	0.54	0.33	mg/kg
BENZO(A)PYRENE	BDL	0.33	mg/kg
BENZO(B)FLUORANTHENE	0.75	0.33	mg/kg
BENZO(K)FLUORANTHENE	BDL	0.33	mg/kg

 (continued on next page)

Parameter	Result	Det. Limit	Units
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	BDL	0.33	mg/kg
CHRYSENE	0.53	0.33	mg/kg
DIBENZ(A,H)ANTHRACENE	BDL	0.33	mg/kg
FLUORANTHENE	0.87	0.33	mg/kg
INDENO(1,2,3-CD)PYRENE	BDL	0.33	mg/kg
NAPHTHALENE	BDL	0.33	mg/kg
PHENANTHRENE	0.56	0.33	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	43		% Rec
PHENOL-D5	47		% Rec
NITROBENZENE-D5	55		% Rec
2-FLUOROBIPHENYL	82		% Rec
2,4,6-TRIBROMOPHENOL	47		% Rec
TERPHENYL-D14	99		% Rec

Sample reanalyzed with no improvement in internal standard areas.

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16791.

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Quality Assurance Officer: chelsmith MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	11-DEC-92	2024	B118585
	Complete	PO Number	
	04-JAN-93	530-06-501	
	Printed	Sampled	
	05-JAN-93	09-DEC-92 15:15	

Report To

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P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-3
LOG #: 10784

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.12		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	2.1	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 16-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	8.0	0.75	mg/kg

LEAD FAA SW846-7420

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M116.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
LEAD	61	5.0	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.16		Grams
FINAL WEIGHT OR VOLUME	50		mL

 (continued on next page)

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	1.2	mg/kg

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 16-DEC-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/kg
CHLOROMETHANE	BDL	0.005	mg/kg
VINYL CHLORIDE	BDL	0.005	mg/kg
BROMOMETHANE	BDL	0.005	mg/kg
CHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/kg
1,1-DICHLOROETHENE	BDL	0.001	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.015	0.001	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/kg
1,1-DICHLOROETHANE	BDL	0.001	mg/kg
CHLOROFORM	BDL	0.001	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/kg
CARBON TETRACHLORIDE	BDL	0.001	mg/kg
BENZENE	BDL	0.001	mg/kg
1,2-DICHLOROETHANE	BDL	0.001	mg/kg
TRICHLOROETHENE	BDL	0.001	mg/kg
1,2-DICHLOROPROPANE	BDL	0.001	mg/kg
BROMODICHLOROMETHANE	BDL	0.001	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/kg
TOLUENE	BDL	0.001	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.001	mg/kg
CHLOROBENZENE	BDL	0.001	mg/kg
ETHYLBENZENE	BDL	0.001	mg/kg
M/P-XYLENE	BDL	0.001	mg/kg
O-XYLENE	BDL	0.001	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/kg

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 11-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.00		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 28-DEC-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.33	mg/kg
ANTHRACENE	BDL	0.33	mg/kg
BENZ(A)ANTHRACENE	BDL	0.33	mg/kg
BENZO(A)PYRENE	BDL	0.33	mg/kg
BENZO(B)FLUORANTHENE	BDL	0.33	mg/kg
BENZO(K)FLUORANTHENE	BDL	0.33	mg/kg
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	BDL	0.33	mg/kg

 (continued on next page)

HERITAGE LABORATORIES, INC. Lab Sample ID: B118585

Parameter	Result	Det. Limit	Units
CHRYSENE	BDL	0.33	mg/kg
DIBENZ(A,H)ANTHRACENE	BDL	0.33	mg/kg
FLUORANTHENE	BDL	0.33	mg/kg
INDENO(1,2,3-CD)PYRENE	BDL	0.33	mg/kg
NAPHTHALENE	BDL	0.33	mg/kg
PHENANTHRENE	BDL	0.33	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	54		% Rec
PHENOL-D5	56		% Rec
NITROBENZENE-D5	77		% Rec
2-FLUOROBIPHENYL	97		% Rec
2,4,6-TRIBROMOPHENOL	52		% Rec
TERPHENYL-D14	102		% Rec

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16791.

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Quality Assurance Officer: Helmuth MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	11-DEC-92	2024	B118586
	Complete	PO Number	
	04-JAN-93	530-06-501	
	Printed	Sampled	
	05-JAN-93	09-DEC-92 16:00	

Report To

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P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-4
LOG #: 10785

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.04		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	11	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 16-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	14	0.75	mg/kg

LEAD FAA SW846-7420

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M116.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
LEAD	25	5.0	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.10		Grams
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	3.6	1.2	mg/kg

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 16-DEC-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/kg
CHLOROMETHANE	BDL	0.005	mg/kg
VINYL CHLORIDE	BDL	0.005	mg/kg
BROMOMETHANE	BDL	0.005	mg/kg
CHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/kg
1,1-DICHLOROETHENE	BDL	0.001	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.017	0.001	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/kg
1,1-DICHLOROETHANE	BDL	0.001	mg/kg
CHLOROFORM	BDL	0.001	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/kg
CARBON TETRACHLORIDE	BDL	0.001	mg/kg
BENZENE	BDL	0.001	mg/kg
1,2-DICHLOROETHANE	BDL	0.001	mg/kg
TRICHLOROETHENE	BDL	0.001	mg/kg
1,2-DICHLOROPROPANE	BDL	0.001	mg/kg
BROMODICHLOROMETHANE	BDL	0.001	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/kg
TOLUENE	BDL	0.001	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.001	mg/kg
CHLOROBENZENE	BDL	0.001	mg/kg
ETHYLBENZENE	BDL	0.001	mg/kg
M/P-XYLENE	0.001	0.001	mg/kg
O-XYLENE	BDL	0.001	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/kg

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 11-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.00		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 28-DEC-92 Instrument: GC/MS SVOA Test: O505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	0.59	0.33	mg/kg
ANTHRACENE	BDL	0.33	mg/kg
BENZ(A)ANTHRACENE	1.1	0.33	mg/kg
BENZO(A)PYRENE	2.0	0.33	mg/kg
BENZO(B)FLUORANTHENE	BDL	0.33	mg/kg
BENZO(K)FLUORANTHENE	4.9	0.33	mg/kg
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	BDL	0.33	mg/kg

 (continued on next page)

HERITAGE LABORATORIES, INC. Lab Sample ID: B118586

Parameter	Result	Det. Limit	Units
CHRYSENE	1.6	0.33	mg/kg
DIBENZ(A;H)ANTHRACENE	3.7	0.33	mg/kg
FLUORANTHENE	1.8	0.33	mg/kg
INDENO(1,2,3-CD)PYRENE	2.0	0.33	mg/kg
NAPHTHALENE	BDL	0.33	mg/kg
PHENANTHRENE	BDL	0.33	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	42		% Rec
PHENOL-D5	46		% Rec
NITROBENZENE-D5	66		% Rec
2-FLUOROBIPHENYL	101		% Rec
2,4,6-TRIBROMOPHENOL	50		% Rec
TERPHENYL-D14	82		% Rec

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16791.

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Quality Assurance Officer: chelmsith MB Jamsen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	11-DEC-92	2024	B118587
	Complete	PO Number	
	04-JAN-93	530-06-501	
	Printed	Sampled	
	05-JAN-93	09-DEC-92 17:30	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-5
LOG #: 10786

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.04		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	5.2	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 16-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	2.4	0.75	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.14		Grams
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	1.5	1.2	mg/kg

 (continued on next page)

LEAD GFAA SW846-7421

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
LEAD	3.4	1.2	mg/kg

Note: Analysis performed by 3 point MSA

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 16-DEC-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/kg
CHLOROMETHANE	BDL	0.005	mg/kg
VINYL CHLORIDE	BDL	0.005	mg/kg
BROMOMETHANE	BDL	0.005	mg/kg
CHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/kg
1,1-DICHLOROETHENE	BDL	0.001	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.012	0.001	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/kg
1,1-DICHLOROETHANE	BDL	0.001	mg/kg
CHLOROFORM	BDL	0.001	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/kg
CARBON TETRACHLORIDE	BDL	0.001	mg/kg
BENZENE	BDL	0.001	mg/kg
1,2-DICHLOROETHANE	BDL	0.001	mg/kg
TRICHLOROETHENE	BDL	0.001	mg/kg
1,2-DICHLOROPROPANE	BDL	0.001	mg/kg
BROMODICHLOROMETHANE	BDL	0.001	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/kg
TOLUENE	0.001	0.001	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.001	mg/kg
CHLOROBENZENE	BDL	0.001	mg/kg
ETHYLBENZENE	BDL	0.001	mg/kg
M/P-XYLENE	0.001	0.001	mg/kg
O-XYLENE	BDL	0.001	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/kg

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 11-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.00		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 16-DEC-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	4.4	0.33	mg/kg
ANTHRACENE	* 45	3.3	mg/kg
BENZ(A)ANTHRACENE	5.8	0.33	mg/kg
BENZO(A)PYRENE	3.1	0.33	mg/kg
BENZO(B)FLUORANTHENE	BDL	0.33	mg/kg
BENZO(K)FLUORANTHENE	3.8	0.33	mg/kg

 (continued on next page)

HERITAGE LABORATORIES, INC. Lab Sample ID: B118587

Parameter	Result	Det. Limit	Units
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	* 18	3.3	mg/kg
CHRYSENE	4.5	0.33	mg/kg
DIBENZ(A,H)ANTHRACENE	BDL	0.33	mg/kg
FLUORANTHENE	* 38	3.3	mg/kg
INDENO(1,2,3-CD)PYRENE	0.67	0.33	mg/kg
NAPHTHALENE	1.8	0.33	mg/kg
PHENANTHRENE	* 42	3.3	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	45		% Rec
PHENOL-D5	57		% Rec
NITROBENZENE-D5	68		% Rec
2-FLUOROBIPHENYL	87		% Rec
2,4,6-TRIBROMOPHENOL	108		% Rec
TERPHENYL-D14	118		% Rec

*Note: * - Results taken from 1:10 (GB3443.c) Run on 12/29/92*

Sample Comments

** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16791.

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Quality Assurance Officer: Helmuth MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	11-DEC-92	2024	B118588
	Complete	PO Number	
	04-JAN-93	530-06-501	
	Printed	Sampled	
	05-JAN-93	09-DEC-92 18:15	

Report To

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P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

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P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-6
LOG #: 10787

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.07		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	3.1	0.75	mg/kg

Note: Matrix interference suspected due to low matrix spike and matrix duplicate spike recovery.

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 16-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	2.8	0.75	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.23		Grams
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	1.2	mg/kg

 (continued on next page)

LEAD GFAA SW846-7421

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
LEAD	3.1	1.1	mg/kg

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 17-DEC-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/kg
CHLOROMETHANE	BDL	0.005	mg/kg
VINYL CHLORIDE	BDL	0.005	mg/kg
BROMOMETHANE	BDL	0.005	mg/kg
CHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/kg
1,1-DICHLOROETHENE	BDL	0.001	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.014	0.001	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/kg
1,1-DICHLOROETHANE	BDL	0.001	mg/kg
CHLOROFORM	BDL	0.001	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/kg
CARBON TETRACHLORIDE	BDL	0.001	mg/kg
BENZENE	BDL	0.001	mg/kg
1,2-DICHLOROETHANE	BDL	0.001	mg/kg
TRICHLOROETHENE	BDL	0.001	mg/kg
1,2-DICHLOROPROPANE	BDL	0.001	mg/kg
BROMODICHLOROMETHANE	BDL	0.001	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/kg
TOLUENE	0.003	0.001	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.001	mg/kg
CHLOROBENZENE	BDL	0.001	mg/kg
ETHYLBENZENE	BDL	0.001	mg/kg
M/P-XYLENE	0.001	0.001	mg/kg
O-XYLENE	BDL	0.001	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/kg

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 11-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.00		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 16-DEC-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	2.9	0.33	mg/kg
ANTHRACENE	* 36	3.3	mg/kg
BENZ(A)ANTHRACENE	* 7.4	3.3	mg/kg
BENZO(A)PYRENE	1.9	0.33	mg/kg
BENZO(B)FLUORANTHENE	BDL	0.33	mg/kg
BENZO(K)FLUORANTHENE	3.6	0.33	mg/kg
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	4.4	0.33	mg/kg

 (continued on next page)

HERITAGE LABORATORIES, INC. Lab Sample ID: B118588

Parameter	Result	Det. Limit	Units
CHRYSENE	5.5	0.33	mg/kg
DIBENZ(A,H)ANTHRACENE	BDL	0.33	mg/kg
FLUORANTHENE	* 52	3.3	mg/kg
INDENO(1,2,3-CD)PYRENE	0.72	0.33	mg/kg
NAPHTHALENE	BDL	0.33	mg/kg
PHENANTHRENE	* 36	3.3	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	38		% Rec
PHENOL-D5	54		% Rec
NITROBENZENE-D5	66		% Rec
2-FLUOROBIPHENYL	90		% Rec
2,4,6-TRIBROMOPHENOL	93		% Rec
TERPHENYL-D14	** 139		% Rec

*Note: * - Result taken from 1:10 dilution (GB3444.c) Run on 12/29/92*
*** - Recovery 85% in dilution*

Sample Comments

** See Note for Parameter*
*** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16791.

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Quality Assurance Officer: MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-DEC-92	2024	B118673
	Complete	PO Number	
	04-JAN-93	530-06-506	
	Printed	Sampled	
	05-JAN-93	14-DEC-92 07:30	

Report To

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SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-8
LOG #: 10789

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.14		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	4.2	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	1.9	0.75	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.06		Grams
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	1.2	mg/kg

 (continued on next page)

LEAD GFAA SW846-7421

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
LEAD	2.3	1.2	mg/kg

Note: Analysis performed by 3 point MSA

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 16-DEC-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/kg
CHLOROMETHANE	BDL	0.005	mg/kg
VINYL CHLORIDE	BDL	0.005	mg/kg
BROMOMETHANE	BDL	0.005	mg/kg
CHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/kg
1,1-DICHLOROETHENE	BDL	0.001	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	* 0.007	0.001	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/kg
1,1-DICHLOROETHANE	BDL	0.001	mg/kg
CHLOROFORM	BDL	0.001	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/kg
CARBON TETRACHLORIDE	BDL	0.001	mg/kg
BENZENE	BDL	0.001	mg/kg
1,2-DICHLOROETHANE	BDL	0.001	mg/kg
TRICHLOROETHENE	BDL	0.001	mg/kg
1,2-DICHLOROPROPANE	BDL	0.001	mg/kg
BROMODICHLOROMETHANE	BDL	0.001	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/kg
TOLUENE	BDL	0.001	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.001	mg/kg
CHLOROBENZENE	BDL	0.001	mg/kg
ETHYLBENZENE	BDL	0.001	mg/kg
M/P-XYLENE	BDL	0.001	mg/kg
O-XYLENE	BDL	0.001	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/kg

*Note: * - Also found in the blank at 0.006 ppm.*

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 16-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.32		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 21-DEC-92 Instrument: GC/MS SVOA Test: O505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	1.0	0.33	mg/kg
ANTHRACENE	BDL	0.33	mg/kg
BENZ(A)ANTHRACENE	BDL	0.33	mg/kg
BENZO(A)PYRENE	BDL	0.33	mg/kg

 (continued on next page)

Parameter	Result	Det. Limit	Units
BENZO(B)FLUORANTHENE	BDL	0.33	mg/kg
BENZO(K)FLUORANTHENE	BDL	0.33	mg/kg
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	BDL	0.33	mg/kg
CHRYSENE	BDL	0.33	mg/kg
DIBENZ(A,H)ANTHRACENE	BDL	0.33	mg/kg
FLUORANTHENE	BDL	0.33	mg/kg
INDENO(1,2,3-CD)PYRENE	BDL	0.33	mg/kg
NAPHTHALENE	BDL	0.33	mg/kg
PHENANTHRENE	BDL	0.33	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	0.33	mg/kg
PENTACHLOROPHENOL	BDL	0.33	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	25		% Rec
PHENOL-D5	27		% Rec
NITROBENZENE-D5	35		% Rec
2-FLUOROBIPHENYL	49		% Rec
2,4,6-TRIBROMOPHENOL	36		% Rec
TERPHENYL-D14	51		% Rec

Sample Comments

** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 17170.

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Quality Assurance Officer: Helmuth MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-DEC-92	2024	B118675
	Complete	PO Number	
	30-DEC-92	530-06-506	
	Printed	Sampled	
	05-JAN-93	14-DEC-92 09:45	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-10
LOG #: 10791

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.02		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	2.6	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	3.9	0.75	mg/kg

LEAD FAA SW846-7420

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M116.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
LEAD	6.2	5.0	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter.	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.08		Grams
FINAL WEIGHT OR VOLUME	50		mL

 (continued on next page)

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	1.2	mg/kg

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 16-DEC-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/kg
CHLOROMETHANE	BDL	0.005	mg/kg
VINYL CHLORIDE	BDL	0.005	mg/kg
BROMOMETHANE	BDL	0.005	mg/kg
CHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/kg
1,1-DICHLOROETHENE	BDL	0.001	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	* 0.008	0.001	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/kg
1,1-DICHLOROETHANE	BDL	0.001	mg/kg
CHLOROFORM	BDL	0.001	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/kg
CARBON TETRACHLORIDE	BDL	0.001	mg/kg
BENZENE	BDL	0.001	mg/kg
1,2-DICHLOROETHANE	BDL	0.001	mg/kg
TRICHLOROETHENE	BDL	0.001	mg/kg
1,2-DICHLOROPROPANE	BDL	0.001	mg/kg
BROMODICHLOROMETHANE	BDL	0.001	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/kg
TOLUENE	BDL	0.001	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.001	mg/kg
CHLOROBENZENE	BDL	0.001	mg/kg
ETHYLBENZENE	BDL	0.001	mg/kg
M/P-XYLENE	BDL	0.001	mg/kg
O-XYLENE	BDL	0.001	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/kg

*Note: * - Also found in the blank at 0.006 ppm*

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 16-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.12		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 29-DEC-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.33	mg/kg
ANTHRACENE	BDL	0.33	mg/kg
BENZ(A)ANTHRACENE	0.73	0.33	mg/kg
BENZO(A)PYRENE	0.68	0.33	mg/kg
BENZO(B)FLUORANTHENE	1.8	0.33	mg/kg
BENZO(K)FLUORANTHENE	BDL	0.33	mg/kg

 (continued on next page)

HERITAGE LABORATORIES, INC. Lab Sample ID: B118675

Parameter	Result	Det. Limit	Units
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	BDL	0.33	mg/kg
CHRYSENE	0.92	0.33	mg/kg
DIBENZ(A,H)ANTHRACENE	BDL	0.33	mg/kg
FLUORANTHENE	1.3	0.33	mg/kg
INDENO(1,2,3-CD)PYRENE	0.68	0.33	mg/kg
NAPHTHALENE	BDL	0.33	mg/kg
PHENANTHRENE	BDL	0.33	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	66		% Rec
PHENOL-D5	78		% Rec
NITROBENZENE-D5	99		% Rec
2-FLUOROBIPHENYL	102		% Rec
2,4,6-TRIBROMOPHENOL	62		% Rec
TERPHENYL-D14	83		% Rec

Sample Comments

* *See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 17170.

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Quality Assurance Officer: Helmuth MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-DEC-92	2024	B118676
	Complete	PO Number	
	30-DEC-92	530-06-506	
	Printed	Sampled	
	05-JAN-93	14-DEC-92 10:30	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-11
LOG #: 10792

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.29		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	1.3	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	1.0	0.75	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.00		Grams
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	1.2	mg/kg

 (continued on next page)

LEAD GFAA SW846-7421

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
LEAD	1.9	1.2	mg/kg

Note: Analysis performed by 3 point MSA

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 16-DEC-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/kg
CHLOROMETHANE	BDL	0.005	mg/kg
VINYL CHLORIDE	BDL	0.005	mg/kg
BROMOMETHANE	BDL	0.005	mg/kg
CHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/kg
1,1-DICHLOROETHENE	BDL	0.001	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	* 0.007	0.001	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/kg
1,1-DICHLOROETHANE	BDL	0.001	mg/kg
CHLOROFORM	BDL	0.001	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/kg
CARBON TETRACHLORIDE	BDL	0.001	mg/kg
BENZENE	BDL	0.001	mg/kg
1,2-DICHLOROETHANE	BDL	0.001	mg/kg
TRICHLOROETHENE	BDL	0.001	mg/kg
1,2-DICHLOROPROPANE	BDL	0.001	mg/kg
BROMODICHLOROMETHANE	BDL	0.001	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/kg
TOLUENE	BDL	0.001	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.001	mg/kg
CHLOROBENZENE	BDL	0.001	mg/kg
ETHYLBENZENE	BDL	0.001	mg/kg
M/P-XYLENE	BDL	0.001	mg/kg
O-XYLENE	BDL	0.001	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/kg

*Note: * - Also detected in the blank at 0.006 ppm.*

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 16-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.13		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 29-DEC-92 Instrument: GC/MS SVOA Test: O505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.33	mg/kg
ANTHRACENE	BDL	0.33	mg/kg
BENZ(A)ANTHRACENE	BDL	0.33	mg/kg
BENZO(A)PYRENE	BDL	0.33	mg/kg

 (continued on next page)

Parameter	Result	Det. Limit	Units
BENZO(B)FLUORANTHENE	BDL	0.33	mg/kg
BENZO(K)FLUORANTHENE	BDL	0.33	mg/kg
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	BDL	0.33	mg/kg
CHRYSENE	BDL	0.33	mg/kg
DIBENZ(A,H)ANTHRACENE	BDL	0.33	mg/kg
FLUORANTHENE	BDL	0.33	mg/kg
INDENO(1,2,3-CD)PYRENE	BDL	0.33	mg/kg
NAPHTHALENE	BDL	0.33	mg/kg
PHENANTHRENE	BDL	0.33	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	65		% Rec
PHENOL-D5	77		% Rec
NITROBENZENE-D5	104		% Rec
2-FLUOROBIPHENYL	103		% Rec
2,4,6-TRIBROMOPHENOL	63		% Rec
TERPHENYL-D14	91		% Rec

Sample reanalyzed with no improvement in internal standard areas.

Sample Comments

* *See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 17170.

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Quality Assurance Officer: Helmuth MB Janssen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	11-DEC-92	2024	B118589
	Complete	PO Number	
	04-JAN-93	530-06-501	
	Printed	Sampled	
	05-JAN-93	09-DEC-92 16:30	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-7
LOG #: 10788

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.05		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	9.2	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 16-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	5.1	0.75	mg/kg

LEAD FAA SW846-7420

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M116.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
LEAD	6.3	5.0	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.00		Grams
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	2.3	1.2	mg/kg

Note: Analysis performed by 3 point MSA

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 15-DEC-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.05	mg/kg
CHLOROMETHANE	BDL	0.05	mg/kg
VINYL CHLORIDE	BDL	0.05	mg/kg
BROMOMETHANE	BDL	0.05	mg/kg
CHLOROETHANE	BDL	0.05	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.05	mg/kg
1,1-DICHLOROETHENE	BDL	0.01	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.06	0.01	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.01	mg/kg
1,1-DICHLOROETHANE	BDL	0.01	mg/kg
CHLOROFORM	BDL	0.01	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.01	mg/kg
CARBON TETRACHLORIDE	BDL	0.01	mg/kg
BENZENE	BDL	0.01	mg/kg
1,2-DICHLOROETHANE	BDL	0.01	mg/kg
TRICHLOROETHENE	BDL	0.01	mg/kg
1,2-DICHLOROPROPANE	BDL	0.01	mg/kg
BROMODICHLOROMETHANE	BDL	0.01	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.01	mg/kg
TOLUENE	0.02	0.01	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.01	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.01	mg/kg
CHLOROBENZENE	BDL	0.01	mg/kg
ETHYLBENZENE	0.15	0.01	mg/kg
M/P-XYLENE	0.08	0.01	mg/kg
O-XYLENE	0.07	0.01	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.01	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.05	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.01	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.05	mg/kg

Note: Sample was diluted 1:10

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 11-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.00		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 16-DEC-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	** 44	3.3	mg/kg
ANTHRACENE	** 10	3.3	mg/kg
BENZ(A)ANTHRACENE	3.2	0.33	mg/kg
BENZO(A)PYRENE	0.64	0.33	mg/kg

 (continued on next page)

Parameter	Result	Det. Limit	Units
BENZO(B)FLUORANTHENE	BDL	0.33	mg/kg
BENZO(K)FLUORANTHENE	1.2	0.33	mg/kg
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	** 17	3.3	mg/kg
CHRYSENE	1.9	0.33	mg/kg
DIBENZ(A,H)ANTHRACENE	BDL	0.33	mg/kg
FLUORANTHENE	** 26	3.3	mg/kg
INDENO(1,2,3-CD)PYRENE	BDL	0.33	mg/kg
NAPHTHALENE	** 44	3.3	mg/kg
PHENANTHRENE	** 55	3.3	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	50		% Rec
PHENOL-D5	61		% Rec
NITROBENZENE-D5	* 142		% Rec
2-FLUOROBIPHENYL	104		% Rec
2,4,6-TRIBROMOPHENOL	99		% Rec
TERPHENYL-D14	103		% Rec

*Note: * - Sample reanalyzed with no improvement in surrogate recovery. Results should be regarded as estimates.*
*** - Results taken from 1:10 dilution (GB3445.c) Run on 12/29/92*

Sample Comments

** See Note for Parameter*
*** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16791.

This Certificate shall not be reproduced, except in full, without the written approval of the lab.

Quality Assurance Officer: Charlmuth MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-DEC-92	2024	B118674
	Complete	PO Number	
	04-JAN-93	530-06-506	
	Printed	Sampled	
	05-JAN-93	14-DEC-92 09:00	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: SS-9
LOG #: 10790

FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P129.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.04		Grams
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
CHROMIUM	4.1	0.75	mg/kg

COPPER FAA SW846-7210

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
COPPER	4.4	0.75	mg/kg

LEAD FAA SW846-7420

Analyst: L. SURRATT Analysis Date: 17-DEC-92 Instrument: FAA Test: M116.1.0
Prep: FAA OR ICP ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P129.7.0

Parameter	Result	Det. Limit	Units
LEAD	6.9	5.0	mg/kg

GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050

Analyst: M. KRASKA Analysis Date: 15-DEC-92 Test: P130.7.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	2.09		Grams
FINAL WEIGHT OR VOLUME	50		mL

 (continued on next page)

ARSENIC GFAA SW846-7060

Analyst: M. KRASKA Analysis Date: 18-DEC-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF S/S/S SAMPLES SW846-3050 P130.7.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	1.2	mg/kg

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: P. WINTERS Analysis Date: 16-DEC-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.025	mg/kg
CHLOROMETHANE	BDL	0.025	mg/kg
VINYL CHLORIDE	BDL	0.025	mg/kg
BROMOMETHANE	BDL	0.025	mg/kg
CHLOROETHANE	BDL	0.025	mg/kg
TRICHLOROFLUOROMETHANE	BDL	0.025	mg/kg
1,1-DICHLOROETHENE	BDL	0.005	mg/kg
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.020	0.005	mg/kg
TRANS-1,2-DICHLOROETHENE	BDL	0.005	mg/kg
1,1-DICHLOROETHANE	BDL	0.005	mg/kg
CHLOROFORM	BDL	0.005	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.005	mg/kg
CARBON TETRACHLORIDE	BDL	0.005	mg/kg
BENZENE	BDL	0.005	mg/kg
1,2-DICHLOROETHANE	BDL	0.005	mg/kg
TRICHLOROETHENE	BDL	0.005	mg/kg
1,2-DICHLOROPROPANE	BDL	0.005	mg/kg
BROMODICHLOROMETHANE	BDL	0.005	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.005	mg/kg
TOLUENE	BDL	0.005	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.005	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.005	mg/kg
CHLOROBENZENE	BDL	0.005	mg/kg
ETHYLBENZENE	BDL	0.005	mg/kg
M/P-XYLENE	0.007	0.005	mg/kg
O-XYLENE	0.008	0.005	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.005	mg/kg
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.025	mg/kg
2-CHLOROETHYLVINYLETHER	BDL	0.005	mg/kg
1,2-DIBROMOETHANE (EDB)	BDL	0.025	mg/kg

Note: Sample diluted 1:5

GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550

Analyst: S. WILLIAMS Analysis Date: 16-DEC-92 Test: P236.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	30.28		Grams
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 21-DEC-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SONICATION EXTRACTION FOR ORGANICS SW846-3550 P236.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	*** 32	6.6	mg/kg
ANTHRACENE	*** 49	6.6	mg/kg
BENZ(A)ANTHRACENE	*** 26	6.6	mg/kg
BENZO(A)PYRENE	** 9.0	1.7	mg/kg
BENZO(B)FLUORANTHENE	*** 15	6.6	mg/kg
BENZO(K)FLUORANTHENE	BDL	0.33	mg/kg

 (continued on next page)

Parameter	Result	Det. Limit	Units
BIS(2-CHLOROETHYL)ETHER	BDL	0.33	mg/kg
CARBAZOLE	BDL	0.33	mg/kg
CHRYSENE	*** 22	6.6	mg/kg
DIBENZ(A,H)ANTHRACENE	0.94	0.33	mg/kg
FLUORANTHENE	*** 130	6.6	mg/kg
INDENO(1,2,3-CD)PYRENE	3.4	0.33	mg/kg
NAPHTHALENE	BDL	0.33	mg/kg
PHENANTHRENE	*** 70	6.6	mg/kg
4-CHLORO-3-METHYLPHENOL	BDL	0.33	mg/kg
2-CHLOROPHENOL	BDL	0.33	mg/kg
2,4-DIMETHYLPHENOL	BDL	0.33	mg/kg
2,4-DINITROPHENOL	BDL	1.6	mg/kg
PENTACHLOROPHENOL	BDL	1.6	mg/kg
PHENOL	BDL	0.33	mg/kg
TETRACHLOROPHENOL	BDL	0.33	mg/kg
2,4,5-TRICHLOROPHENOL	BDL	0.33	mg/kg
2,4,6-TRICHLOROPHENOL	BDL	0.33	mg/kg
SURROGATE RECOVERY			
2-FLUOROPHENOL	47		% Rec
PHENOL-D5	51		% Rec
NITROBENZENE-D5	66		% Rec
2-FLUOROBIPHENYL	* 116		% Rec
2,4,6-TRIBROMOPHENOL	100		% Rec
TERPHENYL-D14	107		% Rec

*Note: * - Sample reanalyzed with no improvement in surrogate recovery. Results should be regarded as estimates.*
*** - Result taken from 1:5 dilution (GB3429.c) Run on 12/28/92*
**** - Result taken from 1:20 dilution (GB446.c) Run on 12/29/92*

Sample Comments

** See Note for Parameter*
*** See Note for Parameter*
**** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 17170.

This Certificate shall not be reproduced, except in full, without the written approval of the lab.

Quality Assurance Officer: Chelsmith MB Janssen

TO ENSURE PROPER HANDLING OF SAMPLES PLEASE COMPLETE THIS ENTIRE FORM

HERITAGE LABORATORIES, INC.

4132 POMPANO ROAD
CHARLOTTE, N.C. 28216 (704) 393-1853

16791

Co. Name: ETE, Inc.
Project Name: SWP-Wil
Quote No.:
PO No.: 530-06-506

ENVIRONMENTAL PROGRAM:
CWA NPDES_____ IWP_____ SLUDGE_____
RCRA MW_____ SW_____ DISPOSAL_____
SDWA_____ CERCLA/SUPERFUND_____ OTHER_____

Sampled by:

Analyses Requested (Note special detection limits or methods): Wilmington Site-Specific List

Report To:
Co: ETE, Inc.
Add: 1445 Ryan Church Rd
Lexington SC 29072
Attn: Greg Kurtz
Phone: 803-957-6270

Accelerated Turnaround Requested _____ (Subject to Additional Charge)

Result Request by: ___/___/___ Mo Day Yr (Date must be Accepted and Approved by Lab.)

Sample ID:	Date:	Time:	Comp	Grab	Sample Description:	Sample Type (Matrix): DW, GW, WW, SOIL, SLUDGE, OTHER	No. of Containers	SV & Metals	VOC	Remarks:	EMS Sample No
SS-1	12/9/92	14:00		X	SWP Log # 10782	Soil	3	1	2		B118583
SS-2		14:45			10783					Due to rain, SS-8	B118
SS-3		15:15			10784					SS-9, SS-10, & SS-11	B118
SS-4		16:00			10785					will be collected	B118
SS-5		17:30			10786					on 12-14-92.	B118587
SS-6		18:15			10787					They will be Fed Ex	B118
SS-7		16:30			10788					to arrive the morning	B11
~~SS-8~~										of 12-15-92.	
~~SS-9~~										SS-10 and SS-11 are	
~~SS-10~~										additional samples that	
~~SS-11~~										don't duplicate the previous	
										sample event. GBK	

Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
Gregory B. Kurtz	12/10/92 14:30			/	
Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
	/			/	
Relinquished by: (Signature)	Date /Time	Received for Lab by: (Signature)	Remarks:		
	12/11/92 1000	Andrew Bunk			

Distribution: Original and yellow copies accompany sample to laboratory; Pink copy retained by client; Yellow copy returned to client.

TO ENSURE PROPER HANDLING OF SAMPLES PLEASE COMPLETE THIS ENTIRE FORM

17170

HERITAGE LABORATORIES, INC.

4132 POMPANO ROAD
CHARLOTTE, N.C. 28216 (704) 393-1853

Co. Name: ETE, Inc
Project Name: SWP-Wil
Quote No.: Z113586 PO No.: 530-06-506

ENVIRONMENTAL PROGRAM:
CWA NPDES_____ IWP_____ SLUDGE_____
RCRA MW_____ SW_____ DISPOSAL_____
SDWA_____ CERCLA/SUPERFUND_____ OTHER_____

Sampled by:

Analyses Requested (Note special detection limits or methods): Wilmington Site-Specific List

Report To:
Co: ETE, Inc
Add: 1445 Pisgah Church Rd
Lexington, SC 29072
Attn: Greg Kuntz
Phone: 803-957-6270

Accelerated Turnaround Requested _____ (Subject to Additional Charge)

Result Request by: ___/___/___ (Mo Day Yr) (Date must be Accepted and Approved by Lab.)

Sample ID:	Date:	Time:	Comp	Grab	Sample Description:	Sample Type (Matrix): DW, GW, WW, SOIL, SLUDGE, OTHER	No. of Containers	SVOMetals	VOC	Remarks:	EMS Sample No
SS-8	12/14/92	7:30		X	SWP Log# 10789	Soil	3	1	2	Final samples to	8118673
SS-9	↓	9:00		↓	10790	↓	↓	↓	↓	sample set collected	8118674
SS-10	↓	9:45		↓	10791	↓	↓	↓	↓	on 12/9/92.	8118675
SS-11	↓	10:30		↓	10792	↓	↓	↓	↓		8118676

Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
Gregory B. Kuntz	12/14/92 12:15			/	
Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
Federal Express	12/15/92 1200	Chris Diggs		/	
Relinquished by: (Signature)	Date /Time	Received for Lab by: (Signature)	Remarks:		
	/				

Distribution: Original and yellow copies accompany sample to laboratory; Pink copy retained by client; Yellow copy returned to client.

Heritage Laboratories, Inc -- Parameter Summary Report
SWP Wilmington Project

		SS-1 B118583 09-DEC-92			SS-2 B118584 09-DEC-92			SS-3 B118585 09-DEC-92			SS-4 B118586 09-DEC-92			SS-5 B118587 09-DEC-92		
Semi-volatiles	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Acenaphthene	83-32-9	0.51	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	0.59	0.33	mg/kg	4.4	0.33	mg/kg
Anthracene	120-12-7	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	*45	0.33	mg/kg
Benz(A)Anthracene	56-55-3	1.1	0.33	mg/kg	0.54	0.33	mg/kg	BDL	0.33	mg/kg	1.1	0.33	mg/kg	5.8	0.33	mg/kg
Benzo(A)Pyrene	50-32-8	0.42	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	2.0	0.33	mg/kg	3.1	0.33	mg/kg
Benzo(B)Fluoranthene	205-99-2	BDL	0.33	mg/kg	0.75	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
Benzo(K)Fluoranthene	207-08-9	1.5	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	4.9	0.33	mg/kg	3.8	0.33	mg/kg
Bis(2-Chloroethyl)Ether	111-44-4	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
Carbazole	86-74-8	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	*18	0.33	mg/kg
4-Chloro-3-Methylphenol	59-50-7	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
2-Chlorophenol	95-57-8	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
Chrysene	218-01-9	1.1	0.33	mg/kg	0.53	0.33	mg/kg	BDL	0.33	mg/kg	1.6	0.33	mg/kg	4.5	0.33	mg/kg
Dibenz(A,H)Anthracene	53-70-3	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	3.7	0.33	mg/kg	BDL	0.33	mg/kg
2,4-Dimethylphenol	105-67-9	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
2,4-Dinitrophenol	25550-58-7	BDL	1.6	mg/kg	BDL	1.6	mg/kg	BDL	1.6	mg/kg	BDL	1.6	mg/kg	BDL	1.6	mg/kg
Fluoranthene	206-44-0	3.8	0.33	mg/kg	0.87	0.33	mg/kg	BDL	0.33	mg/kg	1.8	0.33	mg/kg	*38	0.33	mg/kg
Indeno(1,2,3-Cd)Pyrene	193-39-5	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	2.0	0.33	mg/kg	0.67	0.33	mg/kg
Naphthalene	91-20-3	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	1.8	0.33	mg/kg
Pentachlorophenol	87-86-5	BDL	1.6	mg/kg	BDL	1.6	mg/kg	BDL	1.6	mg/kg	BDL	1.6	mg/kg	BDL	1.6	mg/kg
Phenanthrene	85-01-8	1.5	0.33	mg/kg	0.56	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	*42	0.33	mg/kg
Phenol	108-95-2	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
Tetrachlorophenol	25167-83-3	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
2,4,5-Trichlorophenol	95-95-4	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg
2,4,6-Trichlorophenol	88-06-2	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg	BDL	0.33	mg/kg

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

Site-Specific Ground Water Sample List

SITE-SPECIFIC GROUND WATER SAMPLE LIST
SOUTHERN WOOD PIEDMONT FACILITY
WILMINGTON, NORTH CAROLINA

METALS

Arsenic
Copper
Chromium
Lead

SEMI-VOLATILES

Acenaphthene
Benzo(a)anthracene
Benzo(b)fluoranthene
Bis(2-chloroethyl)ether
4-chloro-3-methylphenol
Chrysene
2,4-dimethylphenol
Fluoranthene
Naphthalene
Phenanthrene
Tetrachlorophenol
2,4,6-trichlorophenol
Anthracene
Benzo(a)pyrene
Benzo(k)fluoranthene
Carbazole
2-chlorophenol
Dibenzo(a,h)anthracene
2,4-dinitrophenol
Indeno(1,2,3-cd)pyrene
Pentachlorophenol
Phenol
2,4,5-trichlorophenol

VOLATILES

Benzene
Bromomethane
Chlorobenzene
2-chloroethylvinylether
Chloromethane
Dibromochloromethane
Dichlorodifluoromethane
1,2-dichloroethane
Dichloromethane
Ethyl benzene
M/P-Xylene
O-Xylene
Toluene
1,1,1-trichloroethane
Trichloroethene
Bromodichloromethane
Carbon Tetrachloride
Chloroethane
Chloroform
Cis-1,3-dichloropropene
1,2-dibromomethane (Edb)
1,1-dichloroethane
1,1-dichloroethene
1,2-dichloropropane
Fluorotrichloromethane
Methyl-T-Butyl Ether (Mtbe)
1,1,2,2-tetrachloroethane
Trans-1,2-dichloroethene
1,1,2-trichloroethane
Vinyl Chloride

Ground Water Sample Summary Table

GROUNDWATER SAMPLE SUMMARY
SOUTHERN WOOD PIEDMONT FACILITY - WILMINGTON, NORTH CAROLINA

SAMPLE NUMBER	DISSOLVED METALS (mg/L)				TOTAL SEMI-VOLATILE ORGANICS (mg/L)	TOTAL VOLATILE ORGANICS (mg/L)	TOTAL VOLATILE ORGANICS CORRECTED FOR DICHLOROMETHANE* (mg/L)	TOTAL ORGANICS (mg/L)
	ARSENIC	CHROMIUM	COPPER	LEAD				
MW-6	ND	ND	ND	ND	ND	ND	ND	ND
MW-7	ND	ND	ND	ND	ND	ND	ND	ND
MW-8	ND	ND	ND	ND	ND	0.002	0.002	ND
MW-8A	ND	ND	ND	ND	ND	0.002	ND	0.002
MW-9	ND	ND	ND	ND	ND	ND	ND	ND
MW-10	ND	ND	ND	ND	ND	ND	ND	ND
MW-11A	ND	ND	ND	ND	0.18	0.018	ND	0.198
MW-13	ND	ND	ND	ND	7.91	0.220	ND	8.130
MW-14	ND	ND	ND	ND	8.75	0.223	ND	8.973
MW-15	0.023	ND	ND	ND	0.25	0.022	ND	0.272
MW-16	ND	ND	ND	ND	ND	0.001	0.001	ND
MW-17	0.0057	ND	ND	ND	0.17	0.052	0.003	0.219
MW-18	ND	ND	ND	ND	ND	0.002	0.002	ND
MW-19	ND	ND	ND	ND	0.66	0.024	ND	0.684
MW-19A	ND	ND	ND	ND	ND	0.001	ND	0.001
MW-20	ND	ND	ND	ND	0.102	ND	ND	0.102
MW-21	ND	ND	ND	ND	ND	0.001	ND	0.001
MW-22	0.013	ND	ND	ND	13.23	0.130	0.002	13.358
MW-23	ND	ND	ND	ND	ND	0.003	0.003	ND
MW-24	ND	ND	ND	ND	0.16	0.005	ND	0.005
MW-25	ND	ND	ND	ND	0.71	ND	ND	0.71

ND Below Laboratory Detection Limit

* Dichloromethane was detected in the groundwater samples analyzed. Because dichloromethane is used as the solvent in the extraction process, it is suspect, in that it may have been introduced to the groundwater in the laboratory.

Ground Water Sample Parameters Summary Tables

GROUNDWATER SAMPLE PARAMETER SUMMARY TABLE - METALS
SOUTHERN WOOD PIEDMONT FACILITY-WILMINGTON, NORTH CAROLINA

	MW-6			MW-7			MW-8			MW-8A			MW-9			MW-10			MW-11A		
METALS	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL
Arsenic	ND	ND	0.005	ND	ND	0.005	ND	ND	0.005	ND	ND	0.005	ND	ND	0.005	0.048	ND	0.005	ND	ND	0.005
Chromium	ND	ND	0.010	0.014	ND	0.010	0.024	ND	0.010	ND	ND	0.010	ND	ND	0.010	0.019	ND	0.010	0.012	ND	0.010
Copper	ND	ND	0.025	ND	ND	0.025	0.026	ND	0.025	ND	ND	0.025	ND	ND	0.025	ND	ND	0.025	ND	ND	0.025
Lead	ND	ND	0.005	0.0097	ND	0.005	0.038	ND	0.010	ND	ND	0.005	ND	ND	0.005	0.018	ND	0.005	0.0095	ND	0.005

	MW-13			MW-14			MW-15			MW-16			MW-17			MW-18			MW-19		
METALS	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL
Arsenic	0.048	ND	0.005	0.018	ND	0.005	0.110	0.023	0.050	ND	ND	0.005	0.040	0.0057	0.005	0.0058	ND	0.005	ND	ND	0.005
Chromium	0.039	ND	0.010	0.069	ND	0.010	0.031	ND	0.010	ND	ND	0.010	0.035	ND	0.010	0.670	ND	0.010	0.030	ND	0.010
Copper	0.061	ND	0.025	0.059	ND	0.025	0.050	ND	0.025	0.030	ND	0.025	0.054	ND	0.025	0.051	ND	0.025	ND	ND	0.025
Lead	0.120	ND	0.050	0.050	ND	0.015	0.042	ND	0.015	0.012	ND	0.005	0.045	ND	0.010	0.081	ND	0.050	0.005	ND	0.005

	MW-19A			MW-20			MW-21			MW-22			MW-23			MW-24			MW-25		
METALS	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL	R*	R**	DL
Arsenic	0.005	ND	0.005	0.010	ND	0.005	0.028	ND	0.005	0.033	0.013	0.005	ND	ND	0.005	0.0064	ND	0.005	0.012	ND	0.005
Chromium	0.011	ND	0.010	ND	ND	0.010	0.032	ND	0.010	0.200	ND	0.010	ND	ND	0.010	0.018	ND	0.010	0.031	ND	0.010
Copper	ND	ND	0.025	0.032	ND	0.025	0.035	ND	0.025	0.038	ND	0.025	ND	ND	0.025	0.027	ND	0.025	0.041	ND	0.025
Lead	0.011	ND	0.005	0.012	ND	0.005	0.061	ND	0.050	0.037	ND	0.010	ND	ND	0.005	0.071	ND	0.050	0.036	ND	0.010

R*: Total Metals Laboratory Analytical Result
R**: Dissolved Metals Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/l.

GROUNDWATER SAMPLE PARAMETER SUMMARY TABLE - SEMI-VOLATILES
SOUTHERN WOOD PIEDMONT FACILITY - WILMINGTON, NORTH CAROLINA

	MW-6		MW-7		MW-8		MW-8A		MW-9		MW-10		MW-11A	
SEMI-VOLATILES	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL
Acenaphthene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	0.05	0.01
Anthracene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	0.02	0.01
Benz(a)Anthracene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Benzo(a)Pyrene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Benzo(b)Fluoranthene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Benzo(k)Fluoranthene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Bis(2-Chloroethyl)Ether	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Carbazole	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	0.04	0.01
4-Chloro-3-Methylphenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2-Chlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Chrysene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Dibenz(a,h)Anthracene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4-Dimethylphenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4-Dinitrophenol	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05
Fluoranthene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	0.01	0.01
Indeno(1,2,3-Cd)Pyrene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Naphthalene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Pentachlorophenol	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05
Phenanthrene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	0.06	0.01
Phenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Tetrachlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4,5-Trichlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4,6-Trichlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01

R*: Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/L.

GROUNDWATER SAMPLE PARAMETER SUMMARY TABLE - SEMI-VOLATILES
SOUTHERN WOOD PIEDMONT FACILITY - WILMINGTON, NORTH CAROLINA

	MW-13		MW-14		MW-15		MW-16		MW-17		MW-18		MW-19	
SEMI-VOLATILES	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL
Acenaphthene	1.10	0.20	0.81	0.01	0.14	0.01	ND	0.01	ND	0.01	ND	0.01	0.18	0.01
Anthracene	0.26	0.20	0.26	0.01	ND	0.01	ND	0.01	0.02	0.01	ND	0.01	0.01	0.01
Benz(a)Anthracene	0.12	0.01	0.14	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Benzo(a)Pyrene	0.04	0.01	0.05	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Benzo(b)Fluoranthene	0.08	0.01	0.11	0.01	ND	0.01	ND	0.01	0.01	0.01	ND	0.01	ND	0.01
Benzo(k)Fluoranthene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Bis(2-Chloroethyl)Ether	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Carbazole	0.32	0.20	0.19	0.01	0.03	0.01	ND	0.01	ND	0.01	ND	0.01	0.07	0.01
4-Chloro-3-Methylphenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2-Chlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Chrysene	0.10	0.01	0.09	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Dibenz(a,h)Anthracene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4-Dimethylphenol	0.01	0.01	ND	0.01	0.03	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4-Dinitrophenol	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05
Fluoranthene	0.76	0.20	0.78	0.01	ND	0.01	ND	0.01	0.08	0.01	ND	0.01	0.02	0.01
Indeno(1,2,3-Cd)Pyrene	0.02	0.01	0.02	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Naphthalene	3.50	0.20	4.90	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	0.30	0.10
Pentachlorophenol	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05
Phenanthrene	1.60	0.20	1.40	0.01	0.05	0.01	ND	0.01	0.06	0.01	ND	0.01	0.08	0.01
Phenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Tetrachlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4,5-Trichlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4,6-Trichlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01

R*: Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/L.

GROUNDWATER SAMPLE PARAMETER SUMMARY TABLE - SEMI-VOLATILES
SOUTHERN WOOD PIEDMONT FACILITY - WILMINGTON, NORTH CAROLINA

	MW-19A		MW-20		MW-21		MW-22		MW-23		MW-24		MW-25	
SEMI-VOLATILES	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL
Acenaphthene	ND	0.01	0.05	0.01	ND	0.01	2.50	0.01	ND	0.01	0.11	0.01	0.12	0.01
Anthracene	ND	0.01	ND	0.01	ND	0.01	0.18	0.01	ND	0.01	ND	0.01	0.07	0.01
Benz(a)Anthracene	ND	0.01	ND	0.01	ND	0.01	0.13	0.01	ND	0.01	ND	0.01	0.05	0.01
Benzo(a)Pyrene	ND	0.01	ND	0.01	ND	0.01	0.06	0.01	ND	0.01	ND	0.01	0.02	0.01
Benzo(b)Fluoranthene	ND	0.01	ND	0.01	ND	0.01	0.12	0.01	ND	0.01	ND	0.01	0.04	0.01
Benzo(k)Fluoranthene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Bis(2-Chloroethyl)Ether	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Carbazole	ND	0.01	ND	0.01	ND	0.01	0.19	0.01	ND	0.01	0.03	0.01	0.02	0.01
4-Chloro-3-Methylphenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2-Chlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Chrysene	ND	0.01	ND	0.01	ND	0.01	0.10	0.01	ND	0.01	ND	0.01	0.04	0.01
Dibenz(a,h)Anthracene	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4-Dimethylphenol	ND	0.01	ND	0.01	ND	0.01	0.03	0.01	ND	0.01	ND	0.01	ND	0.01
2,4-Dinitrophenol	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05
Fluoranthene	ND	0.01	0.012	0.01	ND	0.01	1.70	0.01	ND	0.01	ND	0.01	0.16	0.01
Indeno(1,2,3-Cd)Pyrene	ND	0.01	ND	0.01	ND	0.01	0.02	0.01	ND	0.01	ND	0.01	ND	0.01
Naphthalene	ND	0.01	0.04	0.01	ND	0.01	4.50	0.01	ND	0.01	ND	0.01	ND	0.01
Pentachlorophenol	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05
Phenanthrene	ND	0.01	0.05	0.01	ND	0.01	3.70	0.01	ND	0.01	0.02	0.01	0.19	0.01
Phenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Tetrachlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4,5-Trichlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
2,4,6-Trichlorophenol	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01

R*: Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/L.

GROUNDWATER SAMPLE PARAMETER SUMMARY TABLE-VOLATILES
SOUTHERN WOOD PIEDMONT FACILITY - WILMINGTON, NORTH CAROLINA

	MW-6		MW-7		MW-8		MW-8A		MW-9		MW-10		MW-11A	
VOLATILES	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL
Benzene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.003	0.001
Bromodichloromethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Bromomethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
Carbon Tetrachloride	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chlorobenzene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chloroethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
2-Chloroethylvinylether	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chloroform	ND	0.001	ND	0.001	ND	0.001	0.002	0.001	ND	0.001	ND	0.001	ND	0.001
Chloromethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
Cis-1,3-Dichloropropene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Dibromochloromethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,2-Dibromoethane (Edb)	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
Dichlorodifluoromethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
1,1-Dichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,2-Dichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,1-Dichloroethene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Dichloromethane	ND	0.001	ND	0.001	0.002	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,2-Dichloropropane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Ethyl Benzene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.004	0.001
Fluorotrichloromethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
M/P-Xylene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.007	0.001
Methyl-T-Butyl Ether (Mtbe)	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
O-Xylene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.003	0.001
1,1,2,2-Tetrachloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Toluene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	0.001	0.001
Trans-1,2-Dichloroethene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,1,1-Trichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,1,2-Trichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Trichloroethene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Vinyl Chloride	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005

R*: Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/L.

GROUNDWATER SAMPLE PARAMETER SUMMARY TABLE-VOLATILES
SOUTHERN WOOD PIEDMONT FACILITY - WILMINGTON, NORTH CAROLINA

	MW-13		MW-14		MW-15		MW-16		MW-17		MW-18		MW-19	
VOLATILES	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL
Benzene	0.100	0.010	0.019	0.005	0.005	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Bromodichloromethane	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Bromomethane	ND	0.050	ND	0.025	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
Carbon Tetrachloride	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chlorobenzene	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chloroethane	ND	0.050	ND	0.025	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
2-Chloroethylvinylether	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chloroform	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chloromethane	ND	0.050	ND	0.025	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
Cis-1,3-Dichloropropene	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Dibromochloromethane	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,2-Dibromoethane (Edb)	ND	0.050	ND	0.025	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
Dichlorodifluoromethane	ND	0.050	ND	0.025	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
1,1-Dichloroethane	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,2-Dichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,1-Dichloroethene	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Dichloromethane	ND	0.010	ND	0.005	ND	0.001	0.001	0.001	0.003	0.001	0.002	0.001	ND	0.001
1,2-Dichloropropane	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Ethyl Benzene	0.040	0.010	0.060	0.005	0.008	0.001	ND	0.001	0.006	0.001	ND	0.001	0.011	0.001
Fluorotrichloromethane	ND	0.050	ND	0.025	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
M/P-Xylene	0.050	0.010	0.078	0.005	0.006	0.001	ND	0.001	0.016	0.001	ND	0.001	0.007	0.001
Methyl-T-Butyl Ether (Mtbe)	ND	0.050	ND	0.025	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
O-Xylene	0.020	0.010	0.038	0.005	0.003	0.001	ND	0.001	0.010	0.001	ND	0.001	0.005	0.001
1,1,2,2-Tetrachloroethane	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Toluene	0.010	0.010	0.028	0.005	ND	0.001	ND	0.001	0.017	0.001	ND	0.001	0.001	0.001
Trans-1,2-Dichloroethene	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,1,1-Trichloroethane	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,1,2-Trichloroethane	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Trichloroethene	ND	0.010	ND	0.005	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Vinyl Chloride	ND	0.050	ND	0.025	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005

R*: Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/l

GROUNDWATER SAMPLE PARAMETER SUMMARY TABLE-VOLATILES
SOUTHERN WOOD PIEDMONT FACILITY-WILMINGTON, NORTH CAROLINA

	MW-19A		MW-20		MW-21		MW-22		MW-23		MW-24		MW-25	
VOLATILES	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL	R*	DL
Benzene	ND	0.001	ND	0.001	ND	0.001	0.005	0.001	ND	0.001	ND	0.001	ND	0.001
Bromodichloromethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Bromomethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
Carbon Tetrachloride	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chlorobenzene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chloroethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
2-Chloroethylvinylether	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Chloroform	0.001	0.001	ND	0.001	0.001	0.001	0.004	0.001	ND	0.001	ND	0.001	ND	0.001
Chloromethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
Cis-1,3-Dichloropropene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Dibromochloromethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,2-Dibromoethane (Edb)	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
Dichlorodifluoromethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
1,1-Dichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,2-Dichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,1-Dichloroethene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Dichloromethane	ND	0.001	ND	0.001	ND	0.001	0.002	0.001	0.003	0.001	ND	0.001	ND	0.001
1,2-Dichloropropane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Ethyl Benzene	ND	0.001	ND	0.001	ND	0.001	0.037	0.001	ND	0.001	0.002	0.001	ND	0.001
Fluorotrichloromethane	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
M/P-Xylene	ND	0.001	ND	0.001	ND	0.001	0.048	0.001	ND	0.001	0.002	0.001	ND	0.001
Methyl-T-Butyl Ether (Mtbe)	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005
O-Xylene	ND	0.001	ND	0.001	ND	0.001	0.023	0.001	ND	0.001	0.001	0.001	ND	0.001
1,1,2,2-Tetrachloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Toluene	ND	0.001	ND	0.001	ND	0.001	0.011	0.001	ND	0.001	ND	0.001	ND	0.001
Trans-1,2-Dichloroethene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,1,1-Trichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
1,1,2-Trichloroethane	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Trichloroethene	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001	ND	0.001
Vinyl Chloride	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.005

R*: Laboratory Analytical Result
DL: Laboratory Detection Limit
Note: The Laboratory Analytical Results and Detection Limits are in mg/l.

Ground Water Sample Collection Summary Sheets

ETE, INC.

PO Box 1867
1445 Pisgah Church Rd.
Lexington, SC 29072
(803) 957-6270

AQUEOUS SAMPLE COLLECTION SUMMARY SHEET

SITE NAME/CITY/COUNTY: SWP - Wilmington

PROJECT NUMBER: 530-06-503

SAMPLED BY: Massey & Kuntz

WEATHER: Overcast 55° to 85°

SAMPLE TYPE: Groundwater

SAMPLING METHOD: Dedicated Bailer

SPLITS/SPIKES/DUPLICATES:

SAMPLING CONTAINERS: (NUMBER/SIZE/TYPE) 2/1L/AG; 3/40ml/G; 2/500ml/P

REASON FOR SAMPLING: Phase II Assessment

PARAMETERS REQUESTED: SV, VOC, and Metals

LAB PERFORMING ANALYSIS: Heritage EMS Labs

RESPIRATORY PROTECTION: None

SAMPLE NUMBER	DATE	TIME	(TOC) WELL DEPTH	(TOC) WATER LEVEL	PURGE METHOD	SAMPLE APPEARANCE	(Gal) VOLUME PURGED	(°C) TEMP.	(uMhos) COND.	pH	REMARKS
MW-6	10-15-92	15:20	21.71	2.55	Bailer	S.T. Tan	4.83	22	750	6.2	
							4.83	22	1120	6.1	
							4.83	22	1220	5.7	
MW-7	10-15-92	13:55	21.43	3.66	"	S.T. Brown	2.90	22	630	5.7	
							2.90	23	>2000	5.8	Dry 1.25 Volumes
							2.90	22	>2000	6.2	
MW-8	10-15-92	12:15	21.69	4.22	"	T. Brown	2.85	21	450	5.2	
							2.85	21	450	5.1	Dry 1.5 Volumes
							2.85	21	530	5.1	

SAMPLE NUMBER	DATE	TIME	(TOC) WELL DEPTH	(TOC) WATER LEVEL	PURGE METHOD	SAMPLE APPEARANCE	(Gal) VOLUME PURGED	(°C) TEMP.	(uMhos) COND.	pH	REMARKS
MW-8A	10-15-92	12:55	33.06	3.43	Bailer	Clear	4.83	21	420	5.9	
							4.83	22	400	5.9	
							4.83	21	470	5.9	
MW-9	10-15-92	11:15	21.45	3.82	"	T. Brown	2.87	21	360	5.8	
							2.87	20	440	5.7	Dry 2 Volumes
							2.87	21	440	5.7	
MW-10	10-14-92	13:00	14.00	4.56	"	S.T. Gray	1.54	26	1060	6.9	
							1.54	24	520	6.9	
							1.54	24	520	6.9	
MW-11	10-16-92	07:10	14.12	5.19							No Sample Collected
											0.02 Feet Heavy Product
MW-12	10-16-92	07:25	14.47	5.46							No Sample Collected
											Trace Heavy Product
MW-13	10-15-92	16:15	14.10	4.49	"	T. Brown	1.57	22	1120	6.1	Sheen on Sample
							1.57	22	1110	6.2	Diesel & Creosote Odor
							1.57	22	1040	6.1	
MW-14	10-16-92	8:30	18.61	4.00	"	V.T. Brown	2.38	19	>2000	6.4	Trace Heavy Product
							2.38	20	>2000	6.2	Sheen on Sample
							2.38	20	>2000	6.1	

SAMPLE NUMBER	DATE	TIME	(TOC) WELL DEPTH	(TOC) WATER LEVEL	PURGE METHOD	SAMPLE APPEARANCE	(Gal) VOLUME PURGED	(°C) TEMP.	(uMhos) COND.	pH	REMARKS
MW-15	10-15-92	17:10	13.90	4.50	Bailer	T. Brown	1.53	23	830	6.6	Very Slight Diesel Odor
							1.53	23	1104	6.1	
							1.53	23	>2000	6.0	
MW-16	10-14-92	15:10	13.97	5.04	"	S.T. Gray	1.46	26	1520	6.6	Sheen on Sample
							1.46	25	1350	6.6	Diesel Odor
							1.46	25	1350	6.6	
MW-17	10-14-92	16:00	14.43	4.99	"	S.T. Gray	1.54	24	1320	6.6	Sheen on Sample
							1.54	23	1220	6.6	Diesel Odor
							1.54	23	1220	6.6	
MW-18	10-15-92	14:45	13.48	4.14	"	S.T. Brown	1.52	24	>2000	5.0	
							1.52	23	>2000	6.0	
							1.52	22	>2000	6.1	
MW-19	10-16-92	10:40	15.12	2.92	"	S.T. Tan	1.98	23	105	6.0	Slight Creosote Odor
							1.98	23	100	6.5	
							1.98	23	105	6.4	
MW-19A	10-16-92	11:15	33.27	2.91	"	S.T.	4.94	21	150	6.8	
							4.94	21	90	6.9	
							4.94	20	100	6.9	
MW-20	10-16-92	12:20	14.57	2.80	"	S.T.	1.91	23	240	5.9	
							1.91	23	235	5.8	
							1.91	23	235	5.9	

SAMPLE NUMBER	DATE	TIME	(TOC) WELL DEPTH	(TOC) WATER LEVEL	PURGE METHOD	SAMPLE APPEARANCE	(Gal) VOLUME PURGED	(°C) TEMP.	(uMhos) COND.	pH	REMARKS
MW-21	10-16-92	12:50	8.96	3.22	Bailer	S.T.	0.94	22	290	6.7	
							0.94	22	280	6.2	
							0.94	22	280	6.9	
MW-22	10-13-92	13:40	13.00	3.02	"	S.T. Brown	1.63	23	500	6.4	Sheen on Sample
							1.63	24	470	6.7	Bailer Stained
							1.63	24	470	6.7	
MW-23	10-13-92	14:15	11.00	4.56	"	S.T. Rust	1.41	23	1440	6.4	
							1.41	22	1760	6.5	
							1.41	22	1760	6.5	
MW-24	10-16-92	7:50	13.81	3.48	"	V.T. Brown	1.68	19	>2000	6.6	Slight Creosote Odor
							1.68	20	>2000	6.0	
							1.68	19	>2000	6.3	
MW-25	10-16-92	8:30	15.23	1.63	"	V.T. Brown	2.21	19	>2000	6.4	
							2.21	19	>2000	6.0	Dry 1 Volume
							2.21				
MW-26	10-16-92	10:05	20.05	4.01	"						0.29 Feet Heavy Product
											No Sample Collected
MW-11A	10-16-92	6:20	36.17	3.89	"	S.T.	5.26	21	830	6.2	Slight Creosote Odor
							5.26	19	140	5.2	
							5.26	19	85	4.9	

Ground Water Sample Laboratory Results and Chain-of-Custody

MAS

HERITAGE

SEMI ANNUAL SAMPLING

CASE SUMMARY

Client : Southern Wood Piedmont
Project : Wilmington

Date: 11/24/92

SWP SAMPLE ID	HERITAGE SAMPLE NUMBER	DATE SAMPLED
MW-22	B117577	10/13/92
MW-23	B117578	10/13/92
MW-10	B117579	10/14/92
MW-16	B117580	10/14/92
MW-17	B117581	10/14/92
FIELD BLANK	B117582	10/14/92
SS-1	B117583	10/13/92
SS-2	B117584	10/13/92
SS-3	B117585	10/13/92
SS-4	B117586	10/13/92
SS-5	B117587	10/13/92
SS-6	B117588	10/13/92
SS-7	B117589	10/13/92
SS-8	B117590	10/13/92
SS-9	B117591	10/12/92
TRIP BLANK	B117592	10/14/92
MW-9	B117598	10/15/92
MW-8	B117599	10/15/92
MW-8A	B117600	10/15/92
MW-7	B117601	10/15/92
MW-18	B117602	10/15/92
MW-6	B117603	10/15/92
MW-13	B117604	10/15/92
MW-15	B117605	10/15/92
FIELD BLANK	B117606	10/15/92
TRIP BLANK	B117607	10/15/92
MW-11A	B117638	10/16/92
MW-24	B117639	10/16/92
MW-14	B117640	10/16/92
MW-25	B117641	10/16/92
MW-19	B117642	10/16/92
MW-19A	B117643	10/16/92
MW-20	B117644	10/16/92
MW-21	B117645	10/16/92
FIELD BLANK	B117646	10/16/92
TRIP BLANK	B117647	10/16/92

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HERITAGE

Client : Southern Wood Piedmont
Project : Wilmington

Date: 11/24/92

CASE NARRATIVE

Heritage Sample #s	Analysis/ Method	Remarks
B117583 -> B117591	SW846-8021	Method 8021 for soils requires heated purge and trap conditions. The samples were analyzed using ambient purge conditions. This is a deviation of the method. A method detection limit study supports the ambient purge conditions. Rep 0 represents the original analysis without heated purge and trap, analyzed within holding time. Rep 1 represents the heated purge and trap analysis run outside of holding time.
All Semi-volatiles	SW846-8270	The target compound tetrachlorophenol was not present in the calibration mixture. Response of this compound was checked by a mid-level calibration check standard. No tetrachlorophenol was found in any sample.
All Semi-volatiles	SW846-8270	The relative percent differences show three outliers for the matrix spike/spike dup of sample B117579. The analytical system was in control, as displayed by the Laboratory Control Sample (LCS), which passed QC criteria (also extracted in the analytical batch). B117577 MS/MSD - recoveries for acenaphthene and pyrene are out of control due to high amounts of these compounds in the sample. Recovery for 4-nitrophenol was 0%. The LCS analyzed in the same run was in-control for this compound.
B117580, B117581, B117639, B117640, B117641, B117644	SW846-8270	The samples showed surrogate recoveries of less than 10%. The extracts were re-analyzed, with no improvement in recovery. Samples were not re-extracted, as required by the Heritage Comprehensive Quality Assurance Plan (ComQAP). Matrix interference was confirmed when similiar problems were found during the previous quarter of the project.
B117598 -> B117604, B117639 -> B117641, B117643 -> B117645, B117577 MS/MSD	SW846-8270	During the extraction process, a considerable amount of emulsion formed. Technologies specified by EPA methods were used to enhance extraction efficiency, with little improvement.
B117643 -> B117646	SW846-8270	Surrogate recovery for 2-fluorobiphenyl in the extracted blank was 40%. This recovery is outside of the control limits.

Michele E. Sakwa
Laboratory Director

Helmuth M.B. Janssen
Quality Assurance Officer

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CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117603
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	15-OCT-92 15:20	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-6
LOG #: 10668
FIELD INFORMATION: WD 21.71, WL 2.55, COND. 750, PH 6.7

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 16-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 28-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	990		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 04-NOV-92 Instrument: GC/MS SVOA Test: O505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	27		% Rec
PHENOL-D5	21		% Rec
NITROBENZENE-D5	77		% Rec
2-FLUOROBIPHENYL	88		% Rec
2,4,6-TRIBROMOPHENOL	67		% Rec
TERPHENYL-D14	124		% Rec

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16490.

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Quality Assurance Officer: Helmuth M B Janssen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117601
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	15-OCT-92 13:55	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-7
LOG #: 10666
FIELD INFORMATION: WD 21.43, WL 3.66, COND. 630, PH 5.70

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.014	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.0097	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 16-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 28-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	990		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 02-NOV-92 Instrument: GC/MS SVOA Test: O505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	30		% Rec
PHENOL-D5	24		% Rec
NITROBENZENE-D5	66		% Rec
2-FLUOROBIPHENYL	87		% Rec
2,4,6-TRIBROMOPHENOL	44		% Rec
TERPHENYL-D14	115		% Rec

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16490.

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Quality Assurance Officer: Deborah M B Jensen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117599
	Complete	PO Number	
	11-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	15-OCT-92 12:15	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-8
LOG #: 10664
FIELD INFORMATION: WD 21.69, WL 4.22, COND. 450, PH 5.2

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.024	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.026	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

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GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.038	0.010	mg/L

Note: Dilution 1:2

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 16-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.002	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	990		mL
FINAL VOLUME	1.0		mL

HERITAGE LABORATORIES, INC. Lab Sample ID: B117599

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 05-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	36		% Rec
PHENOL-D5	17		% Rec
NITROBENZENE-D5	84		% Rec
2-FLUOROBIPHENYL	98		% Rec
2,4,6-TRIBROMOPHENOL	53		% Rec
TERPHENYL-D14	101		% Rec

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16490.

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Quality Assurance Officer: Delmarth M B Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117600
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	19-NOV-92	15-OCT-92 12:55	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-8A
LOG #: 10665
FIELD INFORMATION: WD 33.06, WL 3.43, COND. 420, PH 5.9

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.0

Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 16-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1

Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1

Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1

Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: H. KATTNER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	0.002	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	1000		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 02-NOV-92 Instrument: GC/MS SVOA Test: D505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			

2-FLUOROPHENOL	38		% Rec
PHENOL-D5	28		% Rec
NITROBENZENE-D5	68		% Rec
2-FLUOROBIPHENYL	92		% Rec
2,4,6-TRIBROMOPHENOL	66		% Rec
TERPHENYL-D14	100		% Rec

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16490.

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Quality Assurance Officer: Helmsith MB Jamen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117598
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	15-OCT-92 11:15	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-9
LOG #: 10663
FIELD INFORMATION: WD 21.45, WL 3.82, COND. 360, PH 5.8

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

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GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 16-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 28-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	1000		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 02-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	33		% Rec
PHENOL-D5	25		% Rec
NITROBENZENE-D5	62		% Rec
2-FLUOROBIPHENYL	83		% Rec
2,4,6-TRIBROMOPHENOL	66		% Rec
TERPHENYL-D14	105		% Rec

Sample Comments

All 3 VOA vials contained bubbles.

BDL Below Detection Limit

Sample chain of custody number 16490.

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Quality Assurance Officer: Helmuth MB Jensen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-OCT-92	1810	B117579
	Complete	PO Number	
	12-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	14-OCT-92 13:00	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-10
LOG #: 10660
FIELD INFORMATION: WD 14.00, WL 4.56, COND. 1060, PH 6.9

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.019	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.048	0.010	mg/L

Note: Dilution 1:2

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.018	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 15-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

 (continued on next page)

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 28-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 28-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 16-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	990		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 01-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L

 (continued on next page)

HERITAGE LABORATORIES, INC. Lab Sample ID: B117579

Parameter	Result	Det. Limit	Units
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	22		% Rec
PHENOL-D5	22		% Rec
NITROBENZENE-D5	38		% Rec
2-FLUOROBIPHENYL	69		% Rec
2,4,6-TRIBROMOPHENOL	83		% Rec
TERPHENYL-D14	104		% Rec

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16491.

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Quality Assurance Officer: Helmuth MB Janssen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117638
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92 06:20	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-11A
LOG #: 10671
FIELD INFORMATION: WD 36.17, WL 3.89, COND. 930, PH 6.2

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.012	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.0095	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. KRASKA Analysis Date: 17-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	0.003	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	0.001	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	0.004	0.001	mg/L
M/P-XYLENE	0.007	0.001	mg/L
O-XYLENE	0.003	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	1000		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 04-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	0.05	0.01	mg/L
ANTHRACENE	0.02	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
CARBAZOLE	0.04	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	0.01	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	0.06	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	38		% Rec
PHENOL-D5	29		% Rec
NITROBENZENE-D5	41		% Rec
2-FLUOROBIPHENYL	* 40		% Rec
2,4,6-TRIBROMOPHENOL	55		% Rec
TERPHENYL-D14	87		% Rec

*Note: * - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates.*

Sample Comments

ALL VOA VIALS CONTAINED BUBBLES.

** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16489.

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Quality Assurance Officer: Diehmuth MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117604
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	15-OCT-92 16:15	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-13
LOG #: 10669
FIELD INFORMATION: WD 14.10 , WL 4.49, COND. 1120, PH 6.1

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.039	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.061	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.048	0.005	mg/L

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GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.12	0.05	mg/L

Note: Dilution 1:10

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 16-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.05	ug/L
CHLOROMETHANE	BDL	0.05	ug/L
VINYL CHLORIDE	BDL	0.05	ug/L
BROMOMETHANE	BDL	0.05	ug/L
CHLOROETHANE	BDL	0.05	ug/L
TRICHLOROFLUOROMETHANE	BDL	0.05	ug/L
1,1-DICHLOROETHENE	BDL	0.01	ug/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.01	ug/L
TRANS-1,2-DICHLOROETHENE	BDL	0.01	ug/L
1,1-DICHLOROETHANE	BDL	0.01	ug/L
CHLOROFORM	BDL	0.01	ug/L
1,1,1-TRICHLOROETHANE	BDL	0.01	ug/L
CARBON TETRACHLORIDE	BDL	0.01	ug/L
BENZENE	0.10	0.01	ug/L
1,2-DICHLOROETHANE	BDL	0.001	ug/L
TRICHLOROETHENE	BDL	0.01	ug/L
1,2-DICHLOROPROPANE	BDL	0.01	ug/L
BROMODICHLOROMETHANE	BDL	0.01	ug/L
CIS-1,3-DICHLOROPROPENE	BDL	0.01	ug/L
TOLUENE	0.01	0.01	ug/L
1,1,2-TRICHLOROETHANE	BDL	0.01	ug/L
TETRACHLOROETHENE	BDL	0.01	ug/L
DIBROMOCHLOROMETHANE	BDL	0.01	ug/L
1,2-DIBROMOETHANE	BDL	0.05	ug/L
CHLOROBENZENE	BDL	0.01	ug/L
ETHYLBENZENE	0.04	0.01	ug/L
M/P-XYLENE	0.05	0.01	ug/L
O-XYLENE	0.02	0.01	ug/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.01	ug/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.05	ug/L
2-CHLOROETHYLVINYLETHER	BDL	0.01	ug/L

Note: Sample was diluted 1:10

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	990		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 04-NOV-92 Instrument: GC/MS SVOA Test: O505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	* 1.1	0.2	mg/L
ANTHRACENE	* 0.26	0.2	mg/L
BENZ(A)ANTHRACENE	0.12	0.01	mg/L
BENZO(A)PYRENE	0.04	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
BENZO(B)FLUORANTHENE	0.08	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	* 0.32	0.2	mg/L
CHRYSENE	0.10	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	* 0.76	0.2	mg/L
INDENO(1,2,3-CD)PYRENE	0.02	0.01	mg/L
NAPHTHALENE	* 3.5	0.2	mg/L
PHENANTHRENE	* 1.6	0.2	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	0.01	0.01	ug/L
2,4-DINITROPHENOL	BDL	0.05	ug/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	46		mg/L
PHENOL-D5	34		mg/L
NITROBENZENE-D5	50		mg/L
2-FLUOROBIPHENYL	78		mg/L
2,4,6-TRIBROMOPHENOL	88		mg/L
TERPHENYL-D14	90		mg/L

*Note: * - Taken from 1:20 dilution (GB2890.c) 11/08/92*

Sample Comments

** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 164902.

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Quality Assurance Officer: Lee Smith MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117640
	Complete	PO Number	
	18-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92 08:30	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-14
LOG #: 10673
FIELD INFORMATION: WD 18.64, WL 4.00, COND. 72000, PH 6.4

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.069	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.059	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.018	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.050	0.015	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. KRASKA Analysis Date: 17-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 31-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	.025	mg/L
CHLOROMETHANE	BDL	.025	mg/L
VINYL CHLORIDE	BDL	.025	mg/L
BROMOMETHANE	BDL	.025	mg/L
CHLOROETHANE	BDL	.025	mg/L
TRICHLOROFLUOROMETHANE	BDL	.025	mg/L
1,1-DICHLOROETHENE	BDL	.005	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	.005	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	.005	mg/L
1,1-DICHLOROETHANE	BDL	.005	mg/L
CHLOROFORM	BDL	.005	mg/L
1,1,1-TRICHLOROETHANE	BDL	.005	mg/L
CARBON TETRACHLORIDE	BDL	.005	mg/L
BENZENE	0.019	.005	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	.005	mg/L
1,2-DICHLOROPROPANE	BDL	.005	mg/L
BROMODICHLOROMETHANE	BDL	.005	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	.005	mg/L
TOLUENE	0.028	.005	mg/L
1,1,2-TRICHLOROETHANE	BDL	.005	mg/L
DIBROMOCHLOROMETHANE	BDL	.005	mg/L
CHLOROBENZENE	BDL	.005	mg/L
ETHYLBENZENE	0.060	.005	mg/L
M/P-XYLENE	0.078	.005	mg/L
O-XYLENE	0.038	.005	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	.005	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	.025	mg/L
2-CHLOROETHYLVINYLETHER	BDL	.005	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	.025	mg/L

Note: Analysis performed outside of the holding time.
Sample was diluted 1:5
Sample was confirmed by GC/MS

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	970		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 04-NOV-92 Instrument: GC/MS SVOA Test: D505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	** 0.81	0.01	mg/L
ANTHRACENE	** 0.26	0.01	mg/L
BENZ(A)ANTHRACENE	0.14	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
BENZO(A)PYRENE	0.05	0.01	mg/L
BENZO(B)FLUORANTHENE	0.11	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	0.19	0.01	mg/L
CHRYSENE	0.09	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	** 0.78	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	0.02	0.01	mg/L
NAPHTHALENE	*** 4.9	0.01	mg/L
PHENANTHRENE	** 1.4	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	43		% Rec
PHENOL-D5	34		% Rec
NITROBENZENE-D5	* 0		% Rec
2-FLUOROBIPHENYL	67		% Rec
2,4,6-TRIBROMOPHENOL	71		% Rec
TERPHENYL-D14	76		% Rec

*Note: * - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates. See case narrative.*
Sample reanalyzed with no improvement in internal standard areas.
*** - Taken from 1:10 dilution (GB2965.c) run on 11/14/92*
**** - Taken from 1:40 dilution (GB3014.c) run on 11/17/92*

Sample Comments

*	*See Note for Parameter*
**	*See Note for Parameter*
***	*See Note for Parameter*
BDL	*Below Detection Limit*

Sample chain of custody number 16489.

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Quality Assurance Officer: Deborah MB Jensen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117605
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	15-OCT-92 17:10	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-15
LOG #: 10670
FIELD INFORMATION: WD 13.90, WL 4.50, COND. 830, PH 6.6

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.031	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.050	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.11	0.05	mg/L

Note: Dilution 1:10

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GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.042	0.015	mg/L

Note: Dilution 1:3

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 16-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.023	0.005	mg/L

 (continued on next page)

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.005	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	0.005	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	0.008	0.001	mg/L
M/P-XYLENE	0.006	0.001	mg/L
O-XYLENE	0.003	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

Note: Sample was confirmed by GC/MS

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	995		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 04-NOV-92 Instrument: GC/MS SVOA Test: D505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	0.14	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	0.03	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	0.05	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	0.03	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	47		% Rec
PHENOL-D5	34		% Rec
NITROBENZENE-D5	86		% Rec
2-FLUOROBIPHENYL	82		% Rec
2,4,6-TRIBROMOPHENOL	90		% Rec
TERPHENYL-D14	81		% Rec

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16490.

This Certificate shall not be reproduced, except in full, without the written approval of the lab.

Quality Assurance Officer: Helmuth MB Janssen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-OCT-92	1810	B117580
	Complete	PO Number	
	16-NOV-92	530-06-501	
	Printed	Sampled	
	23-NOV-92	14-OCT-92 15:10	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-16
LOG #: 10661
FIELD INFORMATION: WD 13.97, WL 5.04, COND. 1520, PH 6.5

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.030	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.012	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 15-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 28-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 27-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.001	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 16-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	990		mL
FINAL VOLUME	1.0		mL

HERITAGE LABORATORIES, INC. Lab Sample ID: B117580

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 07-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	36		% Rec
PHENOL-D5	27		% Rec
NITROBENZENE-D5	* 8.7		% Rec
2-FLUOROBIPHENYL	80		% Rec
2,4,6-TRIBROMOPHENOL	95		% Rec
TERPHENYL-D14	78		% Rec

*Note: * - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates. See case narrative.*

Sample Comments

* *See Note for Parameter*

BDL Below Detection Limit

Sample chain of custody number 16491.

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Quality Assurance Officer: Chelsmith MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-OCT-92	1810	B117581
	Complete	PO Number	
	16-NOV-92	530-06-501	
	Printed	Sampled	
	23-NOV-92	14-OCT-92 16:00	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-17
LOG #: 10662
FIELD INFORMATION: WD 14.43, WL 4.99, COND. 1320, PH 6.6

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.035	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.054	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.04	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.045	0.010	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 15-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 28-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.0057	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 27-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.003	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	0.017	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	0.006	0.001	mg/L
M/P-XYLENE	0.016	0.001	mg/L
O-XYLENE	0.010	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 16-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	995		mL
FINAL VOLUME	1.0		mL

HERITAGE LABORATORIES, INC. Lab Sample ID: B117581

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 07-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	0.02	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	0.01	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	0.08	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	0.06	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	33		% Rec
PHENOL-D5	* 2.5		% Rec
NITROBENZENE-D5	104		% Rec
2-FLUOROBIPHENYL	70		% Rec
2,4,6-TRIBROMOPHENOL	75		% Rec
TERPHENYL-D14	81		% Rec

*Note: * - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates. See case narrative.*

Sample Comments

* *See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16491.

This Certificate shall not be reproduced, except in full, without the written approval of the lab.

Quality Assurance Officer: Delmuth MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117602
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	15-OCT-92 13:55	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-18
LOG #: 10667
FIELD INFORMATION: WD 13.48, WL 4.14, COND. 72000, PH 5.0

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.67	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.051	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.0058	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0

Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.081	0.05	mg/L

Note: Dilution 1:10

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 16-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1

Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1

Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1

Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 28-OCT-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.002	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	1000		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 02-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	25		% Rec
PHENOL-D5	20		% Rec
NITROBENZENE-D5	65		% Rec
2-FLUOROBIPHENYL	84		% Rec
2,4,6-TRIBROMOPHENOL	27		% Rec
TERPHENYL-D14	93		% Rec

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16490.

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Quality Assurance Officer: Deborah M.B. Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117642
	Complete	PO Number	
	16-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92 10:40	

Report To

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Bill To

SOUTHERN WOOD PIEDMONT
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SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-19
LOG #: 10675
FIELD INFORMATION: WD 15.12, WL 2.92, COND. 105, PH 6.0

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.030	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 03-NOV-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.0050	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. KRASKA Analysis Date: 17-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	0.001	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	0.011	0.001	mg/L
M/P-XYLENE	0.007	0.001	mg/L
O-XYLENE	0.005	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	1000		mL
FINAL VOLUME	1.0		mL

HERITAGE LABORATORIES, INC. Lab Sample ID: B117642

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 05-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	0.18	0.01	mg/L
ANTHRACENE	0.01	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	0.07	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	0.02	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	** 0.30	0.10	mg/L
PHENANTHRENE	0.08	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	37		% Rec
PHENOL-D5	30		% Rec
NITROBENZENE-D5	56		% Rec
2-FLUOROBIPHENYL	68		% Rec
2,4,6-TRIBROMOPHENOL	95		% Rec
TERPHENYL-D14	106		% Rec

*Note: ** - Taken from 1:10 dilution (GB2966.c) on 11/14/92*

Sample Comments

ALL VOA VIALS CONTAINED BUBBLES.

** *See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16489.

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Quality Assurance Officer: Helmuth MB Jamsen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117643
	Complete	PO Number	
	11-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92 11:15	

Report To

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P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-19A
LOG #: 10676
FIELD INFORMATION: WD 33.27, WL 2.91, COND. 150, PH 6.8

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.011	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.0050	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.011	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. KRASKA Analysis Date: 17-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 31-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	0.001	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

Note: Analysis performed outside of the holding time.

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 20-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	975		mL
FINAL VOLUME	1.0		mL

HERITAGE LABORATORIES, INC. Lab Sample ID: B117643

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 05-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	36		% Rec
PHENOL-D5	26		% Rec
NITROBENZENE-D5	59		% Rec
2-FLUOROBIPHENYL	73		% Rec
2,4,6-TRIBROMOPHENOL	96		% Rec
TERPHENYL-D14	107		% Rec

Note: See case narrative.

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16489.

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Quality Assurance Officer: Helmuth MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117644
	Complete	PO Number	
	16-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92 12:20	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-20
LOG #: 10687
FIELD INFORMATION: WD 14.57, WL 2.80, COND. 240, PH 5.9

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.032	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.010	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.012	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. KRASKA Analysis Date: 17-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 31-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

Note: Analysis performed outside of the holding time.

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 20-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	990		mL
FINAL VOLUME	1.0		mL

HERITAGE LABORATORIES, INC. Lab Sample ID: B117644

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 05-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	0.05	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	0.01	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	0.04	0.01	mg/L
PHENANTHRENE	0.05	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	33		% Rec
PHENOL-D5	26		% Rec
NITROBENZENE-D5	* 0		% Rec
2-FLUOROBIPHENYL	75		% Rec
2,4,6-TRIBROMOPHENOL	93		% Rec
TERPHENYL-D14	113		% Rec

*Note: * - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates. See case narrative.*

Sample Comments

** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16489.

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Quality Assurance Officer: Diebmuth MB Janssen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117645
	Complete	PO Number	
	16-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92 12:50	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-21
LOG #: 10678
FIELD INFORMATION: WD 8.96, WL 3.22, COND. 290, PH 6.7

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.032	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.035	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.028	0.005	mg/L

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GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.061	0.050	mg/L

NOTE: DILUTION 1:10

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. KRASKA Analysis Date: 17-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

FAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
NITIAL WEIGHT OR VOLUME	50		mL
INAL VOLUME	50		mL

RSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
RSENIC	BDL	0.005	mg/L

ALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 31-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	0.001	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

Note: Analysis performed outside of the holding time.

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 20-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	985		mL
FINAL VOLUME	1.0		mL

:RITAGE LABORATORIES, INC. Lab Sample ID: B11/645

:MI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

:nalyst: R. ROBERTS Analysis Date: 12-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
:ENAPHTHENE	BDL	0.01	mg/L
NTHRACENE	BDL	0.01	mg/L
ENZ(A)ANTHRACENE	BDL	0.01	mg/L
ENZO(A)PYRENE	BDL	0.01	mg/L
ENZO(B)FLUORANTHENE	BDL	0.01	mg/L
ENZO(K)FLUORANTHENE	BDL	0.01	mg/L
IS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
ARBAZOLE	BDL	0.01	mg/L
HRYSENE	BDL	0.01	mg/L
IBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
:LUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	25		% Rec
PHENOL-D5	20		% Rec
NITROBENZENE-D5	51		% Rec
2-FLUOROBIPHENYL	60		% Rec
2,4,6-TRIBROMOPHENOL	46		% Rec
TERPHENYL-D14	118		% Rec

Note: See case narrative.

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16489.

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Quality Assurance Officer: Helmuth MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-OCT-92	1810	B117577
	Complete	PO Number	
	13-NOV-92	530-06-501	
	Printed	Sampled	
	19-NOV-92	13-OCT-92 13:40	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-22
LOG #: 10658
FIELD INFORMATION: WD 13.00, WL 3.02, COND. 500, PH 6.4

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: H. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.20	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.038	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.033	0.005	mg/L

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GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.037	0.010	mg/L

NOTE: DILUTION 1:2

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 15-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.013	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 28-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 27-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.002	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	0.004	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	0.005	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	0.011	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
1,3-DICHLOROPROPANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	0.037	0.001	mg/L
M/P-XYLENE	0.048	0.001	mg/L
O-XYLENE	0.023	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 16-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	950		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 01-NOV-92 Instrument: GC/MS SVOA Test: D505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	* 2.5	0.01	mg/L
ANTHRACENE	0.18	0.01	mg/L
BENZ(A)ANTHRACENE	0.13	0.01	mg/L
BENZO(A)PYRENE	0.06	0.01	mg/L
BENZO(B)FLUORANTHENE	0.12	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	0.19	0.01	mg/L
CHRYSENE	0.10	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	* 1.7	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	0.02	0.01	mg/L
NAPHTHALENE	** 4.5	0.01	mg/L
PHENANTHRENE	* 3.7	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	0.03	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			

2-FLUOROPHENOL	41		% Rec
PHENOL-D5	34		% Rec
NITROBENZENE-D5	*** 159		% Rec
2-FLUOROBIPHENYL	92		% Rec
2,4,6-TRIBROMOPHENOL	94		% Rec
TERPHENYL-D14	128		% Rec

*Note: * - Taken from 1:20 dilution (GB2889.c) on 11/8/92*
*** - Taken from 1:40 dilution (GB2917.c) on 11/10/92*
**** - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates.*

Sample Comments

** See Note for Parameter*
*** See Note for Parameter*
**** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16491.

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Quality Assurance Officer: Chelsmith MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-OCT-92	1810	B117578
	Complete	PO Number	
	12-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	13-OCT-92 14:15	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-23
LOG #: 10659
FIELD INFORMATION: WD 11.00, WL 2.34, COND. 1440, PH 6.4

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

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GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 15-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 28-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 28-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.003	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 16-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	985		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 01-NOV-92 Instrument: GC/MS SVOA Test: O505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	33		% Rec
PHENOL-D5	29		% Rec
NITROBENZENE-D5	* 10		% Rec
2-FLUOROBIPHENYL	85		% Rec
2,4,6-TRIBROMOPHENOL	70		% Rec
TERPHENYL-D14	112		% Rec

*Note: * - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates.*

Sample Comments

** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16491.

This Certificate shall not be reproduced, except in full, without the written approval of the lab.

Quality Assurance Officer: Deborah M B Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117639
	Complete	PO Number	
	16-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92 07:50	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-24
LOG #: 10672
FIELD INFORMATION: WD 13.81, WL 3.48, COND. 7200, PH 6.6

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.018	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.027	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.0064	0.005	mg/L

 (continued on next page)

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.071	0.050	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. KRASKA Analysis Date: 17-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	0.002	0.001	mg/L
M/P-XYLENE	0.002	0.001	mg/L
O-XYLENE	0.001	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	990		mL
FINAL VOLUME	1.0		mL

HERITAGE LABORATORIES, INC. Lab Sample ID: B117639

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 04-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	0.11	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	0.03	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	0.02	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	38		% Rec
PHENOL-D5	30		% Rec
NITROBENZENE-D5	* 0		% Rec
2-FLUOROBIPHENYL	55		% Rec
2,4,6-TRIBROMOPHENOL	69		% Rec
TERPHENYL-D14	61		% Rec

*Note: * - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates. See case narrative.*

Sample Comments

** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16489.

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Quality Assurance Officer: Delmarth M B Jensen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117641
	Complete	PO Number	
	16-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92 09:20	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: MW-25
LOG #: 10674
FIELD INFORMATION: WD 15.23, WL 1.63, COND. 72000, PH 6.4

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	0.031	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	0.041	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	0.012	0.005	mg/L

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GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0

Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	0.036	0.010	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. KRASKA Analysis Date: 17-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1

Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1

Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1

Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0

Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: H. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: D461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	950		mL
FINAL VOLUME	1.0		mL

HERITAGE LABORATORIES, INC. Lab Sample ID: B117641

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 05-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	0.120	0.01	mg/L
ANTHRACENE	0.070	0.01	mg/L
BENZ(A)ANTHRACENE	0.05	0.01	mg/L
BENZO(A)PYRENE	0.02	0.01	mg/L
BENZO(B)FLUORANTHENE	0.04	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	0.02	0.01	mg/L
CHRYSENE	0.04	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	0.16	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	0.190	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	30		% Rec
PHENOL-D5	27		% Rec
NITROBENZENE-D5	* 0		% Rec
2-FLUOROBIPHENYL	60		% Rec
2,4,6-TRIBROMOPHENOL	83		% Rec
TERPHENYL-D14	70		% Rec

*Note: * - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates. See case narrative.*

Sample Comments

* *See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16489.

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Quality Assurance Officer: Deborah MB Tanner

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117646
	Complete	PO Number	
	16-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92 13:20	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: FIELD BLANK

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

 (continued on next page)

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. KRASKA Analysis Date: 17-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 31-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 31-OCT-92 Instrument: GC/PID ELCD Test: O461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	ug/L
CHLOROMETHANE	BDL	0.005	ug/L
VINYL CHLORIDE	BDL	0.005	ug/L
BROMOMETHANE	BDL	0.005	ug/L
CHLOROETHANE	BDL	0.005	ug/L
TRICHLOROFLUOROMETHANE	BDL	0.005	ug/L
1,1-DICHLOROETHENE	BDL	0.001	ug/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.001	ug/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	ug/L
1,1-DICHLOROETHANE	BDL	0.001	ug/L
CHLOROFORM	BDL	0.001	ug/L
1,1,1-TRICHLOROETHANE	BDL	0.001	ug/L
CARBON TETRACHLORIDE	BDL	0.001	ug/L
BENZENE	BDL	0.001	ug/L
1,2-DICHLOROETHANE	BDL	0.001	ug/L
TRICHLOROETHENE	BDL	0.001	ug/L
1,2-DICHLOROPROPANE	BDL	0.001	ug/L
BROMODICHLOROMETHANE	BDL	0.001	ug/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	ug/L
TOLUENE	BDL	0.001	ug/L
1,1,2-TRICHLOROETHANE	BDL	0.001	ug/L
DIBROMOCHLOROMETHANE	BDL	0.001	ug/L
CHLOROBENZENE	BDL	0.001	ug/L
ETHYLBENZENE	BDL	0.001	ug/L
M/P-XYLENE	BDL	0.001	ug/L
O-XYLENE	BDL	0.001	ug/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	ug/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	ug/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	ug/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	ug/L

Note: Analysis performed outside of the holding time.

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 20-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	985		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 12-NOV-92 Instrument: GC/MS SVOA Test: O505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	35		% Rec
PHENOL-D5	24		% Rec
NITROBENZENE-D5	71		% Rec
2-FLUOROBIPHENYL	74		% Rec
2,4,6-TRIBROMOPHENOL	74		% Rec
TERPHENYL-D14	113		% Rec

Note: See case narrative.

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16489.

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Quality Assurance Officer: Chelsmith MB Jansen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	17-OCT-92	1810	B117647
	Complete	PO Number	
	02-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	16-OCT-92	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: TRIP BLANK

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 31-OCT-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.005	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

Note: Analysis performed outside of the holding time.

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16489.

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Quality Assurance Officer: Helmuth M.B. Janssen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117607
	Complete	PO Number	
	02-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	15-OCT-92 17:45	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: TRIP BLANK

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.005	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

 (continued on next page)

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16490.

This Certificate shall not be reproduced, except in full, without the written approval of the lab.

Quality Assurance Officer: Deborah MB Jensen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	16-OCT-92	1810	B117606
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	15-OCT-92 17:45	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: FIELD BLANK

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

 (continued on next page)

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 16-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: H. KATTHER Analysis Date: 29-OCT-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.002	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 19-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	1000		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 04-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0

Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	31		% Rec
PHENOL-D5	23		% Rec
NITROBENZENE-D5	70		% Rec
2-FLUOROBIPHENYL	79		% Rec
2,4,6-TRIBROMOPHENOL	59		% Rec
TERPHENYL-D14	* 206		% Rec

Note: Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates.

Sample Comments

* *See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16490.

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Quality Assurance Officer: dulsmith MB Janssen

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-OCT-92	1810	B117592
	Complete	PO Number	
	30-OCT-92	530-06-501	
	Printed	Sampled	
	24-NOV-92	14-OCT-92	

Report To	Bill To
SANDRA WATSON SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304	SOUTHERN WOOD PIEDMONT P.O. BOX 5447 SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: TRIP BLANK

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 28-OCT-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	BDL	0.005	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
1,3-DICHLOROPROPANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

 (continued on next page)

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 16491.

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Quality Assurance Officer: Helmuth MB Timmer

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 4132 POMPANO ST. CHARLOTTE, NC 28216 (704)393-1853	15-OCT-92	1810	B117582
	Complete	PO Number	
	10-NOV-92	530-06-501	
	Printed	Sampled	
	23-NOV-92	14-OCT-92 16:30	

Report To

SANDRA WATSON
SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Bill To

SOUTHERN WOOD PIEDMONT
P.O. BOX 5447
SPARTANBURG, SC 29304

Sample Description

PROJECT: SWP WILMINGTON
SAMPLE ID: FIELD BLANK

FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P130.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.0
Prep: FAA OR ICP ACID DIGESTION OF AQUEOUS SAMPLES SW846-3005 P130.4.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: W. GROVES Analysis Date: 20-OCT-92 Test: P130.6.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M103.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P130.6.1

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

 (continued on next page)

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 29-OCT-92 Instrument: GFAA Test: M116.2.0
Prep: GFAA ACID DIGESTION OF AQUEOUS SAMPLES SW846-3020 P130.6.1

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A

Analyst: M. CASHION Analysis Date: 15-OCT-92 Test: P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	500		mL
FINAL VOLUME	500		mL

FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

CHROMIUM FAA SW846-7190

Analyst: M. CASHION Analysis Date: 28-OCT-92 Instrument: FAA Test: M110.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
CHROMIUM	BDL	0.010	mg/L

COPPER FAA SW846-7210

Analyst: M. CASHION Analysis Date: 30-OCT-92 Instrument: FAA Test: M112.1.1
Prep: FAA OR ICP ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3005 P132.4.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
COPPER	BDL	0.025	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 21-OCT-92 Test: P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

LEAD GFAA SW846-7421

Analyst: L. SURRATT Analysis Date: 28-OCT-92 Instrument: GFAA Test: M116.2.1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.0
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
LEAD	BDL	0.005	mg/L

GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020

Analyst: M. CASHION Analysis Date: 29-OCT-92 Test: P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL VOLUME	50		mL

 (continued on next page)

ARSENIC GFAA SW846-7060

Analyst: L. SURRATT Analysis Date: 30-OCT-92 Instrument: GFAA Test: M103.2:1
Prep: GFAA ACID DIGESTION (DISSOLVED METALS) AQUEOUS SAMPLES SW846-3020 P133.6.1
Prep: 0.45 MICRON PORE DIAMETER MEMBRANE FILTRATION SM 302A P110.5.0

Parameter	Result	Det. Limit	Units
ARSENIC	BDL	0.005	mg/L

HALOGENATED AND AROMATIC VOLATILE ORGANICS BY GC/PID ELCD SW846-8021

Analyst: M. KATTNER Analysis Date: 27-OCT-92 Instrument: GC/PID ELCD Test: 0461.1.0

Parameter	Result	Det. Limit	Units
DICHLORODIFLUOROMETHANE	BDL	0.005	mg/L
CHLOROMETHANE	BDL	0.005	mg/L
VINYL CHLORIDE	BDL	0.005	mg/L
BROMOMETHANE	BDL	0.005	mg/L
CHLOROETHANE	BDL	0.005	mg/L
TRICHLOROFLUOROMETHANE	BDL	0.005	mg/L
1,1-DICHLOROETHENE	BDL	0.001	mg/L
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.002	0.001	mg/L
TRANS-1,2-DICHLOROETHENE	BDL	0.001	mg/L
1,1-DICHLOROETHANE	BDL	0.001	mg/L
CHLOROFORM	BDL	0.001	mg/L
1,1,1-TRICHLOROETHANE	BDL	0.001	mg/L
CARBON TETRACHLORIDE	BDL	0.001	mg/L
BENZENE	BDL	0.001	mg/L
1,2-DICHLOROETHANE	BDL	0.001	mg/L
TRICHLOROETHENE	BDL	0.001	mg/L
1,2-DICHLOROPROPANE	BDL	0.001	mg/L
BROMODICHLOROMETHANE	BDL	0.001	mg/L
CIS-1,3-DICHLOROPROPENE	BDL	0.001	mg/L
TOLUENE	BDL	0.001	mg/L
1,1,2-TRICHLOROETHANE	BDL	0.001	mg/L
DIBROMOCHLOROMETHANE	BDL	0.001	mg/L
CHLOROBENZENE	BDL	0.001	mg/L
ETHYLBENZENE	BDL	0.001	mg/L
M/P-XYLENE	BDL	0.001	mg/L
O-XYLENE	BDL	0.001	mg/L
1,1,2,2-TETRACHLOROETHANE	BDL	0.001	mg/L
METHYL-T-BUTYL ETHER (MTBE)	BDL	0.005	mg/L
2-CHLOROETHYLVINYLETHER	BDL	0.001	mg/L
1,2-DIBROMOETHANE (EDB)	BDL	0.005	mg/L

GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: S. WILLIAMS Analysis Date: 16-OCT-92 Test: P233.4.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	900		mL
FINAL VOLUME	1.0		mL

SEMI-VOLATILE ORGANICS (BASE/NEUTRAL/ACID FRACTIONS) SW846-8270

Analyst: R. ROBERTS Analysis Date: 02-NOV-92 Instrument: GC/MS SVOA Test: 0505.3.0
Prep: GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510 P233.4.0

Parameter	Result	Det. Limit	Units
ACENAPHTHENE	BDL	0.01	mg/L
ANTHRACENE	BDL	0.01	mg/L
BENZ(A)ANTHRACENE	BDL	0.01	mg/L
BENZO(A)PYRENE	BDL	0.01	mg/L
BENZO(B)FLUORANTHENE	BDL	0.01	mg/L
BENZO(K)FLUORANTHENE	BDL	0.01	mg/L
BIS(2-CHLOROETHYL)ETHER	BDL	0.01	mg/L

 (continued on next page)

Parameter	Result	Det. Limit	Units
CARBAZOLE	BDL	0.01	mg/L
CHRYSENE	BDL	0.01	mg/L
DIBENZ(A,H)ANTHRACENE	BDL	0.01	mg/L
FLUORANTHENE	BDL	0.01	mg/L
INDENO(1,2,3-CD)PYRENE	BDL	0.01	mg/L
NAPHTHALENE	BDL	0.01	mg/L
PHENANTHRENE	BDL	0.01	mg/L
4-CHLORO-3-METHYLPHENOL	BDL	0.01	mg/L
2-CHLOROPHENOL	BDL	0.01	mg/L
2,4-DIMETHYLPHENOL	BDL	0.01	mg/L
2,4-DINITROPHENOL	BDL	0.05	mg/L
PENTACHLOROPHENOL	BDL	0.05	mg/L
PHENOL	BDL	0.01	mg/L
TETRACHLOROPHENOL	BDL	0.01	mg/L
2,4,5-TRICHLOROPHENOL	BDL	0.01	mg/L
2,4,6-TRICHLOROPHENOL	BDL	0.01	mg/L
SURROGATE RECOVERY			
2-FLUOROPHENOL	* 20		% Rec
PHENOL-D5	21		% Rec
NITROBENZENE-D5	46		% Rec
2-FLUOROBIPHENYL	53		% Rec
2,4,6-TRIBROMOPHENOL	37		% Rec
TERPHENYL-D14	106		% Rec

*Note: * - Surrogate recovery outside of the control limits. Extract was reanalyzed with no improvement. Results have to be regarded as estimates.*

Sample Comments

** See Note for Parameter*
BDL Below Detection Limit

Sample chain of custody number 16491.

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Quality Assurance Officer: Chelsmith MB Jamsen

Waters

Rep 0 - Total

Rep 1 - Dissolved

METALS

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Heritage Laboratories, Inc -- Parameter Summary Report
SWP Wilmington Project

		MW-22 B117577 13-OCT-92			MW-22 REP1 B117577 13-OCT-92			MW-23 B117578 13-OCT-92			MW-23 REP1 B117578 13-OCT-92			MW-10 B117579 14-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	0.033	0.005	mg/L	0.013	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	0.048	0.010	mg/L
Chromium	7440-47-32	0.20	0.010	mg/L	BDL	0.010	mg/L	BDL	0.010	mg/L	BDL	0.010	mg/L	0.019	0.010	mg/L
Copper	7440-50-8	0.038	0.025	mg/L	BDL	0.025	mg/L	BDL	0.025	mg/L	BDL	0.025	mg/L	BDL	0.025	mg/L
Lead	7439-92-1	0.037	0.010	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	0.018	0.005	mg/L

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		MW-10 REP1 B117579 14-OCT-92			MW-16 B117580 14-OCT-92			MW-16 REP1 B117580 14-OCT-92			MW-17 B117581 14-OCT-92			MW-17 REP1 B117581 14-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	0.04	0.005	mg/L	0.0057	0.005	mg/L
Chromium	7440-47-32	BDL	0.010	mg/L	BDL	0.010	mg/L	BDL	0.010	mg/L	0.035	0.010	mg/L	BDL	0.010	mg/L
Copper	7440-50-8	BDL	0.025	mg/L	0.030	0.025	mg/L	BDL	0.025	mg/L	0.054	0.025	mg/L	BDL	0.025	mg/L
Lead	7439-92-1	BDL	0.005	mg/L	0.012	0.005	mg/L	BDL	0.005	mg/L	0.045	0.010	mg/L	BDL	0.005	mg/L

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

Heritage Laboratories, Inc -- Parameter Summary Report
SWP Wilmington Project

		FIELD BLANK B117582 14-OCT-92			FIELD BLANK REP1 B117582 14-OCT-92			TRIP BLANK B117592 14-OCT-92			TRIP BLANK REP1 B117592 14-OCT-92			MW-9 B117598 15-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL	0.005	mg/L	BDL	0.005	mg/L	NA			NA			BDL	0.005	mg/L
Chromium	7440-47-32	BDL	0.010	mg/L	BDL	0.010	mg/L	NA			NA			BDL	0.010	mg/L
Copper	7440-50-8	BDL	0.025	mg/L	BDL	0.025	mg/L	NA			NA			BDL	0.025	mg/L
Lead	7439-92-1	BDL	0.005	mg/L	BDL	0.005	mg/L	NA			NA			BDL	0.005	mg/L

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

Heritage Laboratories, Inc -- Parameter Summary Report
SWP Wilmington Project

		MW-9 REP1 B117598 15-OCT-92			MW-8 B117599 15-OCT-92			MW-8 REP1 B117599 15-OCT-92			MW-8A B117600 15-OCT-92			MW-8A REP1 B117600 15-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Chromium	7440-47-32	BDL	0.010	mg/L	0.024	0.010	mg/L	BDL	0.010	mg/L	BDL	0.010	mg/L	BDL	0.010	mg/L
Copper	7440-50-8	BDL	0.025	mg/L	0.026	0.025	mg/L	BDL	0.025	mg/L	BDL	0.025	mg/L	BDL	0.025	mg/L
Lead	7439-92-1	BDL	0.005	mg/L	0.038	0.010	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L

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Environmental Mgmt.

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		MW-7 B117601 15-OCT-92			MW-7 REP1 B117601 15-OCT-92			MW-18 B117602 15-OCT-92			MW-18 REP1 B117602 15-OCT-92			MW-6 B117603 15-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL	0.005	mg/L	BDL	0.005	mg/L	0.0058	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Chromium	7440-47-32	0.014	0.010	mg/L	BDL	0.010	mg/L	0.67	0.010	mg/L	BDL	0.010	mg/L	BDL	0.010	mg/L
Copper	7440-50-8	BDL	0.025	mg/L	BDL	0.025	mg/L	0.051	0.025	mg/L	BDL	0.025	mg/L	BDL	0.025	mg/L
Lead	7439-92-1	0.0097	0.005	mg/L	BDL	0.005	mg/L	0.081	0.05	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		MW-6 REP1 B117603 15-OCT-92			MW-13 B117604 15-OCT-92			MW-13 REP1 B117604 15-OCT-92			MW-15 B117605 15-OCT-92			MW-15 REP1 B117605 15-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL	0.005	mg/L	0.048	0.005	mg/L	BDL	0.005	mg/L	0.11	0.05	mg/L	0.023	0.005	mg/L
Chromium	7440-47-32	BDL	0.010	mg/L	0.039	0.010	mg/L	BDL	0.010	mg/L	0.031	0.010	mg/L	BDL	0.010	mg/L
Copper	7440-50-8	BDL	0.025	mg/L	0.061	0.025	mg/L	BDL	0.025	mg/L	0.050	0.025	mg/L	BDL	0.025	mg/L
Lead	7439-92-1	BDL	0.005	mg/L	0.12	0.05	mg/L	BDL	0.005	mg/L	0.042	0.015	mg/L	BDL	0.005	mg/L

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		FIELD BLANK B117606 15-OCT-92			FIELD BLANK REP1 B117606 15-OCT-92			TRIP BLANK B117607 15-OCT-92			TRIP BLANK REP1 B117607 15-OCT-92			MW-11A B117638 16-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL	0.005	mg/L	BDL	0.005	mg/L	NA			NA			BDL	0.005	mg/L
Chromium	7440-47-32	BDL	0.010	mg/L	BDL	0.010	mg/L	NA			NA			0.012	0.010	mg/L
Copper	7440-50-8	BDL	0.025	mg/L	BDL	0.025	mg/L	NA			NA			BDL	0.025	mg/L
Lead	7439-92-1	BDL	0.005	mg/L	BDL	0.005	mg/L	NA			NA			0.0095	0.005	mg/L

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		MW-11A REP1 B117638 16-OCT-92			MW-24 B117639 16-OCT-92			MW-24 REP1 B117639 16-OCT-92			MW-14 B117640 16-OCT-92			MW-14 REP1 B117640 16-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL	0.005	mg/L	0.0064	0.005	mg/L	BDL	0.005	mg/L	0.018	0.005	mg/L	BDL	0.005	mg/L
Chromium	7440-47-32	BDL	0.010	mg/L	0.018	0.010	mg/L	BDL	0.010	mg/L	0.069	0.010	mg/L	BDL	0.010	mg/L
Copper	7440-50-8	BDL	0.025	mg/L	0.027	0.025	mg/L	BDL	0.025	mg/L	0.059	0.025	mg/L	BDL	0.025	mg/L
Lead	7439-92-1	BDL	0.005	mg/L	0.071	0.050	mg/L	BDL	0.005	mg/L	0.050	0.015	mg/L	BDL	0.005	mg/L

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		MW-25 B117641 16-OCT-92			MW-25 REP1 B117641 16-OCT-92			MW-19 B117642 16-OCT-92			MW-19 REP1 B117642 16-OCT-92			MW-19A B117643 16-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	0.012	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	0.0050	0.005	mg/L
Chromium	7440-47-32	0.031	0.010	mg/L	BDL	0.010	mg/L	0.030	0.010	mg/L	BDL	0.010	mg/L	0.011	0.010	mg/L
Copper	7440-50-8	0.041	0.025	mg/L	BDL	0.025	mg/L	BDL	0.025	mg/L	BDL	0.025	mg/L	BDL	0.025	mg/L
Lead	7439-92-1	0.036	0.010	mg/L	BDL	0.005	mg/L	0.0050	0.005	mg/L	BDL	0.005	mg/L	0.011	0.005	mg/L

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		MW-19A REP1 B117643 16-OCT-92			MW-20 B117644 16-OCT-92			MW-20 REP1 B117644 16-OCT-92			MW-21 B117645 16-OCT-92			MW-21 REP1 B117645 16-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL	0.005	mg/L	0.010	0.005	mg/L	BDL	0.005	mg/L	0.028	0.005	mg/L	BDL	0.005	mg/L
Chromium	7440-47-32	BDL	0.010	mg/L	BDL	0.010	mg/L	BDL	0.010	mg/L	0.032	0.010	mg/L	BDL	0.010	mg/L
Copper	7440-50-8	BDL	0.025	mg/L	0.032	0.025	mg/L	BDL	0.025	mg/L	0.035	0.025	mg/L	BDL	0.025	mg/L
Lead	7439-92-1	BDL	0.005	mg/L	0.012	0.005	mg/L	BDL	0.005	mg/L	0.061	0.050	mg/L	BDL	0.005	mg/L

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		FIELD BLANK B117646 16-OCT-92			FIELD BLANK REP1 B117646 16-OCT-92			TRIP BLANK B117647 16-OCT-92			TRIP BLANK REP1 B117647 16-OCT-92		
Metals	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Arsenic	7440-38-2	BDL	0.005	mg/L	BDL	0.005	mg/L	NA			NA		
Chromium	7440-47-32	BDL	0.010	mg/L	BDL	0.010	mg/L	NA			NA		
Copper	7440-50-8	BDL	0.025	mg/L	BDL	0.025	mg/L	NA			NA		
Lead	7439-92-1	BDL	0.005	mg/L	BDL	0.005	mg/L	NA			NA		

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

Waters

Semi-Volatiles

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SWP Wilmington Project

		MW-22 B117577 13-OCT-92			MW-23 B117578 13-OCT-92			MW-10 B117579 14-OCT-92			MW-16 B117580 14-OCT-92			MW-17 B117581 14-OCT-92		
Semi-volatiles	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Acenaphthene	83-32-9	*2.5	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Anthracene	120-12-7	0.18	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.02	0.01	mg/L
Benz(A)Anthracene	56-55-3	0.13	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benzo(A)Pyrene	50-32-8	0.06	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benzo(B)Fluoranthene	205-99-2	0.12	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.01	0.01	mg/L
Benzo(K)Fluoranthene	207-08-9	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Bis(2-Chloroethyl)Ether	111-44-4	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Carbazole	86-74-8	0.19	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
4-Chloro-3-Methylphenol	59-50-7	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2-Chlorophenol	95-57-8	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Chrysene	218-01-9	0.10	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Dibenz(A,H)Anthracene	53-70-3	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4-Dimethylphenol	105-67-9	0.03	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4-Dinitrophenol	25550-58-7	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L
Fluoranthene	206-44-0	*1.7	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.08	0.01	mg/L
Indeno(1,2,3-Cd)Pyrene	193-39-5	0.02	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Naphthalene	91-20-3	**4.5	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Pentachlorophenol	87-86-5	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L
Phenanthrene	85-01-8	*3.7	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.06	0.01	mg/L
Phenol	108-95-2	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Tetrachlorophenol	25167-83-3	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,5-Trichlorophenol	95-95-4	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,6-Trichlorophenol	88-06-2	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L

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		FIELD BLANK B117582 14-OCT-92			TRIP BLANK B117592 14-OCT-92			MW-9 B117598 15-OCT-92			MW-8 B117599 15-OCT-92			MW-8A B117600 15-OCT-92		
Semi-volatiles	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Acenaphthene	83-32-9	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Anthracene	120-12-7	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benz(A)Anthracene	56-55-3	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benzo(A)Pyrene	50-32-8	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benzo(B)Fluoranthene	205-99-2	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benzo(K)Fluoranthene	207-08-9	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Bis(2-Chloroethyl)Ether	111-44-4	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Carbazole	86-74-8	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
4-Chloro-3-Methylphenol	59-50-7	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2-Chlorophenol	95-57-8	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Chrysene	218-01-9	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Dibenz(A,H)Anthracene	53-70-3	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4-Dimethylphenol	105-67-9	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4-Dinitrophenol	25550-58-7	BDL	0.05	mg/L	NA			BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L
Fluoranthene	206-44-0	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Indeno(1,2,3-Cd)Pyrene	193-39-5	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Naphthalene	91-20-3	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Pentachlorophenol	87-86-5	BDL	0.05	mg/L	NA			BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L
Phenanthrene	85-01-8	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Phenol	108-95-2	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Tetrachlorophenol	25167-83-3	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,5-Trichlorophenol	95-95-4	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,6-Trichlorophenol	88-06-2	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L

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		MW-7 B117601 15-OCT-92			MW-18 B117602 15-OCT-92			MW-6 B117603 15-OCT-92			MW-13 B117604 15-OCT-92			MW-15 B117605 15-OCT-92		
Semi-volatiles	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Acenaphthene	83-32-9	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	*1.1	0.2	mg/L	0.14	0.01	mg/L
Anthracene	120-12-7	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	*0.26	0.2	mg/L	BDL	0.01	mg/L
Benz(A)Anthracene	56-55-3	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.12	0.01	mg/L	BDL	0.01	mg/L
Benzo(A)Pyrene	50-32-8	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.04	0.01	mg/L	BDL	0.01	mg/L
Benzo(B)Fluoranthene	205-99-2	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.08	0.01	mg/L	BDL	0.01	mg/L
Benzo(K)Fluoranthene	207-08-9	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Bis(2-Chloroethyl)Ether	111-44-4	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Carbazole	86-74-8	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	*0.32	0.2	mg/L	0.03	0.01	mg/L
4-Chloro-3-Methylphenol	59-50-7	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2-Chlorophenol	95-57-8	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Chrysene	218-01-9	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.10	0.01	mg/L	BDL	0.01	mg/L
Dibenz(A,H)Anthracene	53-70-3	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4-Dimethylphenol	105-67-9	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.01	0.01	ug/L	0.03	0.01	mg/L
2,4-Dinitrophenol	25550-58-7	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	ug/L	BDL	0.05	mg/L
Fluoranthene	206-44-0	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	*0.76	0.2	mg/L	BDL	0.01	mg/L
Indeno(1,2,3-Cd)Pyrene	193-39-5	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	0.02	0.01	mg/L	BDL	0.01	mg/L
Naphthalene	91-20-3	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	*3.5	0.2	mg/L	BDL	0.01	mg/L
Pentachlorophenol	87-86-5	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L
Phenanthrene	85-01-8	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	*1.6	0.2	mg/L	0.05	0.01	mg/L
Phenol	108-95-2	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Tetrachlorophenol	25167-83-3	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,5-Trichlorophenol	95-95-4	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,6-Trichlorophenol	88-06-2	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		FIELD BLANK B117606 15-OCT-92			TRIP BLANK B117607 15-OCT-92			MW-11A B117638 16-OCT-92			MW-24 B117639 16-OCT-92			MW-14 B117640 16-OCT-92		
Semi-volatiles	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Acenaphthene	83-32-9	BDL	0.01	mg/L	NA			0.05	0.01	mg/L	0.11	0.01	mg/L	**0.81	0.01	mg/L
Anthracene	120-12-7	BDL	0.01	mg/L	NA			0.02	0.01	mg/L	BDL	0.01	mg/L	**0.26	0.01	mg/L
Benz(A)Anthracene	56-55-3	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	0.14	0.01	mg/L
Benzo(A)Pyrene	50-32-8	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	0.05	0.01	mg/L
Benzo(B)Fluoranthene	205-99-2	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	0.11	0.01	mg/L
Benzo(K)Fluoranthene	207-08-9	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Bis(2-Chloroethyl)Ether	111-44-4	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Carbazole	86-74-8	BDL	0.01	mg/L	NA			0.04	0.01	mg/L	0.03	0.01	mg/L	0.19	0.01	mg/L
4-Chloro-3-Methylphenol	59-50-7	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2-Chlorophenol	95-57-8	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Chrysene	218-01-9	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	0.09	0.01	mg/L
Dibenz(A,H)Anthracene	53-70-3	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4-Dimethylphenol	105-67-9	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4-Dinitrophenol	25550-58-7	BDL	0.05	mg/L	NA			BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L
Fluoranthene	206-44-0	BDL	0.01	mg/L	NA			0.01	0.01	mg/L	BDL	0.01	mg/L	**0.78	0.01	mg/L
Indeno(1,2,3-Cd)Pyrene	193-39-5	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	0.02	0.01	mg/L
Naphthalene	91-20-3	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	***4.9	0.01	mg/L
Pentachlorophenol	87-86-5	BDL	0.05	mg/L	NA			BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L
Phenanthrene	85-01-8	BDL	0.01	mg/L	NA			0.06	0.01	mg/L	0.02	0.01	mg/L	**1.4	0.01	mg/L
Phenol	108-95-2	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Tetrachlorophenol	25167-83-3	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,5-Trichlorophenol	95-95-4	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,6-Trichlorophenol	88-06-2	BDL	0.01	mg/L	NA			BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		MW-25 B117641 16-OCT-92			MW-19 B117642 16-OCT-92			MW-19A B117643 16-OCT-92			MW-20 B117644 16-OCT-92			MW-21 B117645 16-OCT-92		
Semi-volatiles	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Acenaphthene	83-32-9	0.120	0.01	mg/L	0.18	0.01	mg/L	BDL	0.01	mg/L	0.05	0.01	mg/L	BDL	0.01	mg/L
Anthracene	120-12-7	0.070	0.01	mg/L	0.01	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benz(A)Anthracene	56-55-3	0.05	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benzo(A)Pyrene	50-32-8	0.02	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benzo(B)Fluoranthene	205-99-2	0.04	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Benzo(K)Fluoranthene	207-08-9	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Bis(2-Chloroethyl)Ether	111-44-4	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Carbazole	86-74-8	0.02	0.01	mg/L	0.07	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
4-Chloro-3-Methylphenol	59-50-7	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2-Chlorophenol	95-57-8	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Chrysene	218-01-9	0.04	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Dibenz(A,H)Anthracene	53-70-3	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4-Dimethylphenol	105-67-9	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4-Dinitrophenol	25550-58-7	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L
Fluoranthene	206-44-0	0.16	0.01	mg/L	0.02	0.01	mg/L	BDL	0.01	mg/L	0.012	0.01	mg/L	BDL	0.01	mg/L
Indeno(1,2,3-Cd)Pyrene	193-39-5	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Naphthalene	91-20-3	BDL	0.01	mg/L	**0.30	0.10	mg/L	BDL	0.01	mg/L	0.04	0.01	mg/L	BDL	0.01	mg/L
Pentachlorophenol	87-86-5	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L	BDL	0.05	mg/L
Phenanthrene	85-01-8	0.190	0.01	mg/L	0.08	0.01	mg/L	BDL	0.01	mg/L	0.05	0.01	mg/L	BDL	0.01	mg/L
Phenol	108-95-2	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
Tetrachlorophenol	25167-83-3	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,5-Trichlorophenol	95-95-4	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L
2,4,6-Trichlorophenol	88-06-2	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L	BDL	0.01	mg/L

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

		FIELD BLANK B117646 16-OCT-92			TRIP BLANK B117647 16-OCT-92		
Semi-volatiles	CAS Number	Result	DL	Units	Result	DL	Units
Acenaphthene	83-32-9	BDL	0.01	mg/L	NA		
Anthracene	120-12-7	BDL	0.01	mg/L	NA		
Benz(A)Anthracene	56-55-3	BDL	0.01	mg/L	NA		
Benzo(A)Pyrene	50-32-8	BDL	0.01	mg/L	NA		
Benzo(B)Fluoranthene	205-99-2	BDL	0.01	mg/L	NA		
Benzo(K)Fluoranthene	207-08-9	BDL	0.01	mg/L	NA		
Bis(2-Chloroethyl)Ether	111-44-4	BDL	0.01	mg/L	NA		
Carbazole	86-74-8	BDL	0.01	mg/L	NA		
4-Chloro-3-Methylphenol	59-50-7	BDL	0.01	mg/L	NA		
2-Chlorophenol	95-57-8	BDL	0.01	mg/L	NA		
Chrysene	218-01-9	BDL	0.01	mg/L	NA		
Dibenz(A,H)Anthracene	53-70-3	BDL	0.01	mg/L	NA		
2,4-Dimethylphenol	105-67-9	BDL	0.01	mg/L	NA		
2,4-Dinitrophenol	25550-58-7	BDL	0.05	mg/L	NA		
Fluoranthene	206-44-0	BDL	0.01	mg/L	NA		
Indeno(1,2,3-Cd)Pyrene	193-39-5	BDL	0.01	mg/L	NA		
Naphthalene	91-20-3	BDL	0.01	mg/L	NA		
Pentachlorophenol	87-86-5	BDL	0.05	mg/L	NA		
Phenanthrene	85-01-8	BDL	0.01	mg/L	NA		
Phenol	108-95-2	BDL	0.01	mg/L	NA		
Tetrachlorophenol	25167-83-3	BDL	0.01	mg/L	NA		
2,4,5-Trichlorophenol	95-95-4	BDL	0.01	mg/L	NA		
2,4,6-Trichlorophenol	88-06-2	BDL	0.01	mg/L	NA		

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* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

Waters

Volatiles

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Heritage Laboratories, Inc -- Parameter Summary Report
SWP Wilmington Project

		MW-22 B117577 13-OCT-92			MW-23 B117578 13-OCT-92			MW-10 B117579 14-OCT-92			MW-16 B117580 14-OCT-92			MW-17 B117581 14-OCT-92		
General Organics	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Benzene	71-43-2	0.005	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Bromodichloromethane	75-27-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Bromomethane	74-83-9	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Carbon Tetrachloride	56-23-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chlorobenzene	108-90-7	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chloroethane	75-00-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
2-Chloroethylvinylether	110-75-8	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chloroform	67-66-3	0.004	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chloromethane	74-87-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Cis-1,3-Dichloropropene	10061-01-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Dibromochloromethane	124-48-1	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,2-Dibromoethane (Edb)	106-93-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Dichlorodifluoromethane	75-71-8	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
1,1-Dichloroethane	75-34-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,2-Dichloroethane	107-06-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1-Dichloroethene	75-35-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Dichloromethane	75-09-2	0.002	0.001	mg/L	0.003	0.001	mg/L	BDL	0.001	mg/L	0.001	0.001	mg/L	0.003	0.001	mg/L
1,2-Dichloropropane	78-87-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Ethyl Benzene	100-41-4	0.037	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.006	0.001	mg/L
Fluorotrichloromethane	75-69-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
M/P-Xylene	NA	0.048	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.016	0.001	mg/L
Methyl-T-Butyl Ether (Mtbe)	1634-04-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
O-Xylene	95-47-6	0.023	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.010	0.001	mg/L
1,1,2,2-Tetrachloroethane	79-34-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Toluene	108-88-3	0.011	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.017	0.001	mg/L
Trans-1,2-Dichloroethene	156-60-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1,1-Trichloroethane	78-92-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1,2-Trichloroethane	79-00-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Trichloroethene	79-01-6	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Vinyl Chloride	75-01-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L

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		FIELD BLANK B117582 14-OCT-92			TRIP BLANK B117592 14-OCT-92			MW-9 B117598 15-OCT-92			MW-8 B117599 15-OCT-92			MW-8A B117600 15-OCT-92		
General Organics	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Benzene	71-43-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Bromodichloromethane	75-27-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Bromomethane	74-83-9	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Carbon Tetrachloride	56-23-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chlorobenzene	108-90-7	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chloroethane	75-00-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
2-Chloroethylvinylether	110-75-8	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chloroform	67-66-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.002	0.001	mg/L
Chloromethane	74-87-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Cis-1,3-Dichloropropene	10061-01-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Dibromochloromethane	124-48-1	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,2-Dibromoethane (Edb)	106-93-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Dichlorodifluoromethane	75-71-8	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
1,1-Dichloroethane	75-34-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,2-Dichloroethane	107-06-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1-Dichloroethene	75-35-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Dichloromethane	75-09-2	0.002	0.001	mg/L	BDL	0.005	mg/L	BDL	0.001	mg/L	0.002	0.001	mg/L	BDL	0.001	mg/L
1,2-Dichloropropane	78-87-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Ethyl Benzene	100-41-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Fluorotrichloromethane	75-69-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
M/P-Xylene	NA	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Methyl-T-Butyl Ether (Mtbe)	1634-04-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
O-Xylene	95-47-6	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1,2,2-Tetrachloroethane	79-34-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Toluene	108-88-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Trans-1,2-Dichloroethene	156-60-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1,1-Trichloroethane	78-92-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1,2-Trichloroethane	79-00-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Trichloroethene	79-01-6	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Vinyl Chloride	75-01-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L

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		MW-7 B117601 15-OCT-92			MW-18 B117602 15-OCT-92			MW-6 B117603 15-OCT-92			MW-13 B117604 15-OCT-92			MW-15 B117605 15-OCT-92		
General Organics	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Benzene	71-43-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.10	0.01	ug/L	0.005	0.001	mg/L
Bromodichloromethane	75-27-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Bromomethane	74-83-9	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.05	ug/L	BDL	0.005	mg/L
Carbon Tetrachloride	56-23-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Chlorobenzene	108-90-7	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Chloroethane	75-00-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.05	ug/L	BDL	0.005	mg/L
2-Chloroethylvinylether	110-75-8	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Chloroform	67-66-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Chloromethane	74-87-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.05	ug/L	BDL	0.005	mg/L
Cis-1,3-Dichloropropene	10061-01-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Dibromochloromethane	124-48-1	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
1,2-Dibromoethane (Edb)	106-93-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.05	ug/L	BDL	0.005	mg/L
Dichlorodifluoromethane	75-71-8	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.05	ug/L	BDL	0.005	mg/L
1,1-Dichloroethane	75-34-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.005	mg/L
1,2-Dichloroethane	107-06-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	ug/L	BDL	0.001	mg/L
1,1-Dichloroethene	75-35-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Dichloromethane	75-09-2	BDL	0.001	mg/L	0.002	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
1,2-Dichloropropane	78-87-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Ethyl Benzene	100-41-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.04	0.01	ug/L	0.008	0.001	mg/L
Fluorotrichloromethane	75-69-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.05	ug/L	BDL	0.005	mg/L
M/P-Xylene	NA	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.05	0.01	ug/L	0.006	0.001	mg/L
Methyl-T-Butyl Ether (Mtbe)	1634-04-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.05	ug/L	BDL	0.005	mg/L
O-Xylene	95-47-6	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.02	0.01	ug/L	0.003	0.001	mg/L
1,1,2,2-Tetrachloroethane	79-34-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Toluene	108-88-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	0.01	0.01	ug/L	BDL	0.001	mg/L
Trans-1,2-Dichloroethene	156-60-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
1,1,1-Trichloroethane	78-92-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
1,1,2-Trichloroethane	79-00-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Trichloroethene	79-01-6	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.01	ug/L	BDL	0.001	mg/L
Vinyl Chloride	75-01-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.05	ug/L	BDL	0.005	mg/L

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		FIELD BLANK B117606 15-OCT-92			TRIP BLANK B117607 15-OCT-92			MW-11A B117638 16-OCT-92			MW-24 B117639 16-OCT-92			MW-14 B117640 16-OCT-92		
General Organics	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Benzene	71-43-2	BDL	0.001	mg/L	BDL	0.001	mg/L	0.003	0.001	mg/L	BDL	0.001	mg/L	0.019	.005	mg/L
Bromodichloromethane	75-27-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Bromomethane	74-83-9	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	.025	mg/L
Carbon Tetrachloride	56-23-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Chlorobenzene	108-90-7	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Chloroethane	75-00-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	.025	mg/L
2-Chloroethylvinylether	110-75-8	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Chloroform	67-66-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Chloromethane	74-87-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	.025	mg/L
Cis-1,3-Dichloropropene	10061-01-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Dibromochloromethane	124-48-1	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
1,2-Dibromoethane (Edb)	106-93-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	.025	mg/L
Dichlorodifluoromethane	75-71-8	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	.025	mg/L
1,1-Dichloroethane	75-34-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
1,2-Dichloroethane	107-06-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1-Dichloroethene	75-35-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Dichloromethane	75-09-2	0.002	0.001	mg/L	BDL	0.005	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
1,2-Dichloropropane	78-87-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Ethyl Benzene	100-41-4	BDL	0.001	mg/L	BDL	0.001	mg/L	0.004	0.001	mg/L	0.002	0.001	mg/L	0.060	.005	mg/L
Fluorotrichloromethane	75-69-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	.025	mg/L
M/P-Xylene	NA	BDL	0.001	mg/L	BDL	0.001	mg/L	0.007	0.001	mg/L	0.002	0.001	mg/L	0.078	.005	mg/L
Methyl-T-Butyl Ether (Mtbe)	1634-04-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	.025	mg/L
O-Xylene	95-47-6	BDL	0.001	mg/L	BDL	0.001	mg/L	0.003	0.001	mg/L	0.001	0.001	mg/L	0.038	.005	mg/L
1,1,2,2-Tetrachloroethane	79-34-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Toluene	108-88-3	BDL	0.001	mg/L	BDL	0.001	mg/L	0.001	0.001	mg/L	BDL	0.001	mg/L	0.028	.005	mg/L
Trans-1,2-Dichloroethene	156-60-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
1,1,1-Trichloroethane	78-92-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
1,1,2-Trichloroethane	79-00-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Trichloroethene	79-01-6	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	.005	mg/L
Vinyl Chloride	75-01-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	.025	mg/L

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		MW-25 B117641 16-OCT-92			MW-19 B117642 16-OCT-92			MW-19A B117643 16-OCT-92			MW-20 B117644 16-OCT-92			MW-21 B117645 16-OCT-92		
General Organics	CAS Number	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units	Result	DL	Units
Benzene	71-43-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Bromodichloromethane	75-27-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Bromomethane	74-83-9	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Carbon Tetrachloride	56-23-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chlorobenzene	108-90-7	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chloroethane	75-00-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
2-Chloroethylvinylether	110-75-8	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Chloroform	67-66-3	BDL	0.001	mg/L	BDL	0.001	mg/L	0.001	0.001	mg/L	BDL	0.001	mg/L	0.001	0.001	mg/L
Chloromethane	74-87-3	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Cis-1,3-Dichloropropene	10061-01-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Dibromochloromethane	124-48-1	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,2-Dibromoethane (Edb)	106-93-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
Dichlorodifluoromethane	75-71-8	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
1,1-Dichloroethane	75-34-3	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,2-Dichloroethane	107-06-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1-Dichloroethene	75-35-4	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Dichloromethane	75-09-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,2-Dichloropropane	78-87-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Ethyl Benzene	100-41-4	BDL	0.001	mg/L	0.011	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Fluorotrichloromethane	75-69-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
M/P-Xylene	NA	BDL	0.001	mg/L	0.007	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Methyl-T-Butyl Ether (Mtbe)	1634-04-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L
O-Xylene	95-47-6	BDL	0.001	mg/L	0.005	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1,2,2-Tetrachloroethane	79-34-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Toluene	108-88-3	BDL	0.001	mg/L	0.001	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Trans-1,2-Dichloroethene	156-60-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1,1-Trichloroethane	78-92-2	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
1,1,2-Trichloroethane	79-00-5	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Trichloroethene	79-01-6	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L	BDL	0.001	mg/L
Vinyl Chloride	75-01-4	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L	BDL	0.005	mg/L

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		FIELD BLANK B117646 16-OCT-92			TRIP BLANK B117647 16-OCT-92		
General Organics	CAS Number	Result	DL	Units	Result	DL	Units
Benzene	71-43-2	BDL	0.001	ug/L	BDL	0.001	mg/L
Bromodichloromethane	75-27-4	BDL	0.001	ug/L	BDL	0.001	mg/L
Bromomethane	74-83-9	BDL	0.005	ug/L	BDL	0.005	mg/L
Carbon Tetrachloride	56-23-5	BDL	0.001	ug/L	BDL	0.001	mg/L
Chlorobenzene	108-90-7	BDL	0.001	ug/L	BDL	0.001	mg/L
Chloroethane	75-00-3	BDL	0.005	ug/L	BDL	0.005	mg/L
2-Chloroethylvinylether	110-75-8	BDL	0.001	ug/L	BDL	0.001	mg/L
Chloroform	67-66-3	BDL	0.001	ug/L	BDL	0.001	mg/L
Chloromethane	74-87-3	BDL	0.005	ug/L	BDL	0.005	mg/L
Cis-1,3-Dichloropropene	10061-01-5	BDL	0.001	ug/L	BDL	0.001	mg/L
Dibromochloromethane	124-48-1	BDL	0.001	ug/L	BDL	0.001	mg/L
1,2-Dibromoethane (Edb)	106-93-4	BDL	0.005	ug/L	BDL	0.005	mg/L
Dichlorodifluoromethane	75-71-8	BDL	0.005	ug/L	BDL	0.005	mg/L
1,1-Dichloroethane	75-34-3	BDL	0.001	ug/L	BDL	0.001	mg/L
1,2-Dichloroethane	107-06-2	BDL	0.001	ug/L	BDL	0.001	mg/L
1,1-Dichloroethene	75-35-4	BDL	0.001	ug/L	BDL	0.001	mg/L
Dichloromethane	75-09-2	BDL	0.001	ug/L	BDL	0.005	mg/L
1,2-Dichloropropane	78-87-5	BDL	0.001	ug/L	BDL	0.001	mg/L
Ethyl Benzene	100-41-4	BDL	0.001	ug/L	BDL	0.001	mg/L
Fluorotrichloromethane	75-69-4	BDL	0.005	ug/L	BDL	0.005	mg/L
M/P-Xylene	NA	BDL	0.001	ug/L	BDL	0.001	mg/L
Methyl-T-Butyl Ether (Mtbe)	1634-04-4	BDL	0.005	ug/L	BDL	0.005	mg/L
O-Xylene	95-47-6	BDL	0.001	ug/L	BDL	0.001	mg/L
1,1,2,2-Tetrachloroethane	79-34-5	BDL	0.001	ug/L	BDL	0.001	mg/L
Toluene	108-88-3	BDL	0.001	ug/L	BDL	0.001	mg/L
Trans-1,2-Dichloroethene	156-60-5	BDL	0.001	ug/L	BDL	0.001	mg/L
1,1,1-Trichloroethane	78-92-2	BDL	0.001	ug/L	BDL	0.001	mg/L
1,1,2-Trichloroethane	79-00-5	BDL	0.001	ug/L	BDL	0.001	mg/L
Trichloroethene	79-01-6	BDL	0.001	ug/L	BDL	0.001	mg/L
Vinyl Chloride	75-01-4	BDL	0.005	ug/L	BDL	0.005	mg/L

RECEIVED
NOV 25 1992
ENVIRONMENTAL AFFAIRS

* Note: This is a summary report. Please see the Certificate of Analysis for more information. DL = Detection Limit

TO ENSURE PROPER HANDLING OF SAMPLES PLEASE COMPLETE THIS ENTIRE FORM

HERITAGE LABORATORIES, INC.

4132 POMPANO ROAD
CHARLOTTE, N.C. 28216 (704) 393-1853

16489

Co. Name: SWP ETE
Project Name: SWP - Wilmington
Quote No.: PO No.:

ENVIRONMENTAL PROGRAM:
CWA NPDES_____ IWP_____ SLUDGE_____
RCRA MW_____ SW_____ DISPOSAL_____
SDWA_____ CERCLA/SUPERFUND_____ OTHER_____

Sampled by: Greg Kuntz

Analyses Requested (Note special detection limits or methods)

Report To:
Co: Greg Kuntz
Add: ETE, Inc
1445 Pisgah Church Rd
Lexington, SC 29072
Attn:
Phone: 800-746-0654

Accelerated Turnaround Requested _____ (Subject to Additional Charge)

Result Request by: ___/___/___ Mo Day Yr (Date must be Accepted and Approved by Lab.)

Sample ID:	Date:	Time:	Comp	Grab	Sample Description:	Sample Type (Matrix): DW, GW, WW, SOIL, SLUDGE, OTHER	No. of Containers	VOC	8250	Metals	Metals Dissolved	Remarks:	EMS Sample N
MW-11A	10/6/97	6:20		X	10671	GW	7	3	2	1	1		117638
MW-24		7:50			10672								117639
MW-14		8:30			10673								117640
MW-25		9:20			10674								117641
MW-19		10:40			10675								117642
MW-19A		11:15			10676								117643
MW-20		12:20			10677								117644
MW-21		12:50			10678								117645
Field Blank		13:20											117646

Wilmington Site Specific

Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
Gregory B. Kuntz	10/6/92 13:50			10/6/92 1350	S. Kuk
Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
	/			/	
Relinquished by: (Signature)	Date /Time	Received for Lab by: (Signature)	Remarks: Trip Blank arrived in cooler 8021 VOC → B117647		
	10/17/92 1200	Steven H. Gryte			

Distribution: Original and yellow copies accompany sample to laboratory; Pink copy retained by client; Yellow copy returned to client.

TO ENSURE PROPER HANDLING OF SAMPLES PLEASE COMPLETE THIS ENTIRE FORM

HERITAGE LABORATORIES, INC.

4132 POMPANO ROAD
CHARLOTTE, N.C. 28216 (704) 393-1853

16490

Co. Name: SWP ETE
Project Name: SWP Wilmington
Quote No.: PO No.:

ENVIRONMENTAL PROGRAM:
CWA NPDES_____ IWP_____ SLUDGE_____
RCRA MW_____ SW_____ DISPOSAL_____
SDWA_____ CERCLA/SUPERFUND_____ OTHER_____

Sampled by: Greg Kuntz

Analyses Requested (Note special detection limits or methods)

Report To:
Co: Greg Kuntz
Add: ETE, Inc
1445 Dugan Church Rd
Lexington, SC 29072
Attn:
Phone: 800-786-0659

Accelerated Turnaround Requested _____ (Subject to Additional Charge)

Result Request by: ___/___/___ Mo Day Yr (Date must be Accepted and Approved by Lab.)

Sample ID:	Date:	Time:	Comp	Grab	Sample Description:	Sample Type (Matrix): DW, GW, WW, SOIL, SLUDGE, OTHER	No. of Containers	VOC	SV	Metals	Metals Dissolved	Remarks:	EMS Sample N
MW-9	10/15	11:15		X	10663	GW	11	3	2	1	1	Wilmington Site Specific List	117598
MW-8		12:15			10664								117599
MW-8A		12:55			10665								117600
MW-7		13:55			106666								117601
MW-18		14:45			106667								11760
MW-6		15:20			106668								11760
MW-13		16:15			106669								117604
MW-15		17:10			10670								11760
FB		17:45											11760

Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
Gregory B. Kuntz	10/15/92			10/15/92 1815	
Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
	/			/	
Relinquished by: (Signature)	Date /Time	Received for Lab by: (Signature)	Remarks:		
	10/16/92 1000	Steve H. Griffith	Trip Blank arrived in cooler → ~~VOC~~ VOC ONLY → B117607		

Distribution: Original and yellow copies accompany sample to laboratory; Pink copy retained by client; Yellow copy returned to client.

TO ENSURE PROPER HANDLING OF SAMPLES PLEASE COMPLETE THIS ENTIRE FORM

HERITAGE LABORATORIES, INC.

4132 POMPANO ROAD
CHARLOTTE, N.C. 28216 (704) 393-1853

16491

Co. Name: SWP ETE
Project Name: SWP Wilmington
Quote No.: PO No.: 0

ENVIRONMENTAL PROGRAM:
CWA NPDES_____ IWP_____ SLUDGE_____
RCRA MW_____ SW_____ DISPOSAL_____
SDWA_____ CERCLA/SUPERFUND_____ OTHER_____

Sampled by:

Report To:
Co: Greg Kuntz
Add: ETE
1445 Piscah Ch. Rd.
Lexington SC 29072
Attn:
Phone: (800) 786-0654

Accelerated Turnaround Requested _____
(Subject to Additional Charge)

Result Request by: ___/___/___ (Mo Day Yr)
(Date must be Accepted and Approved by Lab.)

Analyses Requested (Note special detection limits or methods)

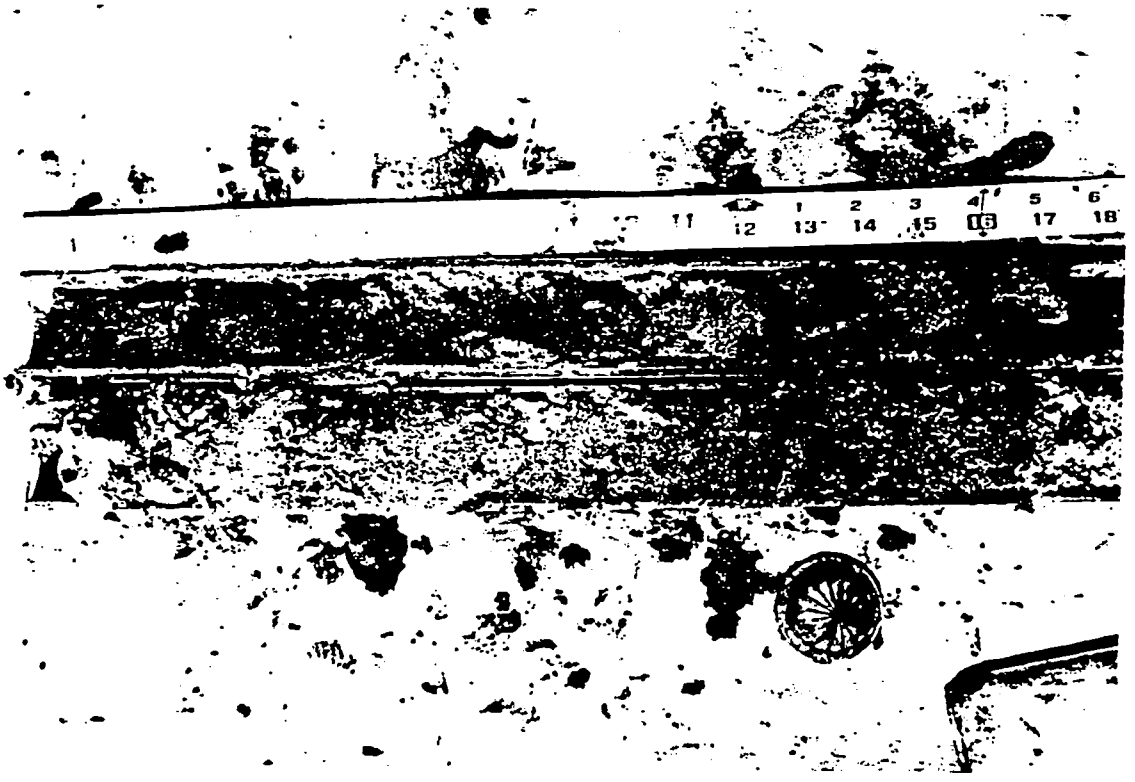
Sample ID:	Date:	Time:	Comp	Grab	Sample Description:	Sample Type (Matrix): DW, GW, WW, SOIL, SLUDGE, OTHER	No. of Containers	VOC	SV	Metals	Metals Dissolved	Remarks:	EMS Sample No
MW-22	10/13	1340		X	10658	GW	7	3	2	1	1		B117577
MW-23	10/13	1415		X	10659		7	3	2	1	1		B117578
MW-10	10/14	1300		X	10660		7	3	2	1	1		B117579
MW-16	10/14	1510		X	10661		7	3	2	1	1		B117580
MW-17	10/14	1600		X	10662		7	3	2	1	1	1 Liter Broken SHL 10/15/92	B117581
FB	10/14	1630		X			7	3	2	1	1		B117582

Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
[signature]	10/14/92 1730			10/14 1800	[signature]
Relinquished by: (Signature)	Date /Time	Received by: (Signature)	Relinquished by: (Signature)	Date /Time	Received by: (Signature)
	/			/	
Relinquished by: (Signature)	Date /Time	Received for Lab by: (Signature)	Remarks:		
	10/15/92 1415	[signature]			

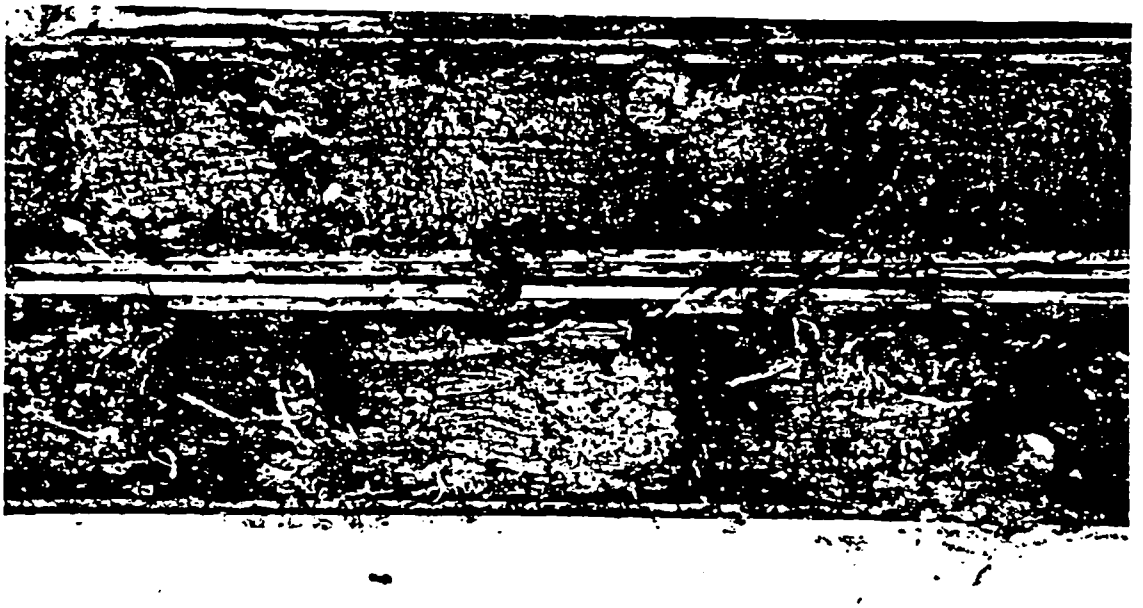
Remarks: Trip Blank also in cooler
→ VOC
→ B117592

SHL 10/15/92

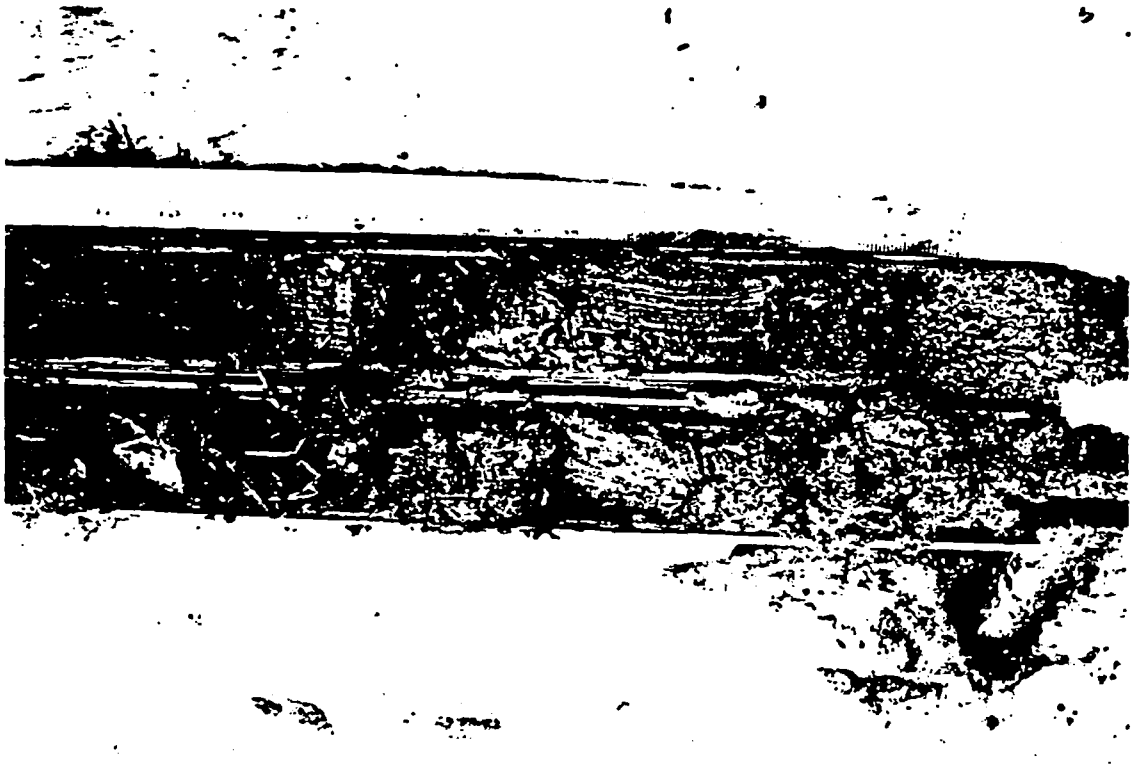
Distribution: Original and yellow copies accompany sample to laboratory; Pink copy retained by client; Yellow copy returned to client.



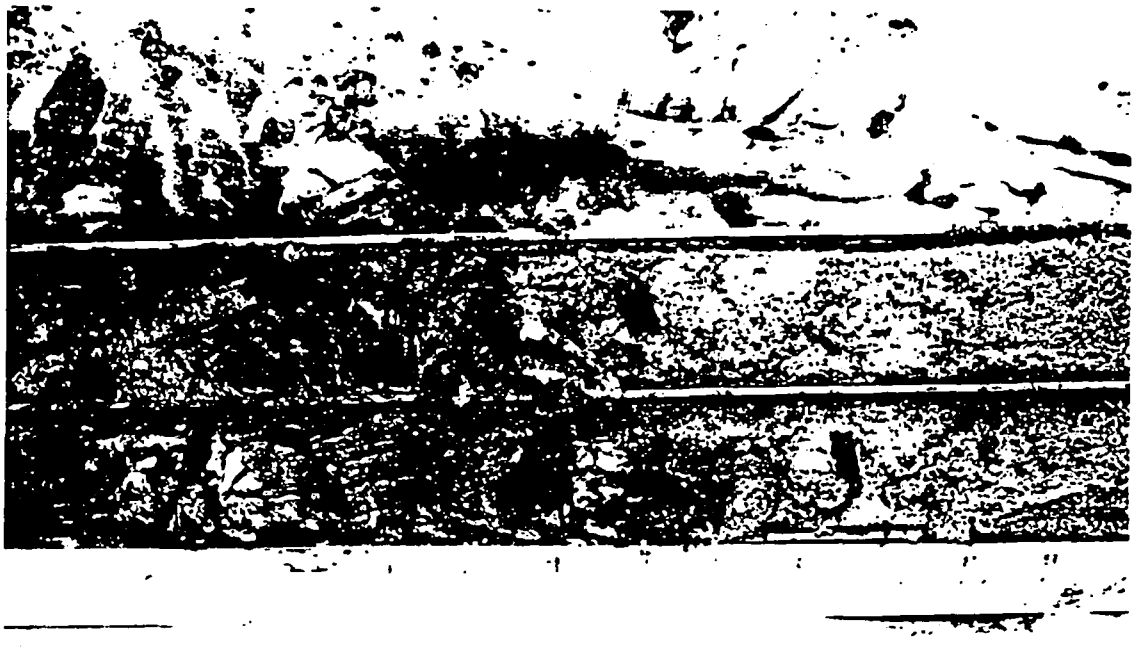
PHOTOGRAPH A
UPPER SAND



PHOTOGRAPH B
PEAT



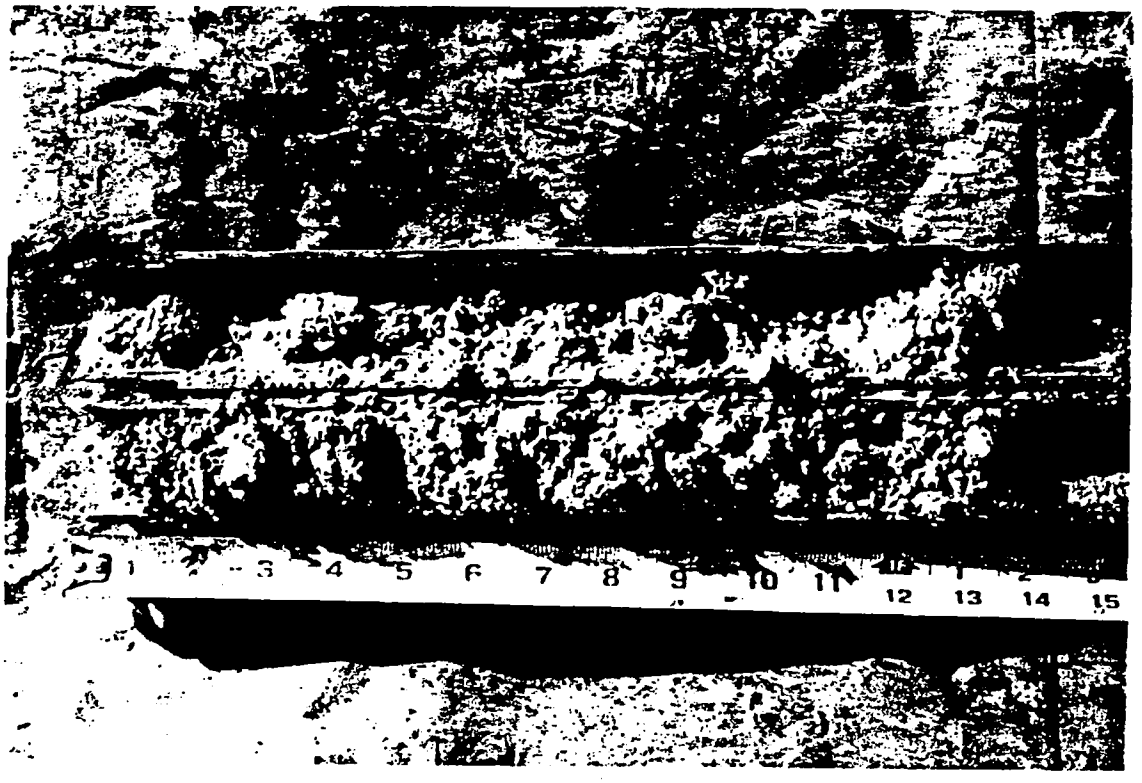
PHOTOGRAPH C
UPPER SAND AND PEAT CONTACT



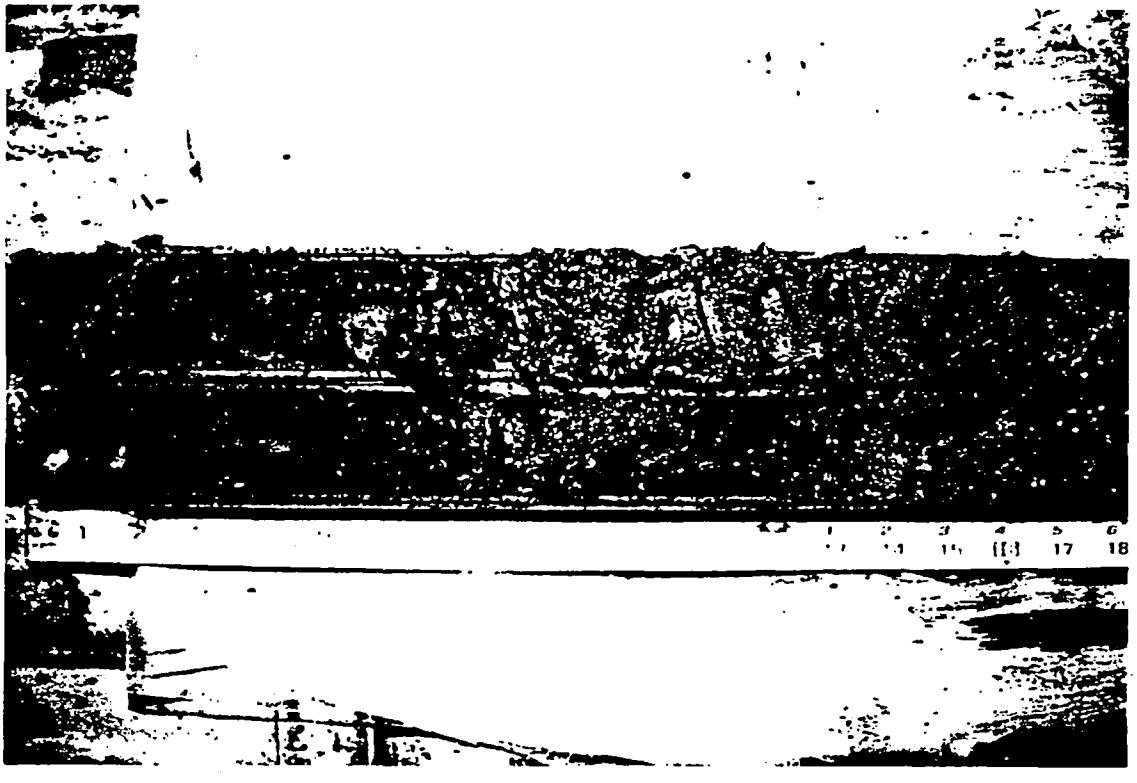
PHOTOGRAPH D
LOWER SAND AND PEAT CONTACT

PHOTOGRAPH E
OLIVE GRAY CLAY

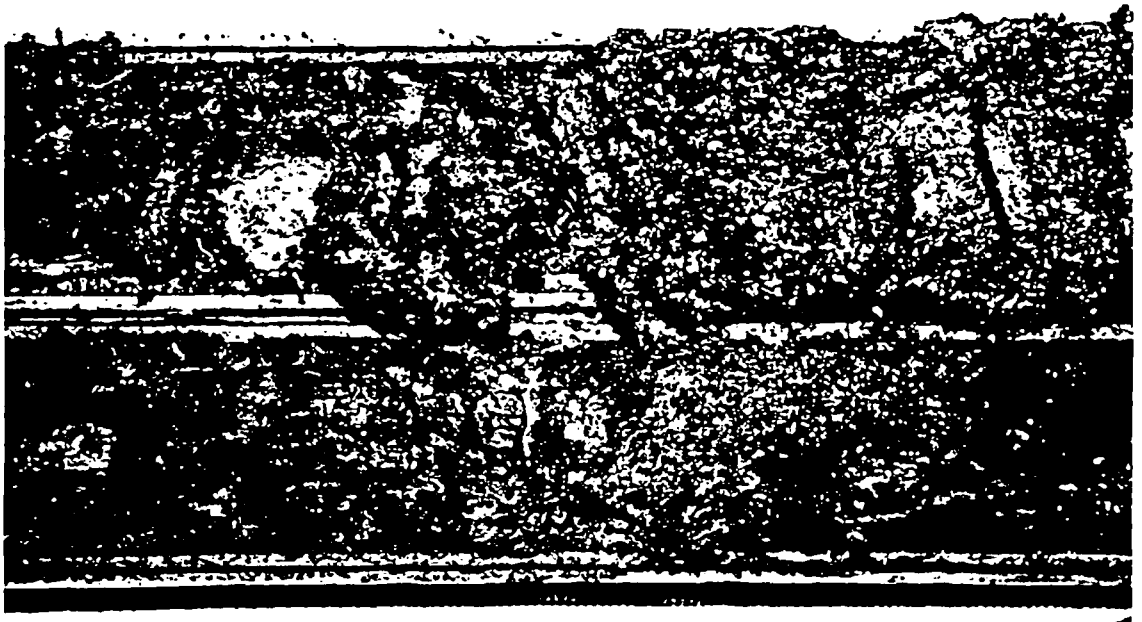
PHOTOGRAPH F
LOWER SAND AND OLIVE GRAY CLAY CONTACT



PHOTOGRAPH G
SANDY SHELL MOLD LIMESTONE



PHOTOGRAPH H
WOOD PRESERVING CONSTITUENTS ON TOP OF PEAT



PHOTOGRAPH I
WOOD PRESERVING CONSTITUENTS ON TOP OF PEAT

REFERENCE 29

MEMORANDUM

To: File
From: Stuart F. Parker, Jr., Hydrogeologist
Date: October 6, 1994
Re: Southern Wood Piedmont Co.,Wilmington
NCD 058 517 467
Surface Water Pathway Definition

Surface water pathway definition is complicated by the convergence of the Cape Fear and Northeast Cape Fear Rivers, along with tributaries, near the site, as well as the tidal nature of the system.

SFP telephoned Edward Beck, Engineer, NCDEHNR Water Quality Section in Wilmington (910-395-3900) on 7/20/94 to inquire as to the upstream extent of tidal flow reversal. Beck explained that the best definition is made by tracing the 5-foot USGS topographic contour; Rivers are considered to undergo tidal reversal downstream of where the contour crosses them. Based on this definition, the Cape Fear and Northeast Cape Fear Rivers are both tidal for a distance more than 15 miles upstream of the site.

Other sources indicate that 1) Flow reversal occurs on the Cape Fear River as far upstream as Phoenix NC, and 2) Maximum salt water intrusion in the Northeast Cape Fear River reaches north of Castle Hayne, beyond the 15-mile target distance limit (Ref. 37, Figs. 2-3, 2-4, Plate 1).

The upstream 15-mile limit for the Cape Fear River is located in Bulldog Cut, a bend approximately 1 mile upstream of the Brunswick/Pender/New Hanover County junction. The 15-mile upstream limit for the Northeast Cape Fear River is located 1.6 miles below the mouth of Prince George Creek near Castle Hayne, NC. The 2 rivers join 1.7 miles upstream of the site, however, the Brunswick River section bypasses both the junction and the site, forming Eagle Island. The downstream 15-mile limit of the Cape Fear River crosses the river at Reeves point, upstream of the open Atlantic Ocean.

(next page)

15-mile surface water pathway: Using USGS data (Ref.38), SFP estimated flow conditions for the various segments of the surface water pathway, as defined above. For each segment, a representative USGS drainage area (in square miles) was multiplied by the local mean annual runoff (MAR)(Ref. 39) and divided by a conversion factor (13.58) to produce a mean annual discharge (cfs).

A representative average drainage area of the Cape Fear River (CFR), upstream of Eagle Island to the 15-mile limit, is 7616 sq mi. The total drainage area at the lower end of this segment is 8760 sq mi. The representative (average) drainage area of the Northeast Cape Fear River (NE CFR) within the 15-mile limit is 1670 cfs. The total drainage area of this segment is 1637 sq mi.

The CFR segment immediately upstream of the site combines the drainage areas of the NE CFR and the upper CFR, equalling 10,397 sq mi. Sturgeon Creek, Jackey's Creek and Mallory Creek add 34.8 sq mi. to the system below Eagle Island. The SWP site and Greenfield Lake add drainage areas of 0.08 and 3.7 sq mi. Dilution effects of tributary streams further downstream were not factored into this segment's total drainage area. The total drainage area calculated for the lower CFR is therefore 10,436 sq mi. Mean annual discharges in cfs, calculated by the above method, are summarized below. Wetland frontage was tabulated from National Wetland Inventory Maps (see Ref. 40):

(next page)

Segment *	Distance (mi)	Drainage Area (sq. mi.)	Flow (cfs)	Wetland Frontage (mi)
Site/ Drainage Ditch	0-0.19	0.08	1 **	0.45
Greenfield Creek	0.19-0.36	3.81	5.89	0.05
Tidal Reversal:				
CFR (GC to NE CFR)	0.36-1.7	10,397	16,078	1.0
NE CFR	1.7-15	1,637	2,531	42.8
Upper CFR	1.7-15	8,760	13,546	34.4
Normal Flow:				
Lower CFR	0.36-15	10,436	16,138	91.9 ***

* Includes main channel and tidal segments of tributaries.
** Rounded upwards (for PREScore) from 0.12 cfs.
*** Includes Brunswick River.

REFERENCE 30

Ref. 30

North Carolina Administrative Code

Title 15A
Department of Environment, Health, and Natural Resources
Division of Environmental Management

Subchapter 2L

Sections .0100, .0200, and .0300

Classifications and Water Quality Standards Applicable To The Groundwaters of North Carolina

Current Through November 8, 1993
Environmental Management Commission
Raleigh, North Carolina

SUBCHAPTER 2L
GROUNDWATER CLASSIFICATION AND STANDARDS

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SUBCHAPTER 2L - GROUNDWATER CLASSIFICATION AND STANDARDS

SECTION .0100 - GENERAL CONSIDERATIONS

.0101 AUTHORIZATION

(a) N.C. General Statute 143-214.1 directs that the Commission develop and adopt after proper study a series of classifications and standards which will be appropriate for the purpose of classifying each of the waters of the state in such a way as to promote the policy and purposes of the act. Pursuant to this statute, the rules in this Subchapter establish a series of classifications and water quality standards applicable to the groundwaters of the state.

(b) These rules are applicable to all activities or actions, intentional or accidental, which contribute to the degradation of groundwater quality, regardless of any permit issued by a governmental agency authorizing such action or activity except an innocent landowner who is a bona fide purchaser of property which contains a source of groundwater contamination, who purchased such property without knowledge or a reasonable basis for knowing that groundwater contamination had occurred, or a person whose interest or ownership in the property is based or derived from a security interest in the property, shall not be considered a responsible party.

History Note: *Statutory Authority G.S. 143-214.1; 143-214.2; 143-215.3(a)(1); 143B-282;*
Eff. June 10, 1979;
Amended Eff. August 1, 1989; July 1, 1988; September 1, 1984; December 30, 1983.

.0102 DEFINITIONS

The definition of any word or phrase used in these Rules shall be the same as given in G.S. 143-212 and G.S. 143-213 except that the following words and phrases shall have the following meanings:

(1) "Bedrock" means any consolidated rock encountered in the place in which it was formed or deposited and which cannot be readily excavated without the use of explosives or power equipment.

(2) "Commission" means the Environmental Management Commission as organized under G.S. 143B.

(3) "Compliance boundary" means a boundary around a disposal system at and beyond which groundwater quality standards may not be exceeded and only applies to facilities which have received a permit issued under the authority of G.S. 143-215.1 or G.S. 130A.

(4) "Contaminant" means any substance occurring in groundwater in concentrations which exceed the groundwater quality standards specified in Rule .0202 of this Subchapter.

(5) "Corrective action plan" means a plan for eliminating sources of groundwater contamination or for achieving groundwater quality restoration or both.

(6) "Director" means Director of the Division of Environmental Management.

(7) "Division" means the Division of Environmental Management.

(8) "Exposure pathway" means a course taken by a contaminant by way of a transport medium after its release to the environment.

(9) "Free product" means a non-aqueous phase liquid which may be present within the saturated zone or in surface water.

(10) "Fresh groundwaters" means those groundwaters having a chloride concentration equal to or less than 250 milligrams per liter.

(11) "Groundwaters" means those waters occurring in the subsurface under saturated conditions.

(12) "Hazardous substance" means any substance as defined by Section 101(14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

(13) "Licensed geologist" means a person who has been duly licensed as a geologist in accordance with the requirements of G.S. 89E.

(14) "Natural remediation" means those natural processes acting to restore groundwater quality, including dilution, filtration, sorption, ion-exchange, chemical transformation and biodegradation.

(15) "Practical Quantitation Limit" means the lowest concentration of a given material that can be reliably achieved among laboratories within specified limits of precision and accuracy by a given analytical method during routine laboratory analysis.

(16) "Natural conditions" means the physical, biological, chemical and radiological conditions which occur naturally.

(17) "Potable waters" means those waters suitable for drinking by humans.

(18) "Professional Engineer" means a person who has been duly registered and licensed as a professional engineer in accordance with the requirements of G.S. 89C.

(19) "Receptor" means any human, plant, animal, or structure which is, or has the potential to be, adversely effected by the release or migration of contaminants. Any well constructed for the purpose of monitoring groundwater and contaminant concentrations shall not be considered a receptor.

(20) "Review boundary" means a boundary around a permitted disposal facility, midway between a waste boundary and a compliance boundary at which groundwater monitoring is required.

(21) "Saline groundwaters" means those groundwaters having a chloride concentration of more than 250 mg/l.

(22) "Saturated zone" means that part of the subsurface below the water table in which all the interconnected voids are filled with water under pressure at or greater than atmospheric. It does not include the capillary fringe.

(23) "Standards" means groundwater quality standards as specified in Rule .0202 of this Subchapter.

(24) "Suitable for drinking" means a quality of water which does not contain substances in concentrations which, either singularly or in combination if ingested into the human body, may cause death, disease, behavioral abnormalities, congenital defects, genetic mutations, or result in an incremental lifetime cancer risk in excess of $1x10^{-6}$, or render the water unacceptable due to aesthetic qualities, including taste, odor or appearance.

(25) "Time of travel" means the time required for contaminants in groundwater to move a unit distance.

(26) "Waste boundary" means the perimeter of the permitted waste disposal area.

(27) "Water table" means the surface of the saturated zone below which all interconnected voids are filled with water and at which the pressure is atmospheric.

History Note: *Statutory Authority G.S. 143-214.1; 143-215; 143B-282; Eff. June 10, 1979. Amended Eff. October 1, 1993; August 1, 1989; July 1, 1988; March 1, 1985.*

.0103 POLICY

(a) The rules established in this Subchapter are intended to maintain and preserve the quality of the groundwaters, prevent and abate pollution and contamination of the waters of the state, protect public health, and permit management of the groundwaters for their best usage by the citizens of North Carolina. It is the policy of the Commission that the best usage of the groundwaters of the state is as a source of drinking water. These groundwaters generally are a potable source of drinking water without the necessity of significant treatment. It is the intent of these Rules to protect the overall high quality of North Carolina's groundwaters to the level established by the standards and to enhance and restore the quality of degraded groundwaters where feasible and necessary to protect human health and the environment, or to ensure their suitability as a future source of drinking water.

(b) It is the intention of the Commission to protect all groundwaters to a level of quality at least as high as that required under the standards established in Rule .0202 of this Subchapter. In keeping with the policy of the Commission to protect, maintain, and enhance groundwater quality within the State of North Carolina, the Commission will not approve any disposal system subject to the provisions of G.S. 143-215.1 which would result in:

(1) the significant degradation of groundwaters which have existing quality that is better than the assigned standard, unless such degradation is found to be in the best interests of the citizens of North Carolina based upon the projected economic benefits of the facility and a determination that public health will be protected, or

(2) a violation of a groundwater quality standard beyond a designated compliance boundary, or

(3) the impairment of existing groundwater uses or increased risk to the health or safety of the public due to the operation of a waste disposal system.

(c) Violations of standards resulting from groundwater withdrawals which are in compliance with water use permits issued pursuant to G.S. 143-215.15, shall not be subject to the corrective action requirements of Rule .0106 of this Subchapter.

(d) No person shall conduct or cause to be conducted, any activity which causes the concentration of any substance to exceed that specified in Rule .0202 of this Subchapter, except as authorized by the rules of this Subchapter.

(e) Work that is within the scope of the practice of geology and engineering, performed pursuant to the requirements of this Subchapter, which involves site assessment, the interpretation of subsurface geologic conditions, preparation of conceptual corrective action plans or any work requiring detailed technical knowledge of site conditions which is submitted to the Director, shall be performed by persons, firms or professional corporations who are duly licensed to offer geological or engineering services by the appropriate occupational licensing board or are exempted from such licensing by

G.S. 89E-6. Work which involves design of remedial systems or specialized construction techniques shall be performed by persons, firms or professional corporations who are duly licensed to offer engineering services. Corporations that are authorized by law to perform engineering or geological services and are exempt from the Professional Corporation Act, G.S. 55B, may perform these services.

History Note: *Statutory Authority G.S. 143-214; 143-214.1; 143-214.2; 143-215.3(e); 143-215.3(a)(1); 143B-282;*
Eff. June 10, 1979;
Amended Eff. August 1, 1989; July 1, 1988; September 1, 1984; December 30, 1983;
RRC Objection Eff. September 17, 1993, due to lack of necessity for Paragraph (e);
Amended Eff. November 4, 1993.

.0104 RESTRICTED DESIGNATION (RS)

(a) The RS designation serves as a warning that groundwater so designated may not be suitable for use as a drinking water supply without treatment. The designation is temporary and will be removed by the Director upon a determination that the quality of the groundwater so designated has been restored to the level of the applicable standards or when the groundwaters have been reclassified by the Commission. The Director is authorized to designate GA or GSA groundwaters as RS under any of the following circumstances:

(1) Where, as a result of man's activities, groundwaters have been contaminated and the Director has approved a corrective action plan, or termination of corrective action, that will not result in the immediate restoration of such groundwaters to the standards established under this Subchapter.

(2) Where a statutory variance has been granted as provided in Rule .0113 of this Subchapter.

(b) Groundwaters occurring within an area defined by a compliance boundary in a waste disposal permit are deemed to be designated RS.

(c) The boundary of a designated RS area may be approximated in the absence of analytical data sufficient to define the dimension of the area. The boundary shall be located at least 250 feet away from the predicted edge of the contaminant plume, and shall include any areas into which the contamination is expected to migrate.

(d) In areas designated RS, the person responsible for groundwater contamination shall establish and implement a groundwater monitoring system sufficient to detect changes in groundwater quality within the RS designated area. Monitoring shall be quarterly for the first year and may be reduced to semi-annually thereafter until the applicable standards have been achieved. If during the monitoring period, contaminant concentrations increase, additional remedial action or monitoring pursuant to these Rules may be required.

(e) The applicant for an RS designation shall also provide written verification that all property owners within and adjacent to the proposed RS area have been notified of the requested RS designation.

(f) The Division shall provide public notice of the intent to designate any groundwater RS in accordance with the following requirements:

(1) Notice shall be published at least 30 days prior to any proposed final action in accordance with G.S. 143-215.4. In addition, notice shall be provided to all

property owners identified pursuant to Paragraph (e) of this Rule and to the local County Health Director and the chief administrative officer of the political jurisdiction(s) in which the contamination occurs.

(2) The notice shall contain the following information:

(A) name, address, and phone number of the agency issuing the public notice;

(B) the location and extent of the designated area;

(C) the county title number, county tax identification number, or the property tax book and page identifiers;

(D) a brief description of the action or actions which resulted in the degradation of groundwater in the area;

(E) actions or intended actions taken to restore groundwater quality;

(F) the significance of the RS designation;

(G) conditions applicable to removal of the RS designation;

(H) address and phone number of a Division contact from whom interested parties may obtain further information.

(3) The Director shall consider all requests for a public hearing, and if he determines that there is significant public interest he shall issue public notice and hold a public hearing in accordance with G.S 143-215.4(b) and Rule .0113(e) of this Section.

(4) These requirements shall not apply to groundwaters defined in Paragraph (b) of this Rule.

History Note: *Statutory Authority G.S. 143-214.1; 143-215.3(a)(1); 143B-282(2); Eff. June 10, 1979; Amended Eff. October 1, 1993; December 1, 1989; August 1, 1989; December 30, 1983.*

.0105 ADOPTION BY REFERENCE

History Note: *Statutory Authority G.S. 143-214.1; Eff. December 30, 1983; Repealed Eff. August 1, 1989.*

.0106 CORRECTIVE ACTION

(a) Where groundwater quality has been degraded, the goal of any required corrective action shall be restoration to the level of the standards, or as closely thereto as is economically and technologically feasible. In all cases involving requests to the Director for approval of corrective action plans, or termination of corrective action, the responsibility for providing all information required by this Rule lies with the person(s) making the request.

(b) Any person conducting or controlling an activity which results in the discharge of a waste or hazardous substance or oil to the groundwaters of the State, or in proximity thereto, shall take immediate action to terminate and control the discharge, mitigate any hazards resulting from exposure to the pollutants and notify the Division of the discharge.

(c) Any person conducting or controlling an activity which has not been permitted by the Division and which results in an increase in the concentration of a substance in excess of the standard, other than agricultural operations, shall:

(1) immediately notify the Division of the activity that has resulted in the increase

and the contaminant concentration levels;

(2) take immediate action to eliminate the source or sources of contamination;

(3) submit a report to the Director assessing the cause, significance and extent of the violation; and

(4) implement an approved corrective action plan for restoration of groundwater quality in accordance with a schedule established by the Director, or his designee. In establishing a schedule the Director, or his designee shall consider any reasonable schedule proposed by the person submitting the plan. A report shall be made to the Health Director of the county or counties in which the contamination occurs in accordance with the requirements of Rule .0114(a) in this Section.

(d) Any person conducting or controlling an activity which is conducted under the authority of a permit issued by the Division and which results in an increase in concentration of a substance in excess of the standards:

(1) at or beyond a review boundary, shall demonstrate, through predictive calculations or modeling, that natural site conditions, facility design and operational controls will prevent a violation of standards at the compliance boundary; or submit a plan for alteration of existing site conditions, facility design or operational controls that will prevent a violation at the compliance boundary, and implement that plan upon its approval by the Director, or his designee.

(2) at or beyond a compliance boundary, shall assess the cause, significance and extent of the violation of standards and submit the results of the investigation, and a plan and proposed schedule for corrective action to the Director, or his designee. The permittee shall implement the plan as approved by and in accordance with a schedule established by the Director, or his designee. In establishing a schedule the Director, or his designee shall consider any reasonable schedule proposed by the permittee.

(e) For the purposes of Paragraphs (c) and (d) of this Rule, an activity conducted under the authority of a permit issued by the Division, and subject to Paragraph (d) of this Rule, is one for which:

(1) a permit has been issued pursuant to G.S. 143-215.1;

(2) the permit was originally issued after December 30, 1983;

(3) the substance for which a standard has been exceeded outside the compliance boundary has been released to groundwater as a result of the permitted activity;

(4) all other activities shall for the purpose of this Rule be deemed not permitted by the Division and subject to the provisions of Paragraph (c) of this Rule.

(f) Corrective action required following discovery of the unauthorized release of a contaminant to the surface or subsurface of the land, and prior to or concurrent with the assessment required in Paragraphs (c) and (d) of this Rule, shall include, but is not limited to:

(1) Prevention of fire, explosion or the spread of noxious fumes;

(2) Abatement, containment or control of the migration of contaminants;

(3) Removal, or treatment and control of any primary pollution source such as buried waste, waste stockpiles or surficial accumulations of free products;

(4) Removal, treatment or control of secondary pollution sources which would be potential continuing sources of pollutants to the groundwaters such as contaminated soils and non-aqueous phase liquids. Contaminated soils which threaten the quality of groundwaters must be treated, contained or disposed of in

accordance with applicable rules and procedures established by the Division. The treatment or disposal of contaminated soils shall be conducted in a manner that will not result in a violation of standards or North Carolina Hazardous Waste Management rules.

(g) The site assessment conducted pursuant to the requirements of Paragraph (c) of this Rule, shall include:

(1) The source and cause of contamination;

(2) Any imminent hazards to public health and safety and actions taken to mitigate them in accordance with Paragraph (f) of this Rule;

(3) All receptors and significant exposure pathways;

(4) The horizontal and vertical extent of soil and groundwater contamination and all significant factors affecting contaminant transport; and

(5) Geological and hydrogeological features influencing the movement, chemical, and physical character of the contaminants.

Reports of site assessments shall be submitted to the Division as soon as practicable or in accordance with a schedule established by the Director, or his designee. In establishing a schedule the Director, or his designee shall consider any reasonable proposal by the person submitting the report.

(h) Corrective action plans for restoration of groundwater quality, submitted pursuant to Paragraphs (c) and (d) of this Rule shall include:

(1) A description of the proposed corrective action and reasons for its selection.

(2) Specific plans, including engineering details where applicable, for restoring groundwater quality.

(3) A schedule for the implementation and operation of the proposed plan.

(4) A monitoring plan for evaluating the effectiveness of the proposed corrective action and the movement of the contaminant plume.

(i) In the evaluation of corrective action plans, the Director, or his designee shall consider the extent of any violations, the extent of any threat to human health or safety, the extent of damage or potential adverse impact to the environment, technology available to accomplish restoration, the potential for degradation of the contaminants in the environment, the time and costs estimated to achieve groundwater quality restoration, and the public and economic benefits to be derived from groundwater quality restoration.

(j) A corrective action plan prepared pursuant to Paragraph (c) or (d) of this Rule must be implemented using the best available technology for restoration of groundwater quality to the level of the standards, except as provided in Paragraphs (k), (l), and (m) of this Rule.

(k) Any person required to implement an approved corrective action plan for a non-permitted site pursuant to this Rule may request that the Director approve such a plan without requiring groundwater remediation to the standards. A request submitted to the Director under this Paragraph shall include a description of site specific conditions, including information on the availability of public water supplies for the affected area; the technical basis for the request; and any other information requested by the Director to thoroughly evaluate the request. In addition, the person making the request must demonstrate to the satisfaction of the Director:

(1) that all sources of contamination and free product have been removed or controlled pursuant to Paragraph (f) of this Rule;

(2) that the time and direction of contaminant travel can be predicted with reasonable certainty;

(3) that contaminants have not and will not migrate onto adjacent properties, or that:

(A) such properties are served by an existing public water supply system dependent on surface waters or hydraulically isolated groundwater, or

(B) the owners of such properties have consented in writing to the request;

(4) that the standards specified in Rule .0202 of this Subchapter will be met at a location no closer than one year time of travel upgradient of an existing or foreseeable receptor, based on travel time and the natural attenuation capacity of subsurface materials or on a physical barrier to groundwater migration that exists or will be installed by the person making the request;

(5) that, if the contaminant plume is expected to intercept surface waters, the groundwater discharge will not possess contaminant concentrations that would result in violations of standards for surface waters contained in 15A NCAC 2B .0200;

(6) that public notice of the request has been provided in accordance with Rule .0114(b) of this Section;

(7) that the proposed corrective action plan would be consistent with all other environmental laws.

(l) Any person required to implement an approved corrective action plan for a non-permitted site pursuant to this Rule may request that the Director approve such a plan based upon natural processes of degradation and attenuation of contaminants. A request submitted to the Director under this Paragraph shall include a description of site specific conditions, including written documentation of projected groundwater use in the contaminated area based on current state or local government planning efforts; the technical basis for the request; and any other information requested by the Director to thoroughly evaluate the request. In addition, the person making the request must demonstrate to the satisfaction of the Director:

(1) that all sources of contamination and free product have been removed or controlled pursuant to Paragraph (f) of this Rule;

(2) that the contaminant has the capacity to degrade or attenuate under the site-specific conditions;

(3) that the time and direction of contaminant travel can be predicted with reasonable certainty;

(4) that contaminant migration will not result in any violation of applicable groundwater standards at any existing or foreseeable receptor;

(5) that contaminants have not and will not migrate onto adjacent properties, or that:

(A) such properties are served by an existing public water supply system dependent on surface waters or hydraulically isolated groundwater, or

(B) the owners of such properties have consented in writing to the request;

(6) that, if the contaminant plume is expected to intercept surface waters, the groundwater discharge will not possess contaminant concentrations that would result in violations of standards for surface waters contained in 15A NCAC 2B .0200;

(7) that the person making the request will put in place a groundwater monitoring program sufficient to track the degradation and attenuation of contaminants and contaminant by-products within and down gradient of the plume and to detect contaminants and contaminant by-products prior to their reaching any existing or foreseeable receptor at least one year's time of travel upgradient of the receptor and no greater than the distance the groundwater at the contaminated site is predicted to travel in five years;

(8) that all necessary access agreements needed to monitor groundwater quality pursuant to Subparagraph (7) of this Paragraph have been or can be obtained;

(9) that public notice of the request has been provided in accordance with Rule .0114(b) of this Section; and

(10) that the proposed corrective action plan would be consistent with all other environmental laws.

(m) The Division or any person required to implement an approved corrective action plan for a non-permitted site pursuant to this Rule may request that the Director approve termination of corrective action.

(1) A request submitted to the Director under this Paragraph shall include:

(A) a discussion of the duration of the corrective action, the total project's cost, projected annual cost for continuance and evaluation of the success of the corrective action;

(B) an evaluation of alternate treatment technologies which could result in further reduction of contaminant levels projected capital and annual operating costs for each technology;

(C) effects, including health and safety impacts, on groundwater users if contaminant levels remain at levels existing at the time corrective action is terminated; and

(D) any other information requested by the Director to thoroughly evaluate the request.

(2) In addition, the person making the request must demonstrate to the satisfaction of the Director:

(A) that continuation of corrective action would not result in a significant reduction in the concentration of contaminants (At a minimum this demonstration must show the duration and degree of success of existing remedial efforts to attain standards and include a showing that the asymptotic slope of the contaminants curve of decontamination is less than a ratio of 1:40 over a term of one year based on quarterly sampling);

(B) that contaminants have not and will not migrate onto adjacent properties, or that:

(i) such properties are served by an existing public water supply system dependent on surface waters or hydraulically isolated groundwater, or

(ii) the owners of such properties have consented in writing to the request;

(C) that, if the contaminant plumes expected to intercept surface waters, the groundwater discharge will not possess contaminant concentrations that would result in violations of standards for surface waters contained in 15A NCAC 2B .0200;

(D) that public notice of the request has been provided in accordance with Rule .0114(b) of this Section; and

(E) that the proposed termination would be consistent with all other environmental laws.

(3) The Director shall not authorize termination of corrective action for any area that, at the time the request is made, has been identified by a state or local groundwater use planning process for resource development.

(4) The Director may authorize the termination of corrective action, or amend the corrective action plan after considering all the information in the request. Upon termination of corrective action, the Director shall require implementation of a

groundwater monitoring program sufficient to track the degradation and attenuation of contaminants at a location of at least one year's predicted time of travel upgradient of any existing or foreseeable receptor. The monitoring program shall remain in effect until there is sufficient evidence that the contaminant concentrations have been reduced to the level of the standards.

(n) Upon a determination by the Director that continued corrective action would result in no significant reduction in contaminant concentrations, and the contaminated groundwaters can be rendered potable by treatment using readily available and economically reasonable technologies, the Director may designate the remaining area of degraded groundwater RS. Where the remaining degraded groundwaters cannot be made potable by such treatment, the Director may consider a request for reclassification of the groundwater to a GC classification as outlined in Rule .0201 of this Subchapter.

(o) If at any time the Director determines that a new technology is available that would remediate the contaminated groundwater to the standards specified in Rule .0202 of this Subchapter, the Director may require the responsible party to evaluate the economic and technological feasibility of implementing the new technology in an active groundwater corrective action plan in accordance with a schedule established by the Director. The Director's determination to utilize new technology at any site or for any particular constituent shall include a consideration of the factors in Paragraph (h) of this Rule.

(p) Where standards are exceeded as a result of the application of pesticides or other agricultural chemicals, the Director shall request the Pesticide Board or the Department of Agriculture to assist the Division of Environmental Management in determining the cause of the violation. If the violation is determined to have resulted from the use of pesticides, the Director shall request the Pesticide Board to take appropriate regulatory action to control the use of the chemical or chemicals responsible for, or contributing to, such violations, or to discontinue their use.

(q) The approval pursuant to this Rule of any corrective action plan, or modification or termination thereof, which permits the migration of a contaminant onto adjacent property, shall not affect any private right of action by any party which may be effected by that contamination.

History Note: *Statutory Authority G.S. 143-215.2; 143-215.3(a)(1); 143B-282;*
Eff. August 1, 1989;
Amended Eff. October 1, 1993; September 1, 1992.

.0107 COMPLIANCE BOUNDARY

(a) For disposal systems individually permitted prior to December 30, 1983, the compliance boundary is established at a horizontal distance of 500 feet from the waste boundary or at the property boundary, whichever is closer to the source.

(b) For disposal systems individually permitted on or after December 30, 1983, a compliance boundary shall be established 250 feet from the waste boundary, or 50 feet within the property boundary, whichever point is closer to the source.

(c) The boundary shall be established by the Director, or his designee at the time of permit issuance. Any sale or transfer of property which affects a compliance boundary shall be reported immediately to the Director, or his designee. For disposal systems which are not governed by Paragraphs (e) or (f) of this Rule, the compliance boundary affected by the sale or transfer of property will be re-established consistent with Paragraphs (a) or (b) of this Rule, whichever is applicable.

(d) Except as provided in Paragraph (g) of this Rule, no water supply wells shall be constructed or operated within the compliance boundary of a disposal system individually permitted or repermitted after January 1, 1993.

(e) Except as provided in Paragraph (g) of this Rule, a permittee shall not transfer land within an established compliance boundary of a disposal system permitted or repermitted after January 1, 1993 unless:

(1) the land transferred is serviced by a community water system as defined in 15A NCAC 18C, the source of which is located outside the compliance boundary; and

(2) the deed transferring the property:

(A) contains notice of the permit, including the permit number, a description of the type of permit, and the name, address and telephone number of the permitting agency; and

(B) contains a restrictive covenant running with the land and in favor of the permittee and the State, as a third party beneficiary, which prohibits the construction and operation of water supply wells within the compliance boundary; and

(C) contains a restrictive covenant running with the land and in favor of the permittee and the State, as a third party beneficiary, which grants the right to the permittee and the State to enter on such property within the compliance boundary for groundwater monitoring and remediation purposes.

(f) Except as provided in Paragraph (g) of this Rule, if at the time a permit is issued or reissued after January 1, 1993, the permittee is not the owner of the land within the compliance boundary, it shall be a condition of the permit issued or renewed that the landowner of the land within the compliance boundary, if other than the permittee, execute and file in the Register of Deeds in the county in which the land is located, an easement running with the land which:

(1) contains:

(A) either a notice of the permit, including the permit number, a description of the type of permit, and the name, address and telephone number of the permitting agency; or

(B) a reference to a notice of the permit with book and page number of its recordation if such notice is required to be filed by statute;

(2) prohibits the construction and operation of water supply wells within the compliance boundary; and

(3) reserves the right to the permittee and the State to enter on such property within the compliance boundary for groundwater monitoring and remediation purposes. The easement may be terminated by the Director when its purpose has been fulfilled or the need for the easement no longer exists. Under those conditions the Director shall, upon request by the landowner, file a document terminating the easement with the appropriate Register of Deeds.

(g) The requirements of Paragraphs (d), (e) and (f) of this Rule are not applicable to ground adsorption treatment systems serving four or fewer single family dwellings or multiunit dwellings of four or fewer units.

(h) The boundary shall form a vertical plane extending from the water table to the maximum depth of saturation.

(i) For ground absorption sewage treatment and disposal systems which are permitted under 15A NCAC 18A .1900, the compliance boundary shall be established at the property boundary.

(j) Penalties authorized pursuant to G.S. 143-215.6A(a)(1) will not be assessed for violations of standards within a compliance boundary unless the violations are the result of violations of permit conditions or negligence in the management of the facility.

(k) The Director shall require:

(1) that permits for all activities governed by G.S. 143-215.1 be written to protect the quality of groundwater established by applicable standards, at the compliance boundary;

(2) that necessary groundwater quality monitoring shall be conducted within the compliance boundary; and

(3) that a violation of standards within the compliance boundary resulting from activities conducted by the permitted facility be remedied through clean-up, recovery, containment, or other response when any of the following conditions occur:

(A) a violation of any standard in adjoining classified groundwaters occurs or can be reasonably predicted to occur considering hydrogeologic conditions, modeling, or other available evidence;

(B) an imminent hazard or threat to the public health or safety exists; or

(C) a violation of any standard in groundwater occurring in the bedrock other than limestones found in the Coastal Plain sediments, unless it can be demonstrated that the violation will not adversely affect, or have the potential to adversely affect a water supply well.

History Note: *Statutory Authority G.S. 143-215.1(b); 143-215.3(a)(1); 143B-282; Eff. August 1, 1989; Amended Eff. October 1, 1993; November 2, 1992.*

.0108 REVIEW BOUNDARY

A review boundary is established around any disposal system midway between the compliance boundary and the waste boundary. When the concentration of any substance equals or exceeds the standard at the review boundary as determined by monitoring, the permittee shall take action in accordance with the provisions of Rule .0106(c)(2)(A) of this Subchapter.

History Note: *Statutory Authority G.S. 143-215.1(b); 143-215.3(a)(1); 143B-282; Eff. August 1, 1989.*

.0109 DELEGATION

(a) The Director is delegated the authority to enter into consent special orders under G.S. 143-215.2 for violations of the standards except when a public meeting is required as provided in 15A NCAC 2H .1203.

(b) The Director is delegated the authority to prepare a proposed special order to be issued by the Commission without the consent of the person affected and to notify the affected person of that proposed order and of the procedure set out in G.S. 150B-23 to contest the proposed special order.

(c) The Director, or his designee shall give public notice of proposed consent special orders as specified in 15A NCAC 2H .1203.

History Note: *Statutory Authority G.S. 143-215.2; 143-215.3(a)(1); 143-215.3(a)(4);*
Eff. August 1, 1989;
Amended Eff. October 1, 1993; October 1, 1990.

.0110 MONITORING

(a) Except where exempted by statute or this Subchapter, any person who causes, permits or has control over any discharge of waste, or groundwater cleanup program, shall install and implement a monitoring system, at such locations, and in such detail, as the Director, or his designee may require to evaluate the effects of the discharge upon the waters of the state, including the effect of any actions taken to restore groundwater quality, as well as the efficiency of any treatment facility. The monitoring plan shall be prepared under the responsible charge of a Professional Engineer or Licensed Geologist and bear the seal of the same.

(b) Monitoring systems shall be constructed in a manner that will not result in the contamination of adjacent groundwaters of a higher quality.

(c) Monitoring shall be conducted and results reported in a manner and at a frequency specified by the Director, or his designee.

History Note: *Statutory Authority G.S. 143-215.1(b); 143-215.3(a)(1); 143-215.65; 143-215.66; 143B-282;*
Eff. August 1, 1989;
Amended Eff. October 1, 1993.

.0111 REPORTS

(a) Any person subject to the requirements for corrective action specified in Rule .0106 of this Section shall submit to the Director, in such detail as the Director may require, a written report that describes:

(1) the results of the investigation specified in Paragraphs (c) and (d) of Rule .0106 of this Section, including but not limited to:
   (A) a description of the sampling procedures followed and methods of chemical analyses used; and
   (B) all technical data utilized in support of any conclusions drawn or determinations made.
(2) the results of the predictive calculations or modeling, including a copy of the calculations or model runs and all supporting technical data, used in the demonstration required in Paragraph (d) of Rule .0106 of this Section; and
(3) the proposed methodology and timetable associated with the corrective action for those situations identified in Paragraphs (c) and (d) of Rule .0106 of this Section.

(b) The report shall be prepared under the responsible charge of a Professional Engineer or Licensed Geologist and bear the seal of the same as specified in Rule .0106(d) of this Section.

History Note: *Statutory Authority G.S. 143-215.1(b); 143-215.3(a)(1); 143-215.65; 143B-282;*
Eff. August 1, 1989;
Amended Eff. October 1, 1993.

.0112 ANALYTICAL PROCEDURES

Tests or analytical procedures to determine compliance or noncompliance with the standards established in Rule .0202 of this Subchapter will be in accordance with:

(1) The most sensitive of the following methods or procedures for substances where the standard is at or above the method detection limit value:

(a) The most recent version of Standard Methods for the Examination of Water and Wastewater, published jointly by American Public Health Association, American Water Works Association and Water Pollution Control Federation;

(b) Methods for Chemical Analysis of Water and Waste, 1979, U.S. Environmental Protection Agency publication number EPA-600/4-79-020, as revised March 1983;

(c) Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods, 3rd Edition, 1986, U.S. Environmental Protection Agency publication number SW-846;

(d) Test Procedures for the Analysis of Pollutants Under the Clean Water Act, Federal Register Vol. 49, No. 209, 40 CFR Part 136, October 26, 1984;

(e) Methods or procedures approved by letter from the Director upon application by the regulated source; or

(2) A method or procedure approved by the Director for substances where the standard is less than the method detection limit value.

History Note: *Statutory Authority G.S. 143-215.3(a)(1); 143B-282;*
Eff. August 1, 1989;
Amended Eff. October 1, 1993.

.0113 VARIANCE

(a) The Commission, on its own initiative or pursuant to a request under G.S. 143-215.3(e), may grant variances to the rules of this Subchapter.

(b) Requests for variances are filed by letter from the applicant to the Environmental Management Commission. The application shall be mailed to the chairman of the Commission in care of the Director, Division of Environmental Management, Post Office Box 29535, Raleigh, N.C. 27626-0535.

(c) The application shall contain the following information:

(1) Applications filed by counties or municipalities must include a resolution of the County Board of Commissioners or the governing board of the municipality requesting the variance.

(2) A description of the past, existing or proposed activities or operations that have or would result in a discharge of contaminants to the groundwaters.

(3) Description of the proposed area for which a variance is requested. A detailed location map, showing the orientation of the facility, potential for groundwater contaminant migration, as well as the area covered by the variance request, with reference to at least two geographic references (numbered roads, named streams/rivers, etc.) must be included.

(4) Supporting information to establish that the variance will not endanger the public health and safety, including health and environmental effects from exposure to groundwater contaminants. (Location of wells and other water supply sources including details of well construction within 1/2 mile of site must be shown on a map).

(5) Supporting information to establish that requirements of this Rule cannot be achieved by providing the best available technology economically reasonable. This

information must identify specific technology considered, and the costs of implementing the technology and the impact of the costs on the applicant.

(6) Supporting information to establish that compliance would produce serious financial hardship on the applicant.

(7) Supporting information that compliance would produce serious financial hardship without equal or greater public benefit.

(8) A copy of any Special Order that was issued in connection with contaminants in the proposed area and supporting information that applicant has complied with the Special Order.

(9) A list of the names and addresses of any property owners within the proposed area of the variance as well as any property owners adjacent to the site covered by the variance.

(d) Upon receipt of the application, the Director will review it for completeness and request additional information if necessary. When the application is complete, the Director shall give public notice of the application and schedule the matter for a public hearing in accordance with G.S. 143-215.4(b) and the procedures set out in Paragraph (e) of this Rule.

(e) Notice of Public Hearing:

(1) Notice of public hearing on any variance application shall be circulated in the geographical areas of the proposed variance by the Director at least 30 days prior to the date of the hearing:

(A) by publishing the notice one time in a newspaper having general circulation in said county;

(B) by mailing to the North Carolina Department of Environment, Health, and Natural Resources, Division of Environmental Health and appropriate local health agency;

(C) by mailing to any other federal, state or local agency upon request;

(D) by mailing to the local governmental unit or units having jurisdiction over the geographic area covered by the variance;

(E) by mailing to any property owner within the proposed area of the variance, as well as any property owners adjacent to the site covered by the variance; and

(F) by mailing to any person or group upon request.

(2) The contents of public notice of any hearing shall include at least the following:

(A) name, address, and phone number of agency holding the public hearing;

(B) name and address of each applicant whose application will be considered at the meeting;

(C) brief summary of the variance request;

(D) geographic description of a proposed area for which a variance is requested;

(E) brief description of activities or operations which have or will result in the discharge of contaminants to the groundwaters described in the variance application;

(F) a brief reference to the public notice issued for each variance application;

(G) information regarding the time and location for the hearing;

(H) the purpose of the hearing;

(I) address and phone number of premises at which interested persons may obtain further information, request a copy of each application, and inspect and copy forms and related documents; and

(J) a brief description of the nature of the hearing including the rules and procedures to be followed. The notice shall also state that additional information

is on file with the Director and may be inspected at any time during normal working hours. Copies of the information on file will be made available upon request and payment of cost or reproduction.

(f) All comments received within 30 days following the date of the public hearing shall be made part of the application file and shall be considered by the Commission prior to taking final action on the application.

(g) In determining whether to grant a variance, the Commission shall consider whether the applicant has complied with any Special Order, or Special Order by Consent issued under G.S. 143-215.2.

(h) If the Commission's final decision is unacceptable, the applicant may file a petition for a contested case in accordance with Chapter 150B of the General Statutes. If the petition is not filed within 60 days, the decision on the variance shall be final and binding.

(i) A variance shall not operate as a defense to an action at law based upon a public or private nuisance theory or any other cause of action.

History Note: *Statutory Authority G.S. 143-215.3(a)(1); 143-215.3(a)(3); 143-215.3(a)(4); 143-215.3(e); 143-215.4;*
Eff. August 1, 1989;
Amended Eff. October 1, 1993.

.0114 NOTIFICATION REQUIREMENTS

(a) Any person subject to the requirements of Rule .0106(c) of this Section shall submit to the local Health Director, and the chief administrative officer of the political jurisdictions in which the groundwater contamination has occurred, a report that describes:

(1) The area extent of the contaminant plume;
(2) The chemical constituents in the groundwater which exceed the standards described in Rule .0202 of this Subchapter;
(3) Actions taken and intended to mitigate threats to human health;
(4) The location of any wells installed for the purpose of monitoring the contaminant plume and the frequency of sampling.

The report described in this Rule shall be submitted no later than five working days after submittal of the completed report assessing the cause, significance and extent of the violation as required by Rule .0106(c).

(b) Any person who submits a request under Rule .0106(k), (l), or (m) of this Section shall notify the local Health Director and the chief administrative officer of the political jurisdictions in which the contaminant plume occurs, and all property owners and occupants within or contiguous to the area underlain by the contaminant plume, and under the areas where it is expected to migrate, of the nature of the request and reasons supporting it. Notification shall be made by certified mail concurrent with the submittal of the request to the Director. A final decision by the Director shall be postponed for a period of 30 days following receipt of the request so that the Director may consider comments submitted by individuals interested in the request.

(c) Any person whose request under Rule .0106(k), (l), or (m) of this Section is granted by the Director shall notify parties specified in Paragraph (b) of this Rule of the Director's decision. Notification shall be made by certified mail within 30 days of receipt of the Director's decision.

History Note: *Statutory Authority G.S. 143-214.1; 143-215.3(a)(1); 143B-282(2)b; Eff. October 1, 1993.*

NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL MANAGEMENT
GROUNDWATER SECTION

Please note that the attached pages 19 through 24 dated 10/25/94 are to **replace** the pages 19 through 24 already incorporated in the 15A NCAC 2L.

SECTION .0200 - CLASSIFICATIONS AND GROUNDWATER QUALITY STANDARDS

.0201 GROUNDWATER CLASSIFICATIONS

The classifications which may be assigned to the groundwaters will be those specified in the following series of classifications:

(1) Class GA groundwaters; usage and occurrence:

(a) Best Usage. Existing or potential source of drinking water supply for humans.

(b) Conditions Related to Best Usage. This class is intended for those groundwaters in which chloride concentrations are equal to or less than 250 mg/l, and which are considered suitable for drinking in their natural state, but which may require treatment to improve quality related to natural conditions.

(c) Occurrence. In the saturated zone.

(2) Class GSA groundwaters; usage and occurrence:

(a) Best Usage. Existing or potential source of water supply for potable mineral water and conversion to fresh waters.

(b) Conditions Related to Best Usage. This class is intended for those groundwaters in which the chloride concentrations due to natural conditions is in excess of 250 mg/l, but which otherwise may be considered suitable for use as potable water after treatment to reduce concentrations of naturally occurring substances.

(c) Occurrence. In the saturated zone.

(3) Class GC groundwaters: usage and occurrence:

(a) Best Usage. The best usage of GC groundwaters is as a source of water supply for purposes other than drinking, including other domestic uses by humans.

(b) Conditions Related to Best Usage. This class includes those groundwaters that do not meet the quality criteria for GA or GSA groundwaters and for which efforts to improve groundwater quality would not be technologically feasible, or not in the best interest of the public. Continued consumption of waters of this class by humans could result in adverse health affects.

(c) Occurrence. Groundwaters of this class may be defined by the Commission pursuant to Section .0300 of this Subchapter on a case by case basis.

History Note: *Statutory Authority G.S. 143-214.1; 143B-282(2);*
Eff. June 10, 1979;
Amended Eff. October 1, 1993; August 1, 1989; September 1, 1984; December 30, 1983.

.0202 GROUNDWATER QUALITY STANDARDS

(a) The groundwater quality standards for the protection of the groundwaters of the state are those specified in this Rule. They are the maximum allowable concentrations resulting from any discharge of contaminants to the land or waters of the state, which may be tolerated without creating a threat to human health or which would otherwise render the groundwater unsuitable for its intended best usage.

(b) The groundwater quality standards for contaminants specified in Paragraphs (g) and (h) of this Rule shall be as listed, except that:

(1) Where the standard for a substance is less than the practical quantitation limit,

the detection of that substance at or above the practical quantitation limit shall constitute a violation of the standard.

(2) Where two or more substances exist in combination, the Director shall consider the effects of chemical interactions as determined by the Division of Epidemiology and may establish maximum concentrations at values less than those established in accordance with Paragraphs (c) and (g) of this Rule. In the absence of information to the contrary, the carcinogenic risks associated with carcinogens present shall be considered additive and the toxic effects associated with non-carcinogens present shall also be considered additive.

(3) Where naturally occurring substances exceed the established standard, the standard will be the naturally occurring concentration as determined by the Director.

(c) Except for tracers used in concentrations which have been determined by the Division of Epidemiology to be protective of human health, and the use of which has been permitted by the Division, substances which are not naturally occurring and for which no standard is specified shall not be permitted in detectable concentrations in Class GA or Class GSA groundwaters. Any person may petition the Director to establish an interim maximum allowable concentration for an unspecified substance, however, the burden of demonstrating those concentrations of the substance which correspond to the levels described in Paragraph (d) of this Rule rests with the petitioner. The petitioner shall submit relevant toxicological and epidemiological data, study results, and calculations necessary to establish a standard in accordance with the procedure prescribed in Paragraph (d) of this Rule. Within three months after the establishment of an interim maximum allowable concentration for a substance by the Director, the Director shall initiate action to consider adoption of a standard for that substance.

(d) Groundwater quality standards for substances in Class GA and Class GSA groundwaters are established as the lesser of:

(1) Systemic threshold concentration calculated as follows: [Reference Dose (mg/kg/day) x 70 kg (adult body weight) x Relative Source Contribution (.10 for inorganics; .20 for organics)] / [2 liters/day (avg. water consumption)];

(2) Concentration which corresponds to an incremental lifetime cancer risk of $1x10^{-6}$;

(3) Taste threshold limit value;

(4) Odor threshold limit value;

(5) Maximum contaminant level; or

(6) National secondary drinking water standard.

(e) The following references, in order of preference, shall be used in establishing concentrations of substances which correspond to levels described in Paragraph (d) of this Rule.

(1) Integrated Risk Information System (U.S. EPA).

(2) Health Advisories (U.S. EPA Office of Drinking Water).

(3) Other health risk assessment data published by U.S. EPA.

(4) Other appropriate, published health risk assessment data, and scientifically valid peer-reviewed published toxicological data.

(f) Groundwater quality standards specified in Paragraphs (g) and (h) of this Rule and interim maximum allowable concentrations established pursuant to Paragraph (c) of this Rule shall be reviewed on a biennial basis. Appropriate modifications to established standards will be made in accordance with the procedure prescribed in Paragraph (d) of this Rule where modifications are considered appropriate based on data published subsequent

to the previous review.

(g) Class GA Standards. Where not otherwise indicated, the standard refers to the total concentration in milligrams per liter of any constituent in a dissolved, colloidal or particulate form which is mobile in groundwater. This does not apply to sediment or other particulate matter which is preserved in a groundwater sample as a result of well construction or sampling procedures.

(1) acetone: 0.7
(2) acrylamide (propenamide): 0.00001
(3) arsenic: 0.05
(4) barium: 2.0
(5) benzene: 0.001
(6) boron: 0.32
(7) bromoform (tribromomethane): 0.00019
(8) butylbenzyl phthalate: 0.10
(9) cadmium: 0.005
(10) carbofuran: 0.036
(11) carbon tetrachloride: 0.0003
(12) chlordane: 2.7×10^{-5}
(13) chloride: 250.0
(14) chlorobenzene: 0.05
(15) chloroform (trichloromethane): 0.00019
(16) 2-chlorophenol: 0.0001
(17) chromium: 0.05
(18) cis-1,2-dichloroethene: 0.07
(19) coliform organisms (total): 1 per 100 milliliters
(20) color: 15 color units
(21) copper: 1.0
(22) cyanide: 0.154
(23) 2, 4-D (2,4-dichlorophenoxy acetic acid): 0.07
(24) 1,2-dibromo-3-chloropropane: 2.5×10^{-5})
(25) dichlorodifluoromethane (Freon-12; Halon): 1.4
(26) 1,1 dichloroethane: 0.7
(27) 1,2-dichloroethane (ethylene dichloride): 0.00038
(28) 1,1-dichloroethylene (vinylidene chloride): 0.007
(29) 1,2-dichloropropane: 0.00056
(30) di-n-butyl (or dibutyl) phthalate (DBP): 0.7
(31) diethylphthalate (DEP): 5.0
(32) di(2-ethylhexyl) phthalate (DEHP): 0.003
(33) di-n-octyl phthalate: 0.14
(34) p-dioxane (1,4-diethylene dioxide): 0.007
(35) dioxin: 2.2×10^{-10}
(36) dissolved solids (total): 500
(37) diundecyl phthalate (Santicizer 711): 0.14
(38) endrin: 0.002
(39) epichlorohydrin (1-chloro-2,3-epoxypropane): 0.00354
(40) ethylbenzene: 0.029
(41) ethylene dibromide (EDB; 1,2-dibromoethane): 4.0×10^{-7}
(42) ethylene glycol: 7.0

(43) fluorene: 0.28
(44) fluoride: 2.0
(45) foaming agents: 0.5
(46) gross alpha (adjusted)particle activity (excluding radium-226 and uranium): 15 pCi/l
(47) heptachlor: 8.0×10^{-6}
(48) heptachlor epoxide: 4.0×10^{-6}
(49) heptane: 2.1
(50) hexachlorobenzene (perchlorobenzene): 0.00002
(51) n-hexane: 0.42
(52) iron: 0.3
(53) lead: 0.015
(54) lindane: 2.0×10^{-4}
(55) manganese: 0.05
(56) mercury: 0.0011
(57) metadichlorobenzene (1,3-dichlorobenzene): 0.62
(58) methoxychlor: 0.035
(59) methylene chloride (dichloromethane): 0.005
(60) methyl ethyl ketone (MEK; 2-butanone): 0.17
(61) methyl tert-butyl ether (MTBE): 0.2
(62) naphthalene: 0.021
(63) nickel: 0.1
(64) nitrate: (as N) 10.0
(65) nitrite: (as N) 1.0
(66) orthodichlorobenzene (1,2-dichlorobenzene): 0.62
(67) oxamyl: 0.175
(68) paradichlorobenzene (1,4-dichlorobenzene): 0.075
(69) pentachlorophenol: 0.0003
(70) pH: 6.5 - 8.5
(71) phenanthrene: 0.21
(72) phenol: 0.30
(73) radium-226 and radium-228 (combined): 5 pCi/l
(74) selenium: 0.05
(75) silver: 0.018
(76) styrene (ethenylbenzene): 0.1
(77) sulfate: 250.0
(78) tetrachloroethylene (perchloroethylene; PCE): 0.0007
(79) toluene (methylbenzene): 1.0
(80) toxaphene: 3.1×10^{-5}
(81) 2, 4, 5,-TP (Silvex): 0.05
(82) trans-1,2-dichloroethene: 0.07
(83) 1,1,1-trichloroethane (methyl chloroform): 0.2
(84) trichloroethylene (TCE): 0.0028
(85) trichlorofluoromethane: 2.1
(86) vinyl chloride (chloroethylene): 1.5×10^{-5}
(87) xylenes (o-, m-, and p-): 0.53
(88) zinc: 2.1

(h) Class GSA Standards. The standards for this class shall be the same as those for

Class GA except as follows:

(1) chloride: allowable increase not to exceed 100 percent of the natural quality concentration.

(2) total dissolved solids: 1000 mg/l.

(i) Class GC Waters.

(1) The concentrations of substances which, at the time of classification exceed the standards applicable to Class GA or GSA groundwaters shall not be caused to increase, nor shall the concentrations of other substances be caused to exceed the GA or GSA standards as a result of further disposal of contaminants to or beneath the surface of the land within the boundary of the area classified GC.

(2) The concentrations of substances which, at the time of classification, exceed the standards applicable to GA or GSA groundwaters shall not be caused to migrate as a result of activities within the boundary of the GC classification, so as to violate the groundwater or surface water quality standards in adjoining waters of a different class.

(3) Concentrations of specific substances, which exceed the established standard at the time of classification, shall be listed in Section .0300 of this Subchapter.

History Note: *Statutory Authority G.S. 143-214.1; 143B-282(a)(2);*
Eff. June 10, 1979;
Amended Eff. November 1, 1994; October 1, 1993; September 1, 1992; August 1, 1989.

SECTION .0300 - ASSIGNMENT OF UNDERGROUND WATER CLASSIFICATIONS

.0301 CLASSIFICATIONS: GENERAL

(a) Schedule of Classifications. The classifications are based on the quality, occurrence and existing or contemplated best usage of the groundwaters as established in Section .0200 of this Subchapter and are assigned statewide except where supplemented or supplanted by specific classification assignments by major river basins.

(b) Classifications and Water Quality Standards. The classifications and standards assigned to the groundwaters are denoted by the letters GA, GSA, or GC. These classifications refer to the classifications and standards established by Rule .0201 of this Subchapter.

History Note: *Statutory Authority G.S. 143-214.1; 143B-282(2);*
Eff. December 30, 1983;
Amended Eff. August 1, 1989.

.0302 STATEWIDE

The classifications assigned to the groundwaters located within the boundaries or under the extraterritorial jurisdiction of the State of North Carolina are:

(1) Class GA Waters. Those groundwaters in the state naturally containing 250 mg/l or less of chloride are classified GA.

(2) Class GSA Waters. Those groundwaters in the state naturally containing greater than 250 mg/l chloride are classified GSA.

(3) Class GC Waters. Those groundwaters assigned the classification GC in Rules .0303 - .0318 of this Section.

History Note: *Statutory Authority G.S. 143-214.1; 143B-282(2);*
Eff. December 30, 1983;
Amended Eff. August 1, 1989.

.0303 BROAD RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1;*
Eff. December 30, 1983.

.0304 CAPE FEAR RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1;*
Eff. December 30, 1983.

.0305 CATAWBA RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1;*
Eff. December 30, 1983.

.0306 CHOWAN RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1;*
Eff. December 30, 1983.

.0307 FRENCH BROAD RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1;*
Eff. December 30, 1983.

.0308 HIWASSEE RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1;*
Eff. December 30, 1983.

.0309 LITTLE TENNESSEE RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1;*
Eff. December 30, 1983.

.0310 SAVANNAH RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1;*
Eff. December 30, 1983.

.0311 LUMBER RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1;*
Eff. December 30, 1983.

.0312 NEUSE RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1; Eff. December 30, 1983.*

.0313 NEW-WATAUGA RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1; Eff. December 30, 1983.*

.0314 PASQUOTANK RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1; Eff. December 30, 1983.*

.0315 ROANOKE RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1; Eff. December 30, 1983.*

.0316 TAR PAMLICO RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1; Eff. December 30, 1983.*

.0317 WHITE OAK RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1; Eff. December 30, 1983.*

.0318 YADKIN-PEE DEE RIVER BASIN

No classification assignments other than those specified in Rule .0302 are made for the river basin.

History Note: *Statutory Authority G.S. 143-214.1; Eff. December 30, 1983.*

.0319 RECLASSIFICATION

The groundwater classifications as assigned may be revised by the Commission following public notice and subsequent public hearing. Changes may be to a higher or lower classification. Reclassification requests may be submitted to the Director.

History Note: *Statutory Authority G.S. 143-214.1; 143-215.3(e); 143B-282(2);*
Eff. December 30, 1983;
Amended Eff. August 1, 1989.

REFERENCE 31

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL MANAGEMENT

ADMINISTRATIVE CODE SECTION:

15A NCAC 2B .0100 - Procedures for Assignment of Water Quality Standards

15A NCAC 2B .0200 - Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina

Amended Effective February 1, 1993

Environmental Management Commission
Raleigh, North Carolina

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SUBCHAPTER 2B - SURFACE WATER STANDARDS: MONITORING

SECTION .0100 - PROCEDURES FOR ASSIGNMENT OF WATER QUALITY STANDARDS

.0101 GENERAL PROCEDURES

(a) The rules contained in Sections .0100, .0200 and .0300 of this Subchapter which pertain to the series of classifications and water quality standards shall be known as the "Classifications and Water Quality Standards Applicable to the Surface Waters of North Carolina."

(b) The Environmental Management Commission, prior to classifying and assigning standards of water quality to any waters of the state, will proceed as follows:

(1) The Commission, or its designee, will determine waters to be studied for the purpose of classification and assignment of water quality standards on the basis of user requests, petitions, or the identification of existing or attainable water uses, as defined by 15A NCAC 2B .0202, not presently included in the water classification.

(2) After appropriate studies of the identified waters to obtain the data and information required for determining the proper classification of the waters or segments of water are completed, the Commission, or its designee, will make a decision on whether to initiate proceedings to modify the classifications and water quality standards of identified waters. In the case of the Commission's designee deciding to initiate said proceedings, the designee will inform the Commission of the decision prior to scheduling a public hearing.

(3) In the case of a petition for classification and assignment of water quality standards according to the requirements of General Statute 150B-20, the Director will make a preliminary recommendation on the appropriate classifications and water quality standards of the identified waters on the basis of the study findings or information included in the petition supporting the classification and standards changes.

(4) The Commission will make a decision on whether to grant or deny a petition in accordance with the provisions of General Statute 150B-20 based on the information included in the petition and the recommendation of the Director. The Commission may deny the petition and request that the Division study the appropriate classifications and water quality standards for the petitioned waters in accordance with Subparagraph (b)(2) of this Rule.

(5) The Director will give due notice of such hearing or hearings in accordance with the requirements of General Statute 143-214.1 and G.S. 150B, and will appoint a hearing officer(s) in consultation with the chairman of the Commission.

(6) The hearing officer(s) will, as soon as practicable after the completion of the hearing, submit a complete report of the proceedings of the hearing to the Commission. The hearing officer(s) shall include in the report a transcript or summary of testimony presented at such public hearing, relevant exhibits, a summary of relevant information from the stream studies conducted by the technical staff of the Commission, and final recommendations as to classification of the designated waters and the standards of water quality and best management practices which should be applied to the classifications recommended.

(7) The Commission, after due consideration of the hearing records and the final recommendations of the hearing officer(s), will adopt its final action with respect to the assignment of classifications, and any applicable standards or best management practices applicable to the waters under consideration. The Commission will publish such action, together with the effective date for the application of the provisions of General Statute 143-215.1 and 143-215.2, as amended, as a part of the Commission's official rules.

(8) The final action of the commission with respect to the assignment of classification with its accompanying standards and best management practices shall contain the Commission's conclusions relative to the various factors given in General Statute 143-214.1(d), and shall specifically include the class or classes to which such specifically designated waters in the watershed or watersheds shall be assigned on the basis of best usage in the interest of the public.

(c) Freshwater Classifications.

(1) Class C; freshwaters protected for secondary recreation, fishing, aquatic life including propagation

and survival, and wildlife; all freshwaters are classified to protect these uses at a minimum;

(2) Class B; freshwaters protected for primary recreation which includes swimming on a frequent or organized basis and all Class C uses;

(3) Class WS-I; waters protected as water supplies which are essentially in natural and undeveloped watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint sources and stormwater discharges of pollution are required; suitable for all Class C uses;

(4) Class WS-II; waters protected as water supplies which are generally in predominantly undeveloped watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint sources and stormwater discharges of pollution are required; suitable for all Class C uses;

(5) Class WS-III; waters protected as water supplies which are generally in low to moderately developed watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint sources and stormwater discharges of pollution are required; suitable for all Class C uses;

(6) Class WS-IV; waters protected as water supplies which are generally in moderately to highly developed watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint sources and stormwater discharges of pollution are required; suitable for all Class C uses;

(7) Class WS-V; waters protected as water supplies which are generally upstream of and draining to Class-IV waters; no categorical restrictions on watershed development or treated wastewater discharges are required; however, the Commission or its designee may apply appropriate management requirements as deemed necessary for the protection of downstream receiving waters (15A NCAC 2B .0203); suitable for all Class C uses.

(d) Tidal Salt Water Classifications.

(1) Class SC; saltwaters protected for secondary recreation, fishing, aquatic life including propagation and survival, and wildlife; all saltwaters are classified to protect these uses at a minimum;

(2) Class SB; saltwaters protected for primary recreation which includes swimming on a frequent or organized basis and all Class SC uses;

(3) Class SA; suitable for commercial shellfishing and all other tidal saltwater uses.

(e) Supplemental Classifications.

(1) Trout waters (Tr); freshwaters protected for natural trout propagation and survival of stocked trout;

(2) Swamp waters (Sw); waters which have low velocities and other natural characteristics which are different from adjacent streams;

(3) Nutrient Sensitive Waters (NSW); waters subject to growths of microscopic or macroscopic vegetation requiring limitations on nutrient inputs;

(4) Outstanding Resource Waters (ORW); unique and special waters of exceptional state or national recreational or ecological significance which require special protection to maintain existing uses;

(5) High Quality Waters (HQW); waters which are rated as excellent based on biological and physical/chemical characteristics through Division monitoring or special studies, native and special native trout waters (and their tributaries) designated by the Wildlife Resources Commission, primary nursery areas (PNA) designated by the Marine Fisheries Commission and other functional nursery areas designated by the Wildlife Resources Commission, critical habitat areas designated by the Wildlife Resources Commission or the Department of Agriculture, all water supply watersheds which are either classified as WS-I or WS-II or those for which a formal petition for reclassification as WS-I or WS-II has been received from the appropriate local government and accepted by the Division of Environmental Management and all Class SA waters.

(f) In determining the best usage of waters and assigning classifications of such waters, the Commission will consider the criteria specified in General Statute 143-214.1(d) and all existing uses as defined by 15A NCAC 2B .0202. In determining whether to revise a designated best usage for waters through a revision to the classifications, the Commission will follow the requirements of 40 CFR 131.10(b),(c),(d) and (g) which are hereby incorporated by reference including any subsequent amendments and editions. This material is available for inspection at the Department of Environment, Health, and Natural Resources, Division of Environmental Management, Water Quality Planning Branch, 512 North Salisbury Street, Raleigh, North Carolina. Copies may be obtained from the U.S. Government Printing Office, Superintendent of Documents,

Washington, DC 20402-9325 at a cost of thirteen dollars ($13.00).

(g) When revising the classification of waters, the Division will collect water quality data within the watershed for those substances which require more stringent control than required by the existing classification. However, such sampling may be limited to only those parameters which are of concern. If the revision to classifications involves the removal of a designated use, the Division will conduct a use attainability study as required by the provisions of 40 CFR 131.10(j) which are hereby incorporated by reference including any subsequent amendments and editions. This material is available for inspection at the Department of Environment, Health, and Natural Resources, Division of Environmental Management, Water Quality Planning Branch, 512 North Salisbury Street, Raleigh, North Carolina. Copies may be obtained from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402-9325 at a cost of thirteen dollars ($13.00).

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. February 1, 1993; August 3, 1992; August 1, 1990; October 1, 1989.

.0102 USE OF CLASSIFICATIONS AND WATER QUALITY STANDARDS

History Note: Statutory Authority G.S. 143-214.1;
Eff. February 1, 1976;
Repealed Eff. January 1, 1985.

.0103 ANALYTICAL PROCEDURES

(a) Chemical/Physical Procedures. Tests or analytical procedures to determine conformity or non-conformity with standards will, insofar as practicable and applicable, conform to the guidelines by the Environmental Protection Agency codified as 40 CFR, Part 136, which are hereby incorporated by reference including any subsequent amendments and editions or such other methods as may be approved by the Director. This material is available for inspection at the Department of Environment, Health, and Natural Resources, Division of Environmental Management, Water Quality Planning Branch, 512 North Salisbury Street, Raleigh, North Carolina. Copies may be obtained from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402-9325 at a cost of thirteen dollars ($13.00).

(b) Biological Procedures. Biological tests to determine conformity or non-conformity with standards will be based on methods published by the U.S. Environmental Protection Agency as outlined in "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, Fourth Edition" (1991; Report No. EPA/600/4-90/027) or subsequent versions, "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Second Edition" (1989; Report No. EPA/600/4-89/001) or subsequent versions, and "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms" (Report No. EPA/600/4-87/028) or subsequent versions, or methods published by the North Carolina Department of Environment, Health, and Natural Resources, as outlined in "Standard Operating Procedures: Biological Monitoring" (1990; Division of Environmental Management, Water Quality Section) or subsequent versions, or such other methods as approved by the Director.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. February 1, 1993; October 1, 1989; January 1, 1985; September 9, 1979.

.0104 CONSIDERATIONS/ASSIGNING/IMPLEMENTING WATER SUPPLY CLASSIFICATIONS

(a) In determining the suitability of waters for use as a source of water supply for drinking, culinary or food processing purposes after approved treatment, the Commission will be guided by the physical, chemical, and bacteriological maximum contaminant levels specified by Environmental Protection Agency regulations adopted pursuant to the Public Health Service Act, 42 U.S.C. 201 et seq., as amended by the Safe Drinking Water Act, 42 U.S.C. 300(f) et seq. In addition, the Commission will be guided by the requirements for unfiltered and filtered water supplies and the maximum contaminant levels specified in the North Carolina Rules Governing Public Water Supplies, 15A NCAC 18C .1100, .1200 and .1500 and comments provided

by the Division of Environmental Health.

(b) All local governments that have land use authority within designated water supply watersheds will adopt and enforce ordinances that at a minimum meet the requirements of G.S. 143-214.5 and this Subchapter. Local governments may adopt and enforce more stringent controls. Local management programs and modifications to these programs must be approved by the Commission and will be kept on file by the Division of Environmental Management, Division of Environmental Health and the Division of Community Assistance.

(c) All waters used for water supply purposes shall be classified to the most appropriate water supply classification as determined by the Commission. Water supplies may be reclassified to a more or less protective water supply classification on a case-by-case basis through the rule-making process.

(d) In considering the reclassification of waters for water supply purposes, the Commission will take into consideration the relative proximity, quantity, composition, natural dilution and diminution of potential sources of pollution to determine that risks posed by all significant pollutants are adequately considered.

(e) For the purposes of implementing the water supply watershed protection rules (15A NCAC 2B .0100, .0200 and .0300) and the requirements of G.S. 143-214.5, the following schedule of implementation shall be applicable:

August 3, 1992 -	Activities administered by the State of North Carolina, such as the issuance of permits for landfills, NPDES wastewater discharges, and land application of sludge/residuals, and road construction activities;
By July 1, 1993 -	Affected municipalities with a population greater than 5,000 shall adopt and submit the appropriate drinking water supply protection management plans, maps and ordinances that meet or exceed the minimum management requirements of these Rules;
By October 1, 1993 -	Affected municipalities with a population less than 5,000 shall adopt and submit the appropriate drinking water supply protection management plans, maps and ordinances that meet or exceed the minimum management requirements of these Rules;
By January 1, 1994 -	Affected county governments shall adopt and submit the appropriate drinking water supply protection management plans, maps and ordinances that meet or exceed the minimum management requirements of these Rules.

Affected local government management plans and drinking water supply protection ordinances shall become effective on or before these dates. Local governments may choose to adopt, implement and enforce these provisions prior to this date. Three copies of the adopted and effective relevant management plans and ordinances shall be sent to the Division along with a cover letter from the municipal or county attorney, or its designated legal counsel, stating that the local government drinking water supply protection management plans and ordinances shall meet or exceed these Rules. The Division shall approve local management plans, maps and ordinances, or request the Commission to take appropriate action under G.S. 143-214.5.

(f) Wherever in this Subchapter it is provided that local governments assume responsibility for operation and maintenance of engineered stormwater control(s), this shall be construed to require responsible local governments to inspect such controls at least once per year, to determine whether the controls are performing as designed and intended. Records of inspections shall be maintained on forms approved or supplied by the Division. Local governments may require payment of reasonable inspection fees by entities which own the controls, as authorized by law. In the event inspection shows that a control is not performing adequately, the local government shall order the owning entity to take corrective actions. If the entity fails to take sufficient corrective actions, the local government may impose civil penalties and pursue other available remedies in accordance with the law. The availability of new engineered stormwater controls as an alternative to lower development density and other measures under the provisions of this Subchapter and local ordinances approved by the Commission shall be conditioned on the posting of adequate financial assurance, in the form of a cash deposit or bond made payable to the responsible local government, or other acceptable security. The establishment of a stormwater utility by the responsible local government shall be deemed adequate financial assurance. The purpose of the required financial assurance is to assure that maintenance, repairs or reconstruction necessary for adequate performance of the controls may be made by the owning entity or the local government which may choose to assume ownership and maintenance responsibility.

(g) Where higher density developments are allowed, stormwater control systems must use wet detention ponds as described in 15A NCAC 2H .1003(g)(2), (i), (k) and (l).

(h) Where no practicable alternative exists, discharge from groundwater remediation projects addressing

water quality problems will be allowed in accordance with other applicable requirements in all water supply classifications.

(i) To further the cooperative nature of the water supply watershed management and protection program provided for herein, local governments with jurisdiction over portions of classified watersheds and local governments which derive their water supply from within such watersheds are encouraged to establish joint water quality monitoring and information sharing programs, by interlocal agreement or otherwise. Such cooperative programs shall be established in consultation with the Division.

(j) Where no practicable alternative exists other than surface water discharge, previously unknown existing unpermitted wastewater discharges will incorporate the best possible technology treatment as deemed appropriate by the Division.

(k) The Commission may designate water supply watersheds or portions thereof as critical water supply watersheds pursuant to G.S. 143-214.5(b).

(l) A more protective classification may be allowed by the Commission although minor occurrences of nonconforming activities are present prior to reclassification. When the Commission allows a more protective classification, expansions of existing wastewater discharges that otherwise would have been prohibited may be allowed if there is no increase in permitted pollutant loading; other discharges of treated wastewater existing at the time of reclassification may be required to meet more stringent effluent limitations as determined by the Division. Consideration of all practicable alternatives to surface water discharge must be documented.

(m) The construction of new roads and bridges and non-residential development shall minimize built-upon area, divert stormwater away from surface water supply waters as much as possible, and employ best management practices (BMPs) to minimize water quality impacts. To the extent practicable, the construction of new roads in the critical area should be avoided. The Department of Transportation shall use BMPs as outlined in their document entitled "Best Management Practices for the Protection of Surface Waters" which is hereby incorporated by reference. This material is available for inspection at the Department of Environment, Health, and Natural Resources, Division of Environmental Management, Water Quality Planning Branch, 512 North Salisbury Street, Raleigh, North Carolina.

(n) Activities within water supply watersheds are also governed by the North Carolina Rules Governing Public Water Supplies, 15A NCAC 18C .1100, .1200 and .1500. Proposed expansions of treated wastewater discharges to water supply waters must be approved by the Division of Environmental Health.

(o) Local governments are responsible for correctly delineating the approximate normal pool elevation for backwaters of water supply reservoirs for the purposes of determining the critical and protected area boundaries as appropriate. Local governments must submit to the Division the boundaries of the critical and protected areas using 1:24,000 scale U.S.G.S. topographical maps. All revisions (expansions or deletions) to these areas must be submitted to the Division and approved by the Commission prior to local government revision.

(p) During the 1992 statewide reclassification of water supply watershed classifications, the Commission shall examine each water supply watershed where any new sanitary landfill for the disposal of nonhazardous solid waste is proposed to be located, and if there was pending on June 30, 1990 a petition for reclassification of such waters to a more protective water supply classification, to determine whether more restrictive standards should be established for the siting of such new sanitary landfills. The Commission, in the reclassification, may establish standards more restrictive than those in 15A NCAC 2B .0211 when required to protect the water supply from inappropriate additional sources of potential contamination due to proposed new sanitary landfills within the water supply watershed.

(q) Local governments will encourage participation in the Agricultural Cost Share Program. The Soil and Water Conservation Commission is the designated management agency responsible for implementing the provisions of these Rules pertaining to agricultural activities. Agricultural activities are subject to the provisions of the Food Security Act of 1985 and the Food, Agriculture, Conservation and Trade Act of 1990 (Public Law 101-624). The following shall be required within WS-I watersheds and the critical areas of WS-II, WS-III and WS-IV watersheds:

(1) Agricultural activities conducted after January 1, 1993 shall maintain a minimum 10 foot vegetated buffer, or equivalent control as determined by the Soil and Water Conservation Commission, along all perennial waters indicated on the most recent versions of U.S.G.S. 1:24,000 (7.5 minute) scale topographic maps or as determined by local government studies; and

(2) Animal operations greater than 100 animal units shall employ Best Management Practices [as

defined by Rule .0202(6) of this Subchapter] by July 1, 1994 recommended by the Soil and Water Conservation Commission.

(r) Existing development is not subject to the requirements of these Rules. Redevelopment is allowed if the rebuilding activity does not have a net increase in built-upon area or provides equal or greater stormwater control than the previous development, except that there are no restrictions on single family residential redevelopment. Expansions to structures classified as existing development must meet the requirements of these Rules; however, the built-upon area of the existing development is not required to be included in the density calculations. Expansions to structures other than existing development must meet the density requirements of these Rules for the entire project site. A deeded single family lot owned by an individual prior to the effective date of the water supply ordinance, regardless of whether a vested right has been established, is not subject to the development restrictions of these Rules; however, this exemption is not applicable to multiple lots under single ownership. Local governments may require the recombination of single-owner nonconforming lots. Local governments may also apply more stringent controls relating to determining existing development, redevelopment or expansions. Development activities may be granted minor exemptions by local governments utilizing the procedures of North Carolina General Statutes Article 18, Chapter 153A or Article 19, Chapter 160A. A description of each project receiving an exemption and the reason for granting the exemption shall be submitted to the Commission on an annual basis. In addition, upon request of a local government, the Commission may grant exemptions of a more significant nature in unique circumstances on a case-by-case basis when necessary to accommodate important social and economic development. For all proposed exemptions the local government considering or requesting the exemption shall notify and allow a reasonable comment period for all other local governments having jurisdiction within the watershed area governed by these Rules and the entity using the water supply for consumption.

(s) Silviculture activities are subject to the provisions of the Forest Practices Guidelines Related to Water Quality (15A NCAC 1I .0101 - .0209). The Division of Forest Resources is the designated management agency responsible for implementing the provisions of these Rules pertaining to silviculture activities.

(t) Local governments shall, as the existing laws allow, develop, implement, and enforce comprehensive nonpoint source and stormwater discharge control programs to reduce water pollution from activities within water supply watersheds such as development, forestry, landfills, mining, on-site sanitary sewage systems which utilize ground adsorption, toxic and hazardous materials, transportation, and water based recreation.

(u) When the Commission assumes a local water supply protection program all local permits authorizing construction and development activities as regulated by the statewide minimum water supply watershed protection rules of this Subchapter must be approved by the Commission prior to local government issuance.

(v) A model local water supply watershed management and protection ordinance, as approved by the Commission in accordance with G.S. 143-214.5, is on file with the Office of Administrative Hearings and may be obtained by writing to: Director, Division of Environmental Management, Post Office Box 29535, Raleigh, North Carolina 27626-0535.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. August 3, 1992; March 1, 1991; October 1, 1989; February 1, 1986.

.0105 DETERMINATION OF SAFETY OR SUITABILITY: CLASS A-II WATERS

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. January 1, 1985; September 9, 1979;
Repealed Eff. February 1, 1986.

.0106 CONSIDERATIONS/ASSIGNING CLASSIFICATIONS FOR PRIMARY RECREATION

In assigning the B or SB classification to waters intended for primary recreation, the Commission will take into consideration the relative proximity of sources of water pollution and will recognize the potential hazards involved in locating swimming areas close to sources of water pollution and will not assign this classification to waters in which such water pollution could result in a hazard to public health. Discharges to waters classified as B or SB will meet the reliability requirements specified in 15A NCAC 2H .0124. Discharges to waters where a primary recreational use is determined by the Director to be attainable will be required to

meet water quality standards and reliability requirements to protect this use concurrently with reclassification efforts.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. October 1, 1989; January 1, 1985; September 9, 1979.

.0107 DEFINITION OF REGULATIONS: CLASSIFICATIONS: AND STANDARDS

History Note: Statutory Authority G.S. 143-214.1;
Eff. February 1, 1976;
Repealed Eff. January 1, 1985.

.0108 CONSIDERATIONS IN ASSIGNING THE SHELLFISHING AREA CLASSIFICATION

In determining the safety or suitability of Class SA waters to be used for shellfishing for market purposes, the Commission will be guided by the existing water quality of the area in relation to the standards to protect shellfishing uses, the potential contamination of the area from both point and nonpoint sources of pollution, and the presence of harvestable quantities of shellfish or the potential for the area to have harvestable quantities through management efforts of the Division of Marine Fisheries. Waters will not be classified SA without the written concurrence of the Division of Health Services, North Carolina Department of Human Resources.

History Note: Statutory Authority G.S. 143-214.1;
Eff. January 1, 1985;
Amended Eff. October 1, 1989.

.0109 WATERS AFFECTED BY DREDGE AND FILL ACTIVITIES

Projects that alter the reach and extent of a freshwater wetland will not be considered as removing existing uses of the wetland in violation of the Antidegradation Policy [pursuant to 15A NCAC 2B .0201(b)] if the alteration protects all existing and designated uses of all waters of the state. In making this determination, the Director will be guided by 40 CFR Part 230, Subparts A through F.

History Note: Statutory Authority G.S. 143-214.1;
Eff. October 1, 1989.

SECTION .0200 - CLASSIFICATIONS AND WATER QUALITY STANDARDS APPLICABLE TO SURFACE WATERS OF NORTH CAROLINA

.0201 ANTIDEGRADATION POLICY

(a) It is the policy of the Environmental Management Commission to maintain, protect, and enhance water quality within the State of North Carolina. Pursuant to this policy, the requirements of 40 CFR 131.12 are hereby incorporated by reference including any subsequent amendments and editions. This material is available for inspection at the Department of Environment, Health, and Natural Resources, Division of Environmental Management, Water Quality Planning Branch, 512 North Salisbury Street, Raleigh, North Carolina. Copies may be obtained from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402-9325 at a cost of thirteen dollars ($13.00). These requirements will be implemented in North Carolina as set forth in Paragraphs (b), (c) and (d) of this Rule.

(b) Existing uses, as defined by Rule .0202 of this Section, and the water quality to protect such uses shall be protected by properly classifying surface waters and having standards sufficient to protect these uses. In cases where the Commission or its designee determines that an existing use is not included in the classification of waters, a project which will affect these waters will not be permitted unless the existing uses are protected.

(c) The Commission shall consider the present and anticipated usage of waters with quality higher than the standards, including any uses not specified by the assigned classification (such as outstanding national resource waters or waters of exceptional water quality) and will not allow degradation of the quality of waters with quality higher than the standards below the water quality necessary to maintain existing and anticipated uses of those waters. Waters with quality higher than the standards are defined by Rule .0202 of this Section. The following procedures will be implemented in order to meet these requirements:

(1) Each applicant for an NPDES permit or NPDES permit expansion to discharge treated waste will document an effort to consider non-discharge alternatives pursuant to 15A NCAC 2H .0105(c)(2).

(2) Public Notices for NPDES permits will list parameters that would be water quality limited and state whether or not the discharge will use the entire available load capacity of the receiving waters and may cause more stringent water quality based effluent limitations to be established for dischargers downstream.

(3) The Division may require supplemental documentation from the affected local government that a proposed project or parts of the project are necessary for important economic and social development.

(4) The Commission and Division will work with local governments on a voluntary basis to identify and develop appropriate management strategies or classifications for waters with unused pollutant loading capacity to accommodate future economic growth.

Waters with quality higher than the standards will be identified by the Division on a case-by-case basis through the NPDES permitting and waste load allocation processes (pursuant to the provisions of 15A NCAC 2H .0100). Dischargers affected by the requirements of Paragraphs (c)(1) through (c)(4) of this Rule and the public at large will be notified according to the provisions described herein, and all other appropriate provisions pursuant to 15A NCAC 2H .0109. If an applicant objects to the requirements to protect waters with quality higher than the standards and believes degradation is necessary to accommodate important social and economic development, the applicant can contest these requirements according to the provisions of General Statute 143-215.1(e) and 150B-23.

(d) The Commission shall consider the present and anticipated usage of High Quality Waters (HQW), including any uses not specified by the assigned classification (such as outstanding national resource waters or waters of exceptional water quality) and will not allow degradation of the quality of High Quality Waters below the water quality necessary to maintain existing and anticipated uses of those waters. High Quality Waters are a subset of waters with quality higher than the standards and are as described by 15A NCAC 2B .0101(e)(5). The following procedures will be implemented in order to meet the requirements of this part:

(1) New or expanded wastewater discharges in High Quality Waters will comply with the following:

(A) Discharges from new single family residences will be prohibited. Those that must discharge will install a septic tank, dual or recirculating sand filters, disinfection and step aeration.

(B) All new NPDES wastewater discharges (except single family residences) will be required to provide the treatment described below:

(i) Oxygen Consuming Wastes: Effluent limitations will be as follows: BOD_5= 5 mg/l, NH_3-N

= 2 mg/l and DO = 6 mg/l. More stringent limitations will be set, if necessary, to ensure that the cumulative pollutant discharge of oxygen-consuming wastes will not cause the DO of the receiving water to drop more than 0.5 mg/l below background levels, and in no case below the standard. Where background information is not readily available, evaluations will assume a percent saturation determined by staff to be generally applicable to that hydroenvironment.

(ii) Total Suspended Solids: Discharges of total suspended solids (TSS) will be limited to effluent concentrations of 10 mg/l for trout waters and PNA's, and to 20 mg/l for all other High Quality Waters.

(iii) Disinfection: Alternative methods to chlorination will be required for discharges to trout streams, except that single family residences may use chlorination if other options are not economically feasible. Domestic discharges are prohibited to SA waters.

(iv) Emergency Requirements: Failsafe treatment designs will be employed, including stand-by power capability for entire treatment works, dual train design for all treatment components, or equivalent failsafe treatment designs.

(v) Volume: The total volume of treated wastewater for all discharges combined will not exceed 50 percent of the total instream flow under 7Q10 conditions.

(vi) Nutrients: Where nutrient overenrichment is projected to be a concern, appropriate effluent limitations will be set for phosphorus or nitrogen, or both.

(vii) Toxic substances: In cases where complex wastes (those containing or potentially containing toxicants) may be present in a discharge, a safety factor will be applied to any chemical or whole effluent toxicity allocation. The limit for a specific chemical constituent will be allocated at one-half of the normal standard at design conditions. Whole effluent toxicity will be allocated to protect for chronic toxicity at an effluent concentration equal to twice that which is acceptable under design conditions. In all instances there may be no acute toxicity in an effluent concentration of 90 percent as measured by the North Carolina "Pass/Fail Methodology for Determining Acute Toxicity in a Single Effluent Concentration". Ammonia toxicity will be evaluated according to EPA guidelines promulgated in the Ammonia Criteria Development Document (1986); EPA document number 440/5-85-001; NTIS number PB85-227114; July 29, 1985 (50 FR 30784).

(C) All expanded NPDES wastewater discharges in High Quality Waters will be required to provide the treatment described in part (1)(B) of this Rule, except for those existing discharges which expand with no increase in permitted pollutant loading.

(2) Development activities which require an Erosion and Sedimentation Control Plan in accordance with rules established by the NC Sedimentation Control Commission or local erosion and sedimentation control program approved in accordance with 15A NCAC 4B .0218, and which drain to and are within one mile of High Quality Waters (HQW) will be required to control runoff from the one inch design storm as follows:

(A) Low Density Option: Developments which limit single family developments to one acre lots and other type developments to 12 percent built-upon area, have no stormwater collection system as defined in 15A NCAC 2H .1002(13), and have built-upon areas at least 30 feet from surface waters will be deemed to comply with this requirement, unless it is determined that additional runoff control measures are required to protect the water quality of High Quality Waters necessary to maintain existing and anticipated uses of those waters, in which case more stringent stormwater runoff control measures may be required on a case-by-case basis. Activities conforming to the requirements described in 15A NCAC 2H .1003(a) [except for Subparagraphs (2) and (3) which apply only to waters within the 20 coastal counties as defined in 15A NCAC 2H .1002(9)] will also be deemed to comply with this requirement, except as provided in the preceding sentence.

(B) High Density Option: Higher density developments will be allowed if stormwater control systems utilizing wet detention ponds as described in 15A NCAC 2H .1003(i), (k) and (l) are installed, operated and maintained which control the runoff from all built-upon areas generated from one inch of rainfall, unless it is determined that additional runoff control measures are required to protect the water quality of High Quality Waters necessary to maintain existing and anticipated uses of those waters, in which case more stringent stormwater runoff control measures may be

required on a case-by-case basis. The size of the control system must take into account the runoff from any pervious surfaces draining to the system.

(C) All waters classified WS-I or WS-II and all waters located in the 20 coastal counties as defined in Rule 15A NCAC 2H .1002(9) are excluded from this requirement since they already have requirements for nonpoint source controls.

If an applicant objects to the requirements to protect high quality waters and believes degradation is necessary to accommodate important social and economic development, the applicant can contest these requirements according to the provisions of G.S. 143-215.1(e) and 150B-23.

(e) Outstanding Resource Waters (ORW) are a special subset of High Quality Waters with unique and special characteristics as described in Rule .0216 of this Section. The water quality of waters classified as ORW shall be maintained such that existing uses, including the outstanding resource values of said Outstanding Resource Waters, will be maintained and protected.

History Note: Statutory Authority G.S. 143-214.1; 143-215.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. February 1, 1993; April 1, 1991; August 1, 1990; October 1, 1989.

.0202 DEFINITIONS

The definition of any word or phrase used in these rules shall be the same as given in Article 21, Chapter 143 of the General Statutes of North Carolina. The following words and phrases, which are not defined in this article, will be interpreted as follows:

(1) Acute toxicity to aquatic life means lethality or other harmful effects sustained by either resident aquatic populations or indicator species used as test organisms in a controlled toxicity test due to a short-term exposure (relative to the life cycle of the organism) to a specific chemical or mixture of chemicals (as in an effluent). Short-term exposure for acute tests is generally 96 hours or less. Acute toxicity will be determined using the following procedures:

(a) for specific chemical constituents or compounds, acceptable levels will be equivalent to a concentration of one-half or less of the Final Acute Value (FAV) as determined according to "Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Life and its Uses" published by the Environmental Protection Agency and referenced in the Federal Register (50 FR 30784, July 29, 1985).

(b) for specific chemical constituents or compounds for which values described under Subparagraph (1)(a) of this Rule can not be determined, acceptable levels will be equivalent to a concentration of one-third or less of the lowest available LC50 value.

(c) for effluents, acceptable levels are defined as no statistically measurable lethality (99 percent confidence level using Students t test) during a specified exposure period. Concentrations of exposure will be determined on a case-by-case basis.

(d) in instances where detailed dose response data indicate that levels of acute toxicity are significantly different from those defined in this Rule, the Director may determine on a case-by-case basis an alternate acceptable level through statistical analyses of the dose response curve.

(2) Acute to Chronic Ratio (ACR) means the ratio of acute toxicity expressed as an LC50 for a specific toxicant or an effluent to the chronic value for the same toxicant or effluent.

(3) Agricultural uses include the use of waters for stock watering, irrigation, and other farm purposes.

(4) Approved treatment, as applied to water supplies, means treatment accepted as satisfactory by the Division of Environmental Health or Division of Environmental Management.

(5) Average (except bacterial) means arithmetical average and includes the analytical results of all samples taken during the specified period; all sampling shall be done as to obtain the most representative sample under prevailing conditions:

(a) Daily Average for dissolved oxygen, shall be of at least four samples;

(b) Weekly Average means the average of all daily composite samples obtained during the calendar week; if only one grab sample is taken each day, the weekly average is the average of all daily grab samples; a minimum of three daily grab samples is needed to calculate a weekly average;

(c) Monthly Average means the average of all daily composites (or grab samples if only one per day) obtained during the calendar month.

The definitions in this Paragraph do not affect the monitoring requirements for NPDES permits but rather are to be used by the Division along with other methodologies in determining violations of water quality standards. Arithmetical averages as defined by this Rule, and not confidence limits nor other statistical descriptions, will be used in all calculations of limitations which require the use of averages pursuant to this Rule and 40 CFR 122.41(l)(4)(iii).

(6) Best Management Practice (BMP) means a structural or nonstructural management-based practice used singularly or in combination to reduce nonpoint source inputs to receiving waters in order to achieve water quality protection goals. .

(7) Best usage of waters as specified for each class means those uses as determined by the Environmental Management Commission in accordance with the provisions of Article 21, Chapter 143-214.1, General Statutes of North Carolina.

(8) Bioaccumulation factor (BAF) is a unitless value that describes the degree to which substances are taken up or accumulated into tissues of acquatic organisms from water directly and from food or other ingested materials containing the accumulated substances, and is usually measured as a ratio of a substance's concentration in tissue versus its concentration in water in situations where exposure to the substance is occurring from both water and the food chain.

(9) Bioconcentration factor (BCF) is a unitless value that describes the degree to which substances are absorbed or concentrated into tissues of aquatic organisms from water directly and is usually measured as a ratio of substance's concentration in tissue versus its concentration in water in situations where exposure to the substance is occurring from water only.

(10) Biological integrity means the ability of an aquatic ecosystem to support and maintain a balanced and indigenous community of organisms having species composition, diversity, population densities and functional organization similar to that of reference conditions.

(11) Buffer means a natural or vegetated area through which stormwater runoff flows in a diffuse manner so that the runoff does not become channelized and which provides for infiltration of the runoff and filtering of pollutants. The buffer is measured landward from the normal pool elevation of impounded structures and from the bank of each side of streams or rivers.

(12) Built-upon area means that portion of a development project that is covered by impervious or partially impervious cover including buildings, pavement, gravel roads, recreation facilities (e.g. tennis courts), etc. (Note: Wooden slatted decks and the water area of a swimming pool are considered pervious.)

(13) Chronic toxicity to aquatic life means any harmful effect sustained by either resident aquatic populations or indicator species used as test organisms in a controlled toxicity test due to long-term exposure (relative to the life cycle of the organism) or exposure during a substantial portion of the duration of a sensitive period of the life cycle to a specific chemical substance or mixture of chemicals (as in an effluent). In absence of extended periods of exposure, early life stage or reproductive toxicity tests may be used to define chronic impacts.

(14) Chronic value for aquatic life means the geometric mean of two concentrations identified in a controlled toxicity test as the No Observable Effect Concentration (NOEC) and the Lowest Observable Effect Concentration (LOEC).

(15) Concentrations are the mass of a substance per volume of water and for the purposes of this Section will be expressed as milligrams per liter (mg/l), micrograms per liter (ug/l), or nanograms per liter (ng/l).

(16) Critical area means the area adjacent to a water supply intake or reservoir where risk associated with pollution is greater than from the remaining portions of the watershed. The critical area is defined as extending either 1/2 mile from the normal pool elevation of the reservoir in which the intake is located or to the ridge line of the watershed (whichever comes first); or 1/2 mile upstream from and draining to the intake (or other appropriate downstream location associated with the water supply) located directly in the stream or river (run-of-the-river), or to the ridge line of the watershed (whichever comes first). Since WS-I watersheds are essentially undeveloped, establishment of a critical area is not required. Local governments may extend the critical area as needed. Major landmarks such as highways or property lines may be used to delineate the outer boundary of the critical area if these landmarks are immediately adjacent to the appropriate outer boundary of 1/2 mile. The Commission may adopt a different critical area size during the reclassification process.

(17) Critical habitat areas are defined for the purposes of the rules of this Section as those waters which are considered to be essential for the continued existence of an endangered or threatened species, and which are so designated by the NC Wildlife Resources Commission for animals or the NC Department of Agriculture for plants.

(18) Designated Nonpoint Source Agency means those agencies specified by the Governor in the North Carolina Nonpoint Source Management Program, as approved by the Environmental Protection Agency.

(19) Development means any land disturbing activity which adds to or changes the amount of impervious or partially impervious cover on a land area or which otherwise decreases the infiltration of precipitation into the soil.

(20) Discharge is the addition of any man-induced waste effluent either directly or indirectly to state surface waters.

(21) Division means the Division of Environmental Management or its successors.

(22) Domestic wastewater discharge means the discharge of sewage, non-process industrial wastewater, other domestic wastewater or any combination of these items. Unless excepted by the Director, domestic wastewater includes liquid waste generated by domestic water using fixtures and appliances, from any residence, place of business, or place of public assembly even if it contains no sewage. Examples of domestic wastewater include once-through non-contact cooling water, seafood packing facility discharges and wastewater from restaurants.

(23) Effluent channel means a discernable confined and discrete conveyance which is used for transporting treated wastewater to a receiving stream or other body of water as provided in Rule .0215 of this Section.

(24) Existing development, for the purposes of these Rules, shall be defined as those projects that are built or those projects that at a minimum have established a vested right under North Carolina zoning law as of the effective date of the local government water supply ordinance, or such earlier time that an affected local government's management plans and ordinances shall specify, based on at least one of the following criteria:

(a) substantial expenditures of resources (time, labor, money) based on a good faith reliance upon having received a valid local government approval to proceed with the project, or

(b) having an outstanding valid building permit in compliance with G.S. 153A-344.1 or G.S. 160A-385.1, or

(c) having expended substantial resources (time, labor, money) and having an approved site specific or phased development plan in compliance with G.S. 153A-344.1 or G.S. 160A-385.1.

(25) Existing uses mean uses actually attained in the water body, in a significant and not incidental manner, on or after November 28, 1975, whether or not they are included in the water quality standards, which either have been actually available to the public or are uses deemed attainable by the Environmental Management Commission. At a minimum, uses shall be deemed attainable if they can be achieved by the imposition of effluent limits and cost-effective and reasonable best management practices (BMPs) for nonpoint source control.

(26) Fishing means the taking of fish by sport or commercial methods as well as the consumption of fish or shellfish or the propagation of fish and such other aquatic life as is necessary to provide a suitable environment for fish.

(27) Freshwater means all waters that under natural conditions would have a chloride ion content of 500 mg/l or less.

(28) Hazardous material means any substance listed as such in: Superfund Amendments and Reauthorization Act (SARA) Section 302 Extremely Hazardous Substances (42 USC 11000 et seq.), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Hazardous Substances (42 USC 9601 et seq.) or Section 311 of the Clean Water Act (CWA), as amended (33 USC 1251 et seq.; oil and hazardous substances) hereby incorporated by reference including any subsequent amendments and editions. This material is available for inspection at the Department of Environment, Health, and Natural Resources, Division of Environmental Management, 512 North Salisbury Street, Raleigh, North Carolina. Copies of SARA and CERCLA may be obtained as a single package from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-9325 at a cost of one hundred and one dollars ($101.00). Copies of CWA may be obtained from the Superintendent of Documents, U.S. Government Printing Office,

Washington, D.C. 20402-9325 at a cost of fifty dollars ($50.00).

(29) Industrial discharge means the discharge of industrial process treated wastewater or wastewater other than sewage and includes:

(a) wastewater resulting from any process of industry or manufacture, or from the development of any natural resource;

(b) wastewater resulting from processes of trade or business, including wastewater from laundromats and car washes, but not wastewater from restaurants;

(c) stormwater will not be considered to be an industrial wastewater unless it is contaminated with industrial wastewater; or

(d) wastewater discharged from a municipal wastewater treatment plant requiring a pretreatment program.

(30) LC50 means that concentration of a toxic substance which is lethal (or immobilizing, if appropriate) to 50 percent of the organisms tested during a specified exposure period. The LC50 concentration for toxic materials shall be determined for sensitive species as defined by Subparagraph (43) of this Rule under aquatic conditions characteristic of the receiving waters.

(31) Local government means a city or county in singular or plural as defined in G.S. 160A-1(2) and G.S. 158A-10.

(32) Lower piedmont and coastal plain waters mean those waters of the Catawba River Basin below Lookout Shoals Dam; the Yadkin River Basin below the junction of the Forsyth, Yadkin, and Davie County lines; and all of the waters of Cape Fear, Lumber, Roanoke, Neuse, Tar-Pamlico, Chowan, Pasquotank, and White Oak River Basins; except tidal salt waters which are assigned S classifications.

(33) MF is an abbreviation for the membrane filter procedure for bacteriological analysis.

(34) Mixing zone means a region of the receiving water in the vicinity of a discharge within which dispersion and dilution of constituents in the discharge occurs and such zones shall be subject to conditions established in accordance with 15A NCAC 2B .0204(b).

(35) Mountain and upper piedmont waters mean all of the waters of the Hiwassee; Little Tennessee, including the Savannah River drainage area; French Broad; Broad; New; and Watauga River Basins; and those portions of the Catawba River Basin above Lookout Shoals Dam and the Yadkin River Basin above the junction of the Forsyth, Yadkin, and Davie County lines.

(36) Nonpoint source pollution means pollution which enters waters mainly as a result of precipitation and subsequent runoff from lands which have been disturbed by man's activities and includes all sources of water pollution which are not required to have a permit in accordance with G.S. 143-215.1(c).

(37) Non-process discharge means industrial effluent not directly resulting from the manufacturing process. An example would be non-contact cooling water from a compressor.

(38) Nutrient sensitive waters mean those waters which are so designated in the classification schedule in order to limit the discharge of nutrients (usually nitrogen and phosphorus). They are designated by "NSW" following the water classification.

(39) Offensive condition means any condition or conditions resulting from the presence of sewage, industrial wastes or other wastes within the waters of the state or along the shorelines thereof which shall either directly or indirectly cause foul or noxious odors, unsightly conditions, or breeding of abnormally large quantities of mosquitoes or other insect pests, or shall damage private or public water supplies or other structures, result in the development of gases which destroy or damage surrounding property, herbage or grasses, or which may cause the impairment of taste, such as from fish flesh tainting, or affect the health of any person residing or working in the area.

(40) Primary Nursery Areas (PNAs) are tidal saltwaters which provide essential habitat for the early development of commercially important fish and shellfish and are so designated by the Marine Fisheries Commission.

(41) Primary recreation includes swimming, skin diving, skiing, and similar uses involving human body contact with water where such activities take place in an organized or on a frequent basis.

(42) Protected area means the area adjoining and upstream of the critical area in a WS-IV water supply in which protection measures are required. The boundaries of the protected areas are defined as extending five miles upstream and draining to water supply reservoirs (measured from the normal pool elevation) or to the ridge line of the watershed (whichever comes first); or 10 miles upstream

and draining to the intake located directly in the stream or river (run-of-the-river), or to the ridge line of the watershed (whichever comes first). Local governments may extend the protected area. Major landmarks such as highways or property lines may be used to delineate the outer boundary of the protected area if these landmarks are immediately adjacent to the appropriate outer boundary of five or 10 miles. In some cases the protected area will encompass the entire watershed. The Commission may adopt a different protected area size during the reclassification process.

(43) Residential development means buildings for residence such as attached and detached single family dwellings, apartment complexes, condominiums, townhouses, cottages, etc. and their associated outbuildings such as garages, storage buildings, gazebos, etc.

(44) Secondary recreation includes wading, boating, other uses not involving human body contact with water, and activities involving human body contact with water where such activities take place on an infrequent, unorganized, or incidental basis.

(45) Sensitive species for aquatic toxicity testing is any species utilized in procedures accepted by the Commission or its designee in accordance with Rule .0103 of this Subchapter, or the following genera:

(a) Daphnia;
(b) Ceriodaphnia;
(c) Salmo;
(d) Pimephales;
(e) Mysidopsis;
(f) Champia;
(g) Cyprinodon;
(h) Arbacia;
(i) Penaeus;
(j) Menidia;
(k) Notropis;
(l) Salvelinus;
(m) Oncorhynchus;
(n) Selenastrum.

Other genera may be accepted by the Commission or its designee on a case-by-case basis.

(46) Shellfish culture includes the use of waters for the propagation, storage and gathering of oysters, clams, and other shellfish for market purposes.

(47) Sludge/residuals means any solid or semisolid waste generated from a wastewater treatment plant, water treatment plant or air pollution control facility permitted under the authority of the Environmental Management Commission.

(48) Source of water supply for drinking, culinary or food-processing purposes means any source, either public or private, the waters from which are used for human consumption, or used in connection with the processing of milk, beverages, food, or other purpose which requires water suitable for human consumption.

(49) Swamp waters mean those waters which are classified by the Environmental Management Commission and which are topographically located so as to generally have very low velocities and certain other characteristics which are different from adjacent streams draining steeper topography. They are designated by "Sw" following the water classification.

(50) Tidal salt waters mean all tidal waters which are classified by the Environmental Management Commission which generally have a natural chloride ion content in excess of 500 parts per million and include all waters assigned S classifications.

(51) Toxic substance or toxicant means any substance or combination of substances (including disease-causing agents), which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, has the potential to cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions or suppression in reproduction or growth) or physical deformities in such organisms or their offspring.

(52) Trout waters are those waters which have conditions which will sustain and allow for trout propagation and survival of stocked trout on a year-round basis. These waters are classified by the Commission after considering the requirements of Rule .0101(b) and (c) of this Subchapter and

include all waters designated by "Tr" in the water classification.

(53) Waste disposal includes the use of waters for disposal of sewage, industrial waste or other waste after approved treatment.

(54) Water dependent structures are those structures for which the use requires access or proximity to or siting within surface waters to fulfill its basic purpose, such as boat ramps, boat houses, docks and bulkheads. Ancillary facilities such as restaurants, outlets for boat supplies, parking lots and commercial boat storage areas are not water dependent structures.

(55) Water quality based effluent limits and best management practices are limitations or best management practices developed by the Division for the purpose of protecting water quality standards and best usage of surface waters consistent with the requirements of General Statute 143-214.1 and the Federal Water Pollution Control Act as amended.

(56) Waters with quality higher than the standards means all waters for which the determination of waste load allocations (pursuant to Rule .0206 of this Section) indicates that water quality is sufficiently greater than that defined by the standards such that significant pollutant loading capacity still exists in those waters.

(57) Watershed means the entire land area contributing surface drainage to a specific point. For the purposes of the water supply protection rules (15A NCAC 2B .0211) local governments may use major landmarks such as highways or property lines to delineate the outer boundary of the drainage area if these landmarks are immediately adjacent to the ridgeline.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. February 1, 1993; August 3, 1992; August 1, 1990; October 1, 1989.

.0203 PROTECTION OF WATERS DOWNSTREAM OF RECEIVING WATERS

Water quality based effluent limitations or management practices for direct or indirect discharges of waste or for other sources of water pollution will be developed by the Division such that the water quality standards and best usage of receiving waters and all downstream waters will not be impaired.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. October 1, 1989; January 1, 1985; September 9, 1979.

.0204 LOCATION OF SAMPLING SITES AND MIXING ZONES

(a) Location of Sampling Sites. In conducting tests or making analytical determinations of classified waters to determine conformity or nonconformity with the established standards, samples shall be collected outside the limits of prescribed mixing zones. However, where appropriate, samples shall be collected within the mixing zone in order to ensure compliance with in-zone water quality requirements as outlined in Paragraph (b) of this Rule.

(b) Mixing Zones. A mixing zone may be established in the area of a discharge in order to provide reasonable opportunity for the mixture of the wastewater with the receiving waters. Water quality standards will not apply within regions defined as mixing zones, except that such zones will be subject to the conditions established in accordance with this Rule. The limits of such mixing zones will be defined by the division on a case-by-case basis after consideration of the magnitude and character of the waste discharge and the size and character of the receiving waters. Mixing zones will be determined such that discharges will not:

(1) result in acute toxicity to aquatic life [as defined by Rule .0202(1) of this Section] or prevent free passage of aquatic organisms around the mixing zone;

(2) result in offensive conditions;

(3) produce undesirable aquatic life or result in a dominance of nuisance species outside of the assigned mixing zone;

(4) endanger the public health or welfare.

In addition, a mixing zone will not be assigned for point source discharges of fecal coliform organisms in waters classified "WS-II," "WS-III," "B," "SB," or "SA." For the discharge of heated wastewater, compliance with federal rules and regulations pursuant to Section 316(a) of the Federal Water Pollution Control Act, as amended, shall constitute compliance with Subparagraph (b) of this Rule.

History Note: Statutory Authority G.S. 143-214.1;
Eff. February 1, 1976;
Amended Eff. October 1, 1989; February 1, 1986; September 9, 1979.

.0205 NATURAL CHARACTERISTICS OUTSIDE STANDARDS LIMITS

Natural waters may on occasion, or temporarily, have characteristics outside of the normal range established by the standards. The adopted water quality standards relate to the condition of waters as affected by the discharge of sewage, industrial wastes or other wastes including those from nonpoint sources and other sources of water pollution. Water quality standards will not be considered violated when values outside the normal range are caused by natural conditions. Where wastes are discharged to such waters, the discharger will not be considered a contributor to substandard conditions provided maximum treatment in compliance with permit requirements is maintained and, therefore, meeting the established limits is beyond the discharger's control.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. October 1, 1989; January 1, 1985.

.0206 FLOW DESIGN CRITERIA FOR EFFLUENT LIMITATIONS

(a) Water quality based effluent limitations are developed to allow appropriate frequency and duration of deviations from water quality standards so that the designated uses of receiving waters are protected. There are water quality standards for a number of categories of pollutants and to protect a range of water uses. For this reason, the appropriate frequency and duration of deviations from water quality standards is not the same for all categories of standards. A flow design criterion is used in the development of water quality based effluent limitations as a simplified means of estimating the acceptable frequency and duration of deviations. More complex modelling techniques can also be used to set effluent limitations directly based on frequency and duration criteria published by the U.S. Environmental Protection Agency pursuant to Section 304(a) of the Federal Clean Water Act as amended. Use of more complex modelling techniques to set water quality based effluent limitations will be approved by the Commission or its designee on a case-by-case basis. Flow design criteria to calculate water quality based effluent limitations for categories of water quality standards are listed as follows:

(1) All standards except toxic substances and aesthetics will be protected using the minimum average flow for a period of seven consecutive days that has an average recurrence of once in ten years (7Q10 flow). Other governing flow strategies such as varying discharges with the receiving waters ability to assimilate wastes may be designated by the Commission or its designee on a case-by-case basis if the discharger or permit applicant provide evidence which establishes to the satisfaction of the Director that the alternative flow strategies will give equal or better protection for the water quality standards. Better protection for the standards means that deviations from the standard would be expected less frequently than provided by using the 7Q10 flow.

(2) Toxic substance standards to protect aquatic life from chronic toxicity will be protected using the 7Q10 flow.

(3) Toxic substance standards to protect human health will be:

(A) The 7Q10 flow for standards to protect human health through the consumption of water, fish and shellfish from noncarcinogens;

(B) The mean annual flow to protect human health from carcinogens through the consumption of water, fish and shellfish unless site specific fish contamination concerns necessitate the use of an alternative design flow;

(4) Aesthetic quality will be protected using the minimum average flow for a period of 30 consecutive days that has an average recurrence of once in two years (30Q2 flow).

(b) In cases where the stream flow is regulated, a minimum daily low flow may be used as a substitute for the 7Q10 flow except in cases where there are acute toxicity concerns for aquatic life. In the cases where there are acute toxicity concerns, an alternative low flow such as the instantaneous minimum release may be used on a case-by-case basis.

(c) Flow design criteria are used to develop water quality based effluent limitations and for the design of wastewater treatment facilities. Deviations from a specific water quality standard resulting from discharges which are affirmatively demonstrated to be in compliance with water quality based effluent limitations for that

standard will not be a violation pursuant to G.S. 143-215.6 when the actual flow is significantly less than the design flow.

(d) In cases where the 7Q10 flow of the receiving stream is estimated to be zero, water quality based effluent limitations will be assigned as follows:

(1) Where the 30Q2 flow is estimated to be greater than zero, effluent limitations for new or expanded (additional) discharges of oxygen consuming waste will be set at BOD_5= 5 mg/l, NH_3-N = 2 mg/l and DO = 6 mg/l, unless it is determined that these limitations will not protect water quality standards. Requirements for existing discharges will be determined on a case-by-case basis by the Director. More stringent limits will be applied in cases where violations of water quality standards are predicted to occur for a new or expanded discharge with the limits set pursuant to this Rule, or where existing limits are determined to be inadequate to protect water quality standards.

(2) If the 30Q2 and 7Q10 flows are both estimated to be zero, no new or expanded (additional) discharge of oxygen consuming waste will be allowed. Requirements for existing discharges to streams where the 30Q2 and 7Q10 flows are both estimated to be zero will be determined on a case-by-case basis.

(3) Other water quality standards will be protected by requiring the discharge to meet the standards unless the alternative limitations are determined by the Director to protect the classified water uses.

(e) Receiving water flow statistics will be estimated through consultation with the U.S. Geological Survey. Estimates for any given location may be based on actual flow data, modelling analyses, or other methods determined to be appropriate by the Commission or its designee.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. February 1, 1993; October 1, 1989; August 1, 1985; January 1, 1985.

.0207 MINIMUM ACCEPTABLE DEGREE OF TREATMENT

History Note: Statutory Authority G.S. 143-214.1;
Eff. February 1, 1976;
Repealed Eff. September 9, 1979.

.0208 STANDARDS FOR TOXIC SUBSTANCES AND TEMPERATURE

(a) Toxic Substances. The concentration of toxic substances, either alone or in combination with other wastes, in surface waters will not render waters injurious to aquatic life or wildlife, recreational activities, public health, or impair the waters for any designated uses. Specific standards for toxic substances to protect freshwater and tidal saltwater uses are listed in Rules .0211 and .0212 of this Section, respectively. Procedures for interpreting the narrative standard for toxic substances and numerical standards applicable to all waters are as follows:

(1) Aquatic life standards. The concentration of toxic substances will not result in chronic toxicity. Any levels in excess of the chronic value will be considered to result in chronic toxicity. In the absence of direct measurements of chronic toxicity, the concentration of toxic substances will not exceed the concentration specified by the fraction of the lowest LC50 value which predicts a no effect chronic level (as determined by the use of acceptable acute/chronic ratios). If an acceptable acute/chronic ratio is not available, then that toxic substance will not exceed one-one hundredth (0.01) of the lowest LC50 or if it is affirmatively demonstrated that a toxic substance has a half-life of less than 96 hours the maximum concentration will not exceed one-twentieth (0.05) of the lowest LC50.

(2) Human health standards. The concentration of toxic substances will not exceed the level necessary to protect human health through exposure routes of fish (or shellfish) tissue consumption, water consumption, or other route identified as appropriate for the water body.

(A) For non-carcinogens, these concentrations will be determined using a Reference Dose (RfD) as published by the U.S. Environmental Protection Agency pursuant to Section 304(a) of the Federal Water Pollution Control Act as amended or a RfD issued by the U.S. Environmental Protection Agency as listed in the Integrated Risk Information System (IRIS) file or a RfD approved by the Director after consultation with the State Health director. Water quality standards or criteria used

to calculate water quality based effluent limitations to protect human health through the different exposure routes are determined as follows:

(i) Fish tissue consumption:

WQS = (RfD-DT) x Body Weight / (FCRxBCF)

where:

WQS = water quality standard or criteria;
RfD = reference dose;
DT = estimated non-fish dietary intake (when available);
FCR = fish consumption rate (assumed to be 6.5 gm/person-day);
BCF = bioconcentration factor, or bioaccumulation factor (BAF), as appropriate.

BCF or BAF values are based on U.S. Environmental Protection Agency publications pursuant to Section 304(a) of the Federal Water Pollution Control Act as amended, literature values, or site specific bioconcentration data approved by the Commission or its designee; FCR values are average consumption rates for a 70 Kg adult for the lifetime of the population; alternative FCR values may be used when it is considered necessary to protect localized populations which may be consuming fish at a higher rate;

(ii) Water consumption (including a correction for fish consumption):

WQS = (RfD-DT) x Body Weight / [WCR+(FCRxBCF)]

where:

WQS = water quality standard or criteria;
RfD = reference dose;
DT = estimated non-fish dietary intake (when available);
FCR = fish consumption rate (assumed to be 6.5 gm/person-day);
BCF = bioconcentration factor, or bioaccumulation factor (BAF), as appropriate;
WCR = water consumption rate (assumed to be 2 liters per day for adults).

To protect sensitive groups, exposure may be based on a 10 Kg child drinking one liter of water per day. Standards may also be based on drinking water standards based on the requirements of the Federal Safe Drinking Water Act [42 U.S.C. 300(f)(g)-1]. For non-carcinogens, specific numerical water quality standards have not been included in this Rule because water quality standards to protect aquatic life for all toxic substances for which standards have been considered are more stringent than numerical standards to protect human health from non-carcinogens through consumption of fish; standards to protect human health from non-carcinogens through water consumption are listed under the water supply classification standards in Rule .0211 of this Section; the equations listed in this Subparagraph will be used to develop water quality based effluent limitations on a case-by-case basis for toxic substances which are not presently included in the water quality standards. Alternative FCR values may be used when it is considered necessary to protect localized populations which may be consuming fish at a higher rate;

(B) For carcinogens, the concentrations of toxic substances will not result in unacceptable health risks and will be based on a Carcinogenic Potency Factor (CPF). An unacceptable health risk for cancer will be considered to be more than one case of cancer per one million people exposed (10^{-6}risk level). The CPF is a measure of the cancer-causing potency of a substance estimated by the upper 95 percent confidence limit of the slope of a straight line calculated by the Linearized Multistage Model or other appropriate model according to U.S. Environmental Protection Agency Guidelines [FR 51 (185): 33992-34003; and FR 45 (231 Part V): 79318-79379]. Water quality standards or criteria for water quality based effluent limitations are calculated using the procedures given in Subparagraphs (A) and (B) of this Rule. Standards to protect human health from carcinogens through water consumption are listed under the water supply classification standards in Rule .0211 of this Section; standards to protect human health from carcinogens through the consumption of fish (and shellfish) only are applicable to all waters as follows:

(i) Berylium: 117 ng/l;
(ii) Benzene: 71.4 ug/l;
(iii) Carbon tetrachloride: 4.42 ug/l;
(iv) Dioxin: 0.000014 ng/l;
(v) Hexachlorobutadiene: 49.7 ug/l;

(vi) Polychlorinated biphenyls: 0.079 ng/l;
(vii) Polynuclear aromatic hydrocarbons: 31.1 ng/l;
(viii) Tetrachloroethane (1,1,2,2): 10.8 ug/l;
(ix) Trichloroethylene: 92.4 ug/l;
(x) Vinyl chloride: 525 ug/l;
(xi) Aldrin: 0.136 ng/l;
(xii) Chlordane: 0.588 ng/l;
(xiii) DDT: 0.591 ng/l;
(xiv) Dieldrin: 0.144 ng/l;
(xv) Heptachlor: 0.214 ng/l.

The values listed in (i) through (xv) in Subparagraph (B) of this Rule may be adjusted by the Commission or its designee on a case-by-case basis to account for site-specific or chemical-specific information pertaining to the assumed BCF, FCR or CPF values or other appropriate data.

(b) Temperature. The Commission may establish a water quality standard for temperature for specific water bodies other than the standards specified in Rules .0211 and .0212 of this Section, upon a case-by-case determination that thermal discharges to these waters, which serve or may serve as a source and/or receptor of industrial cooling water provide for the maintenance of the designated best use throughout a reasonable portion of the water body. Such revisions of the temperature standard must be consistent with the provisions of Section 316(a) of the Federal Water Pollution Control Act as amended and will be noted in Rule .0218 of this Section.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. February 1, 1993; October 1, 1989; January 1, 1985; September 9, 1979.

.0209 VARIANCES FROM APPLICABLE STANDARDS
.0210 BEST USE CRITERIA

History Note: Statutory Authority G.S. 143-214.1;
Eff. February 1, 1976;
Amended Eff. September 9, 1979;
Repealed Eff. January 1, 1985.

.0211 FRESH SURFACE WATER CLASSIFICATIONS AND STANDARDS

(a) General. The water quality standards for all fresh surface waters are the basic standards applicable to Class C waters. Additional and more stringent standards applicable to other specific freshwater classifications are specified in Paragraphs (c) through (f) of this Rule.

(b) All fresh surface waters (Class C).

(1) Best Usage of Waters. Aquatic life propagation and maintenance of biological integrity (including fishing, and fish), wildlife, secondary recreation, agriculture and any other usage except for primary recreation or as a source of water supply for drinking, culinary or food processing purposes;

(2) Conditions Related to Best Usage. The waters will be suitable for aquatic life propagation and maintenance of biological integrity, wildlife, secondary recreation, and agriculture; sources of water pollution which preclude any of these uses on either a short-term or long-term basis will be considered to be violating a water quality standard;

(3) Quality standards applicable to all fresh surface waters:

(A) Chlorophyll a (corrected): not greater than 40 ug/l for lakes, reservoirs, and other slow-moving waters not designated as trout waters, and not greater than 15 ug/l for lakes, reservoirs, and other slow-moving waters designated as trout waters (not applicable to lakes and reservoirs less than ten acres in surface area); the Commission or its designee may prohibit or limit any discharge of waste into surface waters if, in the opinion of the Director, the surface waters experience or the discharge would result in growths of microscopic or macroscopic vegetation such that the standards established pursuant to this Rule would be violated or the intended best usage of the waters would be impaired;

(B) Dissolved oxygen: not less than 6.0 mg/l for trout waters; for non-trout waters, not less than a daily average of 5.0 mg/l with a minimum instantaneous value of not less than 4.0 mg/l; swamp waters, lake coves or backwaters, and lake bottom waters may have lower values if caused by natural conditions;

(C) Floating solids; settleable solids; sludge deposits: only such amounts attributable to sewage, industrial wastes or other wastes as will not make the water unsafe or unsuitable for aquatic life and wildlife or impair the waters for any designated uses;

(D) Gases, total dissolved: not greater than 110 percent of saturation;

(E) Organisms of the coliform group: fecal coliforms not to exceed a geometric mean of 200/100ml (MF count) based upon at least five consecutive samples examined during any 30 day period; nor exceed 400/100ml in more than 20 percent of the samples examined during such period; violations of the fecal coliform standard are expected during rainfall events and, in some cases, this violation is expected to be caused by uncontrollable nonpoint source pollution; all coliform concentrations are to be analyzed using the membrane filter technique unless high turbidity or other adverse conditions necessitate the tube dilution method; in case of controversy over results, the MPN 5-tube dilution technique will be used as the reference method;

(F) Oils; deleterious substances; colored or other wastes: only such amounts as will not render the waters injurious to public health, secondary recreation or to aquatic life and wildlife or adversely affect the palatability of fish, aesthetic quality or impair the waters for any designated uses; for the purpose of implementing this Rule, oils, deleterious substances, colored or other wastes will include but not be limited to substances that cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines pursuant to 40 CFR 110.4(a)-(b) which are hereby incorporated by reference including any subsequent amendments and additions. This material is available for inspection at the Department of Environment, Health, and Natural Resources, Division of Environmental Management, 512 North Salisbury Street, Raleigh, North Carolina. Copies may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-9325 at a cost of thirteen dollars ($13.00).

(G) pH: shall be normal for the waters in the area, which generally shall range between 6.0 and 9.0 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;

(H) Phenolic compounds: only such levels as will not result in fish-flesh tainting or impairment of other best usage;

(I) Radioactive substances:

(i) Combined radium-226 and radium-228: the maximum average annual activity level (based on at least four samples collected quarterly) for combined radium-226 and radium-228 shall not exceed five picoCuries per liter;

(ii) Alpha Emitters: the average annual gross alpha particle activity (including radium-226, but excluding radon and uranium) shall not exceed 15 picoCuries per liter;

(iii) Beta Emitters: the maximum average annual activity level (based on at least four samples, collected quarterly) for strontium-90 shall not exceed eight picoCuries per liter; nor shall the average annual gross beta particle activity (excluding potassium-40 and other naturally occurring radio-nuclides) exceed 50 picoCuries per liter; nor shall the maximum average annual activity level for tritium exceed 20,000 picoCuries per liter;

(J) Temperature: not to exceed 2.8 degrees C (5.04 degrees F) above the natural water temperature, and in no case to exceed 29 degrees C (84.2 degrees F) for mountain and upper piedmont waters and 32 degrees C (89.6 degrees F) for lower piedmont and coastal plain waters. The temperature for trout waters shall not be increased by more than 0.5 degrees C (0.9 degrees F) due to the discharge of heated liquids, but in no case to exceed 20 degrees C (68 degrees F);

(K) Turbidity: the turbidity in the receiving water will not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity will not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level cannot be increased. Compliance with this turbidity standard can be met when land management activities employ Best Management Practices (BMPs) [as defined by Rule .0202(6) of this Section] recommended by the Designated Nonpoint Source Agency [as defined by Rule .0202 of this Section]. BMPs must be in full compliance with all specifications

governing the proper design, installation, operation and maintenance of such BMPs;

(L) Toxic substances: numerical water quality standards (maximum permissible levels) to protect aquatic life applicable to all fresh surface waters:

(i) Arsenic: 50 ug/l;

(ii) Beryllium: 6.5 ug/l;

(iii) Cadmium: 0.4 ug/l for trout waters and 2.0 ug/l for non-trout waters;

(iv) Chlorine, total residual: 17 ug/l for trout waters (Tr); (Action Level of 17 ug/l for all waters not classified as trout waters (Tr); see Paragraph (b)(4) of this Rule);

(v) Chromium, total recoverable: 50 ug/l;

(vi) Cyanide: 5.0 ug/l;

(vii) Fluorides: 1.8 mg/l;

(viii) Lead, total recoverable: 25 ug/l; collection of data on sources, transport and fate of lead will be required as part of the toxicity reduction evaluation for dischargers that are out of compliance with whole effluent toxicity testing requirements and the concentration of lead in the effluent is concomitantly determined to exceed an instream level of 3.1 ug/l from the discharge;

(ix) MBAS (Methylene-Blue Active Substances): 0.5 mg/l;

(x) Mercury: 0.012 ug/l;

(xi) Nickel: 88 ug/l;

(xii) Pesticides:

(I) Aldrin: 0.002 ug/l;

(II) Chlordane: 0.004 ug/l;

(III) DDT: 0.001 ug/l;

(IV) Demeton: 0.1 ug/l;

(V) Dieldrin: 0.002 ug/l;

(VI) Endosulfan: 0.05 ug/l;

(VII) Endrin: 0.002 ug/l;

(VIII) Guthion: 0.01 ug/l;

(IX) Heptachlor: 0.004 ug/l;

(X) Lindane: 0.01 ug/l;

(XI) Methoxychlor: 0.03 ug/l;

(XII) Mirex: 0.001 ug/l;

(XIII) Parathion: 0.013 ug/l;

(XIV) Toxaphene: 0.0002 ug/l;

(xiii) Polychlorinated biphenyls: 0.001 ug/l;

(xiv) Selenium: 5 ug/l;

(xv) Toluene: 11 ug/l or 0.36 ug/l in trout waters;

(xvi) Trialkyltin compounds: 0.008 ug/l expressed as tributyltin.

(4) Action Levels for Toxic Substances: if the Action Levels for any of the substances listed in this Subparagraph (which are generally not bioaccumulative and have variable toxicity to aquatic life because of chemical form, solubility, stream characteristics or associated waste characteristics) are determined by the waste load allocation to be exceeded in a receiving water by a discharge under the specified low flow criterion for toxic substances (Rule .0206 in this Section), the discharger will be required to monitor the chemical or biological effects of the discharge; efforts shall be made by all dischargers to reduce or eliminate these substances from their effluents. Those substances for which Action Levels are listed in this Subparagraph will be limited as appropriate in the NPDES permit based on the Action Levels listed in this Subparagraph if sufficient information (to be determined for metals by measurements of that portion of the dissolved instream concentration of the Action Level parameter attributable to a specific NPDES permitted discharge) exists to indicate that any of those substances may be a significant causative factor resulting in toxicity of the effluent:

(A) Copper: 7 ug/l;

(B) Iron: 1.0 mg/l;

(C) Silver: 0.06 ug/l;

(D) Zinc: 50 ug/l;

(E) Chloride: 230 mg/l;

(F) Chlorine, total residual: 17 ug/l in all waters except trout waters (Tr); [a standard of 17 ug/l exists for waters classified as trout waters and is applicable as such to all dischargers to trout waters; see Subparagraph (b)(3)(L)(iv) of this Rule];

For purposes other than consideration of NPDES permitting of point source discharges as described in this Subparagraph, the Action Levels in this Rule, as measured by an appropriate analytical technique, will be considered as numerical ambient water quality standards.

(c) Class WS-I Waters.

(1) Best Usage of Waters. Source of water supply for drinking, culinary, or food-processing purposes for those users desiring maximum protection of their water supplies, and any best usage specified for Class C waters;

(2) Conditions Related to the Best Usage. Waters of this class are protected water supplies within essentially natural and undeveloped watersheds with no permitted point source dischargers except those specified in Rule .0104 of this Subchapter; waters within this class must be relatively unimpacted by nonpoint sources of pollution; land use management programs are required to protect waters from nonpoint source pollution; the waters, following treatment required by the Division of Environmental Health, will meet the Maximum Contaminant Level concentrations considered safe for drinking, culinary, and food-processing purposes which are specified in the national drinking water regulations and in the North Carolina Rules Governing Public Water Supplies, 15A NCAC 18C .1500; sources of water pollution which preclude any of these uses on either a short-term or long-term basis will be considered to be violating a water quality standard. The Class WS-I classification may be used to protect portions of Class WS-II, WS-III and WS-IV water supplies. For reclassifications occurring after the July 1, 1992 statewide reclassification, the more protective classification requested by local governments will be considered by the Commission when all local governments having jurisdiction in the affected area(s) have adopted a resolution and effective appropriate ordinances to protect the watershed or the Commission acts to protect a watershed when one or more local governments has failed to adopt necessary protection measures.

(3) Quality Standards Applicable to Class WS-I Waters:

(A) Nonpoint Source Pollution: none that would adversely impact the waters for use as a water supply or any other designated use;

(B) Organisms of coliform group: total coliforms not to exceed 50/100 ml (MF count) as a monthly geometric mean value in watersheds serving as unfiltered water supplies;

(C) Phenolic compounds: not greater than 1.0 ug/l (phenols) to protect water supplies from taste and odor problems from chlorinated phenols;

(D) Sewage, industrial wastes: none except those specified in Subparagraph (2) of this Paragraph: or Rule .0104 of this Subchapter;

(E) Solids, total dissolved: not greater than 500 mg/l;

(F) Total hardness: not greater than 100 mg/l as calcium carbonate;

(G) Toxic and other deleterious substances:

(i) Water quality standards (maximum permissible concentrations) to protect human health through water consumption and fish tissue consumption for non-carcinogens in Class WS-I waters:

(I) Barium: 1.0 mg/l;

(II) Chloride: 250 mg/l;

(III) Manganese: 200 ug/l;

(IV) Nickel: 25 ug/l;

(V) Nitrate nitrogen: 10.0 mg/l;

(VI) 2,4-D: 100 ug/l;

(VII) 2,4,5-TP (Silvex): 10 ug/l;

(VIII) Sulfates: 250 mg/l;

(ii) Water quality standards (maximum permissible concentrations) to protect human health through water consumption and fish tissue consumption for carcinogens in Class WS-I waters:

(I) Beryllium: 6.8 ng/l;

(II) Benzene: 1.19 ug/l;

(III) Carbon tetrachloride: 0.254 ug/l;
(IV) Chlorinated benzenes: 488 ug/l;
(V) Dioxin: 0.000013 ng/l;
(VI) Hexachlorobutadiene: 0.445 ug/l;
(VII) Polynuclear aromatic hydrocarbons: 2.8 ng/l;
(VIII) Tetrachloroethane (1,1,2,2): 0.172 ug/l;
(IX) Tetrachloroethylene: 0.8 ug/l;
(X) Trichloroethylene: 3.08 ug/l;
(XI) Vinyl Chloride: 2 ug/l;
(XII) Aldrin: 0.127 ng/l;
(XIII) Chlordane: 0.575 ng/l;
(XIV) DDT: 0.588 ng/l;
(XV) Dieldrin: 0.135 ng/l;
(XVI) Heptachlor: 0.208 ng/l.

(d) Class WS-II Waters.

(1) Best Usage of Waters. Source of water supply for drinking, culinary, or food-processing purposes for those users desiring maximum protection for their water supplies where a WS-I classification is not feasible and any best usage specified for Class C waters.

(2) Conditions Related to Best Usage. Waters of this class are protected as water supplies which are generally in predominantly undeveloped watersheds; discharges which qualify for a General Permit pursuant to 15A NCAC 2H .0127, trout farm discharges, recycle (closed loop) systems that only discharge in response to 10-year storm events and other stormwater discharges are allowed in the entire watershed; new domestic and industrial discharges of treated wastewater are not allowed in the entire watershed; the waters, following treatment required by the Division of Environmental Health, will meet the Maximum Contaminant Level concentrations considered safe for drinking, culinary, and food-processing purposes which are specified in the national drinking water regulations and in the North Carolina Rules Governing Public Water Supplies, 15A NCAC 18C .1500; sources of water pollution which preclude any of these uses on either a short-term or long-term basis will be considered to be violating a water quality standard. The Class WS-II classification may be used to protect portions of Class WS-III and WS-IV water supplies. For reclassifications occurring after the July 1, 1992 statewide reclassification, the more protective classification requested by local governments will be considered by the Commission when all local governments having jurisdiction in the affected area(s) have adopted a resolution and effective appropriate ordinances to protect the watershed or the Commission acts to protect a watershed when one or more local governments has failed to adopt necessary protection measures.

(3) Quality Standards Applicable to Class WS-II Waters:

(A) Sewage, industrial wastes, non-process industrial wastes, or other wastes: none except for those specified in either Subparagraph (2) of this Paragraph and Rule .0104 of this Subchapter; and none which will have an adverse effect on human health or which are not effectively treated to the satisfaction of the Commission and in accordance with the requirements of the Division of Environmental Health, North Carolina Department of Environment, Health, and Natural Resources; any discharger may be required upon request by the Commission to disclose all chemical constituents present or potentially present in their wastes and chemicals which could be spilled or be present in runoff from their facility which may have an adverse impact on downstream water quality; these facilities may be required to have spill and treatment failure control plans as well as perform special monitoring for toxic substances;

(B) Nonpoint Source and Stormwater Pollution: none that would adversely impact the waters for use as a water supply or any other designated use;

(i) Nonpoint Source and Stormwater Pollution Control Criteria For Entire Watershed:

(I) Low Density Option: Development density must be limited to either no more than one dwelling unit per acre or 12 percent built-upon area in the watershed outside of the critical area;

(II) High Density Option: If new development exceeds either one dwelling unit per acre or 12 percent built-upon area, then engineered stormwater controls must be used to control runoff from the first inch of rainfall; new development not to exceed 30 percent built-upon

area:

(III) Land within the watershed will be deemed compliant with the density requirements if the following two conditions are met: The density of all existing development at the time of reclassification meets the density requirement when densities are averaged throughout the entire watershed area at the time of classification; All new development meets this density requirement on a project-by-project basis:

(IV) Clustering of development is allowed on a project-by-project basis as follows: Overall density of the project meets associated density or stormwater control requirements; Built-upon areas shall be designed and sited to minimize stormwater runoff impact to the receiving waters and minimize concentrated stormwater flow; Remainder of tract to remain in vegetated or natural state;

(V) A maximum of five percent of each jurisdiction's portion of the watershed outside of the critical area as delineated on July 1, 1993 may be developed with new non-residential development projects of up to 70 percent built-upon surface area in addition to the new non-residential development approved in compliance with the appropriate requirements of Subparagraphs (d)(3)(B)(i)(I) or (d)(3)(B)(i)(II) of this Paragraph. The Commission may allow 70 percent built-upon area on greater than five percent but not to exceed 10 percent of each jurisdiction's portion of the designated watershed outside of the critical area for new non-residential development. Each project must to the maximum extent practicable minimize built-upon surface area, direct stormwater runoff away from surface waters and incorporate best management practices to minimize water quality impacts: if the local government opts for high density development then appropriate engineered stormwater controls (wet detention basins) must be employed for the new non-residential development which exceeds the low density requirements;

(VI) If local governments choose the high density development option which requires stormwater controls, then they will assume ultimate responsibility for operation and maintenance of the required controls as outlined in Rule .0104(f) of this Subchapter;

(VII) Minimum 100 foot vegetative buffer is required for all new development activities that exceed the low density option requirements as specified in Subparagraphs (d)(3)(B)(i)(I) or (d)(3)(B)(ii)(II) of this Paragraph; otherwise a minimum 30 foot vegetative buffer for development activities is required along all perennial waters indicated on the most recent versions of U.S.G.S. 1:24,000 (7.5 minute) scale topographic maps or as determined by local government studies; nothing in this Section shall stand as a bar to desirable artificial streambank or shoreline stabilization:

(VIII) No new development is allowed in the buffer: water dependent structures, and public projects such as road crossings and greenways may be allowed where no practicable alternative exists; these activities shall minimize built-upon surface area, direct runoff away from the surface waters and maximize the utilization of BMPs:

(IX) Maintain inventory of all hazardous materials used and stored in the watershed; spill/failure containment plan and appropriate safeguards against contamination are required; waste minimization and appropriate recycling of materials is encouraged;

(X) No new discharging landfills are allowed;

(ii) Critical Area Nonpoint Source and Stormwater Pollution Control Criteria:

(I) New industrial development is required to incorporate adequately designed, constructed and maintained spill containment structures if hazardous materials [as defined by 15A NCAC 2B .0202] are either used, stored or manufactured on the premises;

(II) Low Density Option: New development is limited to either no more than one dwelling unit per two acres or six percent built-upon area;

(III) High Density Option: If new development density exceeds either one dwelling unit per two acres or six percent built-upon area, then engineered stormwater controls must be used to control runoff from the first inch of rainfall; development density not to exceed 24 percent built-upon area;

(IV) No new permitted sites for land application of sludge/residuals or petroleum contaminated soils are allowed;

(V) No new landfills are allowed;

(C) Odor producing substances contained in sewage or other wastes: only such amounts, whether alone or in combination with other substances or wastes, as will not cause: taste and odor difficulties in water supplies which cannot be corrected by treatment, impair the palatability of fish, or have a deleterious effect upon any best usage established for waters of this class;

(D) Phenolic compounds: not greater than 1.0 ug/l (phenols) to protect water supplies from taste and odor problems from chlorinated phenols;

(E) Total hardness: not greater than 100 mg/l as calcium carbonate;

(F) Total dissolved solids: not greater than 500 mg/l;

(G) Toxic and other deleterious substances:

(i) Water quality standards (maximum permissible concentrations) to protect human health through water consumption and fish tissue consumption for non-carcinogens in Class WS-II waters:

(I) Barium: 1.0 mg/l;
(II) Chloride: 250 mg/l;
(III) Manganese: 200 ug/l;
(IV) Nickel: 25 ug/l;
(V) Nitrate nitrogen: 10 mg/l;
(VI) 2,4-D: 100 ug/l;
(VII) 2,4,5-TP: 10 ug/l;
(VIII) Sulfates: 250 mg/l;

(ii) Water quality standards (maximum permissible concentrations) to protect human health through water consumption and fish tissue consumption for carcinogens in Class WS-II waters:

(I) Beryllium: 6.8 ng/l;
(II) Benzene: 1.19 ug/l;
(III) Carbon tetrachloride: 0.254 ug/l;
(IV) Chlorinated benzenes: 488 ug/l;
(V) Dioxin: 0.000013 ng/l;
(VI) Hexachlorobutadiene: 0.445 ug/l;
(VII) Polynuclear aromatic hydrocarbons: 2.8 ng/l;
(VIII) Tetrachloroethane (1,1,2,2): 0.172 ug/l;
(IX) Tetrachloroethylene: 0.8 ug/l;
(X) Trichloroethylene: 3.08 ug/l;
(XI) Vinyl Chloride: 2 ug/l;
(XII) Aldrin: 0.127 ng/l;
(XIII) Chlordane: 0.575 ng/l;
(XIV) DDT: 0.588 ng/l;
(XV) Dieldrin: 0.135 ng/l;
(XVI) Heptachlor: 0.208 ng/l;

(e) Class WS-III Waters.

(1) Best Usage of Waters. Source of water supply for drinking, culinary, or food-processing purposes for those users where a more protective WS-I or WS-II classification is not feasible and any other best usage specified for Class C waters;

(2) Conditions Related to Best Usage. Waters of this class are protected as water supplies which are generally in low to moderately developed watersheds; discharges that qualify for a General Permit pursuant to 15A NCAC 2H .0127, trout farm discharges, recycle (closed loop) systems that only discharge in response to 10-year storm events, and other stormwater discharges are allowed in the entire watershed; treated domestic wastewater discharges are allowed in the critical area; no new industrial wastewater discharges except non-process industrial discharges are allowed in the entire watershed; the waters, following treatment required by the Division of Environmental Health, will meet the Maximum Contaminant Level concentrations considered safe for drinking, culinary, or food-processing purposes which are specified in the national drinking water regulations and in the North Carolina Rules Governing Public Water Supplies, 15A NCAC 18C .1500; sources of water pollution which preclude any of these uses on either a short-term or long-term basis will be considered to be violating a water quality standard; the Class WS-III classification may be used to

protect portions of Class WS-IV water supplies. For reclassifications occurring after the July 1, 1992 statewide reclassification, the more protective classification requested by local governments will be considered by the Commission when all local governments having jurisdiction in the affected area(s) have adopted a resolution and effective appropriate ordinances to protect the watershed or the Commission acts to protect a watershed when one or more local governments has failed to adopt necessary protection measures.

(3) Quality Standards Applicable to Class WS-III Waters:

(A) Sewage, industrial wastes, non-process industrial wastes, or other wastes: none except for those specified in Subparagraph (2) of this Paragraph and Rule .0104 of this Subchapter; and none which will have an adverse effect on human health or which are not effectively treated to the satisfaction of the Commission and in accordance with the requirements of the Division of Environmental Health, North Carolina Department of Environment, Health, and Natural Resources; any discharger may be required by the Commission to disclose all chemical constituents present or potentially present in their wastes and chemicals which could be spilled or be present in runoff from their facility which may have an adverse impact on downstream water quality; these facilities may be required to have spill and treatment failure control plans as well as perform special monitoring for toxic substances;

(B) Nonpoint Source and Stormwater Pollution: none that would adversely impact the waters for use as water supply or any other designated use;

(i) Nonpoint Source and Stormwater Pollution Control Criteria For Entire Watershed:

(I) Low Density Option: Development density must be limited to either no more than two dwelling units per acre or 24 percent built-upon on area in watershed outside of the critical area;

(II) High Density Option: If new development density exceeds two dwelling units per acre or 24 percent built-upon area then development must control runoff from the first inch of rainfall; new development not to exceed 50 percent built-upon area:

(III) Land within the watershed will be deemed compliant with the density requirements if the following two conditions are met: The density of all existing development at the time of reclassification meets the density requirement when densities are averaged throughout the entire watershed area: All new development meets these density requirements on a project-by-project basis;

(IV) Clustering of development is allowed on a project-by-project basis as follows: Overall density of the project meets associated density or stormwater control requirements: Built-upon areas are designed and sited to minimize stormwater runoff impact to the receiving waters and minimizes concentrated stormwater flow; Remainder of tract to remain in vegetated or natural state;

(V) A maximum of five percent of each jurisdiction's portion of the watershed outside of the critical area as delineated on July 1, 1993 may be developed with new non-residential development projects of up to 70 percent built-upon surface area in addition to the new non-residential development approved in compliance with the appropriate requirements of Subparagraphs (e)(3)(B)(i)(I) or (e)(3)(B)(i)(II) of this Paragraph. The Commission may allow 70 percent built-upon area on greater than five percent but not to exceed 10 percent of each jurisdiction's portion of the designated watershed outside of the critical area for new non-residential development. Each project must to the maximum extent practicable minimize built-upon surface area, direct stormwater runoff away from surface waters, and incorporate best management practices to minimize water quality impacts; if the local government opts for high density development then appropriate engineered stormwater controls (wet detention basins) must be employed for the new non-residential development which exceeds the low density requirements;

(VI) If local governments choose the high density development option which requires engineered stormwater controls, then they will assume ultimate responsibility for operation and maintenance of the required controls as outlined in Rule .0104(f) of this Subchapter;

(VII) Minimum 100 foot vegetative buffer is required for all new development activities that exceed the low density requirements as specified in Subparagraphs (e)(3)(B)(i)(I) or (e)(3)(B)(ii)(II) of this Paragraph, otherwise a minimum 30 foot vegetative buffer for

development is required along all perennial waters indicated on the most recent versions of U.S.G.S. 1:24,000 (7.5 minute) scale topographic maps or as determined by local government studies; nothing in this Section shall stand as a bar to desirable artificial streambank or shoreline stabilization;

(VIII) No new development is allowed in the buffer; water dependent structures, and public projects such as road crossings and greenways may be allowed where no practicable alternative exists; these activities shall minimize built-upon surface area, divert runoff away from surface waters and maximize the utilization of BMPs;

(IX) Maintain inventory of all hazardous materials used and stored in the watershed; spill/failure containment plan and appropriate safeguards against contamination are required; waste minimization and appropriate recycling of materials is encouraged;

(X) No new discharging landfills are allowed;

(ii) Critical Area Nonpoint Source and Stormwater Pollution Control Criteria:

(I) New industrial development is required to incorporate adequately designed, constructed and maintained spill containment structures if hazardous materials are either used, stored or manufactured on the premises;

(II) Low Density Option: New development limited to one dwelling unit per acre or 12 percent built-upon area;

(III) High Density Option: If new development exceeds either one dwelling unit per acre or 12 percent built-upon area then engineered stormwater controls must be used to control runoff from the first inch of rainfall; development not to exceed 30 percent built-upon area;

(IV) No new permitted sites for land application of sludge/residuals or petroleum contaminated soils are allowed;

(V) No new landfills are allowed;

(C) Odor producing substances contained in sewage, industrial wastes, or other wastes: only such amounts, whether alone or in combination with other substances or wastes, as will not cause taste and odor difficulties in water supplies which cannot be corrected by treatment, impair the palatability of fish, or have a deleterious effect upon any best usage established for waters of this class;

(D) Phenolic compounds: not greater than 1.0 ug/l (phenols) to protect water supplies from taste and odor problems from chlorinated phenols;

(E) Total hardness: not greater than 100 mg/l as calcium carbonate;

(F) Total dissolved solids: not greater than 500 mg/l;

(G) Toxic and other deleterious substances:

(i) Water quality standards (maximum permissible concentrations) to protect human health through water consumption and fish tissue consumption for non-carcinogens in Class WS-III waters:

(I) Barium: 1.0 mg/l;

(II) Chloride: 250 mg/l;

(III) Manganese: 200 ug/l;

(IV) Nickel: 25 ug/l;

(V) Nitrate nitrogen: 10 mg/l;

(VI) 2,4-D: 100 ug/l;

(VII) 2,4,5-TP (Silvex): 10 ug/l;

(VIII) Sulfates: 250 mg/l;

(ii) Water quality standards (maximum permissible concentrations) to protect human health through water consumption and fish tissue consumption for carcinogens in Class WS-III waters:

(I) Beryllium: 6.8 ng/l;

(II) Benzene: 1.19 ug/l;

(III) Carbon tetrachloride: 0.254 ug/l;

(IV) Chlorinated benzenes: 488 ug/l;

(V) Dioxin: 0.000013 ng/l;

(VI) Hexachlorobutadiene: 0.445 ug/l;

(VII) Polynuclear aromatic hydrocarbons: 2.8 ng/l;
(VIII) Tetrachloroethane (1,1,2,2): 0.172 ug/l;
(IX) Tetrachloroethylene: 0.8 ug/l;
(X) Trichloroethylene: 3.08 ug/l;
(XI) Vinyl Chloride: 2 ug/l;
(XII) Aldrin: 0.127 ng/l;
(XIII) Chlordane: 0.575 ng/l;
(XIV) DDT: 0.588 ng/l;
(XV) Dieldrin: 0.135 ng/l;
(XVI) Heptachlor: 0.208 ng/l;

(f) Class WS-IV Waters.

(1) Best Usage of Waters. Source of water supply for drinking, culinary, or food-processing purposes for those users where a more protective WS-I, WS-II or WS-III classification is not feasible and any other best usage specified for Class C waters;

(2) Conditions Related to Best Usage. Waters of this class are protected as water supplies which are generally in moderately to highly developed watersheds or protected areas; discharges which qualify for a General Permit pursuant to 15A NCAC 2H .0127, trout farm discharges, recycle (closed loop) systems that only discharge in response to 10-year storm events, other stormwater discharges and domestic wastewater discharges are allowed in the protected and critical areas; treated industrial wastewater discharges are allowed in the protected and critical areas; however, new industrial wastewater discharges in the critical area are required to meet the provisions of 15A NCAC 2B .0201(d)(1)(B)(iv), (v) and (vii), and 15A NCAC 2B .0203; new industrial connections and expansions to existing municipal discharges with a pretreatment program pursuant to 15A NCAC 2H .0904 are allowed; the waters, following treatment required by the Division of Environmental Health, will meet the Maximum Contaminant Level concentrations considered safe for drinking, culinary, or food-processing purposes which are specified in the national drinking water regulations and in the North Carolina Rules Governing Public Water Supplies, 15A NCAC 18C .1500; sources of water pollution which preclude any of these uses on either a short-term or long-term basis will be considered to be violating a water quality standard;

(3) Quality Standards Applicable to Class WS-IV Waters:

(A) Sewage, industrial wastes, non-process industrial wastes, or other wastes: none except for those specified in Subparagraph (2) of this Paragraph and Rule .0104 of this Subchapter; and none which will have an adverse effect on human health or which are not effectively treated to the satisfaction of the Commission and in accordance with the requirements of the Division of Environmental Health, North Carolina Department of Environment, Health, and Natural Resources; any discharges or industrial users subject to pretreatment standards may be required by the Commission to disclose all chemical constituents present or potentially present in their wastes and chemicals which could be spilled or be present in runoff from their facility which may have an adverse impact on downstream water supplies; these facilities may be required to have spill and treatment failure control plans as well as perform special monitoring for toxic substances;

(B) Nonpoint Source and Stormwater Pollution: none that would adversely impact the waters for use as water supply or any other designated use;

(i) Nonpoint Source and Stormwater Pollution Control Criteria For Entire Watershed or Protected Area:

(I) Low Density Option: Development activities which require a Sedimentation/Erosion Control Plan in accordance with 15A NCAC 4 established by the North Carolina Sedimentation Control Commission or approved local government programs as delegated by the Sedimentation Control Commission must be limited to no more than either: two dwelling units per acre or 24 percent built-upon on area; or three dwelling units per acre or 36 percent built-upon area for projects without curb and gutter street system in the protected area outside of critical area;

(II) High Density Option: If new development activities which require a Sedimentation/Erosion Control Plan exceed the requirements of Subparagraphs (f)(3)(B)(i)(I) of this Rule then development must control the runoff from the first inch of

rainfall; new development not to exceed 70 percent built-upon area;

(III) Land within the critical and protected area will be deemed compliant with the density requirements if the following two conditions are met: The density of all existing development at the time of reclassification meets the density requirement when densities are averaged throughout the entire area; All new development meets these density requirements on a project-by-project basis;

(IV) Clustering of development is allowed on a project-by-project basis as follows: Overall density of the project meets associated density or stormwater control requirements; Built-upon areas are designed and sited to minimize stormwater runoff impact to the receiving waters and minimizes concentrated stormwater flow; Remainder of tract to remain in vegetated or natural state;

(V) If local governments choose the high density development option which requires engineered stormwater controls, then they will assume ultimate responsibility for operation and maintenance of the required controls as outlined in Rule .0104(f) of this Subchapter;

(VI) Minimum 100 foot vegetative buffer is required for all new development activities that exceed the low density option requirements as specified in Subparagraphs (f)(3)(B)(i)(I) or (f)(3)(B)(ii)(I) of this Paragraph, otherwise a minimum 30 foot vegetative buffer for development is required along all perennial waters indicated on the most recent versions of U.S.G.S. 1:24,000 (7.5 minute) scale topographic maps or as determined by local government studies; nothing in this Section shall stand as a bar to desirable artificial streambank shoreline stabilization;

(VII) No new development is allowed in the buffer; water dependent structures, and public projects such as road crossings and greenways may be allowed where no practicable alternative exists; these activities shall minimize built-upon surface area, divert runoff away from surface waters and maximize the utilization of BMPs;

(VIII) Maintain inventory of all hazardous materials used and stored in the watershed or protected area; spill/failure containment plan and appropriate safeguards against contamination are required; waste minimization and appropriate recycling of materials is encouraged;

(ii) Critical Area Nonpoint Source and Stormwater Pollution Control Criteria:

(I) Low Density Option: New development activities which require a Sedimentation/Erosion Control Plan in accordance with 15A NCAC 4 established by the North Carolina Sedimentation Control Commission or approved local government programs as delegated by the Sedimentation Control Commission must be limited to no more than two dwelling units per acre or 24 percent built-upon area;

(II) High Density Option: If new development density exceeds either two dwelling units per acre or 24 percent built-upon area then engineered stormwater controls must be used to control runoff from the first inch of rainfall; new development not to exceed 50 percent built-upon area;

(III) No new permitted sites for land application of sludge/residuals or petroleum contaminated soils are allowed;

(IV) No new landfills are allowed;

(C) Odor producing substances contained in sewage, industrial wastes, or other wastes: only such amounts, whether alone or in combination with other substances or waste, as will not cause taste and odor difficulties in water supplies which can not be corrected by treatment, impair the palatability of fish, or have a deleterious effect upon any best usage established for waters of this class;

(D) Phenolic compounds: not greater than 1.0 ug/l (phenols) to protect water supplies from taste and odor problems due to chlorinated phenols; specific phenolic compounds may be given a different limit if it is demonstrated not to cause taste and odor problems and not to be detrimental to other best usage;

(E) Total hardness: not greater than 100 mg/l as calcium carbonate;

(F) Total dissolved solids: not greater than 500 mg/l;

(G) Toxic and other deleterious substances:

(i) Water quality standards (maximum permissible concentrations) to protect human health

through water consumption and fish tissue consumption for non-carcinogens in Class WS-IV waters:

(I) Barium: 1.0 mg/l;
(II) Chloride: 250 mg/l;
(III) Manganese: 200 ug/l;
(IV) Nickel: 25 ug/l;
(V) Nitrate nitrogen: 10.0 mg/l;
(VI) 2,4-D: 100 ug/l;
(VII) 2,4,5-TP (Silvex): 10 ug/l;
(VIII) Sulfates: 250 mg/l;

(ii) Water quality standards (maximum permissible concentrations) to protect human health through water consumption and fish tissue consumption for carcinogens in Class WS-IV waters:

(I) Beryllium: 6.8 ng/l;
(II) Benzene: 1.19 ug/l;
(III) Carbon tetrachloride: 0.254 ug/l;
(IV) Chlorinated benzenes: 488 ug/l;
(V) Dioxin: 0.000013 ng/l;
(VI) Hexachlorobutadiene: 0.445 ug/l;
(VII) Polynuclear aromatic hydrocarbons: 2.8 ng/l;
(VIII) Tetrachloroethane (1,1,2,2): 0.172 ug/l;
(IX) Tetrachloroethylene: 0.8 ug/l;
(X) Trichloroethylene: 3.08 ug/l;
(XI) Vinyl Chloride: 2 ug/l;
(XII) Aldrin: 0.127 ng/l;
(XIII) Chlordane: 0.575 ng/l;
(XIV) DDT: 0.588 ng/l;
(XV) Dieldrin: 0.135 ng/l;
(XVI) Heptachlor: 0.208 ng/l;

(g) Class WS-V Waters.

(1) Best Usage of Waters. Waters protected as water supplies which are generally upstream and draining to Class WS-IV waters or waters previously used for drinking water supply purposes; no categorical restrictions on watershed development or wastewater discharges are required, however, the Commission or its designee may apply appropriate management requirements as deemed necessary for the protection of waters downstream of receiving waters (15A NCAC 2B .0203); suitable for all Class C uses;

(2) Conditions Related to Best Usage. Waters of this class are protected water supplies; the waters, following treatment required by the Division of Environmental Health, will meet the Maximum Contaminant Level concentrations considered safe for drinking, culinary, or food-processing purposes which are specified in the national drinking water regulations and in the North Carolina Rules Governing Public Water Supplies, 15A NCAC 18C .1500; sources of water pollution which preclude any of these uses on either a short-term or long-term basis will be considered to be violating a water quality standard;

(3) Quality Standards Applicable to Class WS-V Waters:

(A) Sewage, industrial wastes, non-process industrial wastes, or other wastes: none which will have an adverse effect on human health or which are not effectively treated to the satisfaction of the Commission and in accordance with the requirements of the Division of Environmental Health, North Carolina Department of Environment, Health, and Natural Resources; any discharges or industrial users subject to pretreatment standards may be required by the Commission to disclose all chemical constituents present or potentially present in their wastes and chemicals which could be spilled or be present in runoff from their facility which may have an adverse impact on downstream water supplies; these facilities may be required to have spill and treatment failure control plans as well as perform special monitoring for toxic substances;

(B) Nonpoint Source and Stormwater Pollution: none that would adversely impact the waters for use as water supply or any other designated use;

(C) Odor producing substances contained in sewage, industrial wastes, or other wastes: only such amounts, whether alone or in combination with other substances or waste, as will not cause taste and odor difficulties in water supplies which can not be corrected by treatment, impair the palatability of fish, or have a deleterious effect upon any best usage established for waters of this class;

(D) Phenolic compounds: not greater than 1.0 ug/l (phenols) to protect water supplies from taste and odor problems due to chlorinated phenols; specific phenolic compounds may be given a different limit if it is demonstrated not to cause taste and odor problems and not to be detrimental to other best usage;

(E) Total hardness: not greater than 100 mg/l as calcium carbonate;

(F) Total dissolved solids: not greater than 500 mg/l;

(G) Toxic and other deleterious substances:

(i) Water quality standards (maximum permissible concentrations) to protect human health through water consumption and fish tissue consumption for non-carcinogens in Class WS-V waters:

(I) Barium: 1.0 mg/l;
(II) Chloride: 250 mg/l;
(III) Manganese: 200 ug/l;
(IV) Nickel: 25 ug/l;
(V) Nitrate nitrogen: 10.0 mg/l;
(VI) 2,4-D: 100 ug/l;
(VII) 2,4,5-TP (Silvex): 10 ug/l;
(VIII) Sulfates: 250 mg/l.

(ii) Water quality standards (maximum permissible concentrations) to protect human health through water consumption and fish tissue consumption for carcinogens in Class WS-V waters:

(I) Beryllium: 6.8 ng/l;
(II) Benzene: 1.19 ug/l;
(III) Carbon tetrachloride: 0.254 ug/l;
(IV) Chlorinated benzenes: 488 ug/l;
(V) Dioxin: 0.000013 ng/l;
(VI) Hexachlorobutadiene: 0.445 ug/l;
(VII) Polynuclear aromatic hydrocarbons: 2.8 ng/l;
(VIII) Tetrachloroethane (1,1,2,2): 0.172 ug/l;
(IX) Tetrachloroethylene: 0.8 ug/l;
(X) Trichloroethylene: 3.08 ug/l;
(XI) Vinyl Chloride: 2 ug/l;
(XII) Aldrin: 0.127 ng/l;
(XIII) Chlordane: 0.575 ng/l;
(XIV) DDT: 0.588 ng/l;
(XV) Dieldrin: 0.135 ng/l;
(XVI) Heptachlor: 0.208 ng/l.

(h) Class B Waters.

(1) Best Usage of Waters. Primary recreation and any other best usage specified by the "C" classification;

(2) Conditions Related to Best Usage. The waters will meet accepted standards of water quality for outdoor bathing places and will be of sufficient size and depth for primary recreation purposes. Sources of water pollution which preclude any of these uses on either a short-term or long-term basis will be considered to be violating a water quality standard;

(3) Quality standards applicable to Class B waters:

(A) Sewage, industrial wastes, or other wastes: none which are not effectively treated to the satisfaction of the Commission; in determining the degree of treatment required for such waste when discharged into waters to be used for bathing, the Commission will consider the quality and quantity of the sewage and wastes involved and the proximity of such discharges to waters in this class; discharges in the immediate vicinity of bathing areas may not be allowed if the Director

determines that the waste can not be reliably treated to ensure the protection of primary recreation;

(B) Organisms of coliform group: fecal coliforms not to exceed geometric mean of 200/100 ml (MF count) based on at least five consecutive samples examined during any 30-day period and not to exceed 400/100 ml in more than 20 percent of the samples examined during such period.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;
Amended Eff. February 1, 1993; August 3, 1992; March 1, 1991; October 1, 1989.

.0212 TIDAL SALT WATER CLASSIFICATIONS AND STANDARDS

(a) General. The water quality standards for all tidal salt waters are the basic standards applicable to Class SC waters. Additional and more stringent standards applicable to other specific tidal salt water classifications are specified in Paragraphs (c) and (d) of this Rule.

(b) All tidal salt waters (Class SC).

(1) Best Usage of Waters. Aquatic life propagation and maintenance of biological integrity (including fishing, fish and functioning PNAs), wildlife, secondary recreation, and any other usage except primary recreation or shellfishing for market purposes;

(2) Conditions Related to Best Usage. The waters will be suitable for aquatic life propagation and maintenance of biological integrity, wildlife, and secondary recreation: Any source of water pollution which precludes any of these uses, including their functioning as PNAs, on either a short-term or a long-term basis will be considered to be violating a water quality standard;

(3) Quality standards applicable to all tidal salt waters:

(A) Chlorophyll a (corrected): not greater than 40 ug/l in sounds, estuaries, and other slow-moving waters; the Commission or its designee may prohibit or limit any discharge of waste into surface waters if, in the opinion of the Director, the surface waters experience or the discharge would result in growths of microscopic or macroscopic vegetation such that the standards established pursuant to this Rule would be violated or the intended best usage of the waters would be impaired.

(B) Dissolved oxygen: not less than 5.0 mg/l, except that swamp waters, poorly flushed tidally influenced streams or embayments, or estuarine bottom waters may have lower values if caused by natural conditions;

(C) Floating solids; settleable solids; sludge deposits: only such amounts attributable to sewage, industrial wastes or other wastes, as will not make the waters unsafe or unsuitable for aquatic life and wildlife, or impair the waters for any designated uses;

(D) Gases, total dissolved: not greater than 110 percent of saturation;

(E) Organisms of coliform group: fecal coliforms not to exceed geometric mean of 200/100 ml (MF count) based upon at least five consecutive samples examined during any 30 day period; not to exceed 400/100 ml in more than 20 percent of the samples examined during such period; violations of the fecal coliform standard are expected during rainfall events and, in some cases, this violation is expected to be caused by uncontrollable nonpoint source pollution; all coliform concentrations are to be analyzed using the MF technique unless high turbidity or other adverse conditions necessitate the tube dilution method; in case of controversy over results the MPN 5-tube dilution method will be used as the referee method;

(F) Oils; deleterious substances; colored or other wastes: only such amounts as will not render the waters injurious to public health, secondary recreation or to aquatic life and wildlife or adversely affect the palatability of fish, aesthetic quality or impair the waters for any designated uses; for the purpose of implementing this Rule, oils, deleterious substances, colored or other wastes will include but not be limited to substances that cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines pursuant to 40 CFR 110.4(a)-(b).

(G) pH: will be normal for the waters in the area, which generally will range between 6.8 and 8.5 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;

(H) Phenolic compounds: only such levels as will not result in fish-flesh tainting or impairment of other best usage;

(I) Radioactive substances:

(i) Combined radium-226 and radium-228: The maximum average annual activity level (based on at least four samples, collected quarterly) for combined radium-226, and radium-228 will not exceed five picoCuries per liter;

(ii) Alpha Emitters. The average annual gross alpha particle activity (including radium-226, but excluding radon and uranium) will not exceed 15 picoCuries per liter;

(iii) Beta Emitters. The maximum average annual activity level (based on at least four samples, collected quarterly) for strontium-90 will not exceed eight picoCuries per liter; nor shall the average annual gross beta particle activity (excluding potassium-40 and other naturally occurring radio-nuclides) exceed 50 picoCuries per liter; nor will the maximum average annual activity level for tritium exceed 20,000 picoCuries per liter;

(J) Salinity: will not be appreciably modified as a result of hydrological modifications in areas draining to PNAs; projects which are determined by the Director to result in the appreciable modification of salinity within a PNA will be required to employ appropriate water management practices;

(K) Temperature: will not be increased above the natural water temperature by more than 0.8 degrees C (1.44 degrees F) during the months of June, July, and August nor more than 2.2 degrees C (3.96 degrees F) during other months and in no cases to exceed 32 degrees C (89.6 degrees F) due to the discharge of heated liquids;

(L) Turbidity: the turbidity in the receiving water will not exceed 25 NTU; if turbidity exceeds this level due to natural background conditions, the existing turbidity level cannot be increased. Compliance with this turbidity standard can be met when land management activities employ Best Management Practices (BMPs) [as defined by Rule .0202(6) of this Section] recommended by the Designated Nonpoint Source Agency (as defined by Rule .0202 of this Section). BMPs must be in full compliance with all specifications governing the proper design, installation, operation and maintenance of such BMPs;

(M) Toxic substances: numerical water quality standards (maximum permissible levels) to protect aquatic life applicable to all tidal saltwaters:

(i) Arsenic, total recoverable: 50 ug/l;

(ii) Cadmium: 5.0 ug/l;

(iii) Chromium, total: 20 ug/l;

(iv) Cyanide: 1.0 ug/l;

(v) Mercury: 0.025 ug/l;

(vi) Lead, total recoverable: 25 ug/l; collection of data on sources, transport and fate of lead will be required as part of the toxicity reduction evaluation for dischargers that are out of compliance with whole effluent toxicity testing requirements and the concentration of lead in the effluent is concomitantly determined to exceed an instream level of 3.1 ug/l from the discharge;

(vii) Nickel: 8.3 ug/l;

(viii) Pesticides:

(I) Aldrin: 0.003 ug/l;

(II) Chlordane: 0.004 ug/l;

(III) DDT: 0.001 ug/l;

(IV) Demeton: 0.1 ug/l;

(V) Dieldrin: 0.002 ug/l;

(VI) Endosulfan: 0.009 ug/l;

(VII) Endrin: 0.002 ug/l;

(VIII) Guthion: 0.01 ug/l;

(IX) Heptachlor: 0.004 ug/l;

(X) Lindane: 0.004 ug/l;

(XI) Methoxychlor: 0.03 ug/l;

(XII) Mirex: 0.001 ug/l;

(XIII) Parathion: 0.178 ug/l;

(XIV) Toxaphene: 0.0002 ug/l.

(ix) Polycholorinated biphenyls: 0.001 ug/l;

(x) Selenium: 71 ug/l;

(xi) Trialkyltin compounds: 0.002 ug/l expressed as tributyltin.

(4) Action Levels for Toxic Substances: if the Action Levels for any of the substances listed in this Subparagraph (which are generally not bioaccumulative and have variable toxicity to aquatic life because of chemical form, solubility, stream characteristics or associated waste characteristics) are determined by the waste load allocation to be exceeded in a receiving water by a discharge under the specified low flow criterion for toxic substances (Rule .0206 in this Section), the discharger will be required to monitor the chemical or biological effects of the discharge: efforts shall be made by all dischargers to reduce or eliminate these substances from their effluents. Those substances for which Action Levels are listed in this Subparagraph may be limited as appropriate in the NPDES permit if sufficient information exists to indicate that any of those substances may be a significant causative factor resulting in toxicity of the effluent.

(A) Copper: 3 ug/l;

(B) Silver: 0.1 ug/l;

(C) Zinc: 86 ug/l.

(c) Class SA Waters.

(1) Best Usage of Waters. Shellfishing for market purposes and any other usage specified by the "SB" or "SC" classification;

(2) Conditions Related to Best Usage. Waters will meet the current sanitary and bacteriological standards as adopted by the Commission for Health Services and will be suitable for shellfish culture; any source of water pollution which precludes any of these uses, including their functioning as PNAs, on either a short-term or a long-term basis will be considered to be violating a water quality standard;

(3) Quality Standards applicable to Class SA Waters:

(A) Floating solids; settleable solids; sludge deposits: none attributable to sewage, industrial wastes or other wastes;

(B) Sewage: none;

(C) Industrial wastes, or other wastes: none which are not effectively treated to the satisfaction of the Commission in accordance with the requirements of the Division of Health Services;

(D) Organisms of coliform group: fecal coliform group not to exceed a median MF of 14/100 ml and not more than 10 percent of the samples shall exceed an MF count of 43/100 ml in those areas most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions.

(d) Class SB Waters.

(1) Best Usage of Waters. Primary recreation and any other usage specified by the "SC" classification;

(2) Conditions Related to Best Usage. The waters will meet accepted sanitary standards of water quality for outdoor bathing places and will be of sufficient size and depth for primary recreation purposes; any source of water pollution which precludes any of these uses, including their functioning as PNAs, on either a short-term or a long-term basis will be considered to be violating a water quality standard;

(3) Quality Standards applicable to Class SB waters:

(A) Floating solids; settleable solids; sludge deposits: none attributable to sewage, industrial wastes or other wastes;

(B) Sewage; industrial wastes; or other wastes: none which are not effectively treated to the satisfaction of the Commission; in determining the degree of treatment required for such waters discharged into waters which are to be used for bathing, the Commission will take into consideration quantity and quality of the sewage and other wastes involved and the proximity of such discharges to the waters in this class; discharges in the immediate vicinity of bathing areas may not be allowed if the Director determines that the waste can not be treated to ensure the protection of primary recreation;

(C) Organisms of coliform group: fecal coliforms not to exceed a geometric mean of 200/100 ml (MF count) based on at least five consecutive samples examined during any 30 day period and not to exceed 400/100 ml in more than 20 percent of the samples examined during such period.

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. February 1, 1976;

Amended Eff. February 1, 1993; March 1, 1991; October 1, 1989; January 1, 1985.

.0213 REVISIONS TO DISSOLVED OXYGEN STANDARDS

History Note: Statutory Authority G.S. 143-214.1;
Eff. December 14, 1978;
Amended Eff. July 1, 1988;
Repealed Eff. October 1, 1989.

.0214 NUTRIENT SENSITIVE WATERS

(a) In addition to existing classifications, the Commission may classify any surface waters of the state as nutrient sensitive waters (NSW) upon a finding that such waters are experiencing or are subject to excessive growths of microscopic or macroscopic vegetation. Excessive growths are growths which the Commission in its discretion finds to substantially impair the use of the water for its best usage as determined by the classification applied to such waters.

(b) NSW may include any or all waters within a particular river basin as the Commission deems necessary to effectively control excessive growths of microscopic or macroscopic vegetation.

(c) For the purpose of this Rule, the term "nutrients" shall mean phosphorous and/or nitrogen. When considering the assignment of this classification, the Commission may specify as a "nutrient" any other chemical parameter or combination of parameters which it determines to be essential for the growth of microscopic and macroscopic vegetation.

(d) Those waters additionally classified as nutrient sensitive shall be identified in the appropriate schedule of classifications as referenced in Section .0300 of this Subchapter.

(e) For the purpose of this Rule, the term "background levels" shall mean the concentration(s), taking into account seasonal variations, of the specific nutrient or nutrients upstream of a nutrient source.

(f) Quality standards applicable to NSW: no increase in nutrients over background levels unless it is shown to the satisfaction of the Director that the increase:

(1) is the result of natural variations; or

(2) will not endanger human health, safety or welfare and that preventing the increase would cause a serious economic hardship without equal or greater benefit to the public.

History Note: Statutory Authority G.S. 143-214.1;
Eff. May 10, 1979.

.0215 EFFLUENT CHANNELS

The standards of water quality contained in this Section shall not apply to waters within effluent channels, as defined in Rule .0202(15) of this Section, except that said waters shall be maintained at a quality which will prevent the occurrence of offensive conditions, protect public health, and allow maintenance of the standards applicable to all downstream waters. Effluent channels will be designated by the Director, such that the channels will:

(1) be contained entirely on property owned (or otherwise controlled) by the discharger (to be demonstrated by the discharger);

(2) not contain natural waters except when such waters occur in direct response to rainfall events by overland runoff;

(3) be so constructed or modified as to minimize the migration of fish into said channel;

(4) be identified and designated on a case-by-case basis prior to permit issuance.

History Note: Statutory Authority G.S. 143-214.1;
Eff. September 9, 1979;
Amended Eff. October 1, 1989.

.0216 OUTSTANDING RESOURCE WATERS

(a) General. In addition to the existing classifications, the Commission may classify certain unique and special surface waters of the state as outstanding resource waters (ORW) upon finding that such waters are of exceptional state or national recreational or ecological significance and that the waters have exceptional

water quality while meeting the following conditions:

(1) there are no significant impacts from pollution with the water quality rated as excellent based on physical, chemical or biological information;

(2) the characteristics which make these waters unique and special may not be protected by the assigned narrative and numerical water quality standards.

(b) Outstanding Resource Values. In order to be classified as ORW, a water body must exhibit one or more of the following values or uses to demonstrate it is of exceptional state or national recreational or ecological significance:

(1) there are outstanding fish (or commercially important aquatic species) habitat and fisheries;

(2) there is an unusually high level of water-based recreation or the potential for such recreation;

(3) the waters have already received some special designation such as a North Carolina or National Wild and Scenic River, Native or Special Native Trout Waters, National Wildlife Refuge, etc, which do not provide any water quality protection;

(4) the waters represent an important component of a state or national park or forest; or

(5) the waters are of special ecological or scientific significance such as habitat for rare or endangered species or as areas for research and education.

(c) Quality Standards for ORW.

(1) Freshwater: Water quality conditions shall clearly maintain and protect the outstanding resource values of waters classified ORW. Management strategies to protect resource values will be developed on a site specific basis during the proceedings to classify waters as ORW. At a minimum, no new discharges or expansions of existing discharges will be permitted, and stormwater controls for all new development activities requiring an Erosion and Sedimentation Control Plan in accordance with rules established by the NC Sedimentation Control Commission or an appropriate local erosion and sedimentation control program will be required to control stormwater runoff as follows:

(A) Low Density Option: Developments which limit single family developments to one acre lots and other type developments to 12 percent built-upon area, have no stormwater collection system as defined in 15A NCAC 2H .1002(13), and have built-upon areas at least 30 feet from surface water areas will be deemed to comply with this requirement, unless it is determined that additional runoff control measures are required to protect the water quality of Outstanding Resource Waters necessary to maintain existing and anticipated uses of those waters, in which case such additional stormwater runoff control measures may be required on a case-by-case basis.

(B) High Density Development: Higher density developments will be allowed if stormwater control systems utilizing wet detention ponds as described in 15A NCAC 2H .1003(i), (k) and (l) are installed, operated and maintained which control the runoff from all built-upon areas generated from one inch of rainfall, unless it is determined that additional runoff control measures are required to protect the water quality of Outstanding Resource Waters necessary to maintain existing and anticipated uses of those waters, in which case such additional stormwater runoff control measures may be required on a case-by-case basis. The size of the control system must take into account the runoff from any pervious surfaces draining to the system.

(2) Saltwater: Water quality conditions shall clearly maintain and protect the outstanding resource values of waters classified ORW. Management strategies to protect resource values will be developed on a site-specific basis during the proceedings to classify waters as ORW. At a minimum, new development will comply with the low density options as specified in the Stormwater Runoff Disposal rules [15A NCAC 2H .1003 (a)(2)] within 575 feet of the mean high water line of the designated ORW area. New non-discharge permits will be required to meet reduced loading rates and increased buffer zones, to be determined on a case-by-case basis. No dredge or fill activities will be allowed where significant shellfish or submerged aquatic vegetation bed resources occur, except for maintenance dredging, such as that required to maintain access to existing channels and facilities located within the designated areas or maintenance dredging for activities such as agriculture. A public hearing is mandatory for any proposed permits to discharge to waters classified as ORW.

Additional actions to protect resource values will be considered on a site specific basis during the proceedings to classify waters as ORW and will be specified in Paragraph (e) of this Rule. These actions may include anything within the powers of the commission. The commission will also consider local actions which have

been taken to protect a water body in determining the appropriate state protection options. Descriptions of boundaries of waters classified as ORW are included in Paragraph (e) of this Rule and in the Schedule of Classifications (15A NCAC 2B .0302 through .0317) as specified for the appropriate river basin and will also be described on maps maintained by the Division of Environmental Management.

(d) Petition Process. Any person may petition the Commission to classify a surface water of the state as an ORW. The petition shall identify the exceptional resource value to be protected, address how the water body meets the general criteria in Paragraph (a) of this Rule, and the suggested actions to protect the resource values. The Commission may request additional supporting information from the petitioner. The Commission or its designee will initiate public proceedings to classify waters as ORW or will inform the petitioner that the waters do not meet the criteria for ORW with an explanation of the basis for this decision. The petition shall be sent to:

Director
DEHNR/Division of Environmental Management
P.O. Box 29535
Raleigh, North Carolina 27626-0535

The envelope containing the petition shall clearly bear the notation: RULE-MAKING PETITION FOR ORW CLASSIFICATION.

(e) Listing of Waters Classified ORW with Specific Actions. Waters classified as ORW with specific actions to protect exceptional resource values are listed as follows:

(1) Roosevelt Natural Area [White Oak River Basin, Index Nos. 20-36-9.5-(1) and 20-36-9.5-(2)] including all fresh and saline waters within the property boundaries of the natural area will have only new development which complies with the low density option in the stormwater rules as specified in 15A NCAC 2H .1003(a)(2) within 575 feet of the Roosevelt Natural Area (if the development site naturally drains to the Roosevelt Natural Area).

(2) Chattooga River ORW Area (Little Tennessee River Basin and Savannah River Drainage Area): the following undesignated waterbodies that are tributary to ORW designated segments shall comply with Rule .0216(c) of this Section in order to protect the designated waters as per Rule .0203 of this Section. However, expansions of existing discharges to these segments will be allowed if there is no increase in pollutant loading:

(A) North and South Fowler Creeks,
(B) Green and Norton Mill Creeks,
(C) Cane Creek,
(D) Ammons Branch,
(E) Glade Creek, and
(F) Associated tributaries.

(3) Henry Fork ORW Area (Catawba River Basin): the following undesignated waterbodies that are tributary to ORW designated segments shall comply with Rule .0216(c) of this Section in order to protect the designated waters as per Rule .0203 of this Section:

(A) Ivy Creek,
(B) Rock Creek, and
(C) Associated tributaries.

(4) South Fork New and New Rivers ORW Area [New River Basin (Index Nos. 10-1-33.5 and 10)]: the following management strategies, in addition to the discharge requirements specified in Rule .0216(c)(1), will be applied to protect the designated ORW areas:

(A) Stormwater controls described in Rule .0216(c)(1) will apply within one mile and draining to the designated ORW areas;

(B) New or expanded NPDES permitted wastewater discharges located upstream of the designated ORW will be permitted such that the following water quality standards are maintained in the ORW segment:

(i) the total volume of treated wastewater for all upstream discharges combined will not exceed 50 percent of the total instream flow in the designated ORW under 7Q10 conditions;

(ii) a safety factor will be applied to any chemical allocation such that the effluent limitation for a specific chemical constituent will be the more stringent of either the limitation allocated under design conditions (pursuant to 15A NCAC 2B .0206) for the normal standard at the point of discharge, or the limitation allocated under design conditions for one-half the normal

standard at the upstream border of the ORW segment;

(iii) a safety factor will be applied to any discharge of complex wastewater (those containing or potentially containing toxicants) to protect for chronic toxicity in the ORW segment by setting the whole effluent toxicity limitation at the higher (more stringent) percentage effluent determined under design conditions (pursuant to 15A NCAC 2B .0206) for either the instream effluent concentration at the point of discharge or twice the effluent concentration calculated as if the discharge were at the upstream border of the ORW segment;

(C) New or expanded NPDES permitted wastewater discharges located upstream of the disignated ORW will comply with the following:

(i) Oxygen Consuming Wastes: Effluent limitations will be as follows: BOD = 5 mg/l. and NH3-N = 2 mg/l;

(ii) Total Suspended Solids: Discharges of total suspended solids (TSS) will be limited to effluent concentrations of 10 mg/l for trout waters and to 20 mg/l for all other waters;

(iii) Emergency Requirements: Failsafe treatment designs will be employed, including stand-by power capability for entire treatment works, dual train design for all treatment components, or equivalent failsafe treatment designs;

(iv) Nutrients: Where nutrient overenrichment is projected to be a concern, appropriate effluent limitations will be set for phosphorus or nitrogen, or both.

(5) Old Field Creek (New River Basin): the undesignated portion of Old Field Creek (from its source to Call Creek) shall comply with Rule .0216(c) of this Section in order to protect the designated waters as per Rule .0203 of this Section.

(6) In the following designated waterbodies, no additional restrictions will be placed on new or expanded marinas. The only new or expanded NPDES permitted discharges that will be allowed will be non-domestic, non-process industrial discharges.

(A) The Alligator River Area (Pasquotank River Basin) extending from the source of the Alligator River to the U.S. Highway 64 bridge including New Lake Fork, North West Fork Alligator River, Juniper Creek, Southwest Fork Alligator River, Scouts Bay, Gum Neck Creek, Georgia Bay, Winn Bay, Stumpy Creek Bay, Stumpy Creek, Swann Creek (Swann Creek Lake), Whipping Creek (Whipping Creek Lake), Grapevine Bay, Rattlesnake Bay, The Straits, The Frying Pan, Coopers Creek, Babbitt Bay, Goose Creek, Milltail Creek, Boat Bay, Sandy Ridge Gut (Sawyer Lake) and Second Creek, but excluding the Intracoastal Waterway (Pungo River-Alligator River Canal) and all other tributary streams and canals.

(7) In the following designated waterbodies, the only type of new or expanded marina that will be allowed will be those marinas located in upland basin areas, or those with less than 30 slips, having no boats over 21 feet in length and no boats with heads. The only new or expanded NPDES permitted discharges that will be allowed will be non-domestic, non-process industrial discharges.

(A) The Northeast Swanquarter Bay Area including all waters northeast of a line from a point at Lat. 35° 23' 51" and Long. 76° 21' 02" thence southeast along the Swanquarter National Wildlife Refuge hunting closure boundary (as defined by the 1935 Presidential Proclamation) to Drum Point.

(B) The Neuse-Southeast Pamlico Sound Area (Southeast Pamlico Sound Area (Southeast Pamlico Sound Section of the Southeast Pamlico, Core and Back Sound Area); (Neuse River Basin) including all waters within an area defined by a line extending from the southern shore of Ocracoke Inlet northwest to the Tar-Pamlico River and Neuse River basin boundary, then southwest to Ship Point.

(C) The Core Sound Section of the Southeast Pamlico, Core and Back Sound Area (White Oak River Basin), including all waters of Core Sound and its tributaries, but excluding Nelson Bay, Little Port Branch and Atlantic Harbor at its mouth, and those tributaries of Jarrett Bay that are closed to shellfishing.

(D) The Western Bogue Sound Section of the Western Bogue Sound and Bear Island Area (White Oak River Basin) including all waters within an area defined by a line from Bogue Inlet to the mainland at SR 1117 to a line across Bogue Sound from the southwest side of Gales Creek to Rock Point, including Taylor Bay and the Intracoastal Waterway.

(E) The Stump Sound Area (Cape Fear River Basin) including all waters of Stump Sound and Alligator Bay from marker Number 17 to the western end of Permuda Island, but excluding

Rogers Bay, the Kings Creek Restricted Area and Mill Creek.

(F) The Topsail Sound and Middle Sound Area (Cape Fear River Basin) including all estuarine waters from New Topsail Inlet to Mason Inlet, including the Intracoastal Waterway and Howe Creek, but excluding Pages Creek and Futch Creek:

(8) In the following designated waterbodies, no new or expanded NPDES permitted discharges and only new or expanded marinas with less than 30 slips, having no boats over 21 feet in length and no boats with heads will be allowed.

(A) The Swanquarter Bay and Juniper Bay Area (Tar-Pamlico River Basin) including all waters within a line beginning at Juniper Bay Point and running south and then west below Great Island, then northwest to Shell Point and including Shell Bay, Swanquarter and Juniper Bays and their tributaries, but excluding all waters northeast of a line from a point at Lat. 35° 23' 51" and Long. 76° 21' 02" thence southeast along the Swanquarter National Wildlife Refuge hunting closure boundary (as defined by the 1935 Presidential Proclamation) to Drum Point and also excluding the Blowout Canal, Hydeland Canal, Juniper Canal and Quarter Canal.

(B) The Back Sound Section of the Southeast Pamlico, Core and Back Sound Area (White Oak River Basin) including that area of Back Sound extending from Core Sound west along Shackleford Banks, then north to the western most point of Middle Marshes and along the northwest shore of Middle Marshes (to include all of Middle Marshes), then west to Rush Point on Harker's Island, and along the southern shore of Harker's Island back to Core Sound.

(C) The Bear Island Section of the Western Bogue Sound and Bear Island Area (White Oak River Basin) including all waters within an area defined by a line from the western most point on Bear Island to the northeast mouth of Goose Creek on the mainland, east to the southwest mouth of Queen Creek, then south to [illegible]en marker No. 49, then northeast to the northern most point on Huggins Island, then sou[illegible] along the shoreline of Huggins Island to the southeastern most point of Huggins Island. [illegible] south to the northeastern most point on Dudley Island, then southwest along the shoreline of Dudley Island to the eastern tip of Bear Island.

(D) The Masonboro Sound Area (Cape Fear River Basin) including all waters between the Barrier Islands and the mainland from Carolina Beach Inlet to Masonboro Inlet.

History Note: Statutory Authority G.S. 143-214.1;
Eff. February 1, 1986;
Amended Eff. February 1, 1993; December 1, 1992; January 1, 1990; October 1, 1989.

.0217 STORMWATER CONTROL CRITERIA TO PROTECT WATER QUALITY STDS

History Note: Statutory Authority G.S. 143-214.1; 143-215.3(a)(1);
Eff. November 1, 1986;
Repealed Eff. January 1, 1988.

.0218 EXEMPTIONS FROM SURFACE WATER QUALITY STANDARDS

Variances from applicable standards, revisions to water quality standards or site-specific water quality standards may be granted by the Commission on a case-by-case basis pursuant to General Statutes 143-215.3(e), 143-214.3 or 143-214.1. A listing of existing variances will be maintained and made available to the public by the Division. Exemptions established pursuant to this Rule will be reviewed as part of the Triennial Review of Water Quality Standards conducted pursuant to 40 CFR 131.10(g).

History Note: Statutory Authority G.S. 143-214.1; 143-214.3; 143-215.3(e);
Eff. October 1, 1989.

.0219 WATER QUALITY MANAGEMENT PLANS

(a) In implementing the water quality standards to protect the existing uses [as defined by Rule .0202(16) of this Section] of the waters of the state or the water quality which supports those uses, the Commission shall develop water quality management plans on a priority basis to attain, maintain or enhance water quality throughout the state. Additional specific actions deemed necessary by the Commission to protect the water quality or the existing uses of the waters of the state will be specified in Paragraph (b) of this Rule. These

actions may include anything within the powers of the Commission. The Commission may also consider local actions which have been taken to protect a waterbody in determining the appropriate protection options to be incorporated into the water quality management plan.

(b) All waters determined by the Commission to be protected by a water quality management plan are listed with specific actions as follows:

(1) The Lockwoods Folly River Area (Lumber River Basin), which includes all waters of the lower Lockwoods Folly River in an area extending north from the Intracoastal Waterway to a line extending from Genoes Point to Mullet Creek, will be protected by the specific actions described in Subparagraphs (A) through (E) of this Rule.

(A) New development activities within 575' of the mean high water line which require a Sedimentation Erosion Control Plan or a CAMA major development permit must comply with the low density option of the coastal Stormwater Runoff Disposal Rules [as specified in 15A NCAC 2H .1003(a)(2)].

(B) New or expanded NPDES permits will be issued only for non-domestic, non-industrial process type discharges (such as non-industrial process cooling or seafood processing discharges). A public hearing is mandatory for any proposed (new or expanded) NPDES permit to this protected area.

(C) New non-discharge permits will be required to meet reduced loading rates and increased buffer zones, to be determined on a case-by-case basis.

(D) New or expanded marinas must be located in upland basin areas.

(E) No dredge or fill activities will be allowed where significant shellfish or submerged aquatic vegetation bed resources occur, except for maintenance dredging, such as that required to maintain access to existing channels and facilities located within the protected area or maintenance dredging for activities such as agriculture.

History Note: Statutory Authority G.S. 143-214.1; 143-215.8A;
Eff. January 1, 1990.

Parameters	Standards For All Freshwater		More Stringent Standards To Support Additional Uses	
	Aquatic Life	Human Health	WS Classes	Trout
Arsenic (ug/l)	50			
Barium (mg/l)			1.0	
Benzene (ug/l)		71.4	1.19	
Beryllium (ng/l)		117	6.8	
Cadmium (ug/l)	2.0			0.4
Carbon tetrachloride (ug/l)		4.42	0.254	
Chloride (mg/l)	230 (AL)		250	
Chlorinated benzenes (ug/l)			488	
Chlorine, total residual (ug/l)	17 (AL)			17
Chlorophyll a, corrected (ug/l)	40 (N)			15 (N)
Chromium, total (ug/l)	50			
Coliform, total (MFTCC/100ml)			50 (N)(2)	
Coliform, fecal (MFTCC/100ml)		200 (N)		
Copper (ug/l)	7 (AL)			
Cyanide (ug/l)	5.0			
Dioxin (ng/l)		0.000014	0.000013	
Dissolved gases	(N)			
Dissolved oxygen (mg/l)	5.0 (Sw)(1)			6.0
Fluoride (mg/l)	1.8			
Hardness, total (mg/l)			100	
Hexachlorobutadiene (ug/l)		49.7	0.445	
Iron (mg/l)	1.0 (AL)			
Lead (ug/l)	25 (N)			
Manganese (ug/l)			200	
MBAS (ug/l) (Methylene-Blue-Active Substances)	500			
Mercury (ug/l)	0.012			
Nickel (ug/l)	88		25	
Nitrate nitrogen (mg/l)			10	
Pesticides				
Aldrin (ng/l)	2.0	0.136	0.127	
Chlordane (ng/l)	4.0	0.588	0.575	
DDT (ng/l)	1.0	0.591	0.588	
Demeton (ng/l)	100			
Dieldrin (ng/l)	2.0	0.144	0.135	
Endosulfan (ng/l)	50			
Endrin (ng/l)	2.0			
Guthion (ng/l)	10			
Heptachlor (ng/l)	4.0	0.214	0.208	
Lindane (ng/l)	10			
Methoxychlor (ng/l)	30			
Mirex (ng/l)	1.0			
Parathion (ng/l)	13			
Toxaphene (ng/l)	0.2			
2,4-D (ug/l)			100	
2,4,5-TP (Silvex) (ug/l)			10	
pH (units)	6.0-9.0 (Sw)			
Phenolic compounds (ug/l)		(N)	1.0 (N)	
Polychlorinated biphenyls (ng/l)	1.0	0.079		
Polynuclear aromatic hydrocarbons (ng/l)		31.1	2.8	
Radioactive substances		(N)		
Selenium (ug/l)	5			
Silver (ug/l)	0.06 (AL)			
Solids, total dissolved (mg/l)			500	
Solids, suspended	(N)			
Sulfates (mg/l)			250	
Temperature	(N)			
Tetrachloroethane (1,1,2,2) (ug/l)		10.8	0.172	
Tetrachloroethylene (ug/l)			0.8	
Toluene (ug/l)	11			0.36
Toxic Substances	(N)			
Trialkyltin (ug/l)	0.008			
Trichloroethylene (ug/l)		92.4	3.08	
Turbidity (NTU)	50; 25 (N)			10 (N)
Vinyl chloride (ug/l)		525	2	
Zinc (ug/l)	50 (AL)			

Note: (N) See 2B .0211 (b), (c), (d), or (e) for narrative description of limits.
(AL) Values represent action levels as specified in .0211 (b)(4).
(Sw) Designated swamp waters may have a pH as low as 4.3 and dissolved oxygen less than 5.0 mg/l if due to natural conditions.
(1) An instantaneous reading may be as low as 4.0 ug/l but the daily average must be 5.0 ug/l or more.
(2) Applies only to unfiltered water supplies.

WATER QUALITY STANDARDS FOR TIDAL SALTWATER CLASSIFICATIONS

Parameters	Standards For All Tidal Saltwaters		More Stringent Standards To Support Additional Uses
	Aquatic Life	Human Health	Class SA
Arsenic (ug/l)	50		
Benzene (ug/l)		71.4	
Beryllium (ng/l)		117	
Cadmium (ug/l)	5.0		
Carbon tetrachloride (ug/l)		4.42	
Chlorophyll a (ug/l)	40 (N)		
Chromium, total (ug/l)	20		
Coliform, fecal (MFFCC/100ml)		200 (N)	14 (N)
Copper (ug/l)	3 (AL)		
Cyanide (ug/l)	1.0		
Dioxin (ng/l)		0.000014	
Dissolved gases	(N)		
Dissolved oxygen (mg/l)	5.0 (1)		
Hexachlorobutadiene (ug/l)		49.7	
Lead (ug/l)	25 (N)		
Mercury (ug/l)	0.025		
Nickel (ug/l)	8.3		
Phenolic compounds		(N)	
Polychlorinated biphenyls (ng/l)	1.0	0.079	
Polynuclear aromatic hydrocarbons (ng/l)		31.1	
Pesticides (ng/l)			
Aldrin	3.0	0.136	
Chlordane	4.0	0.588	
DDT	1.0	0.591	
Demeton	100		
Dieldrin	2.0	0.144	
Endosulfan	9.0		
Endrin	2.0		
Guthion	10		
Heptachlor	4.0	0.214	
Lindane	4.0		
Methoxychlor	30		
Mirex	1.0		
Parathion	178		
Toxaphene	0.2		
pH (units)	6.8-8.5 (1)		
Radioactive substances		(N)	
Salinity	(N)		
Selenium (ug/l)	71		
Silver (ug/l)	0.1 (AL)		
Solids, suspended	(N)		
Temperature	(N)		
Tetrachloroethane (1,1,2,2) (ug/l)		10.8	
Toxic substances	(N)		
Trialkyltin (ug/l)	0.002		
Trichloroethylene (ug/l)		92.4	
Turbidity (NTU)	25 (N)		
Vinyl chloride (ug/l)		525	
Zinc (ug/l)	86 (AL)		

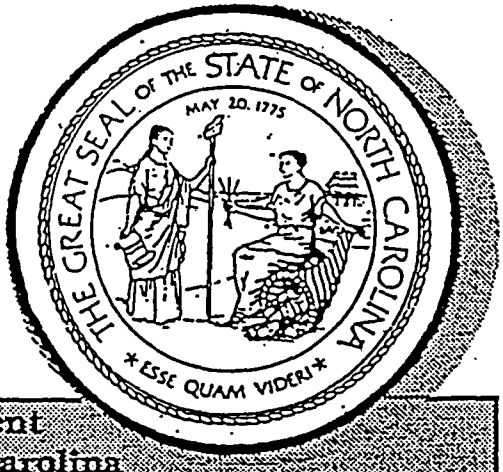
Note: (N) See 2B .0212 (b), (c), or (d) for narrative description of limits.
(AL) Values represent action levels as specified in .0212(b)(4).
(1) Designated swamp waters may have a pH as low as 4.3 and dissolved oxygen less than 5.0 mg/l if due to natural conditions.

RWQ3.STA

REFERENCE 32

STATE OF
NORTH CAROLINA
DEPARTMENT OF
ENVIRONMENT, HEALTH,
AND NATURAL RESOURCES

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



Division of Environmental Management
Raleigh, North Carolina

Reprint from North Carolina Administrative Code: 15A NCAC 2B .0311
Current through: February 1, 1993

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, 15A NCAC 2B .0302 to .0317. 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, WS-IV, WS-V, 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 undeveloped watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint source and stormwater discharge of pollution are required; suitable for all Class C uses;
Class WS-II:	waters protected as water supplies which are generally in predominantly undeveloped watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint source and stormwater discharge of pollution are required; suitable for all Class C uses;
Class WS-III:	waters protected as water supplies which are generally in low to moderately developed watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint source and stormwater discharge of pollution are required; suitable for all Class C uses;
Class WS-IV:	waters protected as water supplies which are generally in moderately to highly developed watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint source and stormwater discharge of pollution are required; suitable for all Class C uses;
Class WS-V:	waters protected as water supplies which are generally upstream and draining to Class WS-IV waters; no categorical restrictions on watershed development or treated wastewater discharges are required, however, the Commission or its designee may apply appropriate management requirements as deemed necessary for the protection of downstream receiving waters (15A NCAC 2B .0203); suitable for all Class C uses;
Class B:	primary recreation and any other usage specified by the "C" classification;
Class C:	aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture.

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:	aquatic life propagation and survival, fishing, wildlife, and secondary recreation.

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;
HQW:	High Quality Waters which are waters that are rated as excellent based on biological and physical/chemical characteristics through division monitoring or special studies, native and special native trout waters (and their tributaries) designated by the Wildlife Resources Commission, primary nursery areas (PNA) designated by the Marine Fisheries Commission and other functional nursery areas designated by the Wildlife Resources Commission, critical habitat areas designated by the Wildlife Resources Commission or the Department of Agriculture, all water supply watersheds which are either classified as WS-I or WS-II or those for which a formal petition for reclassification as WS-I or WS-II has been received from the appropriate local government and accepted by the Division of Environmental Management and all Class SA waters.
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 15A 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 Environment, Health, and Natural Resources
Post Office Box 29535
Raleigh, North Carolina 27626-0535

(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:

.0311 CAPE FEAR RIVER BASIN

Name of Stream	Description	Class	Classification Date	Classification Index No.
	near Acme to Lock # 1 (City of Wilmington water supply intake)			
CAPE FEAR RIVER	From U. S. Corps of Engineers Lock #1 near Acme to a point 0.5 mile upstream of raw water supply intake at Federal Paper Board Corporation (Riegelwood)	WS-IV Sw	8/3/92	18-(59)
Natmore Creek	From source to Cape Fear River	WS-IV Sw	8/3/92	18-60
Salt Marsh Ditch	From source to Natmore Creek	WS-IV Sw	8/3/92	18-60-1
White Oak Canal	From source to Natmore Creek	WS-IV Sw	8/3/92	18-60-2
Weyman Creek	From source to Cape Fear River	WS-IV Sw	8/3/92	18-61
Copper Smith Branch	From source to Weyman Creek	WS-IV Sw	8/3/92	18-61-1
Turkeypen Branch	From source to Weyman Creek	WS-IV Sw	8/3/92	18-61-2
Turner Branch	From source to Weyman Creek	WS-IV Sw	8/3/92	18-61-3
Beaverdam Creek	From source to Weyman Creek	WS-IV Sw	8/3/92	18-61-4
Horsepen Branch	From source to Beaverdam Creek	WS-IV Sw	8/3/92	18-61-4-1
Double Branch	From source to Cape Fear River	WS-IV Sw	8/3/92	18-62
CAPE FEAR RIVER	From a point 0.5 mile upstream of raw water supply intake at Federal Paper Board Corporation (Riegelwood) to raw water supply intake at Federal Paper Board Corporation (Riegelwood), located 0.6 mile upstream of Livingston Creek	WS-IV Sw CA	8/3/92	18-(62.5)
CAPE FEAR RIVER	From raw water supply intake at Federal Paper Board Corporation (Riegelwood) to upstream mouth of Toomers Creek	C Sw	4/1/59	18-(63)
Livingston Creek (Broadwater Lake)	From source to Cape Fear River	C Sw	3/1/77	18-64
Gapway Creek	From source to Livingston Creek	C Sw	4/1/59	18-64-2
Gapway Swamp	From source to Gapway Creek	C Sw	4/1/59	18-64-2-1
Poplar Branch	From source to Livingston Creek	C Sw	4/1/59	18-64-3
Scott Branch	From source to Livingston Creek	C Sw	4/1/59	18-64-4
McClennen Branch	From source to Scott Branch	C Sw	4/1/59	18-64-4-1
Terrapin Branch	From source to Scott Branch	C Sw	4/1/59	18-64-4-2
Boggy Branch (Chapel Creek)	From source to Livingston Creek	C Sw	4/1/59	18-64-5
Johns Branch	From source to Livingston Creek	C Sw	9/1/74	18-64-6
Taylor Branch	From source to Johns Branch	C Sw	9/1/74	18-64-6-1
Dans Creek	From source to Livingston Creek	C Sw	4/1/59	18-64-7
All connecting drainage canals	From source to Dans Creek	C Sw	9/1/74	18-64-7-1
Mill Creek	From source to Dans Creek	C Sw	4/1/59	18-64-7-2
Strauss Canal (Strauss Swamp)	From source to Mill Creek	C Sw	4/1/59	18-64-7-2-1
Simon Branch	From source to Livingston Creek	C Sw	4/1/59	18-64-8
Hall Branch	From source to Livingston Creek	C Sw	4/1/59	18-64-9
Big Branch	From source to Livingston Creek	C Sw	9/1/74	18-64-10
Bay Branch	From source to Big Branch	C Sw	9/1/74	18-64-10-1
Mill Branch	From source to Big Branch	C Sw	9/1/74	18-64-10-2

.0311 CAPE FEAR RIVER BASIN

Name of Stream	Description	Class	Classification Date	Classification Index No.
Cherry Tree Prong	From source to Indian Creek	C Sw	4/1/59	18-70-2
Mulberry Branch	From source to Indian Creek	C Sw	4/1/59	18-70-3
Otter Branch	From source to Mulberry Branch	C Sw	4/1/59	18-70-3-1
Mill Branch	From soruce to Indian Creek	C Sw	4/1/59	18-70-4
CAPE FEAR RIVER	From upstream mouth of Toomers creek to a line across the river from Snows Point (through Snows Marsh) to Federal Point	SC	8/9/81	18-(71)
Cartwheel Branch	From source to Cape Fear River	SC Sw	4/1/59	18-72
Toomers Creek	From upstream mouth to a point 0.8 mile upstream of mouth	WS-IV	8/3/92	18-73-(1)
Toomers Creek	From a point 0.8 mile upstream of mouth to mouth (City of Wilmington water supply intake)	WS-IV CA	8/3/92	18-73-(2)
Northeast Cape Fear River	From source to Muddy Creek	C Sw	9/1/74	18-74-(1)
Barlow Branch	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-2
Lewis Branch (Williams Millpond)	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-3
Horse Pen Branch	From source to Lewis Branch	C Sw	9/1/74	18-74-3-1
Rattlesnake Branch	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-4
Polly Run Creek (Deavers Pond)	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-5
Ladds Branch (Whitfield Pond)	From source to Polly Run Creek	C Sw	9/1/74	18-74-5-1
Wolfscrape Branch	From source to Polly Ann Creek	C Sw	9/1/74	18-74-5-2
Jumping Run Branch	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-6
Juniper Branch	From source to Jumping Run Branch	C Sw	9/1/74	18-74-6-1
Mire Branch	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-7
Reedy Branch	From source to Mire Branch	C Sw	4/1/59	18-74-7-1
Buck Marsh Branch	From source to Northeast Cape Fear River	C Sw	7/1/73	18-74-8
Tom Branch	From source to Buck Marsh Branch	C Sw	9/1/74	18-74-8-1
Jones Branch	From source to Buck Marsh Branch	C Sw	9/1/74	18-74-8-2
Cabin Branch	From source to Buck Marsh Branch	C Sw	9/1/74	18-74-8-3
Poley Branch	From source to Buck Marsh Branch	C Sw	9/1/74	18-74-8-4
Oak Branch	From source to Poley Branch	C Sw	9/1/74	18-74-8-4-1
Mill Branch	From source to Oak Branch	C Sw	9/1/74	18-74-8-4-1-1
Beaverdam Barnch	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-9
Jumping Run	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-10
Great Branch (Hussey Pond)	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-11
Beaverdam Branch (Rouse Pond)	From source to Great Branch	C Sw	4/1/59	18-74-11-1
Horsepen Branch	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-12
Matthews Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-13
Sawyer Branch	From source to Matthews Creek	C Sw	4/1/59	18-74-13-1
Juniper Branch	From source to Matthews Creek	C Sw	4/1/59	18-74-13-2
Sandy Run	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-14
Camp Branch	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-15
Housland Branch	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-16

.0311 CAPE FEAR RIVER BASIN

Name of Stream	Description	Class	Classification Date	Classification Index No.
Cypress Creek	From source to Angola Creek	C Sw	4/1/59	18-74-33-3-1
Back Swamp	From source to Angola Creek	C Sw	9/1/74	18-74-33-3-2
Little Limestone Creek	From source to Back Swamp	C Sw	9/1/74	18-74-33-3-2-1
Nine Mile Creek	From source to Back Swamp	C Sw	7/1/73	18-74-33-3-2-2
Ten Mile Creek	From source to Nine Mile Creek	C Sw	7/1/73	18-74-33-3-2-2-1
Bob Creek	From source to Angola Creek	C Sw	4/1/59	18-74-33-3-3
Moccasin Creek	From source to Angola Creek	C Sw	4/1/59	18-74-33-3-4
Shaken Creek	From source to Holly Shelter Creek	C Sw	4/1/59	18-74-33-4
Juniper Swamp	From source to Shaken Creek	C Sw	4/1/59	18-74-33-4-1
Shelter Swamp Creek	From source to Shaken Creek	C Sw	4/1/59	18-74-33-4-2
Mill Pond	From source to Holly Shelter Creek	C Sw	4/1/59	18-74-33-5
Cams Branch	From source to Holly Shelter Creek	C Sw	4/1/59	18-74-33-6
Ashes Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-34
Fishing Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-35
Peggy Island Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-36
Watermellon Run	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-37
Jumping Run	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-38
Burgaw Creek	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-39
Osgood Branch	From source to Burgaw Creek	C Sw	9/1/74	18-74-39-1
Cypress Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-40
Gregory Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-41
Lillington Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-42
Sand Hill Creek	From source to Lillington Creek	C Sw	4/1/59	18-74-42-1
Graveyard Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-43
Green Oak Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-44
McIntire Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-45
Pike Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-46
Hawkins Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-47
Northeast Cape Fear River	From N.C. Hwy. 210 to Prince George Creek	B Sw	8/1/87	18-74-(47.5)
Honey Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-48
Harrisons Creek	From source to Northeast Cape Fear River	C Sw	7/1/73	18-74-49
Godfrey Creek	From source to Harrisons Creek	C Sw	9/1/74	18-74-49-1
Merricks Creek	From source to Harrisons Creek	C Sw	7/1/73	18-74-49-2
Catskin Creek	From source to Merricks Creek	C Sw	9/1/74	18-74-49-2-1
Trumpeters Swamp	From soruce to Catskin Creek	C Sw	9/1/74	18-74-49-2-1-1
Blossom Swamp	From source to Trumpeters Swamp	C Sw	9/1/74	18-74-49-2-1-1-1
Players Creek	From source to Merricks Creek	C Sw	9/1/74	18-74-49-2-2
Island Creek	From source to Northeast Cape Fear River	C Sw	7/1/73	18-74-50
Old Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-51
Sturgeon Creek	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-52
Northeast Cape Fear River	From Prince George Creek to mouth of Ness Creek	C Sw	9/1/74	18-74-(52.5)
Prince George Creek	From source to Northeast Cape Fear River	C Sw	7/1/73	18-74-53
Turkey Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-54
Long Creek	From source to Northeast Cape Fear River	C Sw	7/1/73	18-74-55
Horse Branch Creek	From source to Long Creek	C Sw	9/1/74	18-74-55-1
Pole Branch (Penderler Lake)	From source to Horse Branch Creek	C Sw	9/1/74	18-74-55-1-1

.0311 CAPE FEAR RIVER BASIN

Name of Stream	Description	Class	Classification Date	Classification Index No.
Long Creek	From source to Horse Branch Creek	C Sw	9/1/74	18-74-55-1-2
Keith Branch	From source to Horse Branch Creek	C Sw	9/1/74	18-74-55-1-3
Cypress Creek	From source to Long Creek	C Sw	4/1/59	18-74-55-2
Bee Branch	From source to Cypress Creek	C Sw	4/1/59	18-74-55-2-1
Mill Branch	From source to Long Creek	C Sw	4/1/59	18-74-55-3
Big Branch	From source to Long Creek	C Sw	4/1/59	18-74-55-4
Jumping Run Branch	From source to Long Creek	C Sw	4/1/59	18-74-55-5
Mill Branch	From source to Long Creek	C Sw	4/1/59	18-74-55-6
Mulberry Branch	From source to Long Creek	C Sw	4/1/59	18-74-55-7
Mill Run	From source to Long Creek	C Sw	4/1/59	18-74-55-8
Rileys Creek	From source to Long Creek	C Sw	7/1/73	18-74-55-9
Rizzo Creek (Resoe Creek)	From source to Rileys Creek	C Sw	9/1/74	18-74-55-9-1
Birch Creek	From source to Rizzo Creek	C Sw	9/1/74	18-74-55-9-1-1
Mill Creek	From source to Rileys Creek	C Sw	9/1/74	18-74-55-9-2
Kellys Creek	From source to Rileys Creek	C Sw	9/1/74	18-74-55-9-3
Guffords Branch	From source to Rileys Creek	C Sw	7/1/73	18-74-55-9-4
Juniper Branch	From source to Long Creek	C Sw	4/1/59	18-74-55-10
Mill Creek	From source to Long Creek	C Sw	4/1/59	18-74-55-11
Collins Branch	From source to Mill Creek	C Sw	4/1/59	18-74-55-11-1
Morgans Creek	From source to Long Creek	C Sw	9/1/74	18-74-55-12
Cowpen Branch	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-56
Tonys Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-57
Lagoon Creek	From source to Northeast Cape Fear River	C Sw	4/1/59	18-74-58
Fishing Creek	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-59
Dock Creek	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-60
Northeast Cape Fear River	From mouth of Ness Creek to Cape Fear River	SC Sw	4/1/59	18-74-(61)
Ness Creek	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-62
Smith Creek	From source to Northeast Cape Fear River	C Sw	9/1/74	18-74-63
Spring Branch	From source to Smith Creek	C Sw	9/1/74	18-74-63-1
Burnt Mill Creek	From source to Smith Creek	C Sw	3/1/77	18-74-63-2
Mineral Springs Branch	From source to Burnt Mill Creek	C SW	8/1/85	18-74-63-2-1
Alligator Creek	From source to Cape Fear River	SC Sw	4/1/59	18-75
Greenfield Creek	From Greenfield Lake to Cape Fear River	SC Sw	4/1/59	18-76
Greenfield Lake	Entire Lake	C Sw	4/1/59	18-76-1
Silver Stream Branch	From source to Greenfield Lake, Greenfield Creek	C Sw	4/1/59	18-76-1-1
Clay Bottom Branch	From source to Greenfield Lake, Greenfield Creek	C Sw	4/1/59	18-76-1-2
Jumping Run Branch	From source to Greenfield Lake, Greenfield Creek	C Sw	4/1/59	18-76-1-3
Squash Branch	From source to Greenfield Lake, Greenfield Creek	C Sw	4/1/59	18-76-1-4
Brunswick River	From source to Cape Fear River	SC	8/9/81	18-77
Sturgeon Creek	From source to Burnswick River	C Sw	4/1/59	18-77-1
Mill Creek	From source to Sturgeon Creek	C Sw	4/1/59	18-77-1-1
Rowell Branch	From source to Mill Creek	C Sw	4/1/59	18-77-1-1-1
Banton Branch	From source to Mill Creek	C Sw	4/1/59	18-77-1-1-2
Redmond Creek	From source to Brunswick River	SC Sw	4/1/59	18-77-2

.0311 CAPE FEAR RIVER BASIN

Name of Stream	Description	Class	Classification Date	Classification Index No.
Carolina Beach Yacht Basin	All waters beginning at a point on the northern side of Snows Cut and running directly east across the Intracoastal Waterway to a point on the eastern side, thence following the shoreline, of the Carolina Beach Yacht Basin to a point on the south side of Snows Cut, thence in a straight line across the cut to the point of beginning.	SB	7/1/87	18-87-31.2
Snows Cut	From Carolina Beach Yacht Basin to Cape Fear River	SC	8/9/81	18-87-31.5
Telfairs Creek	From source to Snows Cut	SC Sw	4/1/59	18-87-31.5-1
CAPE FEAR RIVER (excluding area described below)	From a line across the river from Snows Point (through Snows Marsh) to Federal Point to Atlantic Ocean	SA	1/1/85	18-(87.5)
Walden Creek	From source to Cape Fear River	SC Sw HQW	8/1/90	18-88-1
White Spring Creek	From source to Walden Creek	SC Sw HQW	8/1/90	18-88-1-1
Nigis Creek	From source to Walden Creek	SC Sw HQW	8/1/90	18-88-1-2
Nancys Creek	From source to Walden Creek	SC Sw HQW	8/1/90	18-88-1-3
Gum Log Branch	From source to Nancys Creek	SC Sw HQW	3/1/90	18-88-1-3-1
Governors Creek	From source to Walden Creek	SC Sw HQW	8/1/90	18-88-1-4
Fishing Creek	From source to Governors Creek	SC Sw HQW	8/1/90	18-88-1-4-1
Snows Marsh	Entire Marsh	SC	8/9/81	18-88-2
Price Creek	From source to Cape Fear River	SC Sw	4/1/59	18-88-3
Southport Restricted Area	Beginning at a point on the west bank of the Cape Fear River 1000 yards upstream of Price Creek, thence in an easterly direction to the eastern border of the Lower Cape Fear River Channel, thence in a southwesterly direction along the eastern border of the Lower Cape Fear River ship channel to channel marker # 14 (Qk Fl 14), thence to the northern edge of the mouth of Dutchman Creek, thence along the western bank of the Cape Fear River to the Intracoastal Waterway, thence north across the Intracoastal Waterway to a point on the north shore, thence in a northeasterly direction along the west bank of the Cape Fear River to the point of beginning	SC	1/1/85	18-88-3.5
Shelbed Creek	From Muddy Slough to Cape Fear River	SA	1/1/85	18-88-4
Middle Creek	From Muddy Slough to Cape Fear River	SA	1/1/85	18-88-5

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT, HEALTH AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL MANAGEMENT

ADMINISTRATIVE CODE SECTION

15A NCAC 2B .0100 - Procedures for Assignment of Water Quality Standards

15A NCAC 2B .0200 - Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina

Amended Effective February 1, 1993

Environmental Management Commission
Raleigh, North Carolina

REFERENCE 33

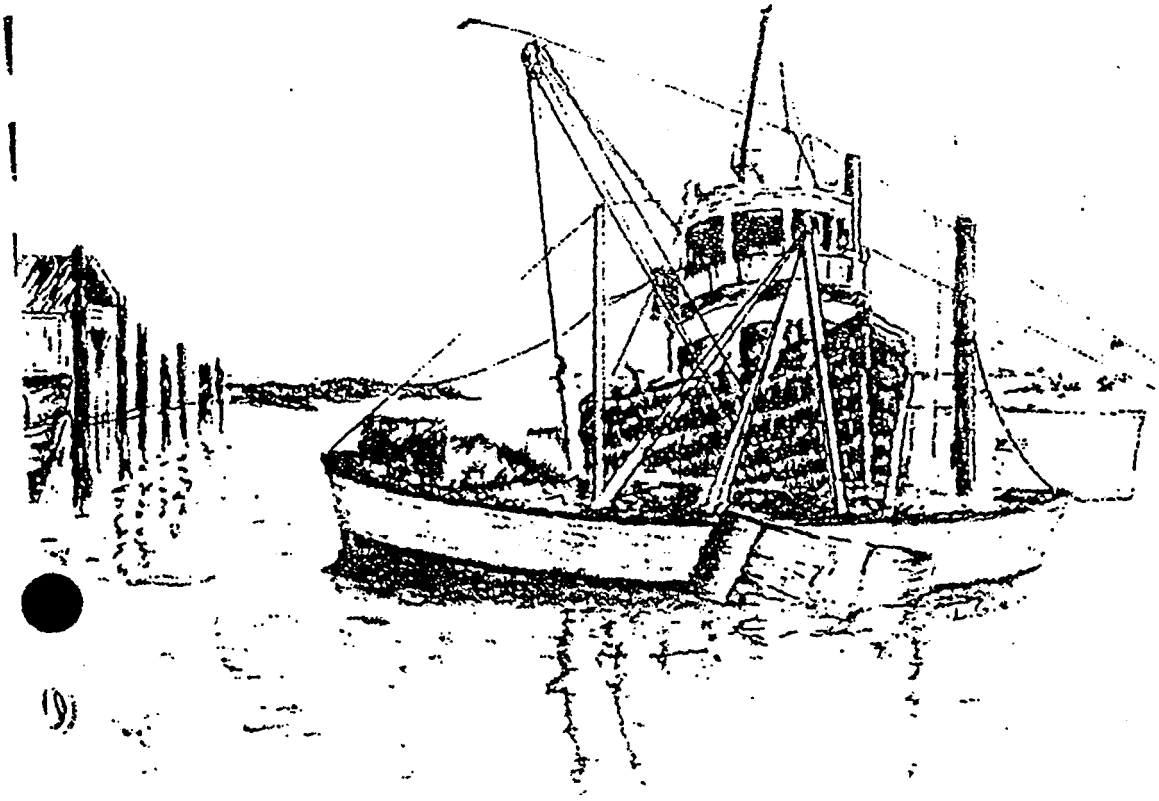
CERCLA

Ref. 33

Hydrology of Major Estuaries And Sounds of North Carolina

United States Geological Survey Water-Supply Paper 2221

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



Ref. 37

Hydrology of Major Estuaries And Sounds of North Carolina

By G. L. GIESE, H. B. WILDER, and G. G. PARKER, JR.

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

U.S. GEOLOGICAL SURVEY WATER-SUPPLY PAPER 2221

2. Hydrology of the Cape Fear River Estuarine System

Together, the lower Cape Fear and Northeast Cape Fear Rivers comprise what we will term the Cape Fear River estuarine system. (See pl. 1.) Actually, the Northeast Cape Fear River basin (drainage area—1,740 mi^2) is a subbasin of the Cape Fear River basin (total drainage area—9,140 mi^2) and the Northeast Cape Fear River estuary may be thought of as a branch of the Cape Fear River estuary. Nevertheless, for ease of analysis the Northeast Cape Fear River estuary will be discussed separately.

The Cape Fear River and the Northeast Cape Fear River estuaries are the only major estuaries in North Carolina having a relatively free and direct access to the ocean, which results in significant tides and tide-affected flow within them. In the Cape Fear River estuary, tides extend up to Lock 1, about 65 miles upstream from the mouth near Southport. As shown in plate 1, the mouth is at a river cross section extending from Fort Caswell east to the western tip of Smith Island. Tide effects in the Northeast Cape Fear River estuary extend about 48 miles from its mouth at Wilmington, which in turn is located about 28 miles upstream from the mouth of the Cape Fear River estuary.

The lower reaches of the Cape Fear River and Northeast Cape Fear River estuaries are subject to saltwater intrusion, sometimes rendering the water unsuitable for some uses. Plate 1 shows the approximate extent of saltwater intrusion in both estuaries, that is, the furthest upstream advance of water containing 200 mg/L of chloride ever known and the furthest upstream advance that has a 50-percent chance of being equaled or exceeded in any year.

Rapid industrial growth has taken place along the banks of the two estuaries in recent years, and a number of industries use the water from them as process water and discharge industrial wastewater into them.

The Cape Fear River and Northeast Cape Fear River estuaries are important navigable waters, and navigation channels are maintained to various depths by the U.S. Army Corps of Engineers. The channel dimensions maintained for navigation will be discussed in more detail in following sections of this report.

The summaries of the hydrology of the Cape Fear River and Northeast Cape Fear River estuaries are based on data and other information from various sources, primarily the Geological Survey. Plate 1 shows the location of key flow and water-quality stations operated in the Cape Fear River basin by the Geological Survey. These stations include the Cape Fear River at Phoenix (sta. 02107570), where the Geological Survey generated records of volumes of water flowing upstream and downstream during each tidal phase for the period April 1966 through March 1969. Data from these stations are published annually in the U.S. Geological Survey water-data report series for North Carolina. Wilder and Slack (1971a and 1971b) summarized data on chemical quality of streams in North Carolina from 1943 through 1967. Wilder and Hubbard (1968) reported on saltwater encroachment in the Cape Fear River estuary; Hubbard and Stamper (1972) reported on the movement and dispersion of soluble pollutants in the Northeast Cape Fear River estuary; the U.S. Army Corps of Engineers (1976) discussed sedimentation and related aspects of hydrology in the lower Cape Fear River estuary. These and other sources of information are acknowledged in the text where appropriate.

THE CAPE FEAR RIVER ESTUARY

The Haw and Deep Rivers, two major tributaries of the Cape Fear River, originate in the Piedmont Province and flow southeast, joining at Moncure, to form the Cape Fear River (pl. 1). From Moncure, the Cape Fear River flows southeast through the Coastal Plain to its mouth near Southport. The Cape Fear River drains a larger part of North Carolina than any other river; the drainage area at the mouth is 9,140 mi^2, all of which is in North Carolina. Of this, the Deep River accounts for 1,422 mi^2 and the Haw River accounts for 1,705 mi^2. Other major tributaries include the Black River (1,563 mi^2) and the Northeast Cape Fear River (1,740 mi^2).

Prior to the construction of Lock 1 about 37 miles upstream from Wilmington, river stage was affected by ocean tides possibly as far as 50 to 75 miles upstream from Wilmington. The construction of Lock 1 eliminated the effect of ocean tides above this point and this lock, therefore, marks the upstream limit of tide effect at the present time. The total length of the estuary from its mouth to Lock 1 is about 65 miles.

The lower part of the estuary, beginning about three miles below Wilmington, averages about a mile in width and contains numerous scattered islands and a few tidal flats. It resembles an elongated bay only a few feet deep except along the ship channel which has been dredged and maintained in this reach to depths of 32–40 feet and widths of 300–500 feet. By comparison, the channel above Wilmington is narrow, with depths ranging from 20 to 60 feet. Tidal currents in the upper reach, particularly near the lower end are strong and velocities may exceed 3 ft/s.

Flow

Flow in the Cape Fear River estuary is strongly tide-affected. Except during periods of high freshwater inflow, regular reversals of flow occur with each tide. During periods of higher-than-average freshwater inflow, outflow at some or all locations in the estuary may be high enough to overwhelm incoming flood tides, resulting in periods when no flow reversal occurs. Because the freshwater inflow is such an important component of flow in the estuary, it will be discussed at length before further considering tide-affected flow.

Freshwater Inflow

The average discharge at the mouth of the Cape Fear River estuary is about 11,000 ft^3/s. Because of the difficulty of accurately measuring flows in the estuary portion of the river, values for discharges were arrived at by summation of flows for gaged areas within the basin and estimates of flows for ungaged areas.

The major part of the freshwater inflow is measured at the stream-gaging stations shown on plate 1. The stations closest to the estuary gage the runoff from 6,660 mi^2 or 73 percent of the total 9,140 mi^2 of drainage area above the mouth of the estuary. The three stations of greatest importance are the most downstream stations on the Cape Fear, Black, and Northeast Cape Fear Rivers. The runoff from 6,500 mi^2 of the Piedmont and the inner part of the Coastal Plain is measured at the three stations listed below:

Number	*Name*	*Drainage area*
02105769	Cape Fear River at Lock 1 near Kelly	5,220 mi^2
02106500	Black River near Tomahawk	680 mi^2
02108000	Northeast Cape Fear River near Chinquapin	600 mi^2

These stations will be referred to as Lock 1, Tomahawk, and Chinquapin, individually, and collectively as index gages.

The largest ungaged areas are in the lower part of the Coastal Plain, the area adjacent to the estuary itself. Most of the runoff from the total area of 2,640 mi^2 below the index stations is ungaged. However, a relationship between the runoff from this ungaged area and the combined runoff at the Tomahawk and Chinquapin stations was established by obtaining periodic base flow measurements at sites in the ungaged areas and relating these on a per square mile basis to concurrent discharges at Tomahawk and Chinquapin (fig. 2.1). These two stations were used in the relation because they drain only areas in the Coastal Plain. The net outflow from the estuary is the sum of discharges for the three index stations plus that contri by the ungaged area, which can be estimated from f 2.1.

Because steady-flow conditions rarely throughout the Cape Fear River basin, lag-time correc must be applied to streamflow records at the various in order to arrive at an estimate of freshwater ou from the estuary at a given time. Lag times, comp from theories of wave celerity and rounded to the ne whole day, are 2 days from Tomahawk to the mout the Black River and 3 days from Chinquapin to the m of the Northeast Cape Fear River.

Combining all flow components, the following pirical equation was developed for estimating freshw outflow (Q_t) from the estuary,

$$Q_t = Q_1 - Q_2 + Q_3 + Q_4 \qquad (2$$

where

Q_t = total outflow from the estuary,
Q_1 = discharge at Lock 1 at day of Q_t,
Q_2 = discharge at Tomahawk two days prior Q_t,
Q_3 = discharge at Chinquapin three days prior Q_t, and
Q_4 = runoff obtained from figure 2.1 using $Q_2 + Q_3$.

Equation 2.1 was used to calculate average 7-day ou flows. The 7-day period was chosen because it was lo enough to dampen the effects of minor, localized vari tions in the pattern of basin runoff and short enough to l a sensitive parameter for relating inflow to the position the saltwater front.

Insofar as water supply, sewage dilution, and sal water encroachment in the Cape Fear River are concerne the most critical flow periods are usually those of su tained low flow. Figure 2.2 shows the average recurren interval, in years, at which various average 7-day min mum flows may be expected to occur. These values we generated by combining estimated annual 7-day minimu flows for the various flow components of equation 2.1. is interesting to note that if releases from the B. Everc Jordan Reservoir (pl. 1) are controlled according to t current operating schedule, then the minimum flow of t Cape Fear River at Lillington is expected to be no le than 600 ft^3/s. Based on this, the minimum discharge the mouth, near Southport, might be about 800 ft^3/s, co pared with an estimated 300 ft^3/s without the reservoir f the 7-day, 100-year minimum net discharge near Sout port.

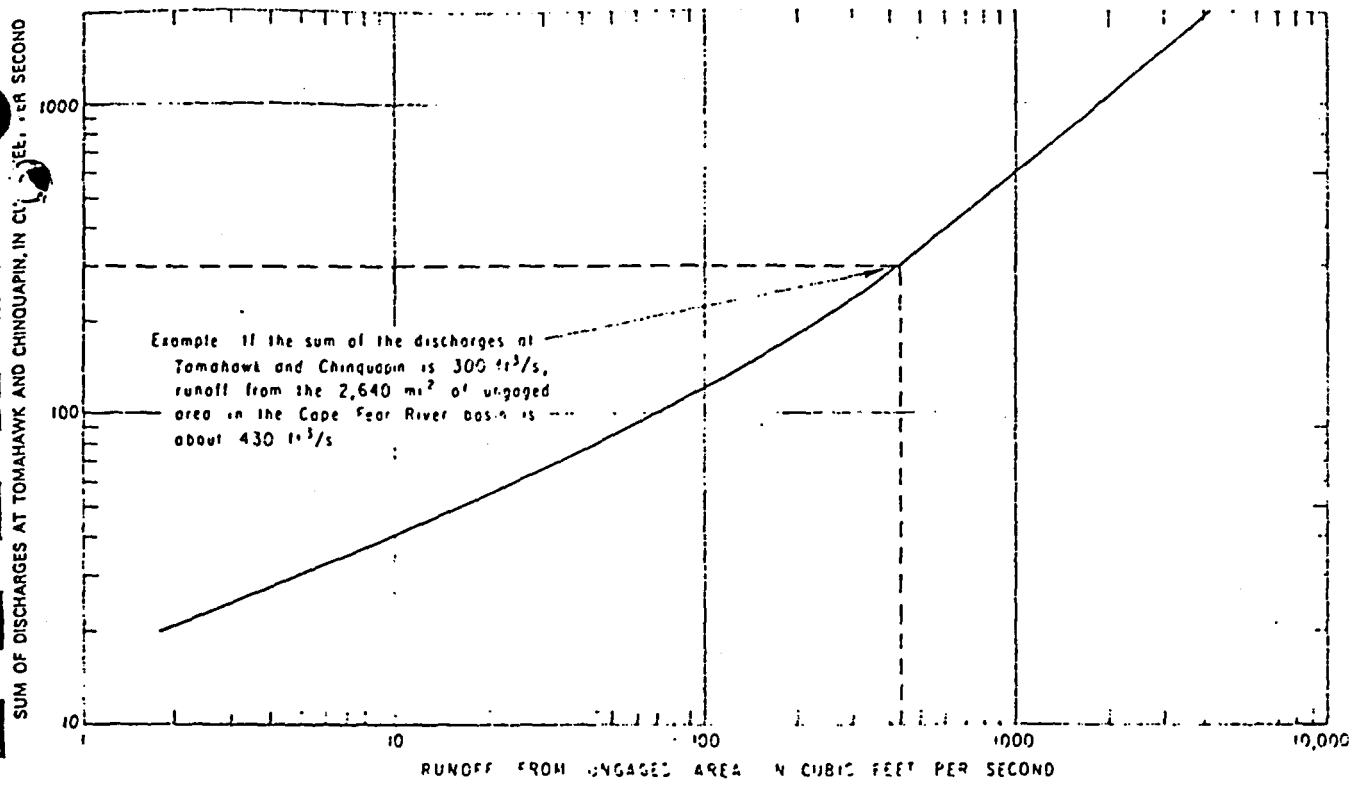


Figure 2.1. Concurrent discharge relation for estimating runoff from the ungaged drainage area between the index stations and the mouth of the Cape Fear River estuary. (Modified from Wilder and Hubbard, 1968.)

Tide-affected Flow

Flow of the Cape Fear River estuary is strongly influenced by ocean tides. The U.S. Geological Survey operated a tidal discharge gaging station near Phoenix (sta. 02107570) from April 1966 through March 1969. (See fig. 2.3.) The purpose of this station was to develop information on tide-affected flows for the estuary which could prove useful, for example, in better understanding the movement and dispersion characteristics of water substances discharged to the river or in better understanding the mechanics of sediment transport and deposition. Volumes of water flowing upstream and downstream on each tidal phase were published in the annual data reports of the U.S. Geological Survey. Calibration measurements were made over full or nearly full tidal cycles on three occasions—May 11–12, 1966, March 8, 1967, and July 27, 1967.

Partial results of the March 8, 1967, series of measurements are shown in figure 2.4. This series of measurements was made under fairly typical tide-affected flow conditions and provided, with other information, a means to calculate the minimum freshwater inflow required to prevent flow reversals in the vicinity of Phoenix.

Figure 2.4 shows that the maximum measured discharge on March 8, 1967, was 15,400 ft³/s downstream at 1100 hours on ebb tide. By contrast, the maximum discharge on flood tide was 6,690 ft³/s upstream at 1915 hours. The average flow over the tidal cycle was 6,240 ft³/s downstream at the Phoenix gage. This value appears reasonable compared with the estimated freshwater flow at Phoenix for March 8 of about 6,500 ft³/s. From this information, it appears that little or no upstream flow should occur near Phoenix whenever the freshwater inflow exceeds about 13,000 ft³/s. Downstream from Phoenix, the tidal component of flow would be larger and a correspondingly larger freshwater inflow would be reqired to prevent flow reversal. Upstream, the tidal component would be less and the freshwater inflow required to prevent reversal would be less also.

Two other facts from figure 2.4 are worth noting. First, times of high and low tides do not occur simultaneously with times of high and low slack water. Rather, slack water occurs from one-half to one-and-a-half hours later than high and low tides. Second, the duration of downstream flow is about 8 hours; the duration of upstream flow is less than 4 hours. These durations are more and less than the expected 6.21 hour duration of a tidal phase unaffected by freshwater inflow. As freshwater inflow increases, the duration of downstream flow also increases.

Figure 2.5 shows typical variations of velocity with depth in the Cape Fear River. This particular profile was taken at the Atlantic Coast Line Railroad Bridge at

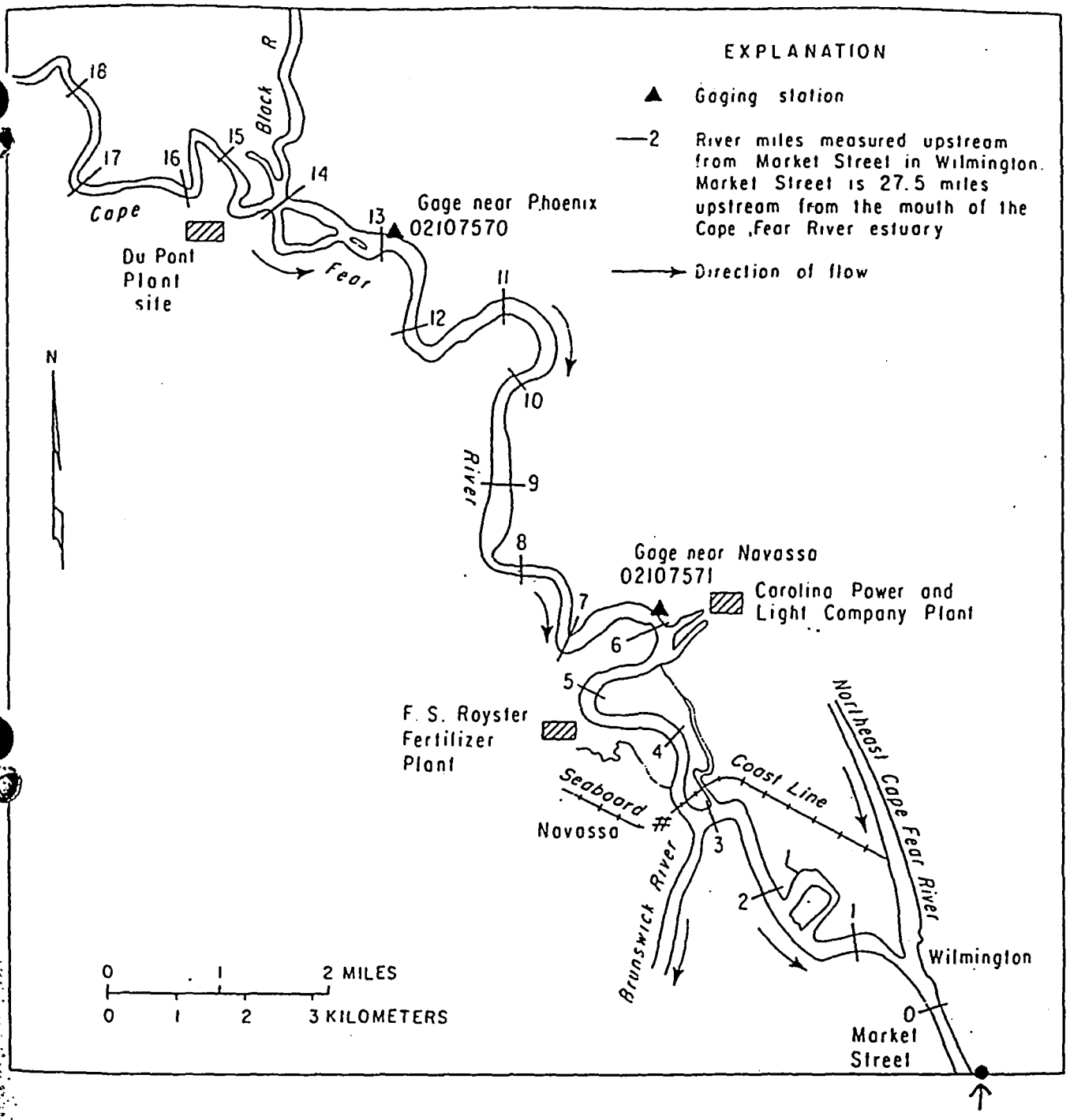


Figure 2.3. Cape Fear River estuary upstream from Wilmington.

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plants. Heating of the estuary water from power-plant operations and industrial-cooling operations may be a significant problem along some reaches. If not for contamination, the water, where fresh, would be suitable for most industrial, domestic, and agricultural uses.

Superimposed on difficulties in freshwater use due to contamination are difficulties due to saltwater intrusion, which may at times affect water quality as far as 20 miles upstream from Wilmington. Details of saltwater intrusion in the estuary are given later.

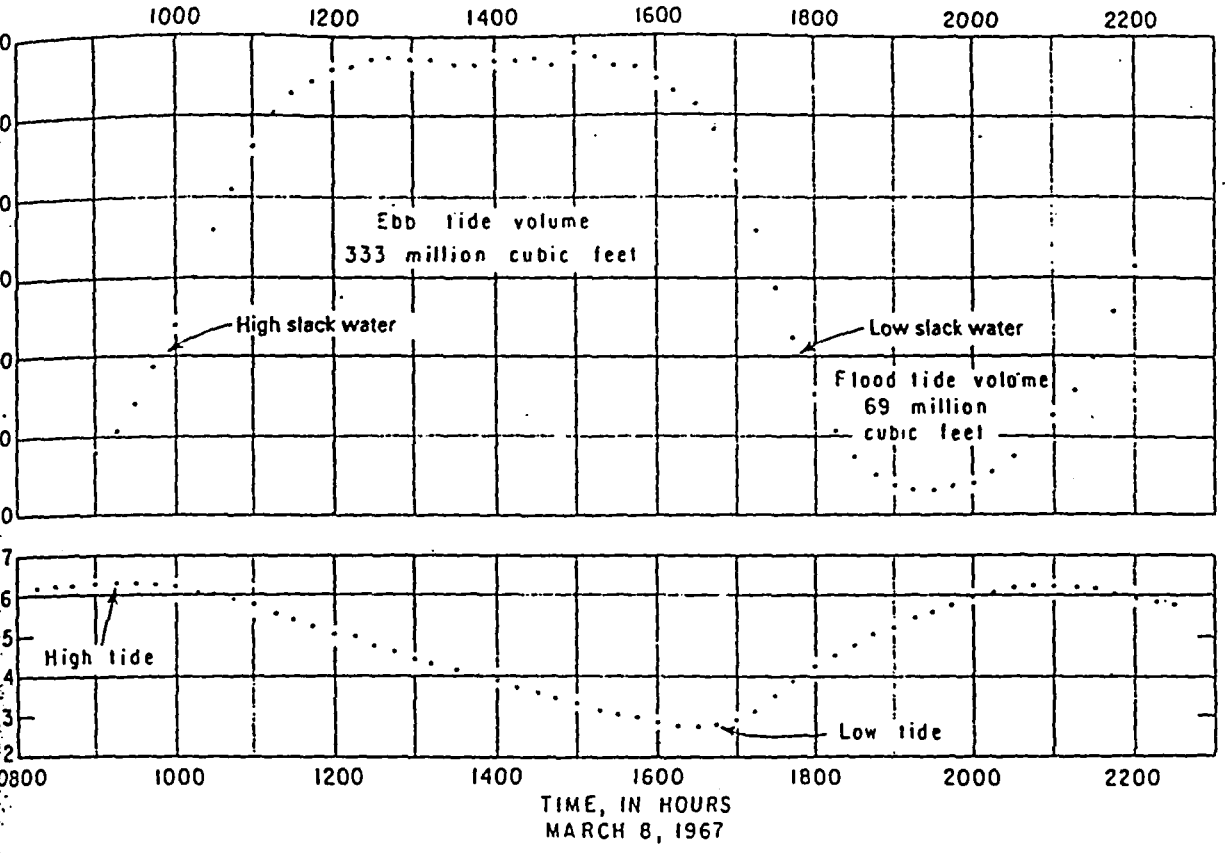


Figure 2.4. Stage and discharge of the Cape Fear River estuary near Phoenix on March 8, 1967.

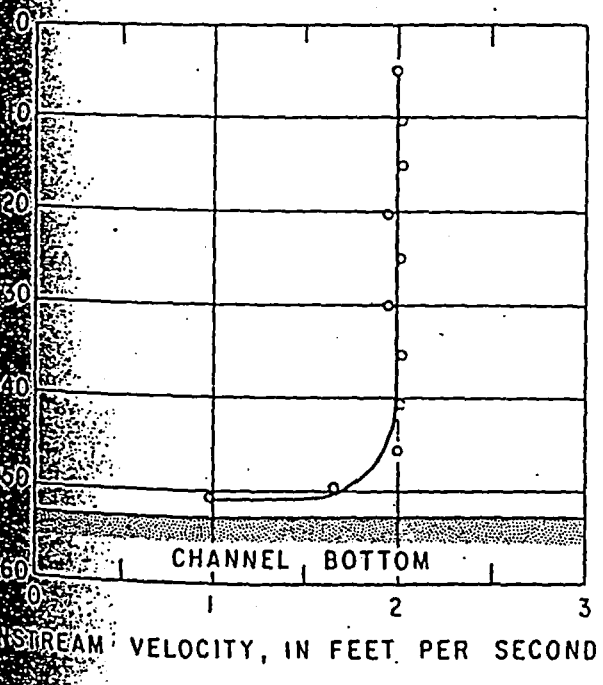


Figure 2.5. Variation of velocity with depth of the Cape Fear estuary at Navassa on May 13, 1966 (at meter station 02105769-0803 hours).

Sediment

The Geological Survey has made suspended-sediment determinations from monthly samples collected at Lock 1 near Kelly (station number 02105769 on pl. 1) since January 1973. The average suspended-sediment load there is about 920 tons/day or 336,000 tons/year. Particle-size analyses (Simmons, 1976) show that over 90 percent of this material is of silt or clay size (.062 mm or less). The fate of this sediment has not been completely studied, but it is known that some is deposited in the estuary. The U.S. Army Corps of Engineers estimates that, in order to maintain navigation facilities at the Military Ocean Terminal at Sunny Point (MOTSU), about 18 miles downstream from Wilmington, 2,238,000 cubic yards, or about 3.5 million tons, of sediment must be removed annually at a cost of $2,169,000 (U.S. Army Corps of Engineers, 1976, p. 4). This gives some idea of the economic impact of sedimentation in the estuary.

Note, from the above discussion, that the amount of material removed from the estuary through dredging far exceeds the amount entering by way of Lock 1. Additional fluvial sediment entering the estuary from the Northeast Cape Fear River and other subbasins probably

does not exceed 35,000 tons/year. Therefore, the primary source of the new shoaling in the Sunny Point area could not be new fluvial sediment, but must be derived from within the estuarine reach or elsewhere—from slumping along the channel, from shore erosion, from old spoil areas, or possibly from sediment derived from the ocean.

Salinity

Variations in Time and Space

The Cape Fear River may be classified under some flow conditions as a partially mixed estuary. That is, turbulence is sufficient to prevent formation of a distinct saltwater wedge or tongue, yet there remains a definite salinity gradient with depth. This is illustrated in figure 2.6, which shows typical longitudinal variations in chloride concentrations of the Cape Fear River at a high slack water on November 1, 1967. The gradient is accounted for by the density differences between freshwater and saltwater. The less dense freshwater tends to flow on top of the heavier saltwater. These density differences are also responsible for upstream density currents which may occur along the channel bottom. These have been observed at and near the Military Ocean Terminal at Sunny Point where a predominant upstream or flood flow exists at times in the lower portions of the river water column (U.S. Army Corps of Engineers, 1976, p. 2).

A different view indicative of salinity stratification is shown in figure 2.7. which is a cross section showing chloride concentrations of the Cape Fear River estuary 1.5 miles upstream from Market Street, Wilmington, on Ju 5, 1962. The top-to-bottom differences are very marke The surface concentration of 150 mg/L of chloride is eqı valent to less than one percent seawater while the botto concentration of 3,000 mg/L or greater is at least 16 pc cent that of seawater.

The salinity of the estuary is in a state of consta flux. Saline water moves in and out of the Cape Fear e tuary regularly in response to tidal action, freshwater i flow, winds, and a number of other, less significant, fa tors. However, it has been found, at least for the part the estuary above Wilmington, that the relative positio of the various lines of equal chloride concentration a fairly constant. In other words, if we know the river mi position of 300 mg/L of chloride, then the position of 2(or 1,000 or 3,000 mg/L of chloride may be predicted wi a fair degree of accuracy, provided that the locations a somewhere above Wilmington. This relation is shown figure 2.8. The values given are for the channel bottom high slack water. Values at the surface would be som what less.

The maximum upstream movement of saltwater i the Cape Fear River estuary probably occurred during tl passage of Hurricane Hazel on October 15, 1954. The ey of the hurricane moved inland near the South Carolir border and proceeded in a northerly direction along a pat that crossed the upper end of the estuary. The cour terclockwise circulation of winds around the hurricane ey produced strong winds from the southeast which raise tides to the highest level ever recorded at Wilmingtor The high tide measured at the National Ocean Survey

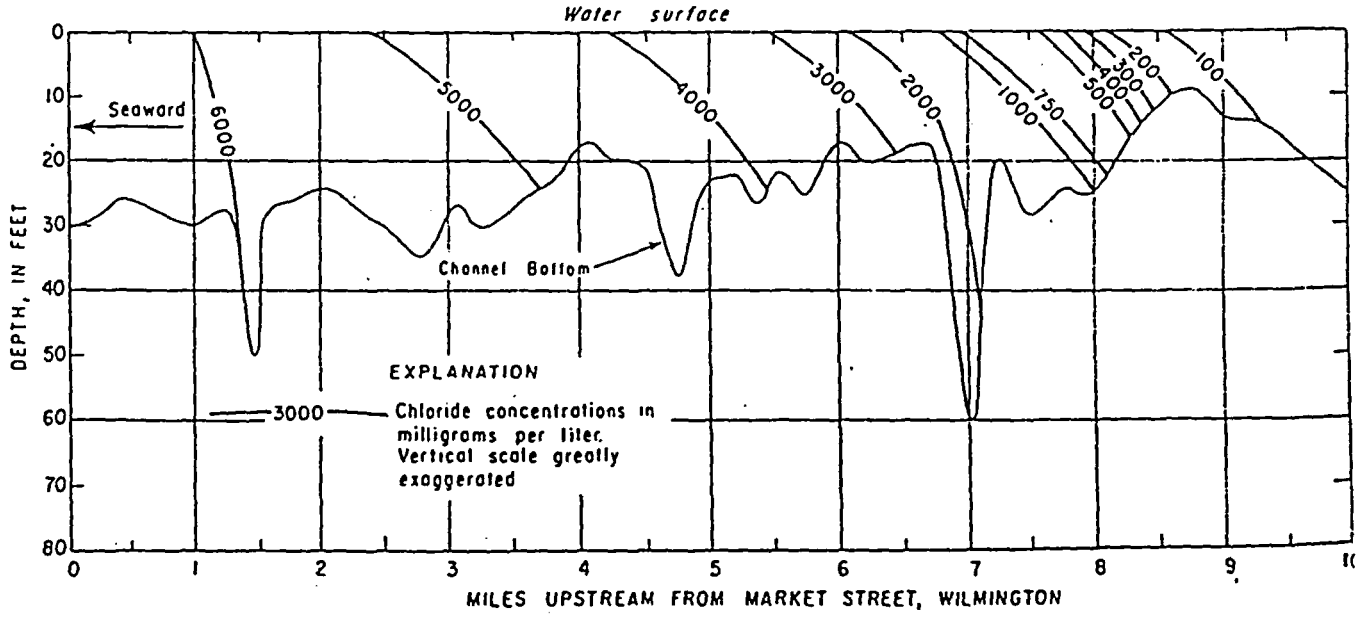


Figure 2.6. Longitudinal variations in chloride concentrations of the Cape Fear River estuary at high-slack water, Novembe 1, 1967. (From Wilder and Hubbard, 1968.) (Refer to fig. 2.3 for locations.)

stant, probabilities may be determined with reasonable accuracy. For example, using figure 2.11 and assuming that the maximum tide will be 4.0 feet above mean low water during the period of annual minimum flow, it may be that encroachment to a point 10 miles above Wilmington will occur when the 7-day average outflow is about 820 ft^3/s, and we estimate from figure 2.2 that such a flow condition will recur on an average of 3.8 years.

It is apparent, from figure 2.11 that saltwater encroachment will not be a problem as far upstream as 15 miles above Wilmington, near the mouth of the Black River, without the simultaneous occurrence of both an exceptionally high tide and an exceptionally low inflow.

Another important factor that will affect the extreme annual position of the saltwater front is the B. Everett Jordan Reservoir. The operating scheme for this reservoir provides for a minimum flow of 600 ft^3/s in the Cape Fear River at Lillington. This reservoir release, plus the minimum inflow that may be expected to occur about once in 100 years, on average, between Lillington and the mouth, will produce about 800 ft^3/s of outflow from the estuary. This augmented flow shoı maximum extent of saltwateı

SOUTHERN WOOD PIEDMONT CO.
WILMINGTON, NC
NCD 058 517 467

THE NORTHEAST CAPE FEAR RIVER ESTUARY

The Northeast Cape Fear River (see pl. 1 and fig. 2.12) originates in Wayne County, flows south through Duplin, Pender, and New Hanover Counties, and at Wilmington flows into the Cape Fear River, which empties into the ocean about 30 miles south of Wilmington. The total area drained is 1,740 mi^2. The entire basin lies within the Coastal Plain and stream gradients average less than one-half foot per mile. The two largest tributaries are Rockfish Creek and Holly Shelter Creek. Much of the main stem of the Northeast Cape Fear River and most of its tributaries are typical black-water, swamp-drainage streams, with imperceptible flows, sand-detritus bottoms, and low turbidity. Tide effects in the Northeast Cape Fear River extend upstream almost 50 miles from the mouth, to near Holly Shelter Creek. Thus, the river may be considered an estuary in that 50-mile reach. Many of the tributaries entering the Northeast Cape Fear River in its tidal reach are also affected by tides.

The lower 2.5 miles of the Northeast Cape Fear River estuary has been dredged and a navigation channel 32 feet deep and 300 feet wide is maintained. Upstream from this, to a point 48 miles above the mouth, the river was cleared to a depth of 6 feet in 1896; upstream from this, to 56 miles above the mouth, the river was cleared to a depth of 3 feet.

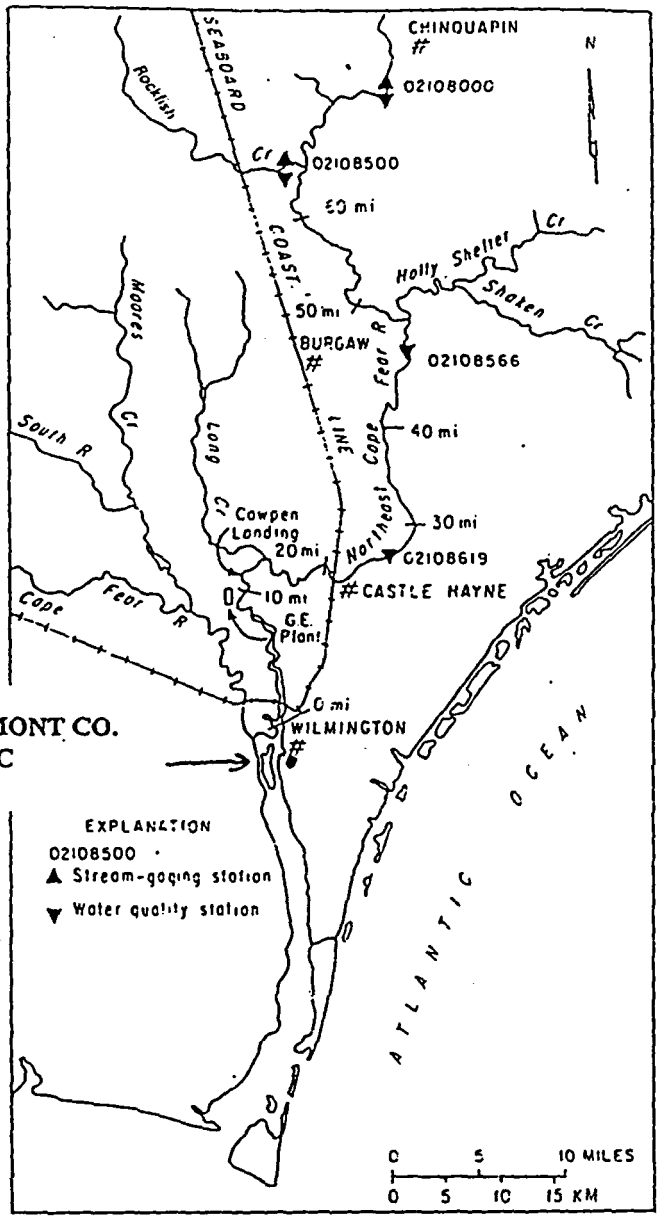


Figure 2.12. Northeast Cape Fear River estuary.

Several industries use the Northeast Cape Fear River and its tributaries both as a source of process water and as a conveyor of industrial wastes. The upper reaches of the Northeast Cape Fear River are used for recreation, primarily boating and fishing.

Freshwater Inflow

The average net outflow of the Northeast Cape Fear River estuary is about 2,120 ft^3/s. Of greater interest than average flow, however, are low flows, because pollution

and saltwater intrusion problems are greatest during low flows. In the Northeast Cape Fear River, an attempt to estimate low flows at the mouth by simple extrapolation of the measured low flow at Chinquapin, based on drainage-area ratios, will lead to erroneously high results. This is because, during low-flow periods, the upper part of the basin contributes a proportionately higher percentage of flow than does the lower part of the basin. For this reason, a relation was developed by Hubbard and Stamper (1972, p. E21) relating the low flow at Chinquapin to the flow at the mouth. The relationship, shown in figure 2.13, provides a reliable approximation of total freshwater flow out of the Northeast Cape Fear River only during stable low-flow recessions, when flow at Chinquapin is less than 360 ft^3/s. Therefore, the relationship should not be extended beyond the limits shown.

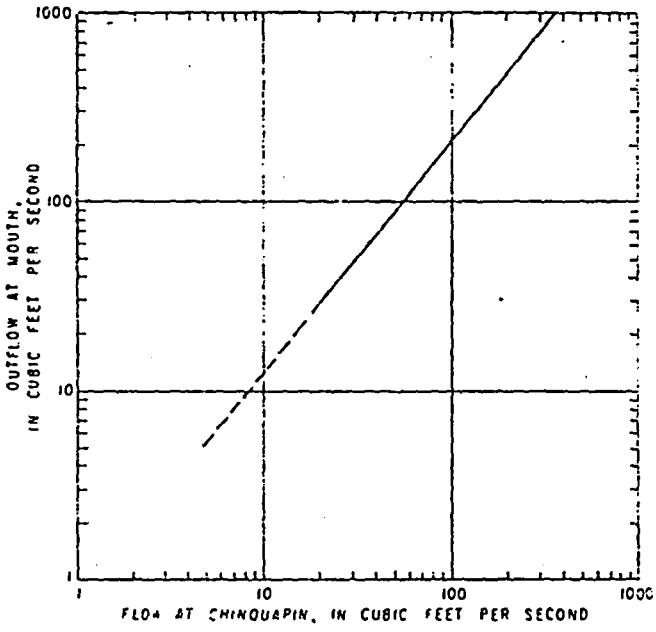


Figure 2.13. Relation between flow measured at Northeast Cape Fear River at Chinquapin and net outflow from the Northeast Cape Fear River estuary at the mouth. (Adapted from Hubbard and Stamper, 1972.)

Another important aspect of low flows is frequency of recurrence. Figure 2.14 shows low-flow frequency curves of net outflow from Hubbard and Stamper (1972). These curves may be used to estimate the frequency of recurrence of various annual minimum consecutive-day average outflows. For example, a minimum annual 7-consecutive-day average inflow of about 15 ft^3/s or less is expected to have an average recurrence interval of about 10 years. The flow relations presented in this section of t report can be used, as discussed later, to develop relatio showing the frequency of recurrence of saltwater intrusi in the Northeast Cape Fear River estuary.

Tide-affected Flow

Tide ranges in the Northeast Cape Fear River e: tuary vary considerably depending on distance upstrea from the mouth at Wilmington. At the General Electri plant, 6.4 miles upstream from the mouth, mean tid range is about 3.4 feet; near Castle Hayne, 23 miles up stream from the mouth, they average about 1.7 feet; nea the mouth of Holly Shelter Creek, 50 miles upstream fro the mouth, there are no lunar tides.

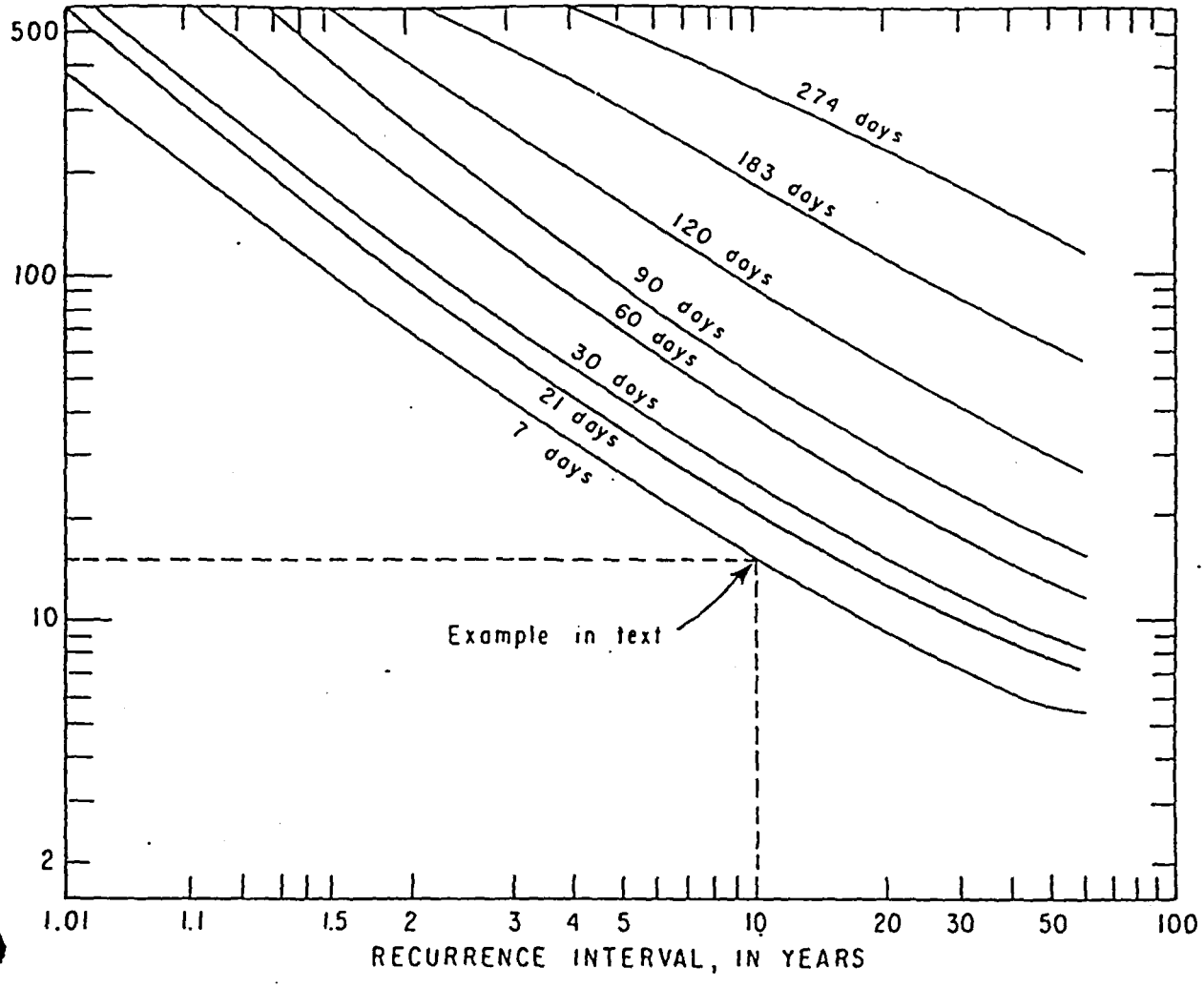
Flow due to tides is the dominant flow componen in the lower reaches of the Northeast Cape Fear estuary Strong flow reversals occur near the mouth with each tida cycle. Here, river velocities due to tides average about 1-1.5 ft/s, and seldom exceed 2 ft/s. Although no specifi information is available on velocities due to tides in th upper reaches of the Northeast Cape Fear River estuary they would become insignificant near river mile 50.

The average freshwater inflow to the estuary i: about 2,100 ft^3/s. At this rate, average velocities near th mouth due to freshwater inflow alone are only about 0.0 ft/s, or 5 to 8 percent of the average velocities attributabl to tides.

The U.S. Geological Survey made a continuou: measurement of tide-affected discharge during one com plete tidal cycle, 6.4 miles upstream from the mouth o the Northeast Cape Fear estuary, on October 23, 1969 The results of the measurement are shown in figure 2.15 The maximum discharge measured on October 23 wa: 22,250 ft^3/s. This occurred during flood tide at 193 hours. The maximum discharge measured on ebb tide wa 18,080 ft^3/s at 1400 hours. These values are much large than the estimated 420 ft^3/s of freshwater inflow for tha day. During ebb tide, a total of 315 million cubic feet o water flowed past the measuring section. Of this amount only about 11 million cubic feet could be accounted for b freshwater inflow to the estuary. This represents about . percent of the total flow volume.

Obviously, tides are the dominant short-term flo component near the mouth of the Northeast Cape Fea River estuary. A freshwater inflow of about 23,000 ft^3/s almost 11 times the average, would have been required t prevent flow reversals during the October 23 measure ments, and flows as large or larger than 23,000 ft^3/s occu only about 0.02 percent of the time. Further upstream, th influence of tides on flow is less and becomes negligibl about 50 miles upstream.

As in the case of the Cape Fear River estuary, time of high and low tides in the Northeast Cape Fear River es



gure 2.14. Low-flow frequency curves for the Northeast Cape Fear River estuary. (Adapted from Hubbard and Stamper, 972.)

ry do not coincide with times of slack water, as shown figure 2.15. During the October 23 measurement, slack ter occurred more than an hour after high and low s.

Detailed vertical velocity profiles are not available the Northeast Cape Fear River estuary. However, ed on some velocity observations made during the Oc- er 23 measurement, profiles would be similar to those erved during measurements of the Cape Fear River es- y, shown earlier in figure 2.5.

During October 1969, a study of the movement and n of dye in the Northeast Cape Fear River estuary by the U.S. Geological Survey. The results of stuuy are contained in the 1972 report by Hubbard and Stamper. Figure 2.16, taken from that report, shows average flushing times for a solute injected into the estuary about 6.5 miles upstream from the mouth. When a solute (or pollutant) is injected as a slug, it travels upstream and downstream with flood and ebb flows. As it does so, it spreads out and becomes diluted, forming a cloud of the solute. In addition to the upstream-downstream movement of the cloud due to tidal flows, there is a net downstream movement of the cloud due to freshwater inflow. This cloud has a center of mass and it is the flushing time of the center of mass to which figure 2.16 refers. For example, referring to figure 2.16, if the outflow is 200 ft^3/s, it would take 30 days for the center of mass to reach the mouth from 6.5 miles upstream. At this

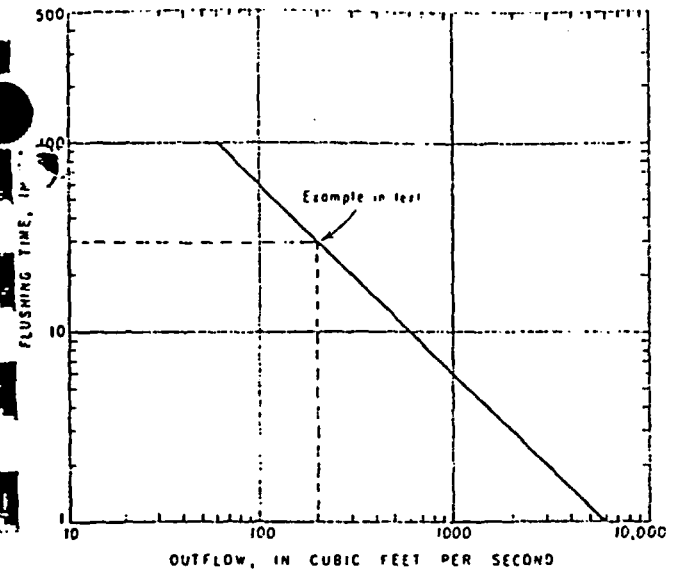


Figure 2.16. Average flushing time for a solute injected into the Northeast Cape Fear River estuary about 6.5 miles upstream from the mouth. (From Hubbard and Stamper, 1972.)

time, one-half of the solute would already have passed the mouth and one-half would not yet have reached the mouth. The results of this analysis can be extended upstream and downstream for different injection points by using cross-sectional areas and average freshwater inflows. Then, mean velocities for a given reach may be determined by the equation:

$$V = \frac{Q}{A} \tag{2.2}$$

where:

V = mean velocity, in feet per second through the subreach
Q = freshwater inflow, in cubic feet per second
A = area, in square feet

Dividing the length of each subreach by the mean velocities gives net traveltimes, which are based on freshwater inflow, disregarding tidal effects.

Hubbard and Stamper (1972) also give maximum concentration buildups at various river cross sections due to various constant injection rates of a solute 6.5 miles upstream from the mouth. They found that the dye cloud dispersed upstream and downstream several miles from the injection point but that maximum solute concentration upstream was only 0.3 miles below the injection point. It is difficult to extrapolate their results upstream or downstream for other injection points in the Northeast Cape Fear River estuary, but maximum concentration buildups would be expected near the injection points.

Water Quality

Summaries of the chemical quality of water at three key sites in the Northeast Cape Fear River basin are given in table 2.2, including observed ranges and average values of major chemical constituents. Iron concentrations sometimes exceed the 0.3 mg/L concentration limits recommended by the U.S. Environmental Protection Agency (1976) [1977] for public water supplies. The same is true for color, which often exceeds the upper limit of 75 color units recommended by the Environmental Protection Agency (1976) [1977]. The color of the Northeast Cape Fear River is derived primarily from decaying vegetation and the leaching of humic acids in swamp areas.

Sediment

The sediment-carrying capacity of the Northeast Cape Fear River and its tributaries is low due to low stream gradients. Most of the sediment that is carried is of clay or silt size (less than 0.062 mm). Based on flow and sediment measurements made at Northeast Cape Fear River at Chinquapin and Rockfish Creek near Wallace, the average annual sediment inflow to the estuary is probably no more than about 15,000 tons (20,000 cubic yards). This amount is less than one-third of the estimated 66,000 cubic yards of sediment that the U.S. Army Corps of Engineers removes on an average annual basis from the Northeast Cape Fear River estuary to maintain navigation.

Obviously, the amount of sediment from upstream sources is not enough to account for the amount of maintenance dredging that is done in the estuary. The question then arises, what is the source of the sediment that forms shoals in the navigation channel and harbor facilities in the Northeast Cape Fear River estuary? This question can be answered only speculatively because little work has been done to determine the exact sources. Probably only a part of the estimated 20,000 cubic yards of sediment that is carried into the estuary by freshwater inflow actually settles in the estuarine zone. Likely, a large proportion of it is carried out into the Cape Fear River estuary. However, sediment that is deposited from upstream sources would tend to settle in the deeper dredged areas.

A second possibility is that some shoaling materials may be transported upstream from the Cape Fear River. This could occur whenever the Northeast Cape Fear estuary is in a partially mixed or stratified state. Then, net upstream flow might prevail near the bottom. The mini-

um mixing ratio needed to produce partially mixed conitions is about 0.5. (Refer to discussion on estuarine types in the section on "General Hydrology.") Based on measurements of tide-affected flow in the estuary, the ...um freshwater inflow needed to produce partially mixed conditions (and, hence net upstream velocities near the channel bottom) would be about 6,500 ft^3/s. Although freshwater inflows of this magnitude or greater occur less than 5 percent of the time, it is possible that significant upstream migration of shoaling materials occurs due to this phenomenon.

The third and possibly the major source of shoaling materials is within the estuarine reach itself. These sources could include materials eroded from the shores, materials resuspended from the channel bottom and moved by tidal action to the shoaling areas, and slumping of materials adjacent to the navigation channel.

Salinity

Variations in Time and Space

With respect to salinity, the Northeast Cape Fear River estuary may be classified as a well mixed estuary, most of the time, at least. This has been verified by several specific conductance surveys, one of which is summarized in figure 2.17. This figure shows lines of equal specific conductance along a channel profile of the Northeast Cape Fear River estuary, based on data collected on November 9, 1966. There was very little difference on that day between surface and bottom specific conductances in most of the reach portrayed here. The mixing index was estimated to be about 0.06 for that day, which is very close to the arbitrary upper limit of 0.05 for a well mixed estuary. Although no extensive specific conductance data were collected within any cross section on that day, it is not likely that any significant specific conductance differences existed within cross sections.

Historically, the maximum observed upstream intrusion of saline water into the Northeast Cape Fear estuary occurred during Hurricane Hazel on October 15, 1954, when chloride concentrations reached 1,450 mg/L at Castle Hayne. Based on this and information in figure 2.18 (discussed later), the saltwater front could have been 2 or 3 miles upstream from Castle Hayne on that date.

The very extreme saltwater encroachment which took place due to Hurricane Hazel was in addition to the extreme encroachment which had already taken place due to record low river flows immediately preceding the hurricane. At Chinquapin, for example, the discharge averaged only 5.3 ft^3/s on October 10–11, 1954, the all-time low for the 37-year period of record. On October 9 and 10, 1954, chloride concentrations were already about 500 mg/L at Castle Hayne, the greatest salinity intrusion of record, up to that time. The recurrence interval of two such rare events occurring in succession is not known, but it may be reckoned in centuries.

The maximum seaward movement of the saltwater front occurs during times of high freshwater inflow, usually in the spring. At such times, the front may be displaced out of the Northeast Cape Fear River estuary altogether, leaving the estuary completely fresh for a short period.

It is not economically feasible on a routine basis to survey the entire river to locate the saltwater front. However, based on previous salinity surveys, a type curve has been developed for the Northeast Cape Fear River estuary which may be used to estimate the specific conductance at any point in the estuary, if the specific conductance is known at only one point (fig. 2.18). As an example of the use of this type curve, suppose that the specific conductance near the channel bottom at a high slack water is 6,000 µmhos at Cowpen Landing, 11.2 miles upstream from the U.S. Highway 17 bridge in Wilmington, (U.S. Highway 17 bridge is about 0.85 miles upstream from the mouth of the estuary) and we want to know the location

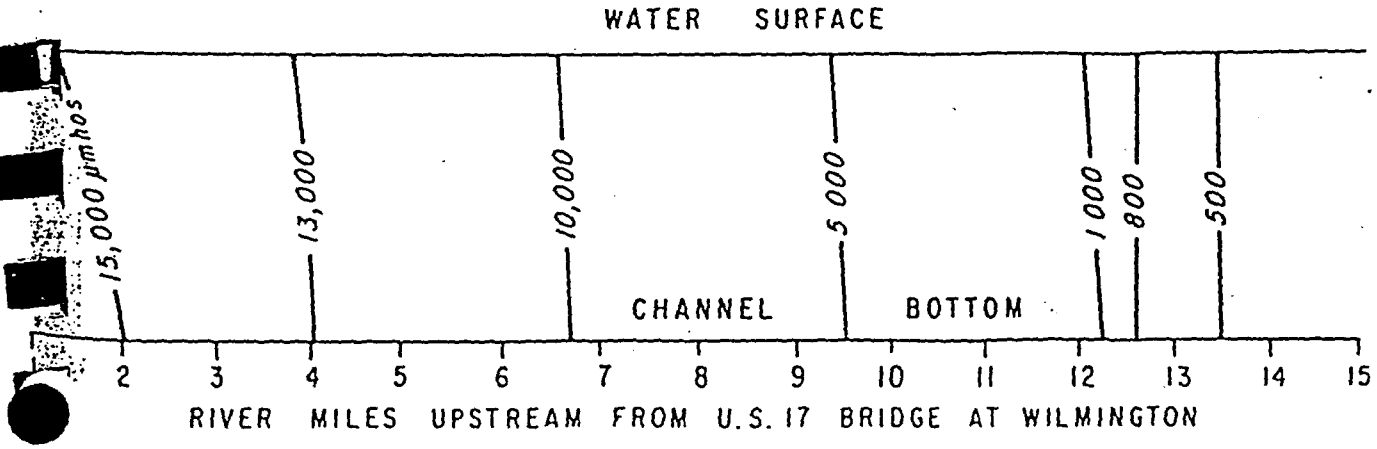
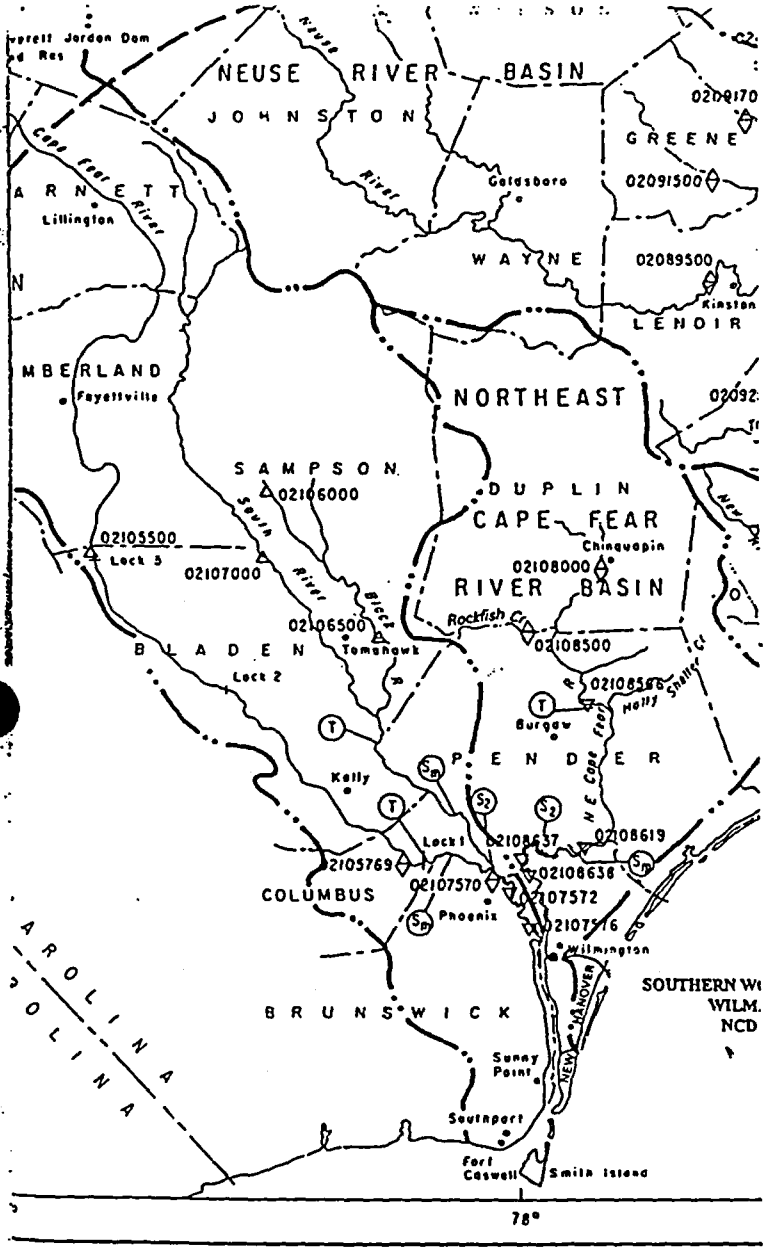


Figure 2.17. Longitudinal variations in specific conductance of the Northeast Cape Fear River estuary on November 9, 1966. (Are variable and should not be inferred from the sketch.



MAJOR ESTUARIES AND SOUNDS OF NOR

REFERENCE 34

B&V WASTE SCIENCE AND TECHNOLOGY CORP.

TELEPHONE MEMORANDUM

US EPA Region IV
Old ATC Refinery
Cape Fear River Flow Rate

BVWST Project 52014.100
BVWST File
April 29, 1993
10:05 a.m.

To: Rufus Allen
Company: U. S. Geological Summary
Phone No.: 919/571-4000

Recorded by: Scotti Thomas

I contacted the USGS to find out the flow rate of the Cape Fear River at Wilmington. Mr. Allen informed me that the nearest gaging station to Wilmington is located at river mile 67 at Lock 1. He said the Cape Fear River is tidally influenced at Wilmington.

REFERENCE 35

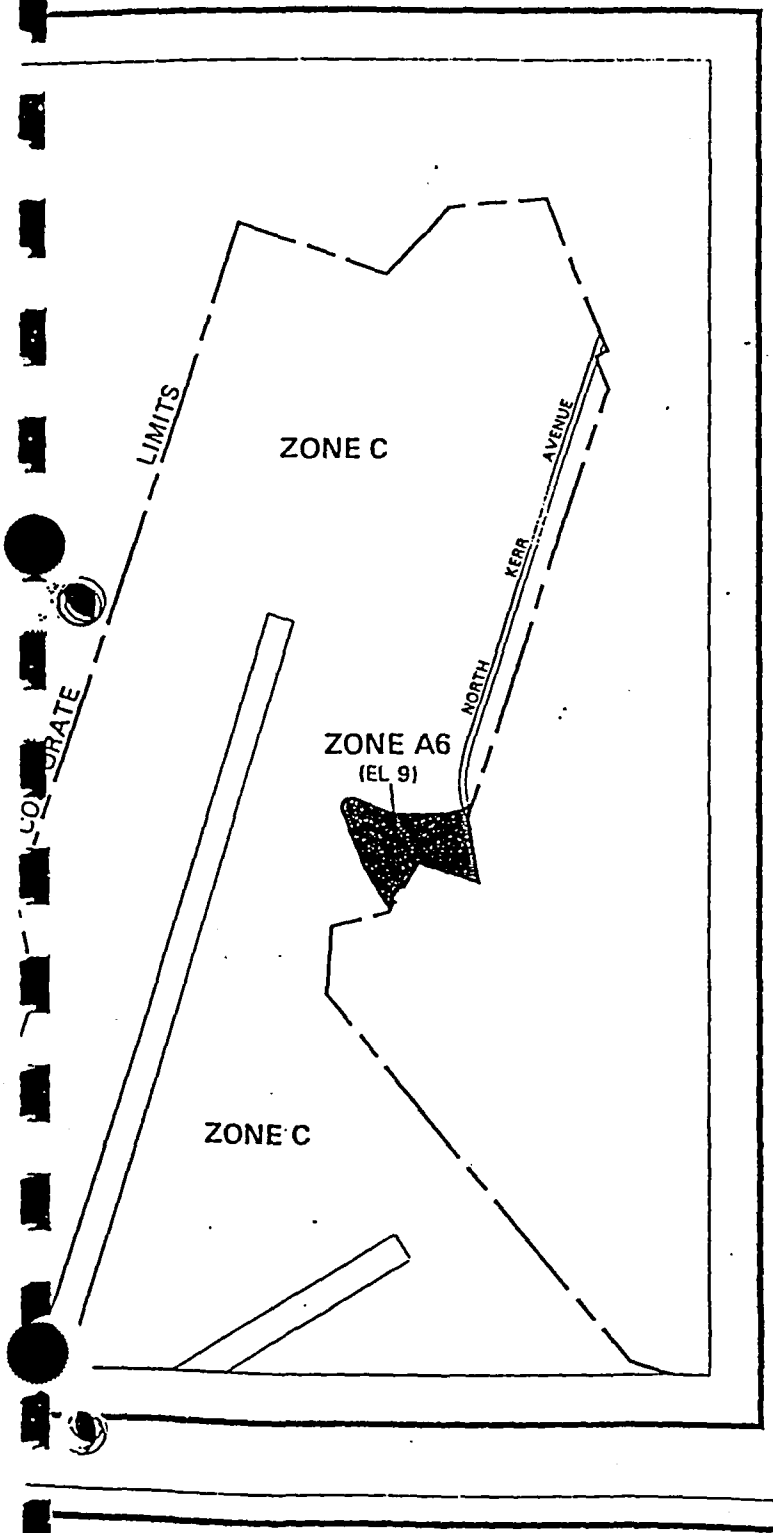
RENCE MARKS

DESCRIPTION OF LOCATION

of headwall of Burnett Boulevard culvert between Front Street and

ll of Barnards Creek culvert under U.S. Route 421.

erguard on River Road bridge over Barnards Creek.



To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

Ref. 35

APPROXIMATE SCALE

1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
WILMINGTON,
NORTH CAROLINA
NEW HANOVER COUNTY

PANEL 10 OF 10

COMMUNITY-PANEL NUMBER
370171 0010 B

MAP REVISED:
APRIL 2, 1986

Federal Emergency Management Agency

REFERENCE 36

BLACK & VEATCH Waste Science, Inc.

TELEPHONE MEMORANDUM

U.S. EPA
Old ATC Refinery
Flow Rate for the
Cape Fear River

BVWS Project 52013.310
BVWS File SA
May 5, 1995
11:35 am

To: Dan Emerson
Company: U.S. Army Corps of Engineers
Phone No.: (910) 251-4761

Recorded by: Kem Reliford

Dan Emerson compiled flow rate data from the 1982 to 1992 10-year period for the Cape Fear River. The average annual flow rate represented by the 10-year data for the Cape Fear River is 5,247 cubic feet per second.

REFERENCE 37

Owner: USEPA Region IV
Plant: Southern Wood Piedmont Unit: Wilmington, NC
Project No. 52014.755 File No.
Title: Wetlands Acreage Estimates

Computed By: Robert Mangum
Date: 6-11 19 92
Checked By
Date 19
Page 1 of 1

Using a Timesaver Acreage Template and the following USGS 7.5 Minute Topographic Quadrangle Maps: Leland, NC (1984); Castle Hayne, NC (1970); Winnabow, NC (1990); and Wilmington, NC (1970, Photorevised 1979).

Wetlands on site: 10 acres

0 - 1/4 Mile Radius: 32.5 acres

1/4 - 1/2 Mile Radius: 130 acres

1/2 - 1 Mile Radius: 690 acres

1 - 2 Mile Radius: 3,400 acres

2 - 3 Mile Radius: 4,640 acres

3 - 4 Mile Radius: 3,840 acres

Total 12,742.50 acres estimated Wetland Acreage within 4-miles (radius) of the Southern Wood Piedmont site in Wilmington, New Hanover County, North Carolina.

DO NOT WRITE IN THIS SPACE

REFERENCE 38

Wetland Delineation

SFP examined National Wetland Inventory 7-
quadrangle maps (included in Figure 3) to determine the
total wetland frontage along those sections of the Cape
the Brunswick River and the Northeast Cape Fear River
within 15 water miles of the site. Total mapped fr
CERCLA-recognized wetlands (e.g., Palustrine Emergent,
Forested, Palustrine Scrub-shrub, etc.) were measured
various river segments and their tributaries which unc
flow-reversal (see Ref. 8). The breakdown of frontage i
as follows:

On-site drainage ditch and Greenfield Creek:	0.45 mile
Cape Fear River (CFR) from Creek to NE CFR:	1.0 mile
NE Cape Fear River:	42.8 miles
Upper Cape Fear River:	34.4 miles
Brunswick River:	33.7 miles
Downstream CFR:	58.2 miles
Total:	170.6 miles

232 421 233 INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1982 234000mE 3780 34° 77°52′30

WILMINGTON, N.C.

HE USER

ls which have been field examined are indicated
nap by an asterisk (*).
corrections to the wetlands information
n this map are solicited. Please forward such
tion to the address indicated.
Classes, Subclasses, and Water Regimes
developed specifically for NATIONAL
NVENTORY mapping.
signated as R4SB, R4SBW, OR R4SBJ
STREAMS) may not meet the defini-
etland
ses the class Unconsolidated Shore (US).
NWI maps that class was designated Beach/
or Flat (FL). Subclasses remain the same in both

RIAL PHOTOGRAPHY

82 DATE: ___/___/___
000 SCALE: _____
R TYPE: _____

U.S. DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

Prepared by National Wetlands Inventory