GROUND WATER MONITORING EVALUATION
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA

UPDATE

The Hazardous Waste Ground Water Task Force evaluated the Southern Wood Piedmont facility in Augusta, Georgia, for compliance with the 40 CFR Part 265, Subpart F regulations during the week of January 26, 1987. Several deficiencies pertaining to the RCRA ground water monitoring system were noted during the evaluation. S. E. Matthews, project coordinator for the evaluation, compiled a report that detailed these deficiencies and summarized the results from water quality samples collected from the RCRA monitoring wells at the facility.

This update chronicles activities at the Southern Wood Piedmont facility following the Task Force evaluation and any actions taken by the Georgia Environmental Protection Division (EPD) and EPA Region IV regarding RCRA ground water monitoring at the facility.

In February 1987, Southern Wood Piedmont (SWP) sampled several of the RCRA monitoring wells. K001 constituents were detected in some of the wells.

In March 1987, the Agency for Toxic Substances and Disease Registry (ATSDR) prepared a RCRA Health Consultation for the SWP facility at the request of the Georgia Department of Human Resources. The report concluded that the data available indicated some concern over the potential exposure of individuals within the residential community around the facility. The report also indicated the need for more data to allow for a better determination of the longer-term health risks. In April 1987, the Georgia Department of Natural Resources reviewed the ATSDR report and prepared a letter listing several questions and suggestions regarding the correct interpretation of the report.

In May 1987, SWP sampled some of the RCRA monitoring wells. K001 constituents were detected. In June 1987, the Georgia EPD sampled neighborhood wells in the vicinity of SWP. No K001 constituents were detected.

Also in June, EPD performed an inspection at SWP. In July, EPD issued two Notices of Violation (NOV) based on deficiencies noted during the June inspection. The violations included deficiencies in the groundwater monitoring system, post-closure care of the surface impoundment and the contingency plan. Many of the issues were resolved by August 1987.

Another sampling event occurred in July 1987, when SWP sampled more monitoring wells. K001 constituents were detected.

In late July, EPD issued an NOV to SWP based on Consent Order EPD-HW-257. This order addressed Part B deficiencies and had been issued prior to the HWGW Task Force evaluation. These issues were resolved by August 1987.

In August 1987, SWP submitted a request to EPD to begin partial corrective actions at the Augusta facility. EPD reviewed the plan and wrote SWP to proceed. SWP began installing additional monitoring wells for assessment purposes.

Also in August, EPD sampled a neighborhood well in which K001 constituents were detected. Another inspection was conducted at SWP.

Late September 1987, EPD issued a Notice of Deficiency to SWP for Part B deficiencies and a NOV on the Ground Water Quality Assessment Plan. A meeting was held between SWP and EPD in October to discuss the September NOD/NOV.

To date, EPA Region IV has taken no enforcement action against the facility.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
HAZARDOUS WASTE GROUND WATER TASK FORCE

GROUND WATER MONITORING EVALUATION
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA
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EXECUTIVE SUMMARY

INTRODUCTION

Task Force Effort

Operations at hazardous waste treatment, storage and disposal (TSD) facilities are regulated by the Resource Conservation and Recovery Act. Regulations promulgated pursuant to RCRA (40 CFR Parts 260 through 265, effective on November 19, 1980 and subsequently modified) address hazardous waste site operations including monitoring of ground water to ensure that hazardous constituents are not released to the environment. The regulations for TSD facilities are implemented (for EPA administered programs) through the hazardous waste permit program outlined in 40 CFR Part 270.

The Administrator of the Environmental Protection Agency (EPA) established a Hazardous Waste Ground Water Task Force (Task Force) to evaluate the level of compliance with ground water monitoring requirements at commercial off-site and selected on-site TSD facilities and address the cause of noncompliance. The Task Force is comprised of personnel from the EPA Headquarters Core Team, Regional EPA Offices and the States.

There were eight Task Force evaluations conducted in Region IV during FY-86 and FY-87. Evaluations have been conducted at both of the region's two off-site commercial facilities. Six evaluations were conducted at private, on-site facilities. The evaluation of Southern Wood Piedmont was the fourth private on-site investigation in Region IV and was conducted the week of January 26, 1987.

Objectives of the Evaluation

The principal objectives of the inspection at Southern Wood Piedmont (SWP) were: to determine compliance of the RCRA surface impoundment with the requirements of 40 CFR Part 265, Subpart F - Ground Water Monitoring and to determine compliance with related requirements of the Part 265 interim status regulations and the state's counterpart regulations; to evaluate the ground water monitoring program described in the RCRA Part B permit application for compliance with Part 270.14(c) and potential compliance with Part 264; to evaluate any ground water monitoring systems associated with solid waste management units at the facility that would provide data and information to be used during the permit review process; and to conduct an audit of the laboratory used by SWP for ground water analyses.

The SWP inspection was coordinated by the Region IV United States Environmental Protection Agency (EPA), Environmental Services Division and included participation by the EPA Headquarters Core Team, Region IV EPA Waste Management Division and the Georgia Department of Natural Resources Environmental Protection Division (EPD). In general, the evaluation involved a review of State, Federal and facility records, a facility inspection, a laboratory evaluation and ground water sampling and analysis.

BACKGROUND

Locale/Facility/Operations

The SWP facility is a wood preserving plant located on a 78-acre site at 1650 Nixon Road, Augusta, Georgia (see Figure 1). The facility is approximately two miles south of the Augusta corporate boundary.

Operations were apparently initiated at the site in the early to mid-1920's based upon property deeds dating back to 1923. Wood-treating preservatives which have been used are creosote, pentachlorophenol, chromated copper arsenate (CCA) and zinc meta-arsenite (ZMA). Use of ZMA was discontinued about 1950, and the use of creosote was discontinued in 1983, so that presently only pentachlorophenol and CCA are used as preservatives.

Raw wood materials are delivered by rail or truck to the facility for processing by the following general steps:

1. Raw wood materials are shaped to the desired product dimensions.

2. Shaped wood products are seasoned by a natural drying processor or by artificial steaming.

3. Seasoned wood is treated with a preservative. Treatment preservatives included creosote, pentachlorophenol, or CCA (chromated copper arsenate salts). Creosote was discontinued as a preservative in December of 1983.

4. Following treatment, final wood products are stored on the plant site until needed by a customer or are shipped directly by rail or truck to customers.

Process water from SWP-Augusta facility operations consists of steam condensate and moisture extracted from wood during the seasoning process, and vacuum pump seal water, vacuum jet condensate and waste stream condensate from the creosote/pentachlorophenol treatment process. These wastes are transported by equipment used to transfer treatment chemicals and, as a result become contaminated with small quantities of creosote and pentachlorophenol. Process waste from these sources is collected at various locations in the processing area and is piped directly to the API separator in series for recovery of organic wood treatment preservatives for recycling in the wood preserving operation. Wastewater generated from the API separators flowed to an unlined surface impoundment. The surface impoundment was aerated to provide biological treatment, increase evaporation and provide sufficient residence time to allow settling of organics and solids. At the time of the

Task Force inspection, the surface impoundment was undergoing closure. (See Figure 2 for flow diagram).

Sludge containing chromium and arsenic from the CCA process is shipped off-site where the CCA sludge is reprocessed. Waste creosote was shipped off-site and burned for energy recovery during the period when treatment with creosote was performed.

The treatment process generates one waste listed as hazardous : "K001: Bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorphenol." These sludges were generated in and stored only in the surface impoundment at the SWP-Augusta facility. However, the facility is closing the surface impoundment as a landfill, treating the wastewater and sending the wastewater to a POTW and the sludge to a hazardous waste disposal site. According to the facility, wastewater from the plant will be pretreated in a Wemco Unit, then sent directly to a POTW.

According to facility reports, several potential contaminants source areas are associated with present and previous plant operations. ZMA mixing tanks were located in the area of the present locker room building. The mixing tanks were not used after about 1950, when ZMA was discontinued as a preserving agent, and the locker room building was constructed in the late 1950's. An old creosote dip tank for butt-treating poles was located near the present bark silo until the late 1950's, when all creosote preserving was accomplished by pressure cylinders. An old ditch was used until the late 1960's to carry waste preservatives to an off-site drainage ditch. A low area at the southeast corner of the plant has been filled with bark, sawdust, plant wastes and construction debris from the late 1960's to the late 1970's. The extent of the fill area and the amount of wastes within it are presently being explored in the field. The presence of the area was reported to the US-EPA in 1980 as a CERCLA site.

Several old sumps and basins, including an old API-type oil/water separator, are located behind the laboratory building and main offices. The present oil/water separator and spray cooling unit are also located in this area. A barometric surge basin, located near the main treatment cylinder building, was removed from service in June 1985. The K001 pond, installed in 1974, has recently been removed from service. Other potential contaminant sources which are still in operation are the tank farm constructed in the early 1960's and the track area.

The facility has RCRA interim status: GAD051034387. In June 1983, the Part B for the facility was submitted for review. A Notice of Deficiency (NOD) was issued by the Georgia Environmental Protection Division (EPD). Since that time, both EPD and EPA-Atlanta have issued Administrative and Consent Orders, NOD's and NOV's (Notice of Violation) for non-compliance with the regulations. EPD and SWP have agreed under the terms of a consent order, to address the entire site for 40 CFR Parts 264, 265, and 270 requirements.

SUMMARY OF FINDINGS AND CONCLUSIONS

COMPLIANCE WITH INTERIM STATUS REQUIREMENTS

The Task Force investigated the interim status ground water monitoring program implemented by SWP. The consensus opinion of the Task Force was that this program is not fully in compliance with the 40 CFR Part 265 Subpart F and the Georgia Hazardous Waste Management Regulations. The following is a more detailed summary of the inspection findings and conclusions.

265.90 Applicability

According to this section of the regulations, an owner/operator of a land disposal facility must implement a ground water monitoring program "capable of determining the facility's impact on the quality of the ground-water in the uppermost aquifer underlying the facility..." This program was to be implemented by November 1981.

At the time of the Task Force evaluation, SWP had not fully defined the hydrology and geology of the uppermost aquifers and had not documented flow directions and gradients and noted any deviations from the norm.

265.91 Ground Water Monitoring System

According to these regulations, an owner/operator must install a ground water monitoring system that is capable of yielding samples for analysis; have a sufficient number, locations and depths of background monitoring wells that are not affected by the facility and yield background quality in the uppermost aquifer; and have a sufficient number, locations and depths of downgradient wells to immediately detect any statistically significant amounts of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer. The monitoring wells must be adequately constructed to obtain representative samples of the uppermost aquifer.

Four wells clusters, MW6 through MW9, were installed in Fall 1984 to replace the five original RCRA monitoring wells that were deemed inadequate by EPD. Wells 6C, 7C, 8B and 9B are utilized for the student's t-test, with well 7C used as the background well.

This well system is not adequate to meet the 265.91 requirements because:

- background well 7C has shown measurable concentrations of K001 constituents in water quality analyses;
- ground water flow direction and gradient has not been adequately defined to determine if the wells are properly located and screened at the appropriate depths;
- well construction materials and techniques may not enable representative ground water samples to be collected from these wells.

265.92 Sampling and Analysis

This section of the regulations requires an owner/operator to obtain and analyze samples from the RCRA monitoring system and to develop a sampling and analysis plan (SAP) that should include procedures and techniques for:

a. sample collection,
b. sample preservation and shipment,
c. analytical procedures, and
d. chain-of-custody control.

It is the contention of the Task Force that the sampling and analysis plan available for review at the time of the inspection was not sufficient to satisfy the regulations. The SAP was neither detailed nor site-specific, but a generic plan used for all SWP sites and lacked information such as:

- What containers and preservatives are used for samples?
- Are the PVC bailers decontaminated between sampling events?
- What are the quality assurance/quality control procedures used for sampling and analysis?

It was noted that the PVC bailers were left hanging in some wells between sampling episodes and were discolored.

265.93 Preparation, Evaluation and Response

The facility tripped the student's T-test in November 1983 and subsequently submitted a ground-water quality assessment plan (GWQAP) to EPD for review. The plan was found to be inadequate and a revised version of the plan was submitted. The present plan is not adequate to satisfy the requirements of this section of the regulations because the hydrology and geology underlying the site are not well defined for assessing the rate, extent or concentrations of contaminants emanating from the site.

265.94 Recordkeeping and Reporting

This section of the regulations requires as owner/operator to keep any information regarding the ground water monitoring system on-site, and to submit specific information to the proper authorities by specific dates.

SWP has their corporate office in Spartanburg, South Carolina. Much of the ground water monitoring data for the facility in Augusta is kept in the corporate offices. The Task Force recommends that any data pertinent to ground water monitoring at the SWP facility in Augusta should be kept on site.

Submittals of ground water monitoring data to State and Federal agencies appears to be within the time constraints posed by the 265.94 regulations.

COMPLIANCE WITH 40 CFR PART 270

The 40 CFR Part 270 regulations cover basic EPA permitting requirements, such as application requirements, standard permit conditions, and monitoring and reporting requirements. These regulations require specific information which is necessary to complete the RCRA post-closure permit application for the SWP K001 surface impoundment. These requirements include:

- define the horizontal and vertical extent of the contaminant plume(s);
- define the rate, extent, and concentrations of the hazardous constituents in the contaminant plume(s);
- define the hydrology and geology of the uppermost and interconnected aquifers.

The regulations also require that a corrective action plan be proposed to remove and/or treat in place all contaminated ground water between the point of compliance and the downgradient property line.

At the time of the Task Force inspection, SWP was in the process of closing the K001 surface impoundment and was collecting hydrologic and geologic information that would define all aspects of the contaminant plume(s). In addition, SWP has submitted an alternate concentration limit proposal which, if approved, will set clean-up standards at the point of compliance which are above background concentrations. The post-closure permit application and alternate concentration limit proposal are undergoing a completeness review by Georgia EPD.

COMPLIANCE WITH 40 CFR PART 264

These regulations define the standards for owners and operators of hazardous waste treatment, storage, and disposal facilities. 40 CFR Part 264 - Subpart F deals with releases from solid waste management units at a facility. A solid waste management unit includes, but is not limited to, any landfill, surface impoundment, waste pile, land treatment unit, incinerator, injection well, tank, container storage unit, wastewater treatment unit, including all conveyances and appurtenances used in waste management or storm water handling, elementary neutralization unit, transfer station, and recycling unit from which hazardous constituents might migrate, irrespective of whether the units were intended for the management of solid and/or hazardous wastes.

Under 40 CFR 264.101, SWP is required to institute remedial investigations and corrective action as necessary to protect human health and the environment from all releases of hazardous waste or hazardous waste constituents from any solid waste management unit at the facility, regardless of the time at which the waste was placed in the unit. SWP has identified several solid waste management units at the facility, and is currently assessing the extent of contamination from these units. Remedial investigations and corrective action will be addressed under the authorized State RCRA permit in accordance with the 1984 Hazardous and Solid Waste Amendments requirements. The permit will contain schedules of compliance for such remedial investigations and corrective actions. These units are not subject to post-closure permitting requirements under Parts 264 and 270, but SWP may decide to address contamination from the K001 surface impoundment and solid waste management units under the same corrective action plan.

TECHNICAL REPORT

TECHNICAL REPORT

INVESTIGATIVE METHODS

The Task Force evaluation of the SWP site consisted of:

- A review and evaluation of records and documents from EPA Region IV, EPD and SWP.
- A facility on-site inspection conducted January 26-30, 1987.
- An off-site analytical laboratory evaluation.
- Sampling and subsequent analysis.

Records/Documents Review and Evaluation

Records and documents from EPA Region IV and the EPD offices, compiled by an EPA contractor (PRC), were reviewed prior to the on-site inspection. During the inspection, facility maps and files were reviewed for further information. During the week of the inspection, the Task Force met with Mr. Ed Gibbs, Environmental Manager for SWP, Steve Hudson, Plant Manager of the SWP Augusta facility, Steve Blevins, Law Engineering consultant to SWP and other SWP personnel. All members of the SWP Staff were helpful in providing information to the Task Force.

Facility Inspection

The facility inspection, conducted January 26-30, 1987, included identification of waste management units, identification and assessment of waste management operations and pollution control practices and verification of location of ground water monitoring wells.

Company representatives were interviewed to identify records and documents of interest, answer questions about the documents and explain (1) facility operations (past and present), (2) site hydrogeology, (3) ground water monitoring system rationale, (4) the ground water sampling and analysis plan and (5) laboratory procedures for obtaining data on ground water quality. Because ground water samples are analyzed by an off-site laboratory, personnel from these facilities will also be interviewed regarding sample handling and analysis, and document control.

Laboratory Evaluation

The off-site laboratory facility handling ground water samples was evaluated regarding its respective responsibilities under the SWP ground water sampling and analysis plan. Analytical equipment and methods, quality assurance procedures and documentation were examined for adequacy. Laboratory records were inspected for completeness, accuracy and compliance with State and Federal requirements. The ability of the laboratory to produce quality data for the required analyses was evaluated. The evaluation results are included as part of this report.

Ground Water Sampling and Analysis

Sampling Locations

Water samples were collected from wells 1A, 1B, 1C, 5A, 5B, 5C, 6A, 6B, 6C, 8A, 8B, 10C, 13D, 18C, 30, 37A, 38A and 38B. Thirteen of the wells are located on SWP property and five wells are located off-site. The selection of these wells for sampling was based on location to provide areal coverage both up and downgradient of the surface impoundment and to monitor possible off-site contamination. The locations are identified in Figure 3.

Samples were taken by an EPA contractor (Alliance Technologies) and sent to EPA contractor laboratories for analysis. EPA Region IV requested and received four sample splits. SWP split for all samples, while EPD declined to split samples for independent analysis. Data from sampling analysis was reviewed to further evaluate the SWP ground water monitoring program and identify contaminants in the ground water. An analytical data summary of the results from the samples collected for the Task Force is presented as Tables 5 and 6. Actual analytical data is not incorporated into this report due to size, but is available upon request from EPA Region IV.

WASTE MANAGEMENT UNITS AND OPERATIONS

Surface Impoundment Description

A surface impoundment or K001 pond was located in the northeast portion of the SWP facility and was in use until 1985. K001 hazardous waste (bottom sediment sludge) was generated in the surface impoundment when suspended solids settled out of the process wastewater associated with the pressure treatment of wood with creosote and pentachlorophenol. The surface impoundment was apparently constructed during the late 1960's or early 1970's over an old drainage ditch previously used to carry process wastewater to an off-site ditch.

According to facility reports, an estimated 118 cubic yards of K001 sludge existed in the surface impoundment. The sludge was a semisolid composed of creosote fractions, sand, wood sugars and sawdust contaminated with pentachlorophenol (61,000 ppm). Based on a January 1985 analysis, the sludge contained significant levels of most K001 parameters as listed in 40 CFR 261, Appendix VII. A subsequent analysis in June 1985 of a sample obtained after the discontinuation of creosote as a treating agent, showed a decrease of most of the parameters. At the time of the Task Force inspection, the sludge had been removed from the surface impoundment. The impoundment was then backfilled with a clayey soil and a synthetic membrane installed on top of the backfill. An upper cover soil was placed on top of the membrane and seeded to minimize erosion and to complete closure as a landfill.

Solid Waste Management Units

In January 1985, EPD requested information regarding solid waste management units at the facility. In May 1985, SWP responded with the following information. Locations of these units are delineated in Figure 4.

ZMA mix tanks: Zinc meta-arsenite was used until about 1950 as a wood-treating preservative. The tanks were located in the area of the present locker room building. These tanks have been backfilled.

Drip tracks: Contains treated utility poles' "kick back", which is a mixture of water, preservative, wood sugars, and some of the creosote constituents found in Appendix VIII, along with some PCP and CCA. This is still an active area.

Tank farm area: This area was constructed in the 1960's and is located in the north central portion of the facility. These tanks are still in operation and hold the chemicals and treatment processes utilized by the facility.

Barometric surge tank: This tank was located near the main treatment cylinder building and was removed from service in June 1985.

CERCLA landfill area: A low area at the southeast corner of the plant where bark, sawdust, construction debris and plant wastes such as boiler ash were placed on the ground from the late 1960's to the late 1970's. The presence of the area was reported to EPA in 1980 as a CERCLA site. To the facility's knowledge, no hazardous waste was deposited in the area. No records exist of the exact nature and quantity of wastes placed in the area.

1973 spill: A SWP employee error resulted in the release of approximately 50,000 gallons of PCP from the treating cylinder. The PCP reportedly flowed across the site and along the south side of Nixon Road to the east side of the property where a temporary dam was constructed in the ditch and the PCP was recovered. The spill was reportedly confined to ditches on or adjacent to SWP property.

Old effluent ditch: Used until the late 1960's to carry waste preservatives to an off-site drainage ditch, was located in the northeastern portion of the facility and has been backfilled.

Dip tank for butt-treating poles: This old creosote tank was located near the present bark silo until the late 1950's, when all creosote preserving was accomplished by pressure. It has been abandoned.

Other solid waste management units include the diesel fuel oil and PCP unloading system, old sump area, cooling water basin for barometric tank, API oil/water separator and the creosote dip tank.

It is recommended that more information on these solid waste management units be submitted for review to determine the contribution of the units to the contaminant plume(s) at the facility.

GEOLOGY/HYDROGEOLOGY

The following is a summary of geologic/hydrologic information compiled by Law Engineering, consultants to SWP.

Regional/Site Geology

The SWP Augusta facility is located in the Fall Line Hills District of the Atlantic Coastal Plain Physiographic Province (Clark and Zisa, 1976). The Fall Line Hills District is highly dissected with little level land except the marshy floodplains and their better drained, narrow stream terraces. Stream valleys lie 50 to 250 feet below the adjacent ridge tops. Relief gradually diminishes to the south and east within the district.

The Fall Line is the northern boundary of the Fall Line Hills District as well as the boundary between the Atlantic Coastal Plain and Appalachian Piedmont Provinces. Geologically, it is the contact between the Cretaceous and younger sediments of the Coastal Plain and the older, crystalline rocks of the Piedmont. Several stream characteristics change as they flow south through this area: rapids and shoals are common near the geologic contact, floodplains are considerably wider on the younger sediments, and the frequency of stream meanders increases. The Fall Line crosses the Savannah River approximately six miles north of the site.

The SWP Augusta facility is situated on the western edge of the broad, marshy stream terrace of the Savannah River. Much of the western Savannah River terrace is occupied by Phinizy Swamp, which occurs at an elevation of approximately 115 feet above National Geodetic Vertical Datum (NGVD). Relief along the terrace is very low below an elevation of 150 feet NGVD, where typical Fall Line Hills are eroded away and covered by alluvium of the Savannah River. Summit elevations of hilltops are as high as 450 feet NGVD. Average elevation at the SWP Augusta facility is approximately 130 feet NGVD.

Several geologic units and hydrogeologic zones occur in the subsurface beneath the SWP - Augusta site, including Recent alluvium and upper Cretaceous Gaillard Formation. The relationship of the geologic units to the hydrologic zones is shown schematically on Figure 5.

The site is underlain by Recent alluvium of the Savannah River (Georgia Geologic Survey, 1976), derived from the adjacent, older crystalline rocks of the Piedmont. The alluvial deposits of the Savannah River terrace range in size from sand and gravel to clay and sandy clay. Sedimentation patterns of the alluvium are complex, with clay beds commonly pinching out (Gorday, 1984). The thickness of the alluvium range from a feather-edge to 80 feet (LeGrand, 1956).

Underlying the Recent alluvium in the Southern Wood Piedmont region are the Cretaceous-aged sediments of the basal Gaillard Formation of the Oconee group (Huddlestun, 1984). The term Tuscaloosa Formation has been used in the past by a number of authors including Cooke (1936), LeGrand (1956) and Siple (1967) for the sediments of the Gaillard Formation. Faye and Prowell (1982), however, note that the sediments in eastern Georgia are younger in age than the Tuscaloosa, and the Tuscaloosa, as defined in its type locality in Alabama, does not extend east of Macon (Smith and King, 1983). Clarke, Brooks and Faye (1985) have referred to the Gaillard equivalent in South Carolina as the Middendorf and the Black Creek Formations. A formal proposal is in preparation by Huddlestun and Chowns to apply the name Gaillard Formation to the unnamed, upper Cretaceous-aged sediments in eastern Georgia.

The Gaillard Formation overlies weathered crystalline bedrock in the SWP Augusta region. There is a minor unconformity marked by red, oxidized sands or clays within the Gaillard. At the top of the formation, there is another unconformity marked by oxidized sediments and indicating the contact with the Tertiary Huber Formation.

The Gaillard Formation is comprised of sands, gravels and clays. The main clay constituent is kaolin, which occurs in lenses or as interstitial clay. The dense, basal sands of the Gaillard contain relatively large amounts of kaolin clay. Balls and boulders of pure white kaolin are common. The sands of the Gaillard tend to be poorly sorted, fine to coarse, angular to subangular quartz, interspersed with clay and muscovite mica (Gorday, 1984). Sedimentary structures include cross bedding. The formation is generally massive (LeGrand, 1956).

The Gaillard Formation dips and thickens to the southeast, creating a wedge of sediments. The base of the Gaillard Formation dips to the south-southeast at approximately 38 feet per mile, while the dip of the top of the Gaillard is approximately 23 feet per mile (Gorday, 1984). Therefore, the Gaillard thickens at a rate of about 15 feet per mile toward the southeast.

The crystalline bedrock which underlies the Gaillard Formation consists of granitic intrusive rocks and a granite diorite complex generally referred to as the Charlotte Belt (King, 1955). Rock types noted include gneisses and schists of varying mineralogy, granite-diorite and slate (Gorday, 1984). The upper 10 to 100 feet of the crystalline rock is typically saprolite (Faye and Prowell, 1982). Saprolite is formed by the in-place weathering of crystalline rock with the preservation of the relict texture of the parent rock. Saprolite can be distinguished from the overlying poorly-consolidated Gaillard Formation by mineralogy and texture.

The Recent alluvium beneath the SWP Augusta facility consists of abandoned backswamp deposits overlain by terrace overbank sediments. The abandoned backswamp of the Savannah River was probably similar to Phinizy Swamp and formed when the river flowed at a higher stage than present. As the Savannah River meandered and the river stage declined toward its present level, channels were cut into the backswamp sediments and filled with coarser channel deposits.

The abandoned backswamp deposits typically represent the lower confining zone of the Recent alluvium. Where absent, lower confinement is provided by the clayey, upper portion of the Gaillard Formation. Lower confinement of the Gaillard Formation is theorized to the be the saprolite and crystalline bedrock.

Based on stratigraphic data collected by Law Engineering, the partially confining layer is continuous laterally beneath the site. This partially confining layer also is generally continuous off-site, but two areas have shown an absence of this layer (well MW-34 and well cluster MW-45).

Regional/Site Hydrology

According to Law Engineering, the uppermost aquifer beneath the SWP Augusta facility includes, in descending order, Recent alluvium and sands of Cretaceous age (see Figure 5). The uppermost aquifer in the site region has been referred to as the basal Cretaceous aquifer by Gorday (1984) and as the Dublin-Midville aquifer system (Clark, Brooks and Faye, 1985). There is some disagreement as to whether or not the base of the uppermost aquifer is the top of the saprolite overlying the crystalline bedrock. In some locations in Richmond County, a clay bed that may be of Cretaceous age underlies the aquifer (Gorday, 1984).

According to Law Engineering, the uppermost aquifer consists primarily of the lower portion of the Gaillard Formation. Included in the uppermost aquifer is the alluvium which overlies the Gaillard. The lower part of the regional Savannah River alluvium is highly permeable and is hydraulically connected to the underlying Gaillard Formation (Gorday, 1984). The clay beds in the lower portion of the alluvium partially confine the underlying Gaillard formation and provide a degree of hydraulic separation between the upper alluvium and the Gaillard. However, the upper alluvium, the clay beds, and the Gaillard Formation are all included in the uppermost aquifer. Therefore, the uppermost aquifer, as defined by Law Engineering, consists of an upper sand zone (surficial sand and clay), a partially-confining zone (soft organic clay) and a lower sand (Gaillard Formation).

According to a USGS report, the crystalline bedrock which underlies the uppermost aquifer is hard, dense and massive, and, in its natural state, practically impervious to water (Siple, 1967). Nonetheless, some water is stored in secondary openings developed by processes that affected the rocks after they had been formed, such as fissures, joints and other fracture openings. For this reason, meager to fair supplies of water are generally obtained from wells completed in the crystalline bedrock. Siple (1967) reports a range of well yields for the bedrock of 2 to 100 gallons per minute (gpm), with a probable average yield of 5 to 10 ppm if a representative sample of well yields and well failures were included in the sampling.

Because of the confining property of the 10 to 100 feet of saprolite and/or basal Cretaceous clay and to the relatively impermeable nature of the crystalline bedrock, the crystalline bedrock is not included as part of the uppermost aquifer by Law Engineering. EPD and the Task Force contends that the hydrologic data collected to date does not support this concept.

Ground water flow in the Recent alluvium is generally toward the site from the south and west and flows off-site in a northeasterly-easterly direction. An average hydraulic gradient of 0.005 and a hydraulic conductivity of 1 X 10-3 ft/min has been determined for the Recent alluvium. Ground water flow velocity has been calculated at 9 ft/yr.

Ground water flow in the Lower Sands appears to be to the northeast. An average hydraulic gradient of 0.0025 and a hydraulic conductivity of 1.1 X 10-2 ft/min has been calculated. The ground water flow velocity has been determined to be 48 ft/yr.

Water levels in the lower sand zone are generally lower than water levels in the upper sand zone, indicating a potential for downward movement of ground water through the partially-confining organic clay beds.

The lower sand is the part of the uppermost aquifer that provides water to most wells in the area. Drinking water for the City of Augusta comes from reservoirs located approximately 3.5 miles north of the facility which receive water from the Savannah River. Drinking water for Richmond County is supplied from two well fields, the nearest of which is about 1/2 mile southwest (i.e., upgradient) of the facility.

The closest active industrial wells to the site are the Babcock and Wilcox wells located about 0.5 miles north of the site. These wells, completed in the lower sand zone, yield approximately 500,000 gallons of water per day. This pumping produces a cone of depression extending outward 500 to 1,000 feet. Based upon the configuration of the potentiometic surface, it appears that ground water beneath the SWP Augusta facility flows to the northeast in the lower sand zone and is not affected by the pumping from Babcock and Wilcox.

Adequacy of Hydrogeologic Characterization

The major sources of hydrogeologic information for this site are the Part B, ground water monitoring data and data collected by Law Engineering. Work has been done as part of the assessment program to develop site-specific data on the physical properties of the aquifers and associated confining units (i.e., vertical/horizontal hydraulic gradients, lithology, stratigraphy, etc.). It is the consensus opinion of the Task Force that more work is needed to: fully define the hydrology and geology of the uppermost and interconnected aquifers; document flow directions and gradients and any deviations from the norm; and define the rate, extent, and concentrations of the hazardous constituents in the contaminant plume(s).

The Task Force does not agree with the interpretation of the uppermost aquifer by SWP or Law Engineering. The permeability data does not support the saprolite and/or basal Cretaceous clay being identified as a confining zone that hydraulically separates the crystalline bedrock from the Recent alluvium and the Gaillard Formation. The definition of uppermost aquifer must be consistent with the regulatory definition of 40 CFR Part 260.10.

The following information should be collected to resolve these hydrogeologic issues:

1. Conduct additional borings to define the vertical and lateral extent of confining units, interconnected aquifers, etc. across the entire SWP site. Continuity, thickness, etc., of these units should be determined. Conduct sieve analyses, permeability and porosity tests on all cores.

2. Install additional series of nested piezometers throughout the site to adequately determine the potentiometric surface and to define the pre-

sence and magnitude of vertical gradients. Note any fluctuations or changes in flow direction and determine reasons for those changes.

The following information should be submitted to the State to resolve the above issues:

- construct flow net analysis,
- seasonal potentiometric water level data and maps,
- most recent reports on the ground water assessment program - include cross sections, geologic logs, water quality, etc.,
- any revisions to the Part B, closure/post-closure plan, sampling and analysis plan, etc., and
- conduct pumping tests both for site characterization and for corrective action design.

GROUND WATER MONITORING PROGRAM DURING INTERIM STATUS

Ground water monitoring at the SWP facility has been conducted under State interim status regulations and the State Consent Order. The following is an evaluation of the monitoring program between November 1981, when the ground water monitoring provisions of the RCRA regulations became effective, and January 1987 when the Task Force investigation was conducted. A summary of the compliance history for this facility has been included as Appendix D of this report.

Regulatory Requirements

Ground water monitoring at this site is now regulated by the Georgia Rules for Hazardous Waste Management. These Rules are the State equivalent of 40 CFR Part 265 Subpart F, which were to be implemented by November 19, 1981.

The State of Georgia received Final Authorization in August 1985. The State regulations are enforceable in lieu of the Federal regulations. The State interim status ground water monitoring requirements are found in Section 391-3-11-.10 of the Georgia Rules for Hazardous Waste Management 265 Subpart F - Ground-Water Monitoring. Table 1 outlines the parameters that were to be sampled and analyzed during the first year of sampling. All the parameters were to be monitored quarterly for one year to establish background concentrations for each parameter. During this period, four replicate measurements were to be obtained for each parameter in Category 3 for each sampling event. After the first year, Category 3 parameters were to be monitored semi-annually, while Category 2 parameters were to be monitored annually.

Monitoring Well Data - Surface Impoundment Detection/Assessment/Corrective Action

The interim status monitoring program was instituted at this site in Fall 1981. Five ground water monitoring wells, designated MW1 to MW5 were installed on October 22-29, 1981, by Froehling and Robertson, Inc. of Greenville, South Carolina (see Table 2). These wells consisted of 1 7/8-inch i.d. PVC well casing with 2 to 6 screened intervals per well. The screens were 0.010-inch slotted PVC. Quarterly sampling was begun in January 1982 and a statistically significant difference was reported in November 1983. Resampling verified the statistical difference. EPD reviewed the Ground Water Quality Assessment

Plan (GWQAP) and found it to be incomplete. EPD also asserted that the five monitoring wells did not meet the requirements of 265.91(a)(2) or 264.97 and a new system was requested. The five original monitoring wells were abandoned in September 1985.

In September 1984, ten additional ground water monitoring wells and one observation well were installed by Law Engineering, consultants to SWP retained in early 1983. The wells were installed at four locations in clusters of two or three wells to determine water quality and aquifer characteristics in various water-bearing zones. The well clusters were designated MW6 through MW9 for consistency with the previously installed monitoring wells. The letter post-script A referred to the deepest well within a cluster, B as the next deepest well and C as the shallowest. Well installation was completed by October 1985. Wells MW6C, MW7C, MW8B and MW9B were utilized for the statistical test, with well MW7C serving as the upgradient well for comparison purposes.

These wells were drilled with a 7 7/8-inch o.d. tricone roller bit, and 4-inch i.d. threaded PVC well casing was inserted in the hole and grouted in place. The boreholes were then advanced with a 3 7/8-inch o.d. tricone roller bit to total depth and 2-inch i.d. threaded PVC casing and 0.010-inch slotted PVC screen was installed. The annulus between the well screen and the bore hole was sand-packed, a bentonite seal was then placed over the sand and the wells then were grouted with Portland cement. Split spoon samples were taken at 2.5-foot intervals to a depth of 10.5 feet. Below that depth, samples were taken at 5-foot intervals. Wells were developed by air-lifting with an air compressor.

During quarterly sampling, the presence of K001 constituents were detected in several of the wells. A deep water supply well located on the SWP property was sampled and analyzed in May 1985. Several K001 constituents were found in this well. Several private water wells in the SWP area were sampled by EPD in May 1985. Two of the private wells showed low levels of extractable organic compounds.

During June-July 1985, 36 new on-and off-site ground water monitoring wells were installed for assessment purposes. The new wells, designated MW10 through MW19, were installed in 12 clusters. Well clusters MW1 through MW5 were installed to replace previously existing monitoring wells MW1 and MW5 constructed in 1981. All wells were installed with steam cleaned equipment. A borehole was advanced with wash drilling techniques using potable water and bentonite drilling mud. In the deepest borings, split spoon samples were taken at 5-foot intervals or changes in lithology. In the shallower wells, split spoon samples were taken in the screened interval only. The borehole was reamed to at least 9 inches and a 6-inch i.d. schedule 40 PVC casing was inserted and grouted with a Portland cement/bentonite mixture. The borehole was then extended using a 4 7/8 to 5 7/8-diameter tricone roller bit, potable water and bentonite mud. A 10-foot section of machine-slotted, 2-inch schedule 40 PVC screen (0.010-inch slot) with a bottom cap was then installed in the borehole. Only threaded PVC was used. A clean well-point sand pack was placed in the annulus to a level at least 2 feet above the top of the screen. A 2-foot bentonite clay seal was installed on top of the sand pack. Grout was then tremied from the top of the clay seal to ground surface. The wells were developed using an air compressor, oil coalescer and air lift techniques to remove at least five well volumes from the well. An 8-inch diameter, steel outer casing having a cover and lock was grouted in place at ground surface.

In January 1986, Law Environmental Services submitted Segment I of the Corrective Action Plan to EPD for review. The plan described a concept for a slurry-trench barrier wall and presented data to support the course of action. At the time of that report, 41 monitoring wells, soil test borings and source exploration wells had been completed. No construction details were included in the report.

In March 1986, Law Environmental Services Submitted Segment II of the Corrective Action Plan to EPD for review. The plan presented a two-phase source control program consisting of soil excavation and free oil removal, and construction of a bio-treatment facility. At the time of the report, a total of 95 borings and wells had been installed. The wells included 29 temporary soil test boring wells along the plant perimeter, 8 source-exploration wells at 6 on-site locations, 7 on- and off-site observation wells and 51 monitoring wells installed at 16 on- and off-site locations.

The soil test borings, designated STB-1 through STB-29 were constructed with a 7 3/8-inch hollow-stem auger, with split-spoon samples taken at 2.5-foot intervals. Average spacing between the borings was about 150 feet. Temporary wells were placed in the soil test borings consisting of 2-inch threaded PVC pipe with 4-foot slotted screens. Sand filters and bentonite seals were placed in the annulus between the PVC and the borehole wall. Grout was not used owing to the temporary purpose of the wells. Depths ranged from 10.5 to 15.5 feet. The wells were installed during the period November 1985 to January 1986.

Eight source-exploration wells were installed on-site to evaluate soil conditions and water quality in the Recent alluvium adjacent to solid waste management units. Source exploration well B-1 was installed October 1984 along an old drainage ditch reported in the eastern portion of the plant. The B-2 well cluster was installed along the old drainage ditch adjacent to an old sump area. Well cluster B-3 was installed in an area where free oil was observed in nearby test pit TP-7, excavated in the Recent alluvium. Well B-4 was installed near the drip tracks but was destroyed by plant operations. Well B-5 was installed as near the removed ZMA mix tank as present structures would allow. Well B-6 was installed in the CERCLA landfill area. These wells were constructed during the period November 1985 to January 1986. Completed depths ranged from 9.5 to 20 feet below land surface.

Eight observation wells were installed from September to October 1985. The wells, OW-1 to OW-8, were installed to collect water-level measurements. The wells were hand-augered with sand packs, bentonite seals or grouts to depths of 5.5 to 9.0 feet. Wells OW-1, OW-2, OW-5, OW-6 and OW-7 were replaced with shallow monitoring wells and are now MW-17D, MW-20, MW-15D, MD-13D and MW-14D, respectively. All of the replaced observation wells consist of 2-inch PVC pipe with 4.0-foot slotted intervals.

In November 1985, well MW-18D was installed into the Recent alluvium. Monitoring well MW-7C had been destroyed during plant operations and was replaced in January 1986. This well had served as the background well for the student's T-test at the site. Also in January 1986, wells MW-21, MW-22, and MW-23 were installed into the Recent alluvium.

Forty-two test pits were excavated on-site with a backhoe to observe potential contaminant sources and to prospect for free oil or oil-impregnated soils. Depths ranged from 1.5 to 12.5 feet. Oil impregnated soils and/or free oil were noted in at least 14 of the test pits.

In March 1986, Law Environmental Services prepared a report on "Alternate Concentration Limits" for the SWP facility in Augusta. The following is a summary of assessment activities at the time of the submittal:

- o Installation of 29 temporary soil test boring/wells along the plant perimeter for the purpose of evaluating soil and ground water conditions in the Recent alluvium for design of a ground water migration control barrier and to supplement previously obtained data on the extent of ground water contamination.

- o Installation of eight source-exploration wells at various on-site locations to evaluate soil conditions and obtain representative ground water samples from various zones within the Recent alluvium and adjacent to specific solid waste management units.

- o Installation of eight temporary observation wells for ground water level measurements at on- and off-site locations.

- o Installation of ten additional monitoring wells completed in the Recent alluvium to provide specific ground water level and ground water quality data.

- o In-situ hydraulic conductivity testing at 12 wells installed in the Recent alluvium.

- o Laboratory falling-head permeability tests of four undisturbed soil samples of the Recent alluvium.

- o Grain-size analysis and Atterberg limits tests on 19 split-spoon samples and four undisturbed samples to verify visual soil classifications and to allow comparison with field hydraulic conductivity data.

- o Excavation of 42 test pits to observe potential contaminant sources, determine shallow soil conditions in the Recent alluvium, prospect for free oil or oil impregnated soils and to obtain bulk soil samples for chemical laboratory analysis.

- o Measurement on four occasions of ground water levels from various on- and off-site wells completed in the Recent alluvium and the upper portion of the underlying Gaillard Formation.

- o Sampling and analysis of ground water from all 55 newly-installed wells.

- o Chemical analysis of 48 bulk soil samples from the test pits and selected split-spoon samples from the soil test borings.

- o Surface geophysical surveying (electromagnetic and resistivity) in an attempt to augment borehole data by providing electrical surveys to interpolate subsurface data between boreholes and in areas where no boreholes currently exist.

- o Downhole geophysical logging of the unused 300+-foot deep production well to determine extent of grout, casing leakage, and zones of relatively higher permeability within the uncased bedrock.

In July 1986, Law Environmental Services submitted Segment III of the Corrective Action Plan to EPD for review. The plan described planned actions to further prevent off-site migration of wood preserving constituents and procedures to recover/treat ground water in areas where constituent concentrations exceeded the maximum allowable concentration limits. At the time of the report, 42 monitoring wells were installed as part of the off-site corrective action plan study. The wells were installed singly or as part of two or three well clusters at 24 off-site locations. Wells or well clusters MW24 through MW47 were installed March to June 1986.

At the time of the Task Force Evaluation, SWP was preparing an update on the assessment/corrective action activities at the site to be submitted to EPD and EPA Region IV. In February 1987, the "1986 Annual Ground Water Quality Assessment Report" was submitted for review and summarized all work to assess ground water quality to date.

After reviewing the monitoring data, some deficiencies were noted. The following are general comments on the well program as it was at the time of the Task Force Evaluation.

1. PVC material is not recommended at sites where organics are of a primary concern. Because organic constituents are the known major problem at SWP Augusta, any future monitoring wells should be constructed on inert materials such as Teflon R or stainless steel. An interphase probe is recommended to detect any immicible layers in the water column.

2. Air should not be used to develop wells. RCRA monitoring wells may be developed with surge blocks, bailers or pumps.

3. Some wells were drilled using drilling muds. This could bias the chemical analyses for these wells. For example, the high barium concentrations in some of the wells could be attributed to constituents in the drilling mud.

4. Upgradient well 7C had shown K001 constituents and was not truly representative of background water quality at the site. At a minimum, a new background well is recommended.

5. At the time of the Task Force evaluation, the assessment work had been confined to assessing contamination in the Recent alluvium. The lower hydrogeologic units should be assessed for possible contamination.

Contaminant plumes emanating from solid waste management units as well as the surface impoundment should also be addressed.

In summary, more assessment activities are needed to fully satisfy the 264/265/270 requirements and the State Consent Order.

Ground Water Sampling -- Surface Impoundment Detection/Assessment/ Corrective Action

The facility began their quarterly RCRA ground water in January 1982 for wells MW-2, MW-3, MW-4 and MW-5, with MW-5 as the upgradient well. Quarterly analyses were taken in January, May, August and October 1982. All parameters required under 265.92(b)(1)(2) and (3) were sampled for. The facility had a waiver from EPD exempting the radiological parameters from analysis. Well MW-3 exceeded the National Interim Primary Drinking Water Standards (NIPDWS) for lead and arsenic the first and second quarters of sampling. In November 1983, the facility notified EPD of a statistically significant difference in pH for wells MW-2 and MW-4 and TOC for wells MW-3 and MW-4. These differences were verified by resampling of the wells.

SWP developed and submitted a Ground Water Quality Assessment Plan (GWQAP) to EPD on November 30, 1983. EPD reviewed the plan and deemed it inadequate. EPD also asserted that the five monitoring wells were inadequate to meet the 265.91(a)(2) or 264.97 requirements.

In March 1984, EPD prepared a proposed consent agreement to SWP requesting a revised GWQAP and a new monitoring system that would meet the 265.91(a)(2) and 264.97 requirements. The revised GWQAP was prepared by Law Engineering for SWP and submitted to EPD May 1984. The plan called for the installation of four new monitoring well clusters. In September 1984, EPD commented on the plan and recommended that five quarterly samples be obtained over a five month period.

In September 1984, installation of ten additional wells (well clusters MW-6, MW-7, MW-8 and MW-9) and one observation well (B-1) was initiated by Law Engineering. The wells were completed in October. Ground water quality samples were collected in November and December 1984, January, March and April 1985. THe analyses included 40 CFR 265.92(b)(1) parameters, dissolved metals and K001 constituents. Previously existing monitoring wells MW-1 and MW-5 were also sampled in November 1984 for K001 constituents.

The presence of K001 constituents was found in several of the newly installed monitoring wells (MW-6C, MW-7A, MW-7C, MW-8A, MW-8B, MW-9A, MW-9B). Concentrations were highest in the shallow monitoring wells. Well MW-6C exceeded the NIPDWS for arsenic. A deep water supply well located on SWP property was sampled by EPD in May 1985. Several K001 constituents were reported present in the well. The facility contends that the source of contamination is suspected to be leakage through the casing from the upper sand zone, and not a plume of contamination at 308 feet (depth of the well).

Several private wells were also sampled by EPD in May 1985. Some K001 constituents were detected in two of the private wells.

EPD submitted a proposed Consent Order to SWP in May 1985. The Order requested an updated GWQAP for the site that was to include results from computer modeling of ground water data, a 40 CFR 261 Appendix VIII scan, and more information on the hydrogeology of the site. The Consent Order was finalized in June 1985.

Law Environmental Services prepared the updated GWQAP in June 1985. The update included results of the Appendix VIII scan, delineation of the waste management area and identification of the point of compliance at the facility. Several Appendix VIII parameters were detected in well MW-6C.

In the November 1985 "Report of On-Going Ground Water Quality Assessment," a description of the assessment activities associated what work had been accomplished to date. Water quality sampling results from November-December 1984 and January, March and April of 1985 were summarized. Sampling results from the summer of 1985 were also summarized. K001 constituents were detected in wells MC-1C and B-1. Barium exceeded the NIPDWS for well MW-5B. In summary, contamination was detected in monitoring well clusters MW-1, MW-6, MW-7, MW-8, MW-9 and observation well B-1.

In January 1986, Segment I of the Corrective Action Plan was submitted for review. This report merely summarized historical water quality data and no new analytical results were submitted.

In March 1986, Segment II of the Corrective Action Plan was submitted. It summarized ground water sampling performed November 1985 through January 1986. Parameters for analysis consisted of K001 constituents and arsenic and zinc. K001 constituents were detected in 36 of 53 samples. Phenolic constituents were detected in wells installed in the central plant area (MW-1C, B-1, B-2A, B-2B, B-3A and B-3B). These wells may be monitoring contamination emanating from solid waste management units. The source of phenolic constituents in wells installed adjacent to the drainage ditches north and east of the plant is probably the PCP spill of April 1973.

Polynuclear Aromatic Hydrocarbons (PAH) were detected in 34 of 53 ground water samples collected in the Recent alluvium. Wells with PAH constituents included MW-6C, MW-8B, MW-9B, STB-11, MW-22, STB-25, B-6 and other wells located north and east of the plant.

Arsenic and zinc were detected in several wells, with the highest concentrations in B-5, located near the discontinued ZMA mix system. Arsenic exceeded the NIPDWS in STB-17, B-2B, and MW-1C.

Soil samples taken from test pits or soil test borings were analyzed for K001 constituents and for arsenic, zinc and chromium. PAH and/or phenols were detected in samples taken near the K001 surface impoundment, the CERCLA landfill and the central plant area. Free oil was also encountered in many test pits and soil borings around the plant.

In July 1986, Segment III of the Corrective Plan was submitted for review. The report summarized the ground water sampling performed April-June 1986, as well as historical water quality data from 1985. K001 constituents were detected in 17 of the 38 wells. Contamination was found in wells, soil test borings, and test pits both on- and off-site. Contamination was more extensive in the Recent alluvium.

At the time of the Task Force evaluation, the facility was preparing an update on the GWQAP. It is obvious from historical water quality that contamination from the K001 surface impoundment, solid waste management units and spills is emanating from the SWP site and traveling off-site. The Task Force recommends that the assessment program should be expanded to include all of the SWP site and more monitoring should be directed towards the lower aquifers underlying the site. Additional wells, soil test borings, cores, etc. are needed to adequately assess the areal and vertical extent of the contaminant plume(s).

Southern Wood Piedmont Sample Collection and Handling Procedures

At the time of the Task Force evaluation, SWP personnel followed the "Sampling and Analysis Plan" submitted as a section of the October 1985 Part B. The following is a summary of the sampling protocol followed by SWP personnel:

A. With gloves on, remove cap from well and place in plastic bag.

B. Remove bailer from well and rinse thoroughly with acetone and distilled water.

C. Rinse water level indicator probe thoroughly with acetone and distilled water.

D. Obtain elevation of the ground water using the water level meter.

E. Insert clean PVC bailer into well and lower until water is reached (usually splashing sounds will be indicated). Continue to lower bailer until filled. Proceed to raise bailer out of well casing.

F. Flush the well before obtaining sample by bailing well to dryness or bailing 3 to 5 casings, (volume of water standing in well) whichever is less. NOTE: In the event of low yielding wells, a 24-hour time span may be needed for recharging after evacuation before sampling can be resumed.

G. Fill bottle(s) directly from bailer without over-filling or spilling -- the bottles contain preservatives.

H. When all bottles are full, rinse the bailer with distilled water and store in the same well casing.

I. Replace cap.

J. Take pH, temperature and conductivity at site with designated instrumentation.

K. Record all measurements taken on field data sheets.

Sampling collection activities proceed from the least contaminated area to the most contaminated area.

A copy of the October 1985 "Sampling and Analysis Plan," chain-of-custody, etc. is included as Appendix C of this report.

At the time of the evaluation, no one from the Task Force was able to observe the sampling collection and handling procedures utilized by SWP. Plans were made for the Task Force project coordinator to observe quarterly sampling at a later date. SWP had by that time implemented a revised "Sampling and Analysis Plan" (March 1987). Observation of sampling procedures under the revised protocol would not serve the purpose of the Task Force objectives. However, EPA-Region IV had observed sampling procedures at other SWP facilities in the Region. SWP utilized the same sampling and analysis plan for all facilities. In all cases, SWP personnel closely followed the protocol that had been established in the October 1985 sampling and analysis plan.

Some comments on the sampling protocol used by SWP are:

1. Bailers should not be left hanging in the saturated zone in a well. It is recommended that the bailers be thoroughly cleaned between sampling episodes and stored wrapped in aluminum foil. New bailing rope should be used for each sampling event.

2. PVC is not recommended as a sampling material when organics are of a primary concern. A more inert material such as Teflon is recommended.

3. Cleaning the bailers with acetone may introduce some organics into the well if the bailers are not totally allowed to dry.

4. An interphase probe is recommended to detect any immicible layers in the water column. Details should be given on how any immicible layers will be sampled.

5. Blanks (equipment, trip, field, etc.) are recommended for quality assurance/quality control purposes.

Except for the bailers left hanging in the saturated zone of a well, the procedures utilized by SWP for RCRA ground water monitoring appear adequate for sampling purposes. However, the RCRA ground water sampling and analysis plan (SAP) is incomplete.

The 265.92 section of the regulations requires an owner/operator to obtain and analyze samples from the RCRA monitoring system and to develop a SAP that should include procedures and techniques for:

a. sample collection,
b. sample preservation and shipment,
c. analytical procedures, and
d. chain-of-custody control.

It is the contention of the Task Force that the sampling and analysis plan available for review at the time of the inspection was not sufficient to satisfy the regulations. The SAP was not detailed nor site-specific, but is a generic plan used for all SWP sites and lacked information such as:

- What type of containers and preservatives are used for samples?

- Are the PVC bailers decontaminated between sampling events?

There are some references in the SAP for the reader to refer to the permit application for specific information on sampling and analysis procedures. The SAP should stand alone as a document and include all information pertinent to sampling and analysis at a facility.

TASK FORCE SAMPLE COLLECTION AND HANDLING PROCEDURES

This section describes the well evacuation and ground water sampling procedures followed by Task Force personnel during the January 1987 site inspection. Samples were collected by an EPA contractor (Alliance Technologies Corp.) to determine if the ground water contains hazardous waste constituents or other indicators of contamination.

Water samples were collected from wells 1A,B,C, 5A,B,C, 6A,B,&C, 8A&B, 10C, 13D, 30, 37A, and 38A&B. Thirteen of the wells are located on SWP property and five wells are located off-site. The selection of these wells was based on well locations to provide areal coverage both up and downgradient of the surface impoundment, and to monitor possible off-site contamination. The well locations are identified in Figure 3.

EPA Region IV requested and received split samples for the wells 5A, 8A&B, 13D. SWP split on all samples and GA-EPD declined to split samples for independent analysis. A field blank was poured the last day of sampling by the EPA contractor at a location specified by the Task Force. Water used to pour the blanks was HPLC water. Duplicates were taken from wells 8A and 38B for quality assessment/quality control (QA/QC) purposes. A trip blank was poured after all samples were taken on the last day and an equipment blank was poured prior to the trip for QA/QC purposes.

All sample bottles and preservatives were provided by an EPA contractor (I-Chem). Samples were collected by the EPA sampling contractor using the following protocol:

a. Depth to ground water was determined by using a Johnson water marker and an Oil Recovery Systems interface probe to detect any immicible layers in the water column. Total well depth also measured.

b. Height and volume of the water column then calculated.

c. Calculated three water column volumes.

d. Purged the well three well volumes using a precleaned 2-inch Teflon double check-valve bailer.

e. Prior to sampling, the EPA sampling contractor monitored the open well for chemical vapors using an OVA meter.

f. Collected a sample aliquot and made field measurements (water temperature, specific conductance and pH) a minimum of three times.

g. EPA contractor filled VOA vials, then filled the remaining sample containers in the order shown on Table 3.

h. EPA contractor placed samples on ice in an insulated container immediately after filling the bottles.

The first step in the ground water well sampling procedure is to measure the depth from a reference point at the wellhead. At SWP, that reference is a known elevation at a mark near the top of the well casing. The EPA sampling contractor used an electric water-level recorder to measure the depth to water. The recorder was rinsed with isopropanol alcohol, followed by a rinse with HPLC deionized water and allowed to air dry. The recorder used for this exercise was clean and kept protected from potential outside contamination. Water-level measurements were made to within 0.01 foot. Task Force personnel noted that the Oil Recovery Systems interface probe detected three distinct phases in the water column for Well 1C. The sample taken from the well was a black, viscous liquid.

The volume of water to be purged was then calculated. The column volume of a well is the volume of standing water in the well and is calculated using the depth-to-water measurement, total well depth (determined in the field with well sounder) and casing radius. For purposes of the Task Force, the column volume is multiplied by three to compute the purge volume. The volume is measured into a graduated bucket as it is taken from the well. In all cases, standard field measurements (temperature, pH, specific conductance) were taken to determine when sampling should begin. Field measurements are given in Table 4.

The wells were purged by the EPA sampling contractor using a pre-cleaned, double check-valve Teflon bailer which was lowered into the well with Teflon-covered stainless steel cable. Prior to purging, OVA readings were made to monitor the open well for chemical vapors. Readings ranged from not above background for most wells to 100 ppm in well 37A. Parameters by parameter, the EPA contractor filled the sample containers in the order listed in Table 3.

After sampling was completed, the EPA contractor took the samples to a staging area where a turbidity measurement was taken. Samples for metals, TOC, phenols, cyanide, and sulfides were preserved.

At the end of the day, samples were packaged for shipment to the EPA Contract Laboratories. The EPA Region IV samples were released to EPA Region IV Environmental Services Division personnel for transport. A "Receipt for Samples" was given to SWP for the samples taken off-site by the Task Force. All samples were shipped according to applicable Department of Transportation regulations (40 CFR Part 171-177). All water samples from monitoring wells were considered "environmental" for shipping purposes.

LABORATORY EVALUATION

Savannah Laboratories and Environmental Services, Inc. (SLES) of Savannah, Georgia, conducts the 40 CFR Part 265 Subpart F water-quality analyses for Southern Wood Piedmont in Augusta, Georgia. The laboratory facilities were evaluated as part of the Task Force Evaluation on September 29, 1987, by Mr. Michael H. Birch of the Laboratory Evaluation and Quality Assurance Section of the EPA Region IV, Environmental Services Division. The laboratory was evaluated for the ability to produce quality data for those parameters required by Part 265.92 and Part 261.32 (K001 listing of hazardous chemicals for wood preservation).

Analytical equipment, sample handling, preservation technique, methods and quality assurance procedures were examined for adequacy. Laboratory records were reviewed for completeness, accuracy and compliance with State and Federal requirements.

Ground-Water Sampling and Analysis Plan

The documents reviewed during the inspection were:

1. "Sample and Analysis Plan For Groundwater Monitoring," SWP, March 1987.
2. "Generic Quality Assurance Plan," SLES, June 1986.
3. "Statement of Qualifications," SLES.

The SWP Sample & Analysis Plan (SAP) For Groundwater Monitoring is a comprehensive document. It presents procedures for collecting, preserving, handling, documenting (field records and chain-of-custody) and shipping samples. The document is a generic plan for all related SWP facilities and was made site specific for the Augusta facility by including tables. Table 2 in the SAP lists holding times of 24 hours for pH, 28 hours for specific conductance, and none established for TOH. The TOH must be a misprint for TOX.

Regulatory Requirement: Samples for pH and specific conductance analyses must be analyzed immediately, and a maximum holding time of seven days is allowed for TOX. (Reference: Table 11-1, SW-846, Third Edition.)

The sample containers prepared by SLES were prelabeled for the required parameters and shipped to the facility. Premeasured preservatives for each sample were shipped in the sampling bottles or in small vials. The sample containers and preservatives meet the EPA requirements. SLES periodically checks the sample preservation, where pH adjustment is required, after the samples arrive in the laboratory.

In the SAP, the Procedures For Obtaining A Representative Ground Sample, (page 9) indicates that the laboratory will supply the filters (usually 0.45 micron membrane filter) for filtering samples for dissolved metals.

Regulatory Requirement: Samples for dissolved metals must be filtered through a 0.45 micron filter.

On page 14, The SAP states that turbid samples for total metal analyses are to be filtered in the field prior to preservation. Filtering of samples collected for analysis of metals used to determine the suitability of ground water as a drinking water supply is not consistent with methods required for such supplies (40 CFR Part 141.23(f)). Data from analysis of filtered samples may be biased low. The effects of filtering on ground-water samples collected at the SWP, Augusta facility need to be documented. The data were reported as "total" instead of "dissolved" metals.

Sample containers, preservatives, and holding times were consistent with EPA requirements, except for the deficiencies mentioned in the SWP Sample and Analysis Plan.

Field measurements (pH and specific conductance) conducted by SLES personnel were not observed by the auditor. Meter calibration, quality control checks, documentation and reporting were discussed with the SLES staff. The pH meter was calibrated daily against a pH 7 buffer. Other buffers were available, but were not used with each calibration.

Regulatory Requirements: The pH meter/electrode system must be calibrated for each use period against a minimum of two buffers that bracket the expected pH of the samples and are approximately three pH units or more apart. (See Method 9040, SW-846.)

Laboratory Sample Analysis

If TOC samples cannot be analyzed immediately, preservation by lowering the sample pH to less than two (<2) is required. SLES was preserving the samples to meet this requirement to retard any biological action during shipping and prior to analysis. The inorganic carbon constituents are normally removed by lowering the sample pH, followed by purging with an inert gas, prior to measuring the TOC. This technique, used for total organic carbon (TOC) samples preserved with H_2SO_4, would cause volatiles to be stripped from the sample during the sample preparation step to remove inorganic carbon (CO_2) prior to measurement of the organic carbon. The method detection limit for TOC (approximately 1 mg/L) is at least one to two orders of magnitude above the concentration of the volatile organic components of the TOC. However, these volatiles should be detected in the VOA analysis. Therefore, the emphasis on organic contamination should be placed on the VOA results instead of the TOC data. Standards were carried through the appropriate digestion steps and were analyzed at the start of each run. However, a calibration standard or a quality control standard was not analyzed periodically throughout the process while the samples were analyzed.

Regulatory Requirement: The calibration must be verified after every 15 samples throughout the analytical process to ensure proper calibration. (See Method 9060, SW-846.)

Samples for phenol analysis were preserved with sulfuric acid to pH <2 and analyzed by EPA Method 420.1, EPA 600/04-79-020. The contract laboratory lowered the sample aliquot pH to one (1) prior to the distillation step. This practice may result in data biased low for this parameter. Check standards were carried through the same procedure.

Method 420.1, Method 9065, SW-846, and Footnote 25, 40 CFR Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants, Federal Register, June 30, 1986, require that the sample pH be raised to approximately 4 prior to distillation.

Quality Assurance and Data Documentation

The SLES laboratory has established a formal quality assurance (QA) program that consists of a QA plan, standard operating procedures (SOP) and includes the use of duplicates, spikes, and reference standards to verify the quality of data for each parameter analyzed. Instrument calibration and maintenance records were maintained, and temperatures of regulated devices were checked and documented. All raw data, quality control records and calculations were documented and maintained on file as required. Method detection limits (MDL) were determined according to procedures in EPA's 40 CFR Part 136, Appendix B. When matrix interferences or some other problem prevents the routine reporting of MDLs, the laboratory reports a Practical Quantitation Limit (PQL), which is proper protocol as stipulated in the guidelines for EPA's Contract Laboratory Program for reporting data with sample matrix interferences.

Summary

Based on the overall findings, the contract laboratory has the capability to provide acceptable quality data for the ground-water monitoring program. Field filtration of turbid samples could cause biased data for copper, arsenic and chromium. The data would be something less than "total" metals. The deficiencies noted for pH (holding time and methodology) could cause the results to be questionable and subsequent failure of the Student's t Test. The holding time deficiency noted for TOX would cause the data to be questionable. The deficiencies noted for phenol and TOC would have no major impact on data quality.

All other analytical data for parameters indicating the presence of K001 chemicals, (Table 7); parameters establishing ground-water quality, (Table 8); and parameters used as indicators of ground-water contamination, (Table 9); would be acceptable for the Subpart F, Ground-Water Monitoring requirements.

Please note that the Sampling and Analysis Plan in use at the time of the Task Force evaluation is not the same plan that was evaluated as part of the September 1987 lab evaluation. Both plans have been included in Appendix C for the reader's reference.

MONITORING DATA ANALYSIS

Acceptability and Validity of Data

The samples collected during this evaluation were analyzed by Compu Chem Laboratories, Research Triangle Park, North Carolina, and Centec Laboratories, Salem, Virginia. Compu Chem performed the organic analyses and Centec performed the inorganic analyses. The results were compiled and tabulated by Life Systems, Inc. and forwarded to the Task Force for evaluation. The OSWER functional guidelines for evaluating contract laboratory program data, as well as the Region IV EPA protocols were used to assess the validity of the data. The quality assurance/quality control check of the data indicated that much of the purgeable, extractable, pesticide and PCB data was unusable because the holding times for the samples were exceeded. Some data for the inorganic, conventional and indicator parameters was considered to be unreliable because contamination was found in the blanks taken in the field and from the equipment used in the field. All other data was given as an actual value, as quantitative or qualitative, as estimated in concentrations or as presumptive evidence of material. (See Table 5 for analytical data summary.)

DISCUSSION OF RESULTS

Inorganic Elements/Compounds

The contract laboratory data indicated that 20 elements and compounds were detected in samples collected from the monitoring wells at SWP. The National Interim Primary Drinking Water Standard (NIPDWS) of 10 ug/l for cadmium was exceeded in well 13D with 14 ug/l. The NIPDWS of 50 ug/l for lead was met or exceeded in wells 13D and 37A, with 57 ug/l and 50 ug/l respectively. Well 1B had an estimated value of 3.8 ug/l for mercury which exceeds the NIPDWS of 2 ug/l. The NIPDWS of 50 ug/l was exceeded for arsenic in wells 1C and 6C with estimated values of 36,000 ug/l and 1,000 ug/l respectively. The NIPDWS of 50 ug/l for chromium was exceeded in well 30 with 170 ug/l. However, the analytical data for arsenic and chromium should not be used because of blank contamination. The Secondary Drinking Water Standards for iron and manganese were exceeded in the majority of the eighteen wells sampled.

Conventional/Indicator Parameters

Nine conventional/indicator parameters were detected in the monitoring wells sampled by the Task Force. Chloride values ranged from 20 ug/l in well 8A to 1,800 mg/l in well 8B. Fluoride concentrations ranged from not detected to 9.4 mg/l in well 1C. Sulfate values ranged from not detected to 2,900 mg/l in well 6A. Values for sulfides ranged from not detected to 5.0 mg/l in well 1C. Values for phenols (4AAP) ranged from not detected to 49,000 mg/l in well 1C. POC concentrations ranged from not detected to an estimated value of 26 mg/l in well 5B. POX concentrations ranged from not detected to an estimated value of 290 ug/l in well 13D. The majority of the TOC and TOX values were not usable because of blank contamination.

Extractable Organic Compounds

The majority of the contract laboratory extractable data was not usable because the holding times were exceeded for the samples. Very few actual concentrations were given for the wells. Most of these values were estimated. Resampling and reanalysis are necessary for verification.

Purgeable Organic Compounds

Again, as with the extractable data, the majority of the purgeable data was not usable. Most actual values given are estimated. Any further discussion of the results would be pointless.

Split Samples

Split samples were taken from wells 5A, 8A, 8B, and 13D. It was difficult to compare the EPA-ESD data with the contract laboratory data because so much of the contract data was unusable or unreliable for reasons stated previously.

The EPA-ESD data indicated that 49 extractable organic compounds were detected in well 8B, six extractable compounds were detected in well 5A, only one ex- tractable compound was detected in well 13D, and none in well 8A. No purgeable organic compounds were detected in wells 8A and 13D, well 5A had one purgeable compound, and well 8B indicated 10 purgeable compounds. None of the NIPDWS were exceeded in these four wells. Iron exceeded the Secondary Drinking Water Standard in wells 8A, 8B, and 13D. Manganese exceeded these standards in well 8B.

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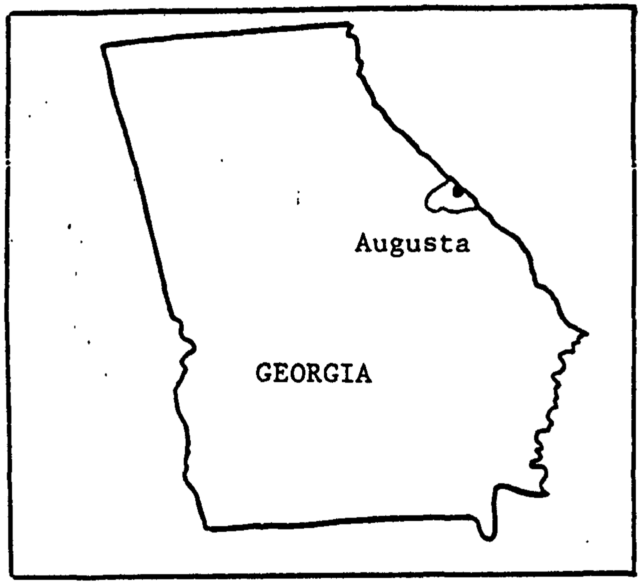
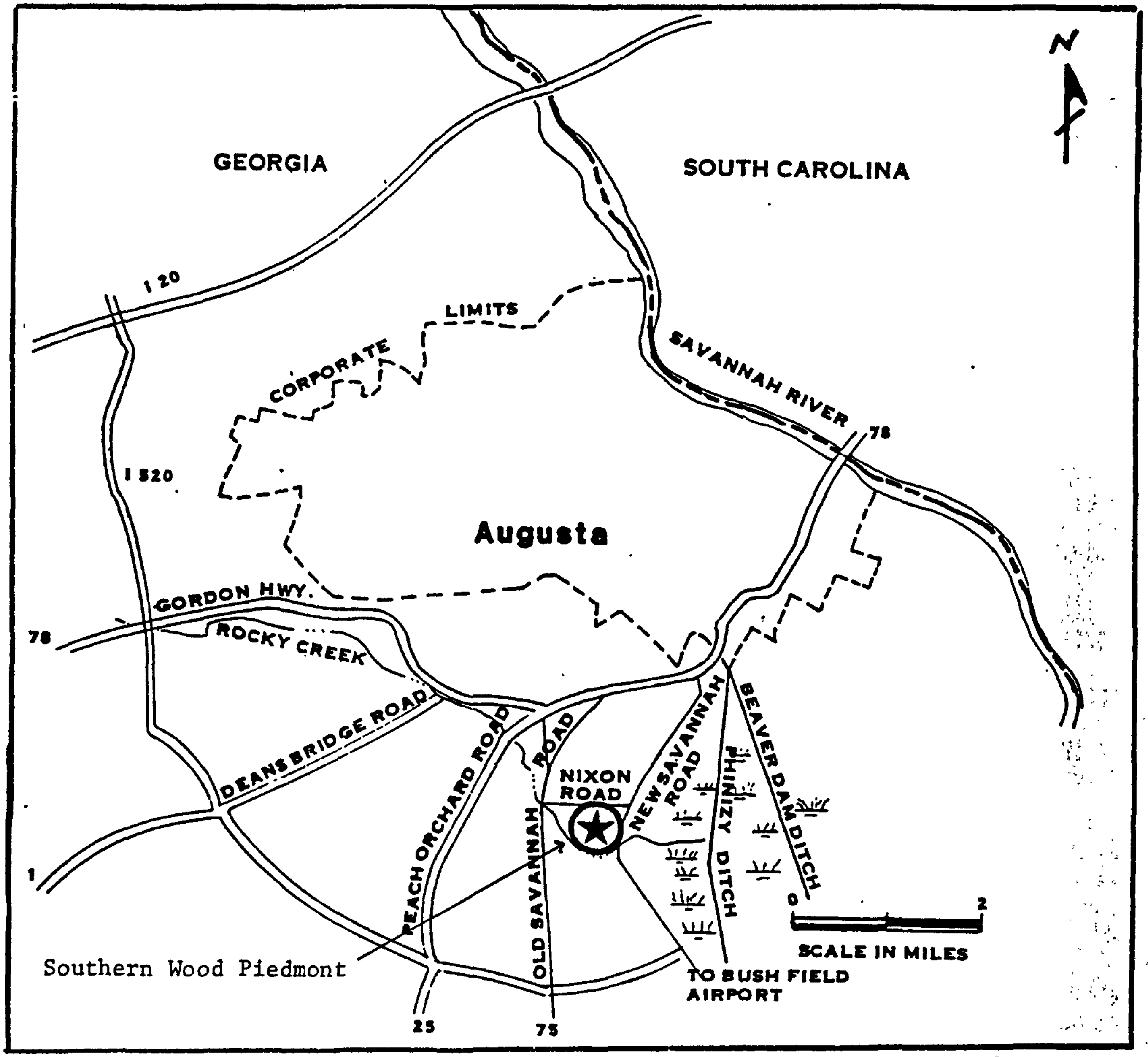


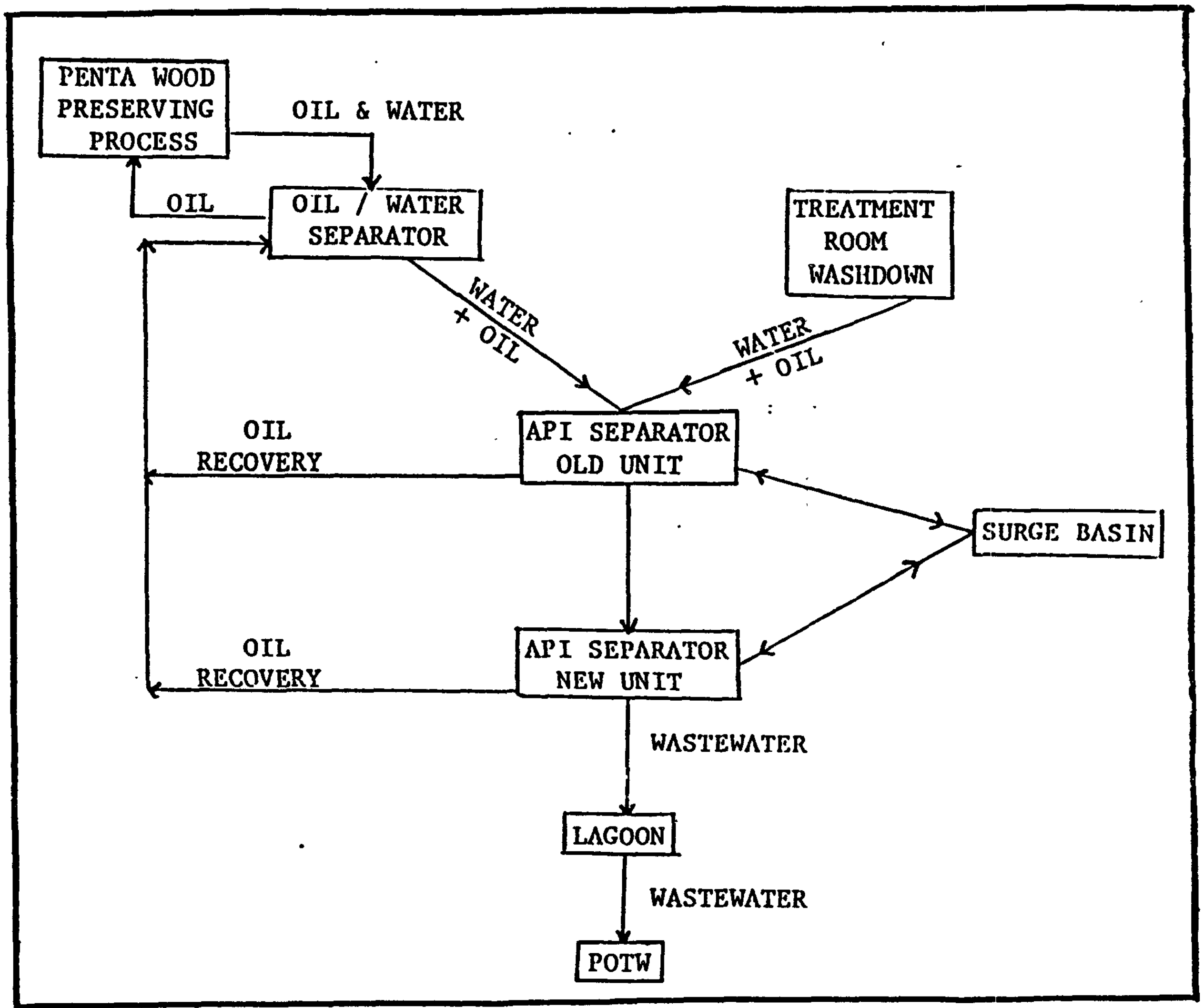


after Law

FIGURE 1

FACILITY
LOCATION MAP

SOUTHERN WOOD
PIEDMONT
AUGUSTA, GEORGIA



after SWP

FIGURE 2

PROCESS WATER FLOW DIAGRAM

SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA

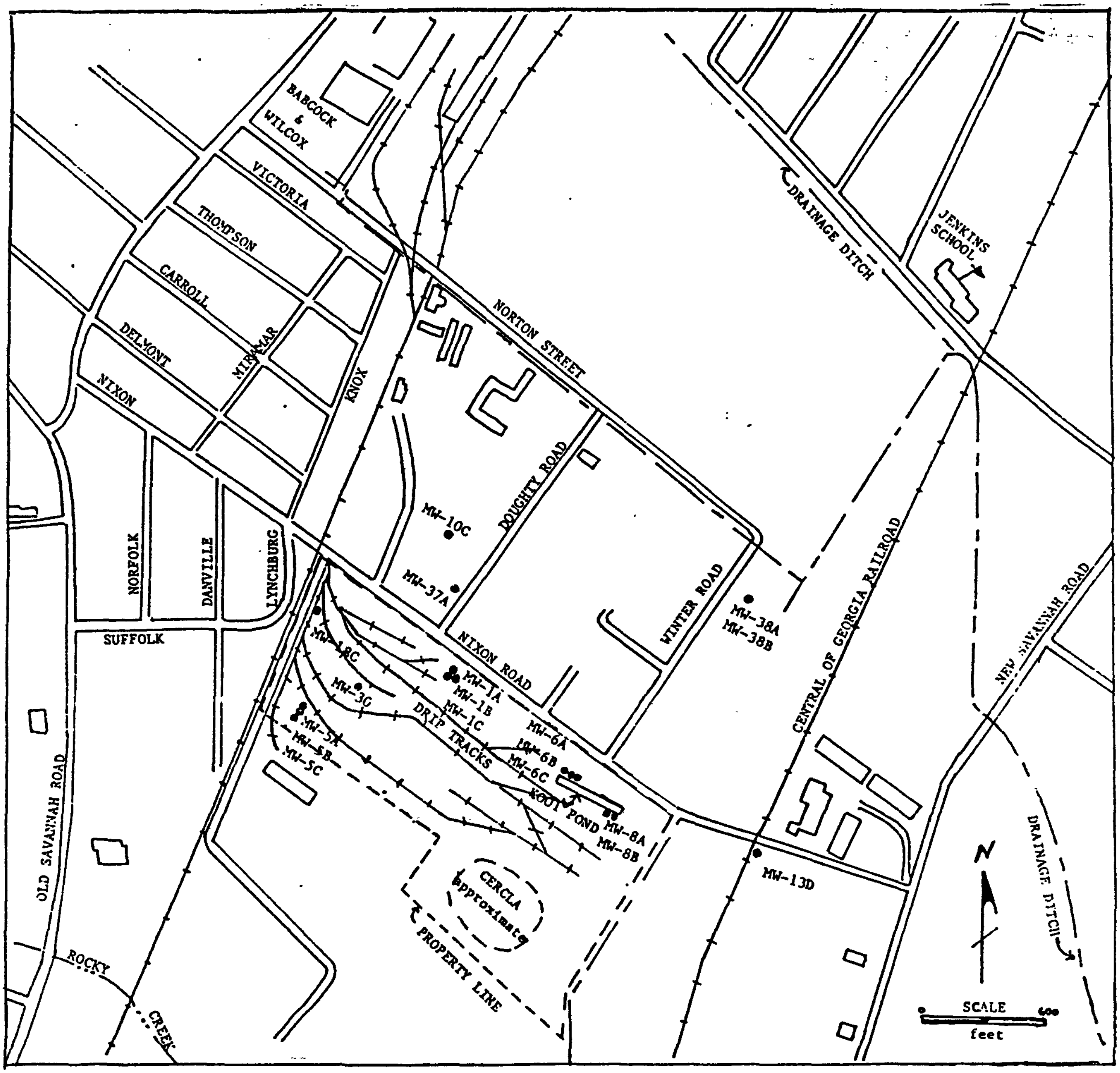


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FIGURE 3

LOCATION OF GROUNDWATER MONITORING WELLS
SAMPLED DURING THE TASK FORCE INSPECTION

SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA

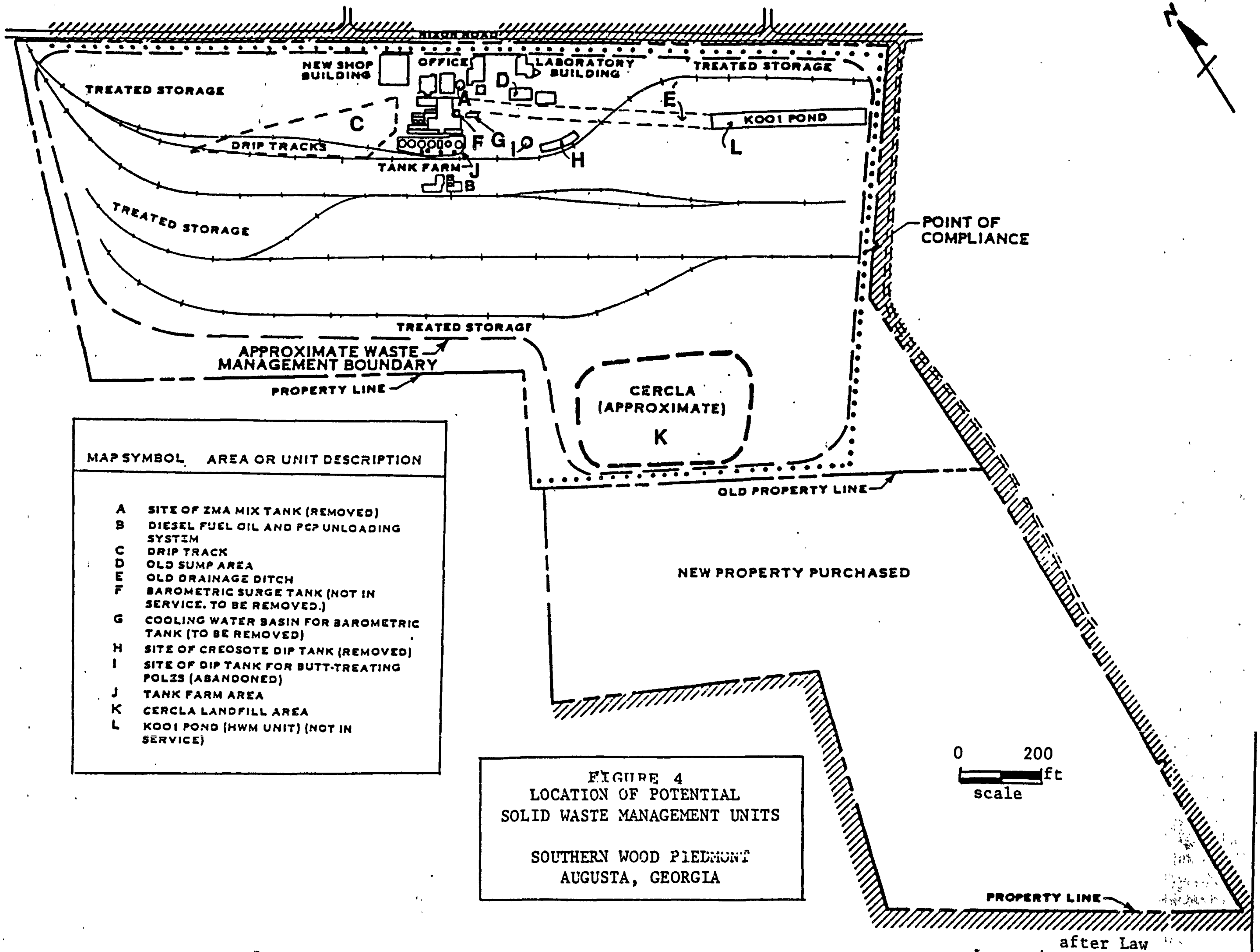
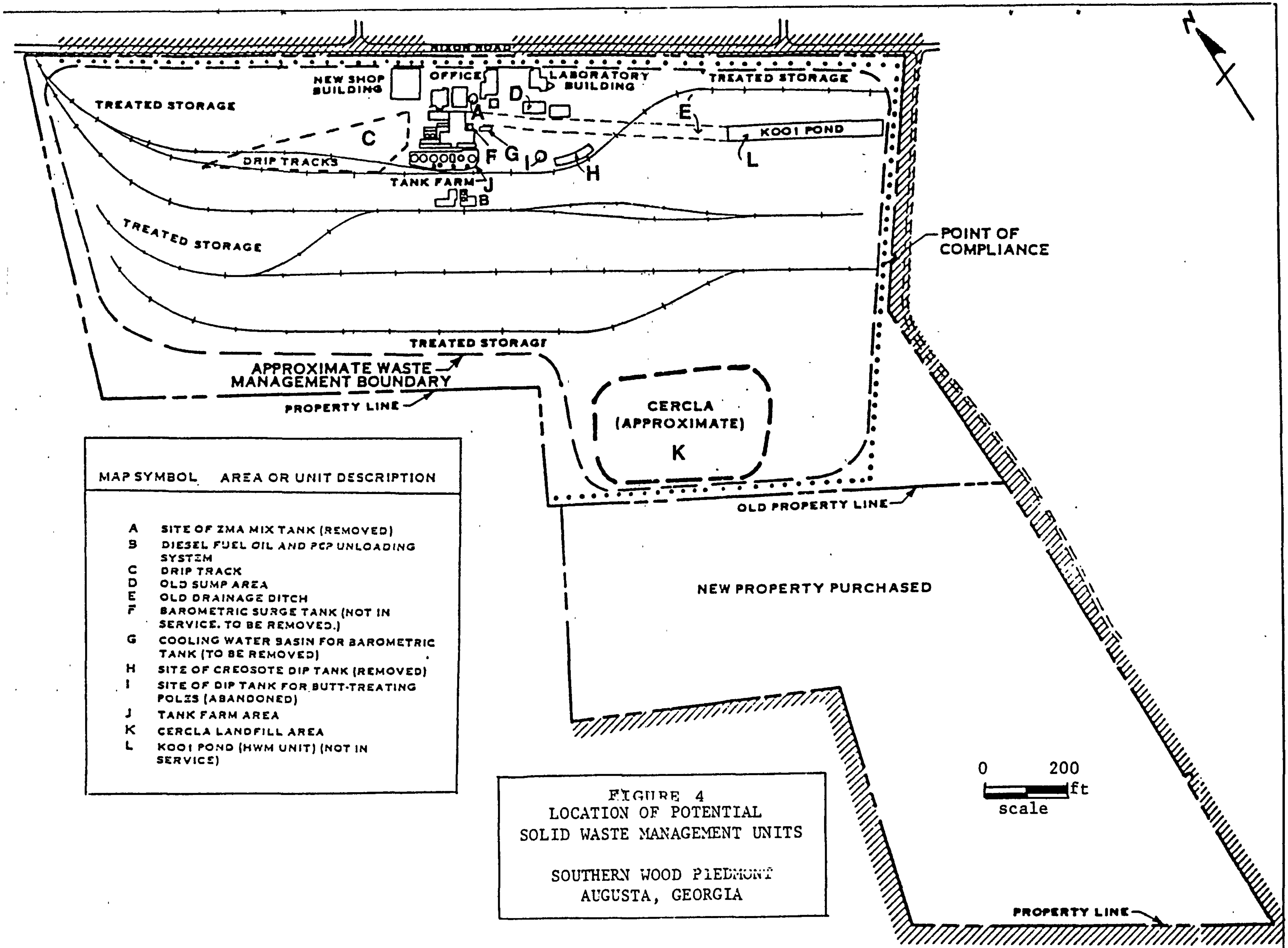


FIGURE 4
LOCATION OF POTENTIAL
SOLID WASTE MANAGEMENT UNITS

SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA



MAP SYMBOL	AREA OR UNIT DESCRIPTION
A	SITE OF ZMA MIX TANK (REMOVED)
B	DIESEL FUEL OIL AND PCP UNLOADING SYSTEM
C	DRIP TRACK
D	OLD SUMP AREA
E	OLD DRAINAGE DITCH
F	BAROMETRIC SURGE TANK (NOT IN SERVICE. TO BE REMOVED.)
G	COOLING WATER BASIN FOR BAROMETRIC TANK (TO BE REMOVED)
H	SITE OF CREOSOTE DIP TANK (REMOVED)
I	SITE OF DIP TANK FOR BUTT-TREATING POLES (ABANDONED)
J	TANK FARM AREA
K	CERCLA LANDFILL AREA
L	KOOI POND (HWM UNIT) (NOT IN SERVICE)

FIGURE 4
LOCATION OF POTENTIAL
SOLID WASTE MANAGEMENT UNITS

SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA

after Law

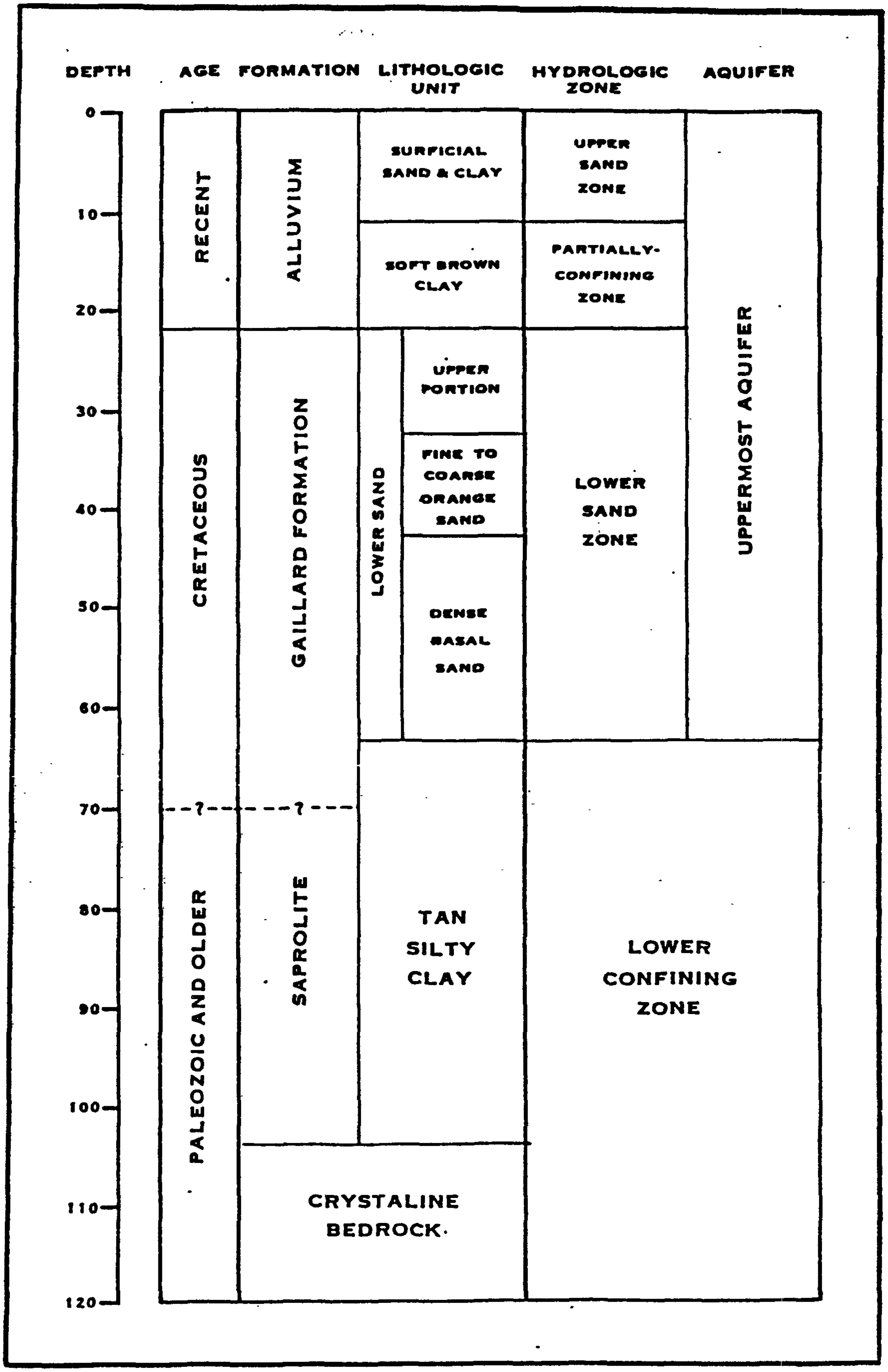


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FIGURE 5
SCHEMATIC GEOLOGIC SECTION
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA

TABLE 1
RCRA GROUND WATER MONITORING PARAMETERS

*Category 1	**Category 2	***Category 3
Arsenic	Chloride	pH
Barium	Iron	Specific Conductance
Cadmium	Manganese	Total Organic Carbon
Chromium	Phenols	Total Organic Halogen
Fluoride	Sodium	
Lead	Sulfate	
Mercury		
Nitrate (as N)		
Selenium		
Silver		
Endrin		
Lindane		
Methoxychlor		
Toxaphene		
2, 4-D		
2,4,5-TP Silvex		
Radium		
Gross Alpha		
Gross Beta		
Turbidity		
Coliform Bacteria		

*EPA Interim Primary Drinking Water Standards
**Ground Water Quality Parameters
***Ground Water Contamination Indicator Parameters

TABLE 2

Wells Designated for Ground Water Monitoring

Well	Date of Active Monitoring	Monitoring Designation
MW2	January 1982	downgradient
MW3	to	downgradient
MW4	October 1984	downgradient
MW5		upgradient
MW6C	October 1984	downgradient
MW7C	to	upgradient
MW8B	?	downgradient
MW9B		downgradient
		upgradient

TABLE 3
ORDER OF SAMPLE COLLECTION,
BOTTLE TYPE AND PRESERVATIVE LIST

Parameter	Bottle	Preservative
Volatile Organic Analysis (VOA)	2 40-ml VOA vials	
Purgeable Organic Carbon (POC)	1 40-ml VOA vial	
Purgeable Organic Halogens (POX)	1 40-ml VOA vial	
Extractable Organics	6 1-qt. amber glasses	
Total Metals	1 qt. plastic	HNO3
Total Organic Carbon (TOC)	1 150-ml glass	H2SO4
Total Organic Halogens (TOX)	1 qt. amber glass	
Phenols	1 qt. amber glass	H2SO4
Cyanide	1 qt. plastic	NaOH
Sulfide	1 qt. plastic	Zinc acetate, N OH
Anions	1 40-oz. glass	
Dioxin	2 1-qt amber glass	
Dissolved Metals	1 qt. plastic	

TABLE 4
FIELD MEASUREMENTS
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA.

WELL NUMBER	DATE SAMPLED	WATER LEVEL (in feet from top of csg.)	TOTAL DEPTH of well (in feet)	GALLONS PURGED	TIME	pH	TEMP. °C.	SPECIFIC CONDUCTIVITY (umhos)	OVA (ppm)	REMARKS
MW 1A	1-30-87	11.29	63.51	26.5	0843 0901 0913	6.4 5.3 5.6	21.3 20.8 20.6	87 71 73	NAB	low turbidity; clear water
MW 1B	1-30-87	11.28	47.35	17.6	0857 0920 0935	5.9 5.4 5.2	21.0 20.9 20.8	79 75 68	NAB	highly turbid; yellow-gold color
MW 1C	1-30-87	4.95	22.40	--	--	-	--	--	40	three distinct phases in the water column; black, viscous liquid
MW 5A	1-26-87	10.18	60.43	24.5	1430 1500 1535	12.5 12.2 11.7	18.5 18.1 18.1	9500 5000 3500	NAB	
MW 5B	1-28-87	9.67	45.79	17.3	1020 1035	12.6 12.4	16.9 16.4	11,500 10,500	NAB	purged well to dryness; turbid; visible suspended particles; tan-colored
MW 5C	1-27-87	3.26	18.01	7.1	1510 1520 1530 0916	7.0 6.1 5.4 5.9	13.4 15.9 15.8 10.7	310 290 250 275	NAB	purged 1-26-87; turbid over 100 NTU
MW 6A	1-29-87	10.71	73.89	30.8	1258 1323 1345	7.8 7.0 6.6	18.6 18.7 18.7	12 85 66	--	over 100 NTU turbid; cloudy; white-grey color
MW 6B	1-29-87	11.26	39.39	13.75	1445 1450 1500	6.1 6.1 6.1	18.5 19.0 19.1	185 140 101	--	turbid; over 100 NTU; milky color
MW 6C	1-29-87	6.02	12.95	4.0	1610 1615	5.2 5.0	15.0 14.1	490 470	--	very turbid; blue-grey color
MW 8A	1-28-87	10.42	29.04	9.5	1345 1400 1410	8.8 7.8 7.9	15.2 17.2 17.9	155 136 130	--	over 100 NTU
MW 8B	1-28-87	5.88	7.21	1.0	1358 1410	6.1 6.1	13.2 12.6	6400 7250	--	over 100 NTU; blue-grey color; visible particles; chemical odor in water
MW 10C	1-27-87	3.66	20.98	8.5	1305 1335	4.1 4.6	12.1 14.6	130 161	NAB	very turbid and silty; grey-brown color
MW 13D	1-29-87	2.66	11.41	4.3	0855 0859 0905	5.9 5.7 5.6	10.1 12.2 12.5	93 99 100	--	turbid; heavy particulates; yellow color
MW 18C	1-30-87	11.32	39.00	13.5	1120 1128 1130 1135 1140	10.3 7.2 6.3 6.0 5.8	20.4 19.8 19.4 19.4 19.5	260 200 180 180 180	NAB	very turbid; grey-black color; suspended particles
MW 30	1-27-87	4.07	15.22	7.0	1045	5.4	19.3	140	NAB	purge water had low turbidity; sample water had high turbidity
MW 37A	1-27-87	17.69	37.63	9.75	1325 1335 1340	5.7 5.7 5.6	18.0 16.7 18.0	142 163 175	100	very turbid; over 100 NTU; yellow color
MW 38A	1-28-87	6.20	30.05	11.5	0940 0955 1000	10.5 10.0 9.6	15.7 17.9 17.6	390 270 230	--	orange color; clear hard crystals on bailer rope
MW 38B	1-28-87	0.96	7.68	4.5	0945 0955 1000	4.8 5.2 5.2	10.4 12.1 12.3	105 144 142	--	

TABLE 5
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA
HWGWTF
ANALYTICAL DATA SUMMARY

	1A 01/30/87	1B 01/30/87	1C 01/30/87	5A 01/26/87	5B 01/28/87	5C 01/27/87	6A 01/29/87	6B 01/29/87	6C 01/29/87	8A 01/28/87	8B 01/28/87	10C 01/27/87	13D 01/29/87	18C 01/30/87	30 01/27/87	37A 01/27/87
RCRA WASTE CHARACTERISTICS	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
POTASSIUM	1.2	3.3	11	3.9	7.2	5.3	0.68	1.7	6.0	2.1	21	2.0	2.9	2.1	3.7	3.0
PURGEABLE ORGANIC CARBON	NA	NA	20J	--	2.6J	--	--	--	26J	--	24J	--	--	--	--	--
	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
TOTAL ORGANIC HALOGEN	NA	NA	690	--	--	--	--	--	670	--	480	--	--	--	--	--
PURGEABLE ORGANIC HALOGEN	NA	NA	9J	--	--	--	--	--	--	--	--	--	290J	--	--	--
ACETONE	10UR	NA	100UR	--	200UR	--	10UR	60UR	200UR	10UR	500UR	--	10UR	10UR	--	--
CARBON DISULFIDE	5UR	NA	50UR	--	2JR	--	5UR	5UR	2J	2J	30UR	--	5UR	5UR	--	--
VINYL ACETATE	10UR	NA	100UR	10UR	10UR	10UR	10UR	10UR	10UR	10UR	50UR	10UR	10UR	10UR	10UR	10UR
METHYL ETHYL KETONE	10UR	NA	60UR	10UR	11R	10UR	10UR	10UR	60UR	10UR	40UR	10UR	10UR	10UR	10UR	10UR
METHYL ISOBUTYL KETONE	10UR	NA	100UR	--	4JR	--	10UR	10UR	10UR	10UR	50UR	--	10UR	10UR	--	--
DIBROMOMETHANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
METHYL BUTYL KETONE	10UR	NA	80J	--	10UR	--	10UR	10UR	10UR	10UR	50UR	--	10UR	10UR	--	--
1,1,1,2-TETRACHLOROETHANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
STYRENE	5UR	NA	42J	--	5UR	--	5UR	5UR	31J	5UR	30UR	--	5UR	5UR	--	--
1,2,3-TRICHLOROPROPANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
INORGANIC ELEMENT/COMPOUND	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
SILVER	--	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	--	--	36000J	NA	--	--	--	--	1000J	--	29J	--	--	--	--	--
BARIUM	--	740	--	86	150	--	23	530	130	--	500	190	92	160	420	750
BERYLLIUM	--	4	2	--	--	--	--	5	--	--	--	3	--	--	5	5
CADMIUM	--	--	--	--	--	--	--	--	--	--	--	--	14	--	--	--
CHROMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	170	--
COPPER	--	31	--	--	--	--	20	43	--	--	--	43	22	--	130	41
LEAD	--	28	--	--	--	5.0	17	23	4.6	4.5	7.4	32	57	9.8	47	50
SELENIUM	--	--	--	--	--	--	--	--	--	--	--	6.2J	--	--	9.6J	--
THALLIUM	--	--	--	--	--	--	--	--	7	--	--	--	--	--	--	--
VANADIUM	--	140	--	--	--	140	--	--	--	--	130	160	160	--	370	180
ZINC	21	150	1700	--	20	62	32	70	41	21	110	43	32	28	95	150
MERCURY	0.5JN	3.8JN	--	--	--	--	--	--	--	--	0.3JN	0.5JN	0.2JN	--	0.6JN	0.3JN
ALUMINUM	--	86000J	790J	3100J	3300J	5800J	1600J	59000J	6800J	2500J	17000J	48000J	53000J	9100J	88000J	140000J
MANGANESE	52	760	640	--	--	170	14	87	360	7	1300	110	27	220	200	410
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
CALCIUM	6.6	8.6	42	180	220	17	13	39	13	16	110	5.0	4.1	12000	6.2	7.1
MAGNESIUM	0.95	3.5	8.2	0.12	--	4.3	8.6	3.2	4.1	0.77	27	2.3	1.5	2.3	3.1	4.6
IRON	0.03	57	56	0.06	--	0.84	0.99	7.2	16	--	160	13	18	3.2	16	78
SODIUM	3.8	5.3	20	8.1	52	9.4	2.9	3.6	40	--	1300	9.7	22	14	12	7.3
SELECTED CHLORINATED COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
HEPTACHLOR	--	--	NA	--	--	--	--	--	--	--	--	0.15JN	--	--	--	--
ALPHA-BHC	0.22J	--	NA	--	--	--	--	--	--	--	--	0.05UR	--	--	--	0.05UR
BETA-BHC	--	--	NA	--	--	--	--	--	--	--	--	0.05UR	--	--	--	0.05UR

TABLE 5
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA
HWGWTF
ANALYTICAL DATA SUMMARY

	1A 01/30/87	1B 01/30/87	1C 01/30/87	5A 01/26/87	5B 01/28/87	5C 01/27/87	6A 01/29/87	6B 01/29/87	6C 01/29/87	8A 01/28/87	8B 01/28/87	10C 01/27/87	13D 01/29/87	18C 01/30/87	30 01/27/87	37A 01/27/87
SELECTED CHLORINATED COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
GAMMA-BHC (LINDANE)	--	--	NA	--	--	--	--	--	--	--	--	0.05UR	--	--	--	0.08J
DELTA-BHC	--	--	NA	--	--	--	--	--	--	--	--	0.05UR	--	--	--	--
2,3,7,8 TCDD (DIOXIN)	--	--	--	--	--	--	--	110%	--	--	--	--	--	--	--	--
HEXACHLORODIBENZODIOXIN (TOTAL)	--	--	8.6J	--	--	--	--	79%	--	--	--	--	--	--	--	--
HEPTACHLORODIBENZODIOXIN (TOTAL)	--	--	490J	--	--	--	--	--	0.82J	--	1.0J	--	--	--	--	--
OCTACHLORODIBENZODIOXIN	--	--	1000J	--	--	--	--	--	400J	--	350J	--	--	--	--	--
TETRACHLORODIBENZOFURAN (TOTAL)	--	--	--	--	--	--	--	97%	--	--	--	--	--	--	--	--
HEXACHLORODIBENZOFURAN (TOTAL)	--	--	8.0J	--	--	--	--	--	--	--	2.2J	--	--	--	--	--
HEPTACHLORODIBENZOFURAN (TOTAL)	--	--	28J	--	--	--	--	--	12J	--	0.72J	--	--	--	--	--
OCTACHLORODIBENZOFURAN	--	--	54J	--	--	--	--	--	21J	--	--	--	--	--	--	--
2,4-D	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	2.0R	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR
2,4,5-TP	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	6.0R	0.1UR	1.0R	0.1UR	0.1UR	0.1UR
2,4,5-T	0.1UR	0.1UR	0.1UR	0.1UR	0.3R	0.1UR	0.1UR	0.1UR	0.1UR	0.3R	1.0R	0.1UR	0.5R	0.1UR	0.1UR	0.4R
CHLOROBENZILATE	1.0UR	1.0UR	1.0UR	--	1.0UR	1.0UR	1.0UR	1.0UR	15R	1.0UR	13R	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
1,3-DICHLOROBENZENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROETHYL) ETHER	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROETHANE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-CHLOROISOPROPYL) ETHER	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODI-N-PROPYLAMINE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
NITROBENZENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBUTADIENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	19	170	18000J	--	--	--	--	--	8400	--	5400	--	--	--	45	120
BIS(2-CHLOROETHOXY) METHANE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
ISOPHORONE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	--	--	450J	--	--	--	--	--	42J	--	--	--	--	--	--	--
ACENAPHTHENE	36	11	6900J	--	--	--	--	--	660	--	300	--	--	--	6J	7J
2,4-DINITROTOLUENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-DINITROTOLUENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORENE	26	--	6600J	--	--	--	--	--	400	--	160	--	--	--	3J	3J
DIETHYL PHTHALATE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
HEXACHLOROBENZENE (HCB)	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
4-BROMOPHENYL PHENYL ETHER	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENANTHRENE	23	--	13000J	--	--	--	--	--	530	--	84	--	--	--	--	--
ANTHRACENE	--	--	1900J	--	--	--	--	--	56J	--	--	--	--	--	--	--
DI-N-BUTYLPHTHALATE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	--	--	5000J	--	--	--	--	--	110	--	--	--	--	--	--	--
PYRENE	--	--	2700J	--	--	--	--	--	63J	--	--	--	--	--	--	--
BENZYL BUTYL PHTHALATE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL) PHTHALATE	--	--	330J	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	--	--	490J	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 5
SOUTHERN WOOD PIEDMONT
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ANALYTICAL DATA SUMMARY

EXTRACTABLE ORGANIC COMPOUNDS	1A 01/30/87	1B 01/30/87	1C 01/30/87	5A 01/26/87	5B 01/29/87	5C 01/27/87	6A 01/29/87	6B 01/29/87	6C 01/29/87	8A 01/28/87	8B 01/28/87	10C 01/27/87	13D 01/29/87	18C 01/30/87	30 01/27/87	37A 01/27/87
	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
CHRYSENE	--	--	520J	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-DICHLOROBENZIDINE	20UR	20UR	2000UR	20UR	20UR	20UR	20UR	20UR	200UR	20UR	100UR	20UR	--	20UR	20UR	20UR
DI-N-OCTYLPHTHALATE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(B AND/OR K)FLUORANTHENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO-A-PYRENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
INDENO (1,2,3-CD) PYRENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZO(GHI)PERYLENE	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
2-CHLOROPHENOL	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
2-NITROPHENOL	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
PHENOL	--	--	13000J	--	--	--	--	--	5400	--	1300	--	--	--	--	--
2,4-DIMETHYLPHENOL	--	--	6300J	--	--	--	--	--	4600	--	1700	--	--	--	--	7J
2,4-DICHLOROPHENOL	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
4-CHLORO-3-METHYLPHENOL	--	--	1000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-DINITROPHENOL	--	--	5000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYL-4,6-DINITROPHENOL	--	--	5000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
PENTACHLOROPHENOL	--	--	5000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
4-NITROPHENOL	--	--	5000UR	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHYLPHENOL (2 ISOMERS)	--	--	8000JN	--	--	--	--	--	--	--	--	--	--	--	--	--
INDOLE	--	--	2000JN	--	--	--	--	--	--	--	--	--	--	--	--	--
1-METHYLNAPHTHALENE	20JN	--	4000JN	--	--	--	--	--	--	--	--	--	--	--	--	--
DIMETHYLNAPHTHALENE (2 ISOMERS)	--	--	2000JN	--	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZOTHIOPHENE	--	--	800JN	--	--	--	--	--	--	--	--	--	--	--	--	--
3 UNIDENTIFIED COMPOUNDS	--	--	4000J	--	--	--	--	--	--	--	--	--	--	--	--	--
BENZENEPROPANOIC ACID	--	--	--	--	20JN	--	--	--	--	--	--	--	--	--	--	--
DODECANOIC ACID	--	--	--	--	60JN	--	--	--	--	--	--	--	--	--	--	--
TETRADECANOIC ACID	--	--	--	--	30JN	--	--	--	--	--	--	--	--	--	--	--
1 UNIDENTIFIED COMPOUND	--	--	--	--	20J	--	--	--	--	--	--	--	--	--	--	--
DIMETHYLPHENOL (NOT 2,4-)(2 ISOMERS)	--	--	--	--	--	--	--	--	900JN	--	--	--	--	--	--	--
ETHYLMETHYLPHENOL	--	--	--	--	--	--	--	--	400JN	--	--	--	--	--	--	--
QUINOLINE	--	--	3000JN	--	--	--	--	--	2000JN	--	--	--	--	--	--	--
ISOQUINOLINE	--	--	--	--	--	--	--	--	400JN	--	--	--	--	--	--	--
BIPHENYL	--	--	2000JN	--	--	--	--	--	200JN	--	--	--	--	--	--	--
NAPHTHOPYRANDIONE	--	--	--	--	--	--	--	--	100JN	--	--	--	--	--	--	--
7 UNIDENTIFIED COMPOUNDS	--	--	--	--	--	--	--	--	4000J	--	--	--	--	--	--	--
DIMETHYLPYRIDINE	--	--	--	--	--	--	--	--	200JN	--	200JN	--	--	--	--	--
INDENE	--	--	--	--	--	--	--	--	--	--	400JN	--	--	--	--	--
DIMETHYLPHENOL	--	--	--	--	--	--	--	--	--	--	300JN	--	--	--	--	--
ETHYLHEXANOIC ACID	--	--	--	--	--	--	--	--	--	--	300JN	--	--	--	--	--
METHYLQUINOLINE	--	--	1000JN	--	--	--	--	--	900JN	--	600JN	--	--	--	--	--
CARBAZOLE	--	--	--	--	--	--	--	--	200JN	--	200JN	--	--	--	--	--
9 UNIDENTIFIED COMPOUNDS	--	--	--	--	--	--	--	--	--	--	5000J	--	--	--	--	--
QUINOLINONE	--	--	10000JN	--	--	--	--	--	5000JN	--	2000JN	--	--	--	--	--
OCTAHYDROTRIMETHYLMETHYLETHYLPHENANTHRENOL	--	--	--	--	--	--	--	--	--	--	--	20JN	--	--	--	--
2 UNIDENTIFIED COMPOUNDS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20J	--
PROPENYLBENZENE	--	--	--	--	--	--	--	--	--	--	300JN	--	--	--	--	10JN
BENZOTHIOPHENE	--	--	2000JN	--	--	--	--	--	--	--	500JN	--	--	--	--	6JN
4-METHYL-2-PENTANONE	--	--	--	--	5J	--	--	4J	--	--	--	--	--	--	--	--

TABLE 5
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ANALYTICAL DATA SUMMARY

	1A 01/30/87	1B 01/30/87	1C 01/30/87	5A 01/26/87	5B 01/28/87	5C 01/27/87	6A 01/29/87	6B 01/29/87	6C 01/29/87	8A 01/28/87	8B 01/28/87	10C 01/27/87	13D 01/29/87	18C 01/30/87	30 01/27/87	37A 01/27/87
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
PYRIDINE	--	--	--	--	--	--	--	--	120J	--	--	--	--	--	--	--
2-PICOLINE	--	--	--	--	--	--	--	--	260	--	--	--	--	--	--	--
ACETOPHENONE	--	--	--	--	--	--	--	--	960	--	--	--	--	--	--	--
A,A-DIMETHYLPHENETHYLAMINE	50UR	50UR	5000UR	50UR	50UR	50UR	50UR	50UR	500UR	50UR	300UR	50UR	50UR	50UR	50UR	50UR
N-NITROSODI-N-BUTYLAMINE	10UR	10UR	1000UR	10UR	10UR	10UR	10UR	10UR	100UR	10UR	50UR	10UR	10UR	10UR	10UR	10UR
DIBENZO(A,J)PYRENE	10UR	10UR	1000UR	10UR	10UR	10UR	10UR	10UR	100UR	10UR	50UR	10UR	10UR	10UR	10UR	10UR
DIBENZO(A,E)PYRENE	10UR	10UR	1000UR	10UR	10UR	10UR	10UR	10UR	100UR	10UR	50UR	10UR	10UR	10UR	10UR	10UR
2,6-DICHLOROPHENOL	10UR	10UR	1000UR	10UR	10UR	10UR	10UR	10UR	100UR	10UR	50UR	10UR	10UR	10UR	10UR	10UR
3,3'-DIMETHYLBENZIDINE	100UR	100UR	10000UR	100UR	100UR	100UR	100UR	100UR	1000UR	100UR	500UR	100UR	100UR	100UR	100UR	100UR
METHAPYRILENE	50UR	50UR	5000UR	50UR	50UR	50UR	50UR	50UR	500UR	50UR	300UR	50UR	50UR	50UR	50UR	50UR
DIBENZO(A,H)PYRENE	10UR	10UR	100UR	10UR	10UR	10UR	10UR	10UR	100UR	10UR	50UR	10UR	10UR	10UR	10UR	10UR
DI-N-PROPYLNITROSAMINE	10UR	10UR	100UR	10UR	10UR	10UR	10UR	10UR	100UR	10UR	50UR	10UR	10UR	10UR	10UR	10UR
4-METHYLPHENOL	--	--	20000J	--	--	--	--	--	9100	--	5300	--	--	--	--	--
PURGEABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
CHLOROMETHANE	10UR	NA	100UR	--	10UR	--	10UR	10UR	10UR	10UR	50UR	--	10UR	10UR	--	--
BROMOMETHANE	10UR	NA	100UR	--	10UR	--	10UR	10UR	10UR	10UR	50UR	--	10UR	10UR	--	--
VINYL CHLORIDE	10UR	NA	100UR	--	10UR	--	10UR	10UR	10UR	10UR	50UR	--	10UR	10UR	--	--
CHLOROETHANE	10UR	NA	100UR	--	10UR	--	10UR	10UR	10UR	10UR	50UR	--	10UR	10UR	--	--
METHYLENE CHLORIDE	10UR	NA	20UR	--	5UR	--	10UR	10UR	10UR	30UR	50UR	--	5UR	10UR	--	--
1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
1,1-DICHLOROETHANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
TRANS-1,2-DICHLOROETHENE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
CHLOROFORM	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UP	5UR	30UR	--	5UR	5UR	--	--
1,2-DICHLOROETHANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
1,1,1-TRICHLOROETHANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
CARBON TETRACHLORIDE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
BROMODICHLOROMETHANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
1,2-DICHLOROPROPANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
TRANS-1,3-DICHLOROPROPENE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
TRICHLOROETHENE(TRICHLOROETHYLENE)	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
BENZENE	5UR	NA	82J	--	5UR	--	5UR	5UR	59J	5UR	13J	--	5UR	5UR	--	1J
DIBROMOCHLOROMETHANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
1,1,2-TRICHLOROETHANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
CIS-1,3-DICHLOROPROPENE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
2-CHLOROETHYLVINYL ETHER	10UR	NA	100UR	10UR	10UR	10UR	10UR	10UR	10UR	10UR	50UR	10UR	10UR	10UR	10UR	10UR
BROMOFORM	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
1,1,2,2-TETRACHLOROETHANE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
TETRACHLOROETHENE(TETRACHLOROETHYLENE)	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
TOLUENE	5UR	NA	84J	--	5UR	--	5UR	5UR	85J	5UR	37JN	--	5UR	5UR	--	1JN
CHLOROBENZENE	5UR	NA	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
ETHYL BENZENE	5UR	NA	34J	--	5UR	--	5UR	5UR	49J	5UR	41J	--	5UR	5UR	--	--
TOTAL XYLENES	5UR	NA	170J	--	5UR	--	5UR	5UR	200J	5UR	120J	--	5UR	5UR	--	2J
DIFLUORODICHLOROMETHANE	5UR	--	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
IODOMETHANE	5UR	--	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
ACROLEIN	10UR	--	100UR	--	10UR	--	10UR	10UR	10UR	10UR	50UR	--	10UR	10UR	--	--
ACRYLONITRILE	10UR	--	100UR	--	10UR	--	10UR	10UR	10UR	10UR	50UR	--	10UR	10UR	--	--

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ANALYTICAL DATA SUMMARY

	1A 01/30/87	1B 01/30/87	1C 01/30/87	5A 01/26/87	5B 01/29/87	5C 01/27/87	6A 01/29/87	6B 01/29/87	6C 01/29/87	8A 01/28/87	8B 01/28/87	10C 01/27/87	13D 01/29/87	18C 01/30/87	30 01/27/87	37A 01/27/87
PURGEABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
TRICHLOROFLUOROMETHANE	5UR	--	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
ETHYL CYANIDE	50UR	--	500UR	--	50UR	--	50UR	50UR	50UR	50UR	300UR	--	50UR	5UR	--	--
3-CHLOROPROPENE	5UR	--	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	50UR	--	--
ISOBUTYL ALCOHOL	50UR	--	500UR	50UR	50UR	50UR	50UR	50UR	50UR	50UR	300UR	50UR	50UR	50UR	50UR	50UR
1,4-DIOXANE	5000UR	--	50000UR	5000UR	5000UR	5000UR	5000UR	5000UR	5000UR	5000UR	3000UR	5000UR	5000UR	5000UR	5000UR	5000UR
CROTONALDEHYDE	50UR	--	500UR	50UR	50UR	50UR	50UR	50UR	50UR	50UR	300UR	50UR	50UR	50UR	50UR	50UR
1,2-DIBROMOETHANE	5UR	--	50UR	--	5UR	--	5UR	5UR	5UR	5UR	30UR	--	5UR	5UR	--	--
CONVENTIONAL PARAMETERS	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
CHLORIDE	3.5	5.4	56	12	6.0	10	2.8	2.6	55	2.0	1800	4.8	2.6	9.0	16	7.6
FLUORIDE	NA	NA	9.4	--	2.5	--	--	--	6.4	1.1	--	--	--	--	1.5	--
SULFATE	NA	NA	1.2	1900	6.0	32	2900	1.8	--	2.5	2.9	30	16	18	6.9	--
SULFIDES	1.4	--	5.0	--	--	--	--	--	1.1	--	--	--	--	--	--	--
	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
PHENOLS (4AAP)	NA	NA	43000	--	170	--	--	--	15000	--	5400	--	--	--	--	--
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
TOTAL ORGANIC CARBON	NA	NA	420	--	20	--	--	--	220	--	220	--	--	--	--	--

****

FOOTNOTES
NA - NOT ANALYZED
J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED
U - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT
R - QUALITY CONTROL INDICATES THAT DATA ARE UNUSEABLE, COMPOUND MAY OR MAY NOT BE PRESENT
RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION, THE VALUE IS THAT REPORTED BY THE LABORATORY

TABLE 5 (CON'T)
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA
HWGWTF
ANALYTICAL DATA SUMMARY

	38A 01/28/87	38B 01/28/87
RCPA WASTE CHARACTERISTICS	MG/L	MG/L
POTASSIUM	3.6	3.5
	UG/L	UG/L
ACETONE	10UR	10UR
CARBON DISULFIDE	5UR	5UR
VINYL ACETATE	10UR	10UR
METHYL ETHYL KETONE	10UR	10UR
METHYL ISOBUTYL KETONE	10UR	10UR
DIBROMOMETHANE	5UR	5UR
METHYL BUTYL KETONE	10UR	10UR
1,1,1,2-TETRACHLOROETHANE	5UR	5UR
STYRENE	5UR	5UR
1,2,3-TRICHLOROPROPANE	5UR	5UR
INORGANIC ELEMENT/COMPOUND	UG/L	UG/L
LEAD	9.3	13
ZINC	42	28
MERCURY	0.3JN	--
ALUMINUM	9800J	14000J
MANGANESE	62	66
	MG/L	MG/L
CALCIUM	10	10
MAGNESIUM	2.1	2.3
IRON	2.6	2.7
SODIUM	6.6	6.7
SELECTED CHLORINATED COMPOUNDS	UG/L	UG/L
2,4-D	1.0UR	1.0UR
2,4,5-TP	0.1UR	0.8R
2,4,5-T	0.1UR	0.1UR
CHLOROBENZILATE	1.0UR	1.0UR
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L
3,3'-DICHLOROBENZIDINE	20UR	20UR
1 UNIDENTIFIED COMPOUND	--	70J
A,A-DIMETHYLPHENETHYLAMINE	50UR	50UR
N-NITROSODI-N-BUTYLAMINE	10UR	10UR
DIBENZO(A,J)PYRENE	10UR	10UR
DIBENZO(A,E)PYRENE	10UR	10UR
2,6-DICHLOROPHENOL	10UR	10UR
3,3'-DIMETHYLBENZIDINE	100UR	100UR
METHAPYRILENE	50UR	50UR

TABLE 5 (CON'T)
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA
HWGWTF
ANALYTICAL DATA SUMMARY

	38A 01/28/87	38B 01/28/87
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L
DIBENZO(A,H)PYRENE	10UR	10UR
DI-N-PROPYLNITROSAMINE	10UR	10UR
PURGEABLE ORGANIC COMPOUNDS	UG/L	UG/L
CHLOROMETHANE	10UR	10UR
BROMOMETHANE	10UR	10UR
VINYL CHLORIDE	10UR	10UR
CHLOROETHANE	10UR	10UR
METHYLENE CHLORIDE	10UR	10UR
1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	5UR	5UR
1,1-DICHLOROETHANE	5UR	5UR
TRANS-1,2-DICHLOROETHENE	5UR	5UR
CHLOROFORM	5UR	5UR
1,2-DICHLOROETHANE	5UR	5UR
1,1,1-TRICHLOROETHANE	5UR	5UR
CARBON TETRACHLORIDE	5UR	5UR
BROMODICHLOROMETHANE	5UR	5UR
1,2-DICHLOROPROPANE	5UR	5UR
TRANS-1,3-DICHLOROPROPENE	5UR	5UR
TRICHLOROETHENE(TRICHLOROETHYLENE)	5UR	5UR
BENZENE	5UR	5UR
DIBROMOCHLOROMETHANE	5UR	5UR
1,1,2-TRICHLOROETHANE	5UR	5UR
CIS-1,3-DICHLOROPROPENE	5UR	5UR
2-CHLOROETHYLVINYL ETHER	10UR	10UR
BROMOFORM	5UR	5UR
1,1,2,2-TETRACHLOROETHANE	5UR	5UR
TETRACHLOROETHENE(TETRACHLOROETHYLENE)	5UR	5UR
TOLUENE	5UR	5UR
CHLOROBENZENE	5UR	5UR
ETHYL BENZENE	5UR	5UR
TOTAL XYLENES	5UR	5UR
DIFLUORODICHLOROMETHANE	5UR	5UR
IODOMETHANE	5UR	5UR
ACROLEIN	10UR	10UR
ACRYLONITRILE	10UR	10UR
TRICHLOROFLUOROMETHANE	5UR	5UR
ETHYL CYANIDE	50UR	50UR
3-CHLOROPROPENE	50UR	5UR
ISOBUTYL ALCOHOL	50UR	50UR
1,4-DIOXANE	5000UR	5000UR
CROTONALDEHYDE	50UR	50UR
1,2-DIBROMOETHANE	5UR	5UR
CONVENTIONAL PARAMETERS	MG/L	MG/L
CHLORIDE	3.9	3.8

TABLE 5 (CON'T)
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA
HWGWTF
ANALYTICAL DATA SUMMARY

	38A 01/28/87	38B 01/28/87
CONVENTIONAL PARAMETERS	MG/L	MG/L
SULFATE	35	36
SULFIDES	1.2	--

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###FOOTNOTES###
J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED
U - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT
R - QUALITY CONTROL INDICATES THAT DATA ARE UNUSEABLE, COMPOUND MAY OR MAY NOT BE PRESENT
RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION, THE VALUE IS THAT REPORTED BY THE LABORATORY

TABLE 6
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA
ESD - ATHENS
ANALYTICAL DATA SUMMARY

	5A 01/26/87 1600	8A 01/28/87 1425	8B 01/28/87 1600	13D 01/29/87 0900
INORGANIC ELEMENT/COMPOUND	UG/L	UG/L	UG/L	UG/L
BARIUM	77	--	500	85
CHROMIUM	--	--	45	48
COPPER	--	--	--	18
STRONTIUM	750	110	520	52
TITANIUM	--	32	140	260
VANADIUM	14	20	150	160
YTTRIUM	--	13	--	18
ZINC	--	12	90	20
MERCURY	--	--	NAI	--
ALUMINUM	2900	2000	20000	51000
MANGANESE	--	--	1800	42
	MG/L	MG/L	MG/L	MG/L
CALCIUM	160	15	120	4.0
MAGNESIUM	0.61	0.77	29	1.5
IRON	--	0.70	180	20
SODIUM	6.5	3.0	1300	22
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L
NAPHTHALENE	--	--	5100	--
ACENAPHTHENE	--	--	160	--
FLUORENE	--	--	97	--
PHENANTHRENE	--	--	52	--
PHENOL	1.1J	--	650	--
2,4-DIMETHYLPHENOL	--	--	1100	--
HYDROXYMETHOXYBENZALDEHYDE	8JN	--	--	--
(HYDROXYMETHOXYPHENYL)ETHANONE	10JN	--	--	--
(HYDROXYDIMETHOXYPHENYL)ETHANONE	1JN	--	--	--
PHOSPHORIC ACID,TRIPHENYL ESTER	3JN	--	--	--
CYCLOHEXANONE	--	--	200JN	--
DIMETHYLPYRIDINE	--	--	50JN	--
ETHYLMETHYLBENZENE (2 ISOMERS)	--	--	100JN	--
ISOCYANOBENZENE	--	--	50JN	--
TRIMETHYLPYRIDINE (2 ISOMERS)	--	--	200JN	--
ETHENYLMETHYLBENZENE (2 ISOMERS)	--	--	400JN	--
METHYLHEPTANONE	--	--	200JN	--
INDENE	--	--	200JN	--
TRIMETHYLBICYCLOHEPTANONE	--	--	50JN	--
DIMETHYLPHENOL (NOT 2,4-)(4 ISOMERS)	--	--	1000JN	--
ETHYLHEXANOIC ACID	--	--	200JN	--
TRIMETHYLCYCLOHEXANEMETHANOL	--	--	200JN	--
METHYLPROPYNYLBENZENE	--	--	200JN	--
TRIMETHYLPENTANEDIOL	--	--	200JN	--
CHLOROPHENOL (NOT 2-)	--	--	800JN	--
BENZOTHIOPHENE	--	--	500JN	--
ETHYLHEXANEDIOL	--	--	100JN	--

TABLE 6
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA
ESD - ATHENS
ANALYTICAL DATA SUMMARY

	5A 01/26/87 1600	8A 01/28/87 1425	8B 01/28/87 1600	13D 01/29/87 0900
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L
ETHYLMETHYLPHENOL (3 ISOMERS)	--	--	400JN	--
BENZENEACETIC ACID	--	--	300JN	--
DIHYDROINDENONE	--	--	300JN	--
1-METHYLNAPHTHALENE	--	--	300JN	--
METHYLQUINOLINE (2 ISOMERS)	--	--	800JN	--
BENZENEPROPANOIC ACID	4JN	--	800JN	--
DIHYDROINDENOL	--	--	300JN	--
BIPHENYL	--	--	100JN	--
METHYLINDOLE	--	--	50JN	--
DIMETHYLQUINOLINE (2 ISOMERS)	--	--	100JN	--
METHYLDIHYDROINDOLE	--	--	200JN	--
NAPHTHALENECARBONITRILE	--	--	200JN	--
NAPHTHALENOL	--	--	200JN	--
BIPHENYLOL (2 ISOMERS)	--	--	400JN	--
METHYLNAPHTHALENOL (3 ISOMERS)	--	--	100JN	--
ISOQUINOLINONE	--	--	1000JN	--
ISOQUINOLINOL	--	--	1000JN	--
METHYLQUINOLINONE (2 ISOMERS)	--	--	200JN	--
METHYLQUINOLINOL (2 ISOMERS)	--	--	100JN	--
DIBENZOFURANOL	--	--	100JN	--
3 UNIDENTIFIED COMPOUNDS	--	--	2000J	--
HEXANOIC ACID	--	--	50JN	--
2-METHYLPHENOL	--	--	830	--
4-METHYLPHENOL	--	--	3500	--
DIBENZOFURAN	--	--	100	--
2-METHYLNAPHTHALENE	--	--	280	--
OCTAMETHYLCYCLOTETRASILOXANE	--	--	--	5JN
PURGEABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L
BENZENE	--	--	17	--
TOLUENE	--	--	39	--
ETHYL BENZENE	--	--	51	--
TOTAL XYLENES	--	--	130	--
HEPTANONE (2 ISOMERS)	--	--	40JN	--
ACETONE	92J	--	980	--
METHYL ETHYL KETONE	--	--	110	--
METHYL BUTYL KETONE	--	--	21J	--
METHYL ISOBUTYL KETONE	--	--	7.6J	--
STYRENE	--	--	7.3J	--
CONVENTIONAL PARAMETERS	UG/L	UG/L	UG/L	UG/L
PHENOL (4AAP)	NA	NA	6100A	--
	MG/L	MG/L	MG/L	MG/L
TOTAL ORGANIC CARBON	3.8	--	250	8.7

TABLE 6
SOUTHERN WOOD PIEDMONT
AUGUSTA, GEORGIA
ESD - ATHENS
ANALYTICAL DATA SUMMARY

5A	8A	8B	13D
01/26/87	01/28/87	01/28/87	01/29/87
1600	1425	1600	0900

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FOOTNOTES
A - AVERAGE VALUE
NA - NOT ANALYZED
NAI - INTERFERENCES
J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 7

Parameters Indicating the Presence of K001 Chemicals

pentachlorophenol	tetrachlorophenol
phenol	phenanthrene + anthracene
2-chlorophenol	chrysene + benz(a)anthracene
p-chloro-m-cresol	naphthalene
2,4-dimethylphenol	fluoranthene
2,4-dinitrophenol	benzo(b,k)fluoranthene
2,4,6-trichlorophenol	indeno(1,2,3-cd)pyrene
acenaphthene	benzo(a,h)anthracene
copper	arsenic
chromium	

TABLE 8

Parameters Establishing Ground Water Quality

Chloride	Iron
Manganese	Sodium
Sulfate	

TABLE 9

Parameters Used As Indicators of Ground Water Contamination

Specific Conductance	Total Organic Halogen

APPENDIX A

Task Force Analytical Results

Due to size, the raw data is not included in this report. A copy of the data can be requested from:

EPA, Region IV
Residuals Management Branch
Waste Compliance Section
345 Courtland Street, NE.
Atlanta, Georgia 30365
(404) 347-7603

APPENDIX B

Monitoring Well Construction Data Summary

after Law Environmental Services
for Southern Wood Piedmont

TABLE 1

MONITORING WELL CONSTRUCTION DATA SUMMARY

1986 ANNUAL GROUND-WATER QUALITY ASSESSMENT REPORT

SOUTHERN WOOD PIEDMONT - AUGUSTA, GEORGIA FACILITY

WELL NO.	DATE INSTALLED	WELL TYPE	GROUND ELEVATION (FEET,MSL)	TOP OF RISER ELEVATION (FEET,MSL)	DEPTHS FROM GROUND SURFACE TO; BOTTOM OF SEAL (FEET)	BOTTOM OF SCREEN (FEET)	GEORGIA STATE PLANE COORDINATES NORTH	EAST
MW-1A	06/21/85	III	131.8	134.19	48.0	60.02	1,246,248.0	551,008.3
B	06/21/85	III	131.6	134.18	31.0	44.02	1,246,254.3	551,011.8
C	06/25/85	III	131.8	134.41	6.0	19.50	1,246,248.8	551,013.0
MW-5A	06/28/85	III	131.9	132.85	42.0	57.0	1,246,210.4	550,014.9
B	06/29/85	III	131.9	134.09	29.0	43.0	1,246,214.0	550,017.6
C	06/29/85	II	131.9	134.26	5.0	15.0	1,246,218.2	550,020.8
MW-6A	09/28/84	III	130.3	132.32	58.6	70.6	1,245,892.4	551,501.5
B	09/28/84	III	130.2	132.82	28.6	36.4	1,245,887.3	551,509.4
C	09/29/84	III	130.3	132.17	3.8	9.9	1,245,882.4	551,517.9
MW-7A	10/02/84	III	129.8	132.16	60.9	69.7	1,245,840.8	551,192.7
B	10/02/84	III	129.9	132.69	26.6	35.0	1,245,837.9	551,197.1
C	01/22/86	II	130.6	132.92	8.0	16.5	---	---
MW-8A	09/28/84	III	128.8	131.41	54.5	66.0	1,245,681.9	551,744.9
B	09/30/84	III	129.0	131.55	3.6	10.0	1,245,680.1	551,753.9
MW-9A	09/29/84	III	130.1	132.01	29.3	36.9	1,245,719.0	551,777.3
B	09/30/84	III	130.1	131.96	3.8	10.0	1,245,713.7	551,785.0
MW-10A	06/29/85	III	131.7	134.29	52.0	64.5	1,247,136.5	550,741.0
B	06/30/85	III	131.7	134.18	26.0	40.0	1,247,129.6	550,731.4
C	06/30/85	II	131.6	134.18	6.0	18.0	1,247,127.5	550,740.1
MW-11A	07/15/85	III	129.9	129.86	49.0	61.02	1,245,464.9	549,537.4
B	07/15/85	III	130.0	130.01	30.5	42.02	1,245,472.4	549,540.2
C	07/16/85	III	129.9	129.72	11.0	17.13	1,245,479.9	549,542.8
MW-12A	07/19/85	III	126.7	128.85	47.5	59.02	1,245,025.9	551,410.3
B	07/23/85	III	126.5	129.26	40.5	46.59	1,245,019.7	551,406.4
C	07/23/85	III	126.7	129.20	22.5	35.02	1,245,015.1	551,403.6
MW-13A	06/25/85	III	126.2	128.39	48.5	63.2	1,245,514.3	552,464.2
B	06/26/85	III	126.1	128.58	40.5	55.0	1,245,522.5	552,467.9
C	06/26/85	II	126.3	128.68	15.6	30.0	1,245,528.7	552,470.7
D	12/10/85	II	125.9	126.56	3.0	8.3	---	---
MW-14A	07/09/85	III	123.7	126.04	49.5	62.02	1,247,325.6	553,178.3
B	07/15/85	III	123.6	126.38	33.0	44.02	1,247,329.9	553,180.1
C	07/10/85	II	123.6	126.14	10.0	24.02	1,247,333.9	553,182.8
D	12/10/85	II	124.9	126.90	5.0	12.0	---	---

TABLE 1 (CONT'D)

MONITORING WELL CONSTRUCTION DATA SUMMARY

1986 ANNUAL GROUND-WATER QUALITY ASSESSMENT REPORT

SOUTHERN WOOD PIEDMONT - AUGUSTA, GEORGIA FACILITY

LL .	DATE INSTALLED	WELL TYPE	GROUND ELEVATION (FEET, MSL)	TOP OF RISER ELEVATION (FEET, MSL)	DEPTHS FROM GROUND SURFACE TO: BOTTOM OF SEAL (FEET)	BOTTOM OF SCREEN (FEET)	GEORGIA STATE PLANE COORDINATES NORTH	EAST
15A	07/27/85	III	124.2	126.37	44.5	56.52	1,244,498.7	552,016.7
B	07/28/85	III	124.3	126.77	33.0	44.02	1,244,504.7	552,019.1
C	07/28/85	III	124.3	126.14	16.0	27.52	1,244,511.4	552,021.3
D	12/11/85	II	124.0	126.94	3.5	9.75	---	---
16A	06/18/85	III	120.3	120.59	57.5	74.52	1,244,639.0	554,005.7
B	06/20/85	III	120.1	120.04	50.5	62.02	1,244,645.7	554,006.8
C	06/19/85	II	120.0	119.90	11.1	24.02	1,244,656.1	554,007.3
17A	07/03/85	III	125.2	125.13	45.3	58.02	1,246,725.7	522,724.9
B	07/09/85	III	124.9	125.09	31.0	42.02	1,246,735.7	552,733.5
C	07/02/85	II	125.1	125.21	14.0	26.22	1,246,715.4	552,715.5
D	12/10/85	II	125.3	125.47	3.0	9.5		
18A	07/23/85	III	132.9	135.78	53.0	66.52	1,246,728.0	550,059.5
B	07/23/85	III	132.9	135.39	40.7	52.02	1,246,716.2	550,056.6
C	07/24/85	III	132.9	135.27	26.0	37.52	1,246,701.2	550,052.1
D	11/26/85	II	132.8	133.55	1.0	9.5		
19A	07/28/85	III	133.1	135.56	49.0	61.02	1,246,366.8	549,920.8
B	07/27/85	III	133.3	135.58	28.0	39.02	1,246,378.8	549,923.7
C	07/27/85	III	133.1	135.46	8.0	15.90	1,246,391.6	549,929.1
20	12/09/85	II	126.0	126.29	3.0	9.5	---	---
21	01/23/86	II	128.3	130.88	3.0	9.5	---	---
22	01/24/86	II	127.9	130.19	3.0	9.5	---	---
23	01/24/86	II	128.3	130.54	3.0	9.5		
24A	03/27/86	III	128.7	128.60	46.0	59.57	1,245,145.5	551,757.8
B	03/25/86	III	128.7	128.59	16.0	34.07	1,245,158.0	551,755.7
C	03/19/86	II	128.8	128.66	7.0	14.57	1,245,152.4	551,755.9
25A	06/02/86	III	127.6	127.62	14.0	23.51	1,245,348.2	551,823.3
B	03/19/86	II	127.4	127.58	5.5	12.07	1,245,352.6	551,825.9

TABLE ONE

MONITORING WELL CONSTRUCTION DATA
SOUTHERN WOOD PIEDMONT - AUGUSTA, GEORGIA

WELL NO.	4"PVC TOTAL DEPTH	4" PVC STICKUP	2"PVC TOTAL DEPTH	2"PVC STICKUP	PROTEC-TIVE CASING STICKUP	2"PVC SCREENED PORTION	AQUIFER ZONE
MW-6A	58.6	1.35	70.6	2.09	3.00	70.6-65.6	Lower Sand
MW-6B	23.2	1.71	36.4	2.31	3.22	36.4-31.4	Lower Sand
MW-6C	2.2	1.50	9.9	1.96	3.15	9.9-5.9	Upper Sand
MW-7A	55.0	0.75	69.7	2.42	2.53	69.7-64.7	Lower Sand
MW-7B	20.0	1.25	35.0	2.87	3.20	35.0-30.0	Lower Sand
MW-7C	1.5	1.00	7.2	1.60	2.95	7.2-4.2	Upper Sand
MW-8A	59.5	1.70	66.0	2.59	3.56	66.0-61.0	Lower Sand
MW-8B	2.0	1.40	9.0	2.50	3.63	9.0-5.0	Upper Sand
MW-9A	28.6	1.45	36.9	1.85	2.71	36.9-31.9	Lower Sand
MW-9B	2.0	1.30	10.0	2.90	1.75	10.0-6.0	Upper Sand
B-1	-	-	20.0	2.05	3.33	20.0-15.0	Lower Sand

All measurements are in feet from ground surface.

TABLE 1 (CONT'D)

MONITORING WELL CONSTRUCTION DATA SUMMARY

1986 ANNUAL GROUND-WATER QUALITY ASSESSMENT REPORT

SOUTHERN WOOD PIEDMONT - AUGUSTA, GEORGIA FACILITY

ELL O.	DATE INSTALLED	WELL TYPE	GROUND ELEVATION (FEET, MSL)	TOP OF RISER ELEVATION (FEET, MSL)	DEPTHS FROM GROUND SURFACE TO: BOTTOM OF SEAL (FEET)	BOTTOM OF SCREEN (FEET)	GEORGIA STATE PLANE COORDINATES NORTH	EAST
-26	03/20/86	II	128.0	128.19	3.0	8.07	1,245,210.4	551,605.4
-27	03/21/86	II	126.8	126.82	2.0	7.57	1,244,977.7	551,752.2
-28	03/25/86	II	128.1	127.93	6.0	14.57	1,245,465.0	551,724.3
-29A	03/27/86	III	127.4	128.92	16.0	28.07	1,245,679.5	552,089.7
B	03/25/86	II	127.5	129.02	3.0	8.07	1,245,692.2	552,095.2
-30	03/25/86	II	132.6	134.21	6.0	13.07	1,246,242.4	550,463.8
-31	03/26/86	II	128.2	128.05	4.0	10.57	1,245,348.2	551,670.1
-32	03/26/86	II	128.3	129.91	2.0	8.07	1,244,910.0	551,080.2
-33	03/27/86	II	128.7	130.74	2.0	7.57	1,245,075.1	550,740.9
-34A	04/04/86	III	124.3	126.43	24.0	42.1	1,244,910.1	552 107.2
B	04/01/86	II	124.0	126.21	4.0	16.6	1,244,912.2	552,116.0
-35A	04/14/86	III	127.0	127.41	16.50	31.53	1,245,358.2	552,080.7
B	04/01/86	II	127.0	128.48	2.0	8.05	1,245,353.8	552,088.1
-36A	06/05/86	III	130.7	130.37	17.0	29.0	1,246,447.9	551,149.7
B	04/02/86	II	131.0	131.04	2.3	7.10	1,246,450.2	551,154.2
-37A	04/15/86	III	130.6	130.67	23.90	37.55	1,246,711.7	550,885.7
B	04/03/86	II	130.8	130.65	2.50	7.7	1,246,713.4	550,892.6
-38A	04/03/86	III	126.5	126.34	12.60	29.5	1,246,799.6	552,441.2
B	04/03/86	II	126.5	126.36	1.90	7.0	1,246,799.7	552,450.9
-39A								
B	04/16/86	II	128.8	OUT	4.0	9.52	1,246,000.0	551,916.3
-40A	06/04/86	III	125.5	125.37	17.1	27.0	1,246,363.0	552,176.5
B	04/21/86	II	125.5	125.35	2.0	8.07	1,246,365.2	552,171.7

TABLE 1 (CONT'D)

MONITORING WELL CONSTRUCTION DATA SUMMARY

1986 ANNUAL GROUND-WWATER QUALITY ASSESSMENT REPORT

SOUTHERN WOOD PIEDMONT - AUGUSTA, GEORGIA FACILITY

ELL O.	DATE INSTALLED	WELL TYPE	GROUND ELEVATION (FEET,MSL)	TOP OF RISER ELEVATION (FEET,MSL)	DEPTHS FROM GROUND SURFACE TO: BOTTOM OF SEAL (FEET)	BOTTOM OF SCREEN (FEET)	GEORGIA STATE PLANE COORDINATES NORTH	EAST
-41A	04/23/86	III	126.6	128.83	16.0	31.57	1,244,770.2	552,043.8
B	04/22/86	II	126.3	127.85	2.0	8.07	1,244,765.7	552,048.4
-42A	04/23/86	III	127.8	129.52	16.0	31.57	1,245,273.0	552,231.6
B	04/22/86	II	127.6	129.39	2.0	8.07	1,245,265.2	552,230.8
-43A	05/28/86	III	125.7	128.24	34.4	49.15	1,244,331.8	552,889.3
B	04/21/86	*	123.3	124.84	*	4.0	1,244,351.2	552,897.4
C	05/21/86	II	125.7	127.98	13.5	33.91	1,244,330.0	552,893.0
-44A	05/22/86	III	126.4	129.22	18.9	31.50	1,244,555.6	552,583.3
B	04/23/86	*	124.2	125.91	*	4.3	1,244,601.5	552,552.3
-45A	05/20/86	II	127.8	130.03	11.3	20.02	1,244,800.0	552,222.6
B	04/22/86	*	124.9	126.11	*	6.3	1,244,833.5	552,233.9
-46A	06/02/86	III	130.4	130.27	12.9	24.6	1,246,937.4	551,043.4
B	06/02/86	III	130.4	130.29	3.0	2.71	1,246,941.8	551,045.4
-47A	05/29/86	III	125.0	128.25	9.3	28.75	1,244,142.9	552,060.8
B	05/30/86	III	125.1	127.71	4.3	10.05	1,244,148.5	552,061.7
1C	12/4/86	III	131.0	134.2	26.4	34.6		
2C	12/4/86	III	131.0	134.1	26.6	34.6		
3C	12/9/86	III	129.0	131.8	26.7	34.6		
4C	12/9/86	III	130.0	133.0	38.0	45.0		

ell installed by hand. Only annular space outside outer casing grouted.
nside riser screened for full length.

TABLE 2

TEMPORARY WELL CONSTRUCTION DATA SUMMARY

SEGMENT 3: OFF-SITE PLUME CONTROL

SOUTHERN WOOD PIEDMONT - AUGUSTA, GEORGIA FACILITY

WELL NO.	DATE INSTALLED	WELL TYPE	GROUND ELEVATION (FEET/MSL)	TOP OF RISER ELEVATION (FEET/MSL)	DEPTHS FROM GROUND SURFACE TO: BOTTOM OF SEAL (FEET)	BOTTOM OF SCREEN (FEET)
B-1	10/02/84	II	127.3	131.92	12.0	19.5
B-2A	12/05/85	III	129.7	132.04	9.75	15.5
B	12/03/85	II	129.6	131.94	4.25	11.75
B-3A	12/12/85	III	131.2	132.69	12.25	18.5
B	12/11/85	II	131.1	132.61	5.0	12.50
B-4	11/26/85	II	130.8	131.75	1.0	9.0
B-5	12/03/85	II	130.5	130.37	1.0	9.5
B-6	01/24/86	III	130.8	133.40	5.0	12.5
STB-1	11/25/85	II	129.6	130.74	1.0	13.75
STB-2	11/25/85	II	130.2	131.12	1.0	14.25
STB-3	11/26/85	II	129.3	130.04	1.0	9.0
STB-4	12/04/85	II	130.2	132.63	1.0	11.5
STB-5	12/04/85	II	134.2	134.73	1.0	14.0
STB-6	12/03/85	II	130.2	131.03	1.0	14.0
STB-7	11/24/85	II	128.7	129.02	1.0	14.0
STB-8	11/24/85	II	130.8	131.37	1.0	14.0
STB-9	11/24/85	II	128.2	129.19	1.0	13.5
STB-10	11/23/85	II	128.2	128.96	1.0	14.0
STB-11	11/23/85	II	129.9	130.32	1.0	14.0
STB-12	11/22/85	II	129.3	130.28	1.0	9.0
STB-13	11/23/85	II	129.4	129.89	1.0	13.5
STB-14	11/22/85	II	130.0	130.29	1.0	9.0
STB-15	11/22/85	II	130.2	130.45	1.0	9.0
STB-16	11/22/85	II	130.2	132.72	1.0	9.0

TABLE 2 (CONT'D)

TEMPORARY WELL CONSTRUCTION DATA SUMMARY

SEGMENT 3: OFF-SITE PLUME CONTROL

SOUTHERN WOOD PIEDMONT - AUGUSTA, GEORGIA FACILITY

WELL NO.	DATE INSTALLED	WELL TYPE	GROUND ELEVATION (FEET/MSL)	TOP OF RISER ELEVATION (FEET/MSL)	DEPTHS FROM GROUND SURFACE TO: BOTTOM OF SEAL (FEET)	BOTTOM OF SCREEN (FEET)
STB-17	11/21/85	II	128.1	129.93	1.0	9.0
STB-18	11/21/85	II	129.0	129.58	1.0	9.0
STB-19	11/21/85	II	129.9	129.96	1.0	9.0
STB-20	11/21/85	II	130.1	130.21	1.0	9.0
STB-21	11/21/85	II	129.8	130.52	1.0	13.5
STB-22	11/21/85	II	130.3	131.08	1.0	13.5
STB-23	11/24/85	II	131.7	132.19	1.0	9.0
STB-24	11/25/85	II	130.8	131.72	1.0	9.0
STB-25	11/25/85	II	129.9	130.25	1.0	14.5
STB-26	11/25/85	II	130.0	130.65	1.0	13.5
STB-27	01/22/86	II	131.2	132.90	1.0	9.5
STB-28	01/22/86	II	131.1	134.37	1.0	12.0
STB-29	01/22/86	II	131.1	131.67	1.0	9.5
OW-3	09/09/85	II	129.0	132.33	---	6.25
OW-4	10/24/85	II	126.6	127.61	---	8.5
OW-8	10/24/85	II	120.1	120.1	---	8.5

APPENDIX C

Sampling and Analysis Plan

Southern Wood Piedmont

Augusta, Georgia

T045-D02-201-003

SAMPLING AND ANALYSIS PLAN

FOR

SOUTHERN WOOD PIEDMONT COMPANY

GROUNDWATER MONITORING DURING CLOSURE

October, 1985

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GROUND-WATER MONITORING PLAN

SAMPLING AND ANALYSIS PROCEDURES

INTRODUCTION

A basic premise in developing these procedures is the need for obtaining a representative sample for analysis. Representative samples are those which have the physical and chemical characteristics of the ground-water in the zone being monitored. In particular, emphasis is placed on reducing the potential for contamination or degradation of the sample by the sampling, preservation and shipping processes. In general, the philosophy in developing these procedures is to utilize simple equipment but not preclude the use of more sophisticated equipment if desired at a future time. Parameter selection, sampling procedures, and analytical procedures are discussed herein.

WELL INSTALLATION PROCEDURES AND DEVELOPMENT METHODS

Type II or III ground-water quality monitoring wells will be installed. Details of the wells are provided in Figures 2A and 2B (pages 9 and 10). The following items are important to the construction of a water quality monitoring well.

-Pre-Drilling:

Construction materials and equipment (drill rods, casing, etc.) will be properly cleaned to reduce the potential for well contamination. The cleaning procedure will include steam cleaning.

After cleaning, materials (pipe, granular backfill, etc.) will be protected from contamination. This will be accomplished by wrapping pipe in plastic and covering stockpiled materials (sand, gravel, etc.) with plastic.

Water used in well installation/drilling will be clean, preferably of drinking quality.

-Borehole Drilling and Sampling:

Type II well boreholes will be advanced without the use of drilling muds such as bentonite.

Type III well outer casing installation only may use mud.

Split spoon samplers, drill rods, and augers will be steam cleaned between each borehole location.

If borehole stability becomes a problem, a temporary casing will be utilized.

-Well Installation:

Boreholes will be flushed with clear water during placement of the screen, solid pipe, and granular backfill.

Depths of materials will be checked during installation to verify continuity and "as installed" well configuration.

Wells will have a locking protective casing capable of being locked to prevent damage and/or vandalism.

Wells will be allowed to stablize for a period of about 24 hours and then developed by bailing, pumping, or airlift methods. The amount of water to be removed is dependent on the subsurface conditions and drilling techniques. The criteria for well development is visual (lack of significant turbidity) and chemical (stabilized pH and/or conductivity measurements).

PARAMETER SELECTION

The parameters and concentrations to be evaluated by the ground-water monitoring program have a direct impact on the procedures for sampling, sample preservation and analysis. The specific parameters recommended for this monitoring plan are presented in Table I (page 11).

FREQUENCY OF SAMPLING AND ANALYSIS

Southern Wood Piedmont will monitor those wells and parameters proposed in the permit application. This sampling and analysis will be performed quarterly, to continue to assess the rate and extent of the plume. This monitoring will continue until a Post Closure Care Permit is granted. Once this permit is granted, Compliance Monitoring/Corrective Action will be initiated for those parameters determined by SWP and the Regional Administrator.

SAMPLE COLLECTION AND PRESERVATION

Sample collection will be performed by personnel thoroughly trained in the collecting, handling and shipping of groundwater samples.

Analyses of the water samples will most probably be conducted by Savannah Laboratories and Environmental Services of Savannah, Georgia.

Field personnel will use techniques that insure integrity of the sample by precluding any outside contamination. They will report any problems with or variance from these procedures. Such variations in sampling techniques may be significant in the ultimate interpretation of the data.

Since some compounds can be detected in the parts per billion or parts per trillion range, care must be taken to prevent contamination of samples by the sampling process. The following precautions or suggestions should be taken:

1) sample collection activities should proceed progressively from the least contaminated area to the most contaminated area (if this condition is known);
2) each sample should be obtained using appropriate equipment (bailers).

Two types of samples are normally collected: grab samples and composite samples. Grab samples are defined as one time samples of limited quantities taken for analyses of specific parameters. Composite samples, required when a larger volume is needed for the analyses of numerous parameters, involve multiple sampling over a period of time and combining subsamples to maintain representative conditions. For the groundwater samples individual grab samples will be obtained using a properly cleaned PVC bailer. An example of one type of bailer is illustrated in Figure 3 (page 12).

composite sample. The composite sample can also be collected by using a bailer to fill an appropriate sized glass container which has been cleaned prior to use.

NOTE: If samples are needed for metal analysis, they will be collected and filtered in the field using an appropriate filter. The filters will be discarded after use at each well site.

Sampling equipment: the following equipment will be used in the actual sampling procedure.

1) bailers: SWP has designated PVC bailers per well which will remian in the wells when not in use. One bailer for each well will help minimize the introduction of trace contaminants from other sources.

2) Sample bottles: Prelabled and preservative added sample bottles will be used. Sample bottles will be prepared and labeled by the chosen laboratory. Preservative will be added and the number and type of bottles for each well will be on a form included with the bottles. Bottles will be prepared according to EPA 600/4-79-020 and other EPA guidelines. Types of bottles and preservatives are included in Table 2 (page 13). Size of bottles to be used will be determined by the laboratory (depending on parameter required).

3) Distilled water:

4) Gloves: All gloves used are disposable. A new pair will be used at each well and discarded after use.

5) Plastic bags:

6) Acetone:

7) Rope: Polypropylene or nylon rope will be used and changed at each well prior to sampling.

8) pH meter: Corning Model 3 pH meter will be used.

9) Conductivity Bridge: YSI Model 31 Conductivity Bridge will be used.

10) Thermometer: A thermometer will be used to take the temperature of the groundwater at the time of sampling.

11) Water depth Indicator: Soiltest, Inc., Model DR-760A water level meter will be used to determine the water level of the wells prior to sampling. The indicator will be rinsed with açetone and distilled water in between samplings at each location.

ACTUAL SAMPLING PROCEDURE

A. With gloves on, remove cap from well and place in plastic bag.

B. Remove bailer from well and rinse thoroughly with acetone and distilled water.

C. Rinse water level indicator probe thoroughly with acetone and distilled water.

D. Obtain elevation of the groundwater using the water level meter.

E. Insert clean PVC bailer into well and lower until water is reached (usually splashing sounds will be indicated). Continue to lower bailer until filled. Proceed to raise bailer out of well casing.

F. Flush the well before obtaining sample by bailing well to dryness or bailing 3 to 5 casings, (volume of water standing in well) whichever is less. NOTE: In the event of low yielding wells, a 24-hour time span may be needed for recharging after evacuation before sampling can be resumed.

G. Fill bottle (s) directly from bailer without over-filling or spilling--the bottles contain preservatives.

H. When all bottles are full, rinse the bailer with distilled water and store in the same well casing.

I. Replace cap.

J. Take pH, temperature and conductivity at site with designated instrumentation.

K. Record all measurements taken on field data sheets.

CHAIN OF CUSTODY AND SAMPLE SHIPPING

A Chain of Custody is defined as an accurate written record which will trace possession and handling of the sample from the moment of collection through laboratory analysis and final recording of results. An Example of a Chain of Custody Form is shown on Table 3 (page 14).

The most practical way to minimize chain of custody problems is to involve the least number of people and use standardized documentation. The activities associated with establishing and maintaining a chain of custody can be summarized as follows:

* Each sample should be identified on the container(s). Note: Table 2 (page 13).
* Proper packaging and dispatching samples to the appropriate laboratory for analysis. Sample containers will be packed in a proper transportation container (cooler) along with the chain of custody record form, copies of pertinent field records, and copies of analysis request forms, as needed. Field personnel will place a seal (such as a strip of tape) around the cap of the individual sample container which would indicate tampering if removed. The transportation containers will then be sealed and labeled.
* When transferring the possession of the samples, the transferee will sign and record the date and time on the chain of custody record. Each person who takes custody will fill in the appropriate section of the chain of custody record.

* Laboratory personnel should then reconcile the information on the sample label and seal against that on the chain of custody record. Discrepancies between the information on the sample and seal and that on the chain of custody record and the sample analysis request sheet should be resolved before the sample is assigned for analysis. Samples should then be placed in a secured sample storage room or locked cabinet until assigned to an analyst for analysis.

ANALYTICAL PROCEDURES

The parameters to be analyzed are summarized in Table 1 (page 11). The recommended methods for analyses of these parameters are presented in Table 4, (page 15).

CHECKLIST OF DO'S AND DON'TS FOR SAMPLING GROUND-WATER

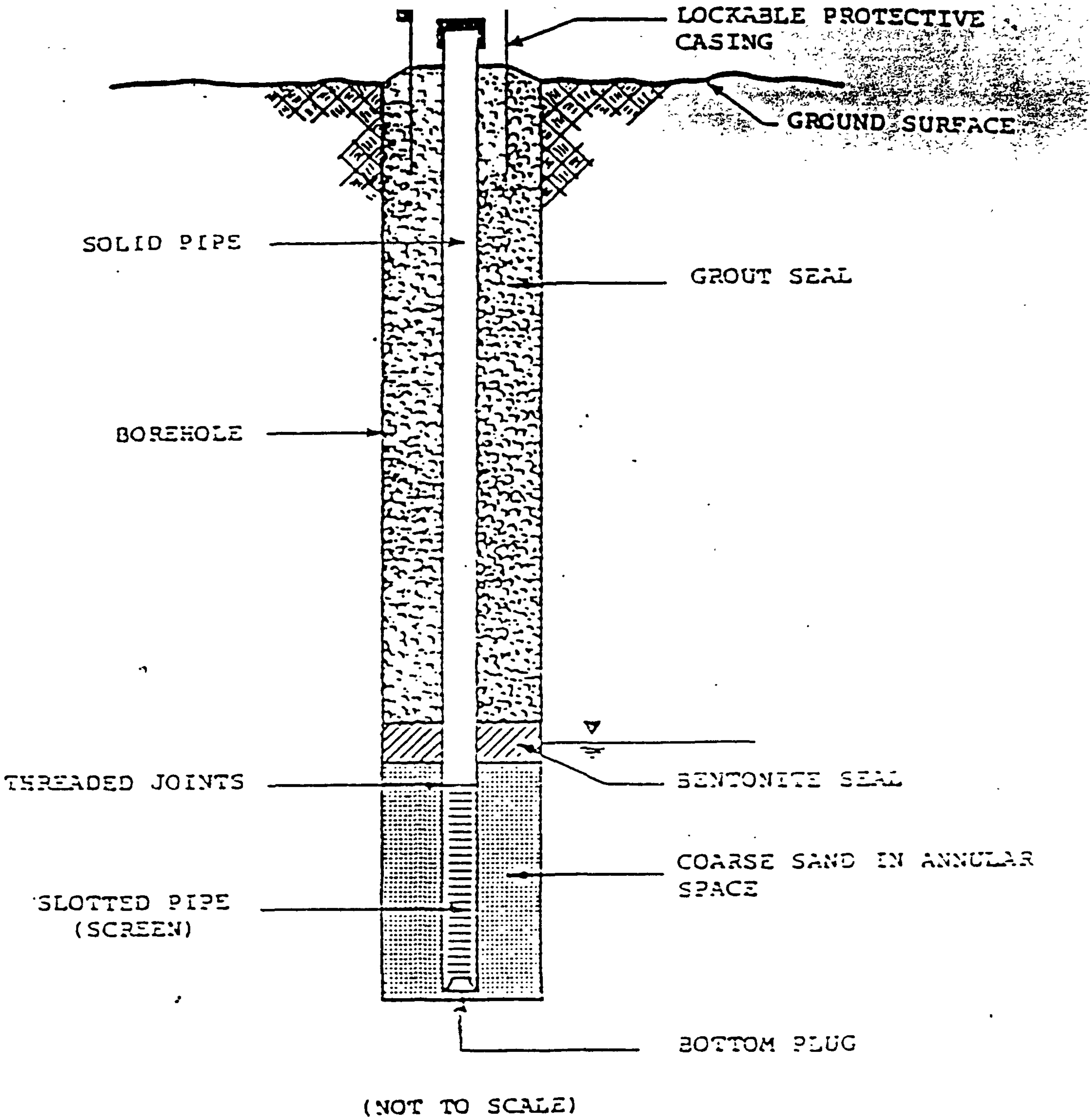
The following checklist of "do's and don'ts" is included for personnel who conduct the sampling.

DO

- CLEAN EQUIPMENT BEFORE MEASURING WATER LEVELS AND OBTAINING SAMPLES
- MEASURE WATER LEVELS BEFORE DISTURBING THE WELL
- REMOVE WATER FROM THE WELL BEFORE COLLECTING WATER SAMPLES
- USE WATERPROOF, INDELIBLE INK FOR FIELD RECORDS
- RECORD ANY INDICATION OF UNUSUAL CONDITIONS AT SAMPLING LOCATIONS
- FILTER TURBID SAMPLES FOR METAL ANALYSES IN THE FIELD PRIOR TO PRESERVATION, IF APPLICABLE.
- REPORT ANY PROBLEMS IN FIELD MEASUREMENTS OR SAMPLING

DON'T

- ALLOW CLEAN SAMPLE CONTAINERS TO BECOME CONTAMINATED PRIOR TO USE
- PRESERVE TURBID SAMPLES FOR METAL ANALYSES IN FIELD PRIOR TO FILTERING
- ASSUME SAMPLES SHIPPED TO LABORATORY ARRIVE ON TIME - ALWAYS CONFIRM.



SOUTHERN WOOD PIEDMONT CO.

LAW ENGINEERING TESTING COMPANY

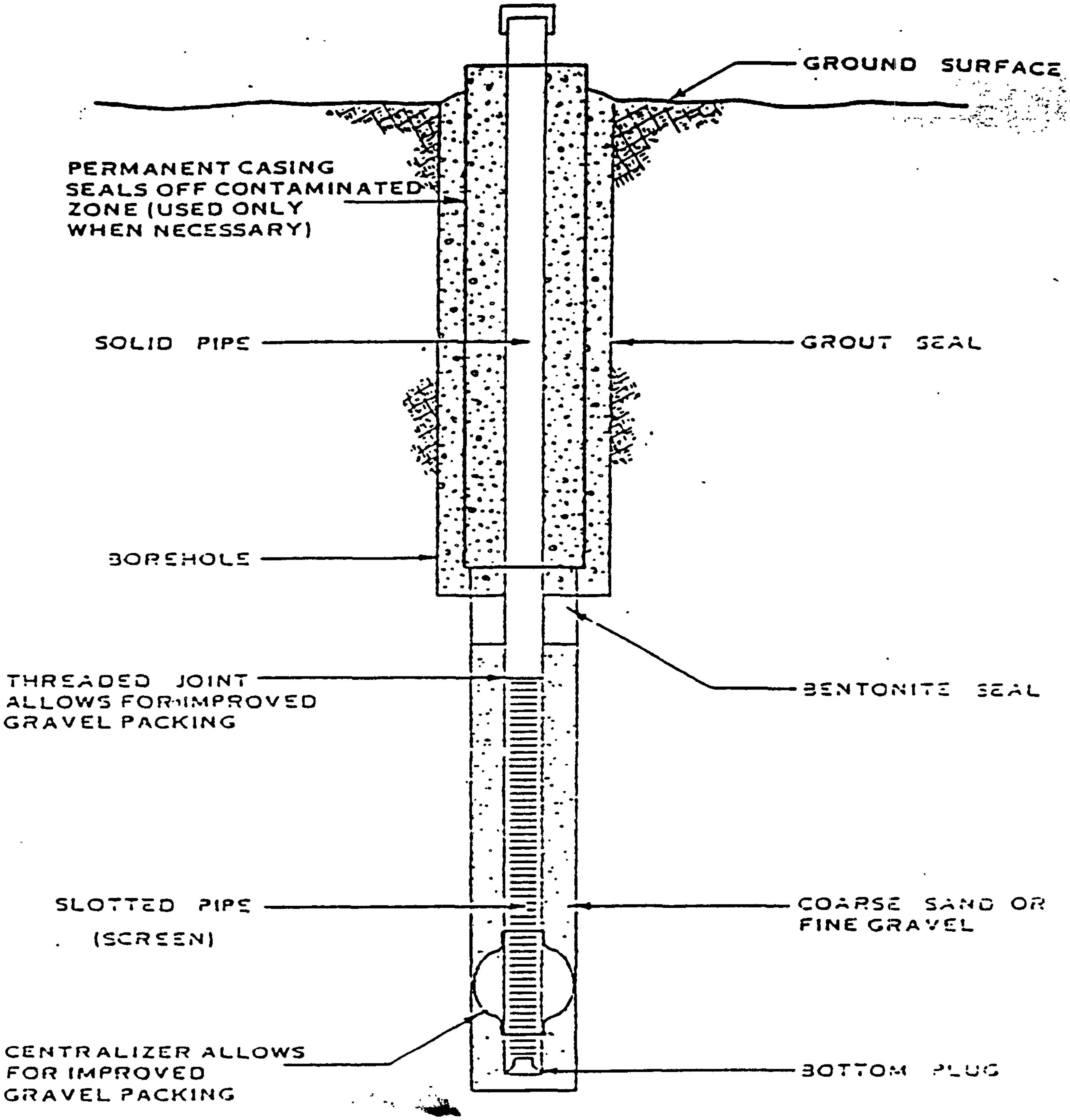
MARIETTA, GEORGIA

SCHEMATIC OF GROUND-WATER QUALITY MONITORING WELL

TYPE II

JOB NO. MH2345

FIGURE 2A



(NOT TO SCALE)

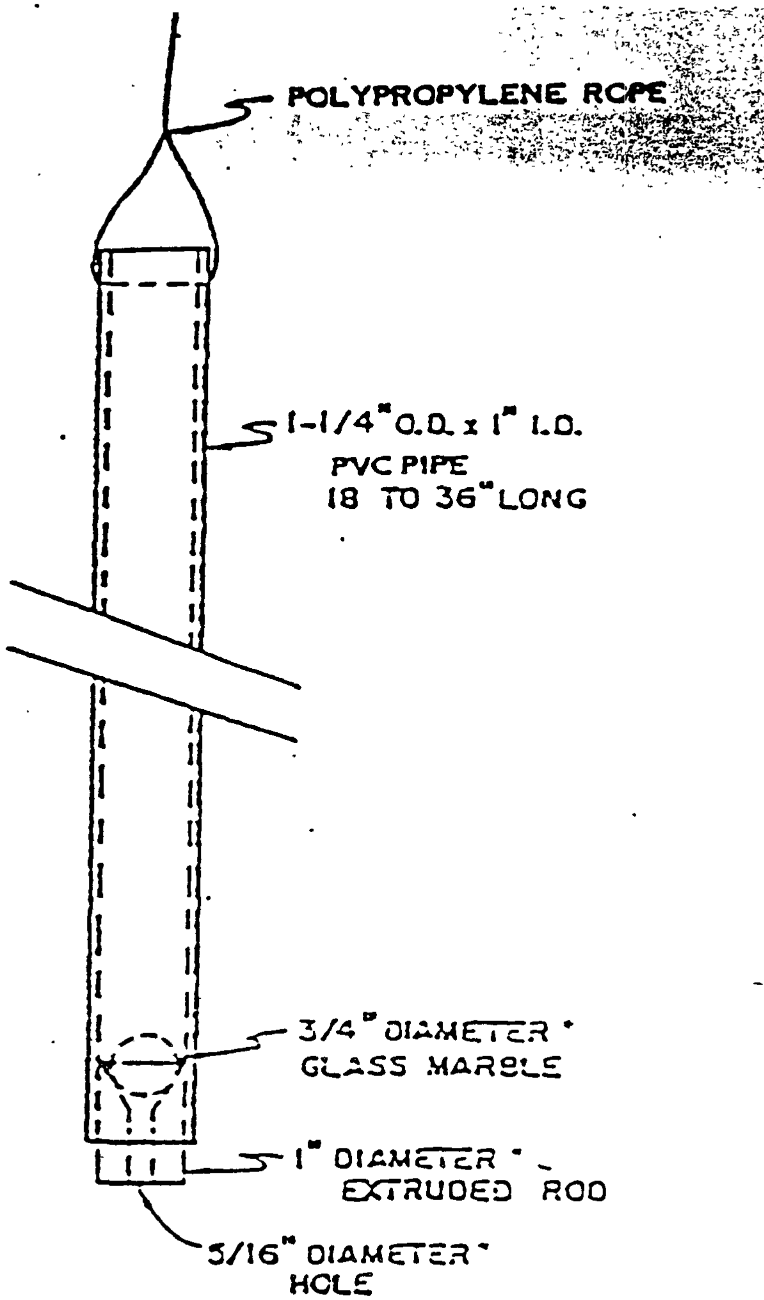
SOUTHERN WOOD PIEDMONT CO.	LAW ENGINEERING TESTING COMPANY MARIETTA GEORGIA	TYPE III WATER QUALITY MONITORING WELL JOB NO. MH2345 FIGURE 2B

TABLE 1

Summary of Parameters and Frequency of Analyses
Groundwater Monitoring Program
Southern Wood Piedmont

Parameters proposed to indicate the presence of contaminants are listed in the permit application.

The samples will be taken and analyzed quarterly



SOUTHERN WOOD PIEDMONT CO. AUGUSTA, GEORGIA	LAW ENGINEERING TESTING COMPANY MARIETTA, GEORGIA	SCHEMATIC OF BAILER FOR WELL SAMPLING JOB NO. MH2345 FIGURE 3

TABLE 2

SAMPLE CONTAINERS, PRESERVATIVES, VOLUMES AND HOLDING TIMES

K001 PARAMETERS	CONTAINER	COLOR CODE	PRESERVATIVES	HOLDING TIME
Refer to permit application	Glass	purple	cool at 4 C	7 days

SAMPLE MONITORING

CHAIN OF CUSTODY RECORD

Company: ____________________

Name: ____________________

Location: ____________________

Collector's Name: ____________________ Company: ____________________

____

Date Sampled: ____________________

Field Information: ____________________

____

____

Sample Identification	Time									Savannah Lab ID#

Chain of Possession

1. ____________________ ____________________ ____________________
Collector Company Date Sampled

2. ____________________ ____________________ ____________________
Recipient Savannah Laboratories Date Received

TABLE 4

GROUND-WATER QUALITY PARAMETERS AND METHODS

GROUND-WATER PARAMETERS	ANALYTICAL METHOD
K001 constituents as listed in the permit application	EPA 8040-8100

SAMPLING AND ANALYSIS PLAN

FOR

GROUNDWATER MONITORING

SOUTHERN WOOD PIEDMONT COMPANY
AUGUSTA, GEORGIA

MARCH, 1987

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SAMPLING AND ANALYSIS PROCEDURES

GROUND-WATER MONITORING PLAN

INTRODUCTION

The basic premise in developing this plan is the need to obtain a representative groundwater sample.

Representative samples have the physical and chemical characteristics of the groundwater within the zone (aquifer) from which a sample is obtained. This plan when followed will guide environmental field personnel in techniques that insure the integrity of the sample during the collection, storage, and transportation processes.

This plan and the procedures outlined should be read carefully and completely before sampling begins. Don't refer to individual sections without having read the entire S & A procedures.

Emphasis has been placed on procedures that not only reduce the potential of contaminating the sample by careless sampling but that prevent degradating the sample from improper preservation and/or packaging for shipment prior to chemical analysis.

Groundwater sampling and analysis requires implementation of the following sequence of decisions, procedures or events:

1) Well and Parameter selection
2) Water level evaluation
3) Well evacuation procedure
4) Procedure for obtaining representative sample
5) Preparation of sample for shipment to analytical lab
6) Proper documentation of field events including Chain of Custody

Procedures for each of the above are found in the following plan.

GENERAL SAMPLING REQUIREMENTS

Environmental sampling will be performed by an outside contractor or SWP personnel trained in collecting and processing environmental samples for transport to a qualified analytical laboratory. Personnel are required to maintain a field log and record the following: 1) All Calcuations 2) Visual Observations 3) Field Measurements (pH, temperature, conductance, etc.), and 4) Problems or variance from procedures listed in this plan.

Before beginning the sampling event, personnel are requested to review the following:

1) sample collection activities should proceed progressively from the least contaminated area to the most contaminated area (if this condition is known);

2) each sample should be obtained using appropriate sampling equipment. Dedicated bailers are provided at routinely monitored wells. New rope will be used at each well. This rope will be discarded after sampling.

3) Equipment must be cleaned prior to use by the procedure below:
   a. Rinse thoroughly with distilled water
   b. Rinse with appropriate *solvent
   c. Final rinse with distilled water.
   d. Rinse bailer with distilled water before storing.

* Use Hexane unless visual contaminates are noted. Acetone should then be used. Carefully remove, by distilled water rinse any residual acetone.

I. WELL AND PARAMETER SELECTION

The groundwater wells listed in Table I, page 15, have been chosen because their hydrogeologic location enables them to yield groundwater, when analyzed, that indicates groundwater quality at the site. Southern Wood Piedmont will collect and analyze water from these wells once a quarter to continue the sites' Groundwater Assessment Program.

The chemical analytical parameters have been chosen because they are representative of plant operations. These parameters are listed in Table I, page 15.

EPA analytical methods to be used for the parameters selected for this plan are presented in Table 4, page 20.

II. WELL WATER LEVEL DETERMINATION

A groundwater level determination at each well is necessary before sampling can begin. The water level within the well is used to calculate the volume of standing water in the well casing and when converted to mean sea level is evaluated by hydrogeologists to determine groundwater flow direction. The measurement is taken as follows:

A. Preparation for water level measurement:

1. Place a clean plastic sheet on ground around well. This sheet will be used to prevent surface soils from coming into contact with the purging equipment and lines which would introduce contamination into the well.
2. Unlock well and place cap on the plastic sheet or in plastic bag.
3. Remove bailer from well and place on the plastic sheet.
4. Rinse water level indicator probe thoroughly with solvent and distilled water, being careful not to get into or on well.
5. Using water level meter, obtain the water level using the following procedure:

B. Measuring Water Levels:

1. Turn switch on meter
2. Check instrument to see if working properly by pressing knob until needle reads 1 miliamperes.
3. Rinse probe with solvent followed by distilled water.
4. Begin to lower cord into well watching closely for the first meter reading.
5. When needle moves, continue to lower cord until 1 miliamperes reading is obtained. Repeat for accuracy.
6. Mark the cord at the top of the PVC pipe immediately when the meter deflects.
7. Remove cord from pipe and measure from the marked area to the nearest number (ft.) on the cord.
8. Record this number in field log book.
9. Remove the cord from well.
10. Rinse indicator probe with solvent and distilled water.
11. Place water level meter in appropriate container and proceed with well evacuation.

III. WELL EVACUATION PROCEDURE:

Monitoring wells must be purged prior to sampling. The purging process is necessary to avoid collection of nonrepresentative (stagnant or stratified) water and to allow water representative of the aquifer to enter the well.

A. Record in field log book the calculated amount of water to be evacuated from the well. Also record the calculations from which the number was obtained.

B. Determine the volume of water to be removed from well using the following equations:

1. Refer to well boring logs for the depth of the well. Subtract the depth to water elevation from the total depth of well to obtain the amount of standing water in the well casing.

2. Calculate area (A) (in square feet) using the following equations. $A=\pi r^2$ $\pi=3.14$ $r=1/2d$ d=diameter of well. (All SWP monitoring wells should have a 2 inch diameter.)

3. To obtain the volume of the well, multiply the area of the well by the standing water depth in the well using this equation: V = A x D depth(ft.)

4. Multiply the volume of water obtained by the constant, 7.48 to convert the volume from square feet to gallons.

5. To convert from gallons to liters, multiply gallons by 4. Evacuate at least three but preferable five times the number obtained.

C. Remove the calculated amount of water from the well by bailing and collecting it in a container of known volume (5 gallon pail)*.

D. Once the calculated amount of water has been evacuated, discard water as follows and proceed with the sampling procedure. Purge water should be disposed of on-site preferably in the wastewater treatment system, unless the pruged water is deemed a hazardous material. It should then be drummed and disposed of using facility disposal processes.

E. After the evuacation procedure is complete rinse bailer with solvent followed by distilled water. Catch rinse (water obtained from rinsing the bailer) and place in bottle labelled 'field blank'. One (1) to two (2) field blanks will be collected per sampling event. The field blank will be analyzed for the same parameters as the other samples.

* Bail the well to dryness or 3 to 5 volumes, whichever is less. If well is slow to recharge, allow enough time after purging (not to exceed 24 hours) for water to re-enter casing before sampling.

IV. SAMPLING EQUIPMENT: Detailed below is a list of equipment and implements needed to obtain a represenative ground water sample.

1) Bailers: Each well has a dedicated PVC bailer. (An example of the bailer is illustrated in Figure 3, page 14). Bailers are stored in the wells unless visual contamination exist in the well, or headspace in the well is not sufficient to keep bailer from touching water. When the bailers can not be stored in the well, they will be labelled and stored elsewhere on the site.

2) Sample containers: The container type (glass, plastic), the perservatives it contains (if any), and the number of each type of container to be filled at each well, will be on a form included with the sample bottles. The types of containers and preservatives used are included in Table 2 (page 16). The containers will be prepared by the laboratory according to EPA 600/4-79-020 and other EPA guidelines . Field and trip blank containers will be included with each sampling event. The field blank is to contain water from the final rinsing of equipment used during sampling. The field blank will be analyzed for the same parameters as the sample. The trip blank will contain water from the analytical laboratory. The trip blank will also be analyzed along with the sample. Size of sample containers will be determined by the laboratory (depending on parameter required). The sample container will be shipped to the plant site in coolers prior to each sampling event. The laboratory will also include with the sample containers a Chain of Custody form to be used when returning filled containers to the lab for analysis.

3) Distilled water: distilled water is required for cleaning equipment and implements before and after the sampling event.

4) Gloves: Disposable plastic or rubber gloves will be used at each well or sampling site and discarded after use.

5) Plastic bags: optional

6) Appropriate cleaning solvent: Acetone or Hexane; used for cleaning equipment.

7) Rope: New polypropylene or nylon rope must be used at each well prior to sampling. Discard rope after sampling at each well is complete.

8) pH meter: Corning Model 3 pH Meter or equivalent will be used. Calibrate pH meter with buffer prior to use.

9) Conductivity Bridge: YSI Model 31 Conductivity Bridge or equivalent will be used. Calibrate conductivity meter with standard solutions prior to use.

10) Thermometer: A thermometer will be used to take the temperature of the groundwater at the time of sampling.

11) Water Depth Indicator: Soiltest, Inc., Model DR-760A water level meter or equivalent such as an electronic meter or wetted tape, will be used to determine the water level of the wells prior to sampling. The indicator will be rinsed with appropriate solvent and distilled water in between samplings at each location.

12) Plastic Sheets: These sheets approximately 4 feet by 4 feet, will be placed on the ground around the well during sampling. The sheet will be discarded after sampling and a different sheet used at the next well.

13) Measuring tape: to be used during water level measurements.

14) Five (5) gallon pail: to contain the groundwater during evacuation.

15) Funnel (optional): for transferring sample from bailer to sample bottle.

16) Beaker: to be used when measuring pH, Specific Conductance and temperature.

17) Sealing tape: for sealing cooler and/or bottles prior to shipping to analytical laboratory.

V. PROCEDURES FOR OBTAINING A REPRESENTATIVE GROUND WATER SAMPLE

After the water level measurement has been taken and the well has been purged, use the following procedures to obtain a resentative groundwater sample .

1. Connect an adequate length of clean new rope to the well's dedicated bailer. Obtain groundwater samples by lowering bailer into well until it contacts the water surface. Allow bailer to sink, filling with minimal water surface disturbance. Slowly retrieve bailer from well taking care not to allow rope or bailer to contact ground or surrounding obstacles.
2. Quickly transfer enough water to a beaker and measure the pH, temperature and specific conductance. Record these measurements in field log book.
3. Sample collection bottles will have been provided by the laboratory contracted to analyze the ground water. The bottles will need only to be labelled as to the well from which the sample was obtained. Fill the labelled bottles in a way as to minimize agitation and aeration, using a funnel if necessary.

   Do not overfill bottles as some may contain preservatives. The contract laboratory will provide; 1) a form in the shipping container indicating the number and type of bottles to be filled during the sampling event and; 2) prelabelled bottles with the necessary perservatives.
4. The sample request form accompanying the sample containers will indicate when samples are needed for dissolved metals. The laboratory will supply the field filter (usually 0.45 micron membrane filter). Filter the sample in the field. Label the bottle containing the filtered sample, "Dissolved Metals." Discard filter after use. When samples are needed for "Total Metals," do not filter sample.

5. Repeat above steps as needed to acquire a sufficient sample volume to fill all containers.

6. Observe sample as container(s) are filled and record observations in field log book. ie., extremely turbid, visual oil, etc.

<u>NOTE</u>: 1) pH and conductance must be analyzed in quadruplicates at up-gradient wells.

2) Do not take pH, conductance or temperature directly from sample bottle.

7. Rinse pH and conductivity probes and thermometer with appropriate solvent and distilled water. Collect rinse and add to bottle labeled "field blank." After rinsing, place instruments in designated containers.
8. Add any needed information to labels. (ie., MW4, up-gradient, filtered, etc.)
9. Immediately place sample containers in ice.
10. Remove rope from bailer and discard.
11. Rinse bailer with appropriate solvent and distilled water. Store bailer as discussed on page 6.
12. Wash any other equipment used, ie., beaker, funnel, 5 gallon pail, etc., with water and detergent, solvent and distilled water.
13. Discard plastic sheet, gloves, etc. and repeat the same procedure at the next well.

VI. PREPARATION OF SAMPLE FOR SHIPMENT TO ANALYTICAL LABORATORY

After all samples are obtained and placed into shipping container, before the sample can be sent to the analytical laboratory, the following steps must be taken:

1. Pack sample containers very carefully
2. Place ice in shipping container after packing
3. Place shipping label on container to be shipped
4. Seal container with tape
5. Check package for intergerity.

Carefully fill out Chain of Custody Form to include sample identification; sample number; date sample taken, etc. If Sample Analysis Form is used, indicate which bottles are to be analyzed and what parameters are needed. If Sample Analysis Form is not used indicate on Chain of Custody Form analysis requested. Refer to description of Chain of Custody Form, page 21.

Make a copy of the Chain of Custody Form, Sample Analysis Form, and Field Log. Place original paperwork in cooler with sample bottles. Add more ice to cooler, if necessary, label and seal cooler. Ship cooler to analytical laboratory.

VII. DOCUMENTATION OF FIELD EVENTS

All field events, ie., observations, measurements, calculations, etc., must be documented. Field personnel are instructed to record all field events in log notebook. At the end of the sampling the notes should be dated, signed and copied. A copy should accompany the sample bottles when shipped to the analytical laboratory.

A Chain of Custody Form should also accompany the sample bottles. A Chain of Custody form is an accurate written record which will trace possession and handling of the sample from the moment of collection through laboratory analysis and final recording of results. An example of a Chain of Custody Form is shown on Table 3 (page 19).

The most practical way to minimize chain of custody problems is to involve the least number of people and use standardized documentation. The activities associated with establishing and maintaining a chain of custody can be summarized as follows:

* Each sample should be identified on the container(s).
  Note: Table 2 (page 16).

* Proper packaging and dispatching samples to the appropriate laboratory for analysis. Sample containers will be packed in a proper transportation container (cooler) along with the chain of custody record form, copies of pertinent field records, and copies of analysis request forms, as needed. Field personnel will place a seal (such as a strip of tape) around the cap of the individual sample container or around the transportation containers which would indicate tampering if removed.

* When transferring the possession of the samples, the transferee will sign and record the date and time on the chain of custody record. Each person who takes custody will fill in the appropriate section of the chain of custody record.

* Laboratory personnel should then reconcile the information on the sample label and seal against that on the chain of custody reocrd. Discrepancies between the information on the sample and seal and that on the chain of custody record and the sample analysis request sheet should be resolved before the sample is assigned for analysis. Samples should then be placed in a secured sample storage room or locked cabinet until assigned to an analyst for analysis.

CHECKLIST OF DO'S AND DON'TS FOR SAMPLING GROUND-WATER

The following checklist of "do's and don'ts" is included for personnel who conduct the sampling.

DO

CLEAN EQUIPMENT BEFORE MEASURING WATER LEVELS AND OBTAINING SAMPLES

MEASURE WATER LEVELS BEFORE DISTURBING THE WELL

REMOVE WATER FROM THE WELL BEFORE COLLECTING WATER SAMPLES

USE WATERPROOF, INDELIBLE INK FOR FIELD RECORDS

RECORD ANY INDICATION OF UNUSUAL CONDITIONS AT SAMPLING LOCATIONS

FILTER TURBID SAMPLES FOR METAL ANALYSES IN THE FIELD PRIOR TO PRESERVATION, IF APPLICABLE.

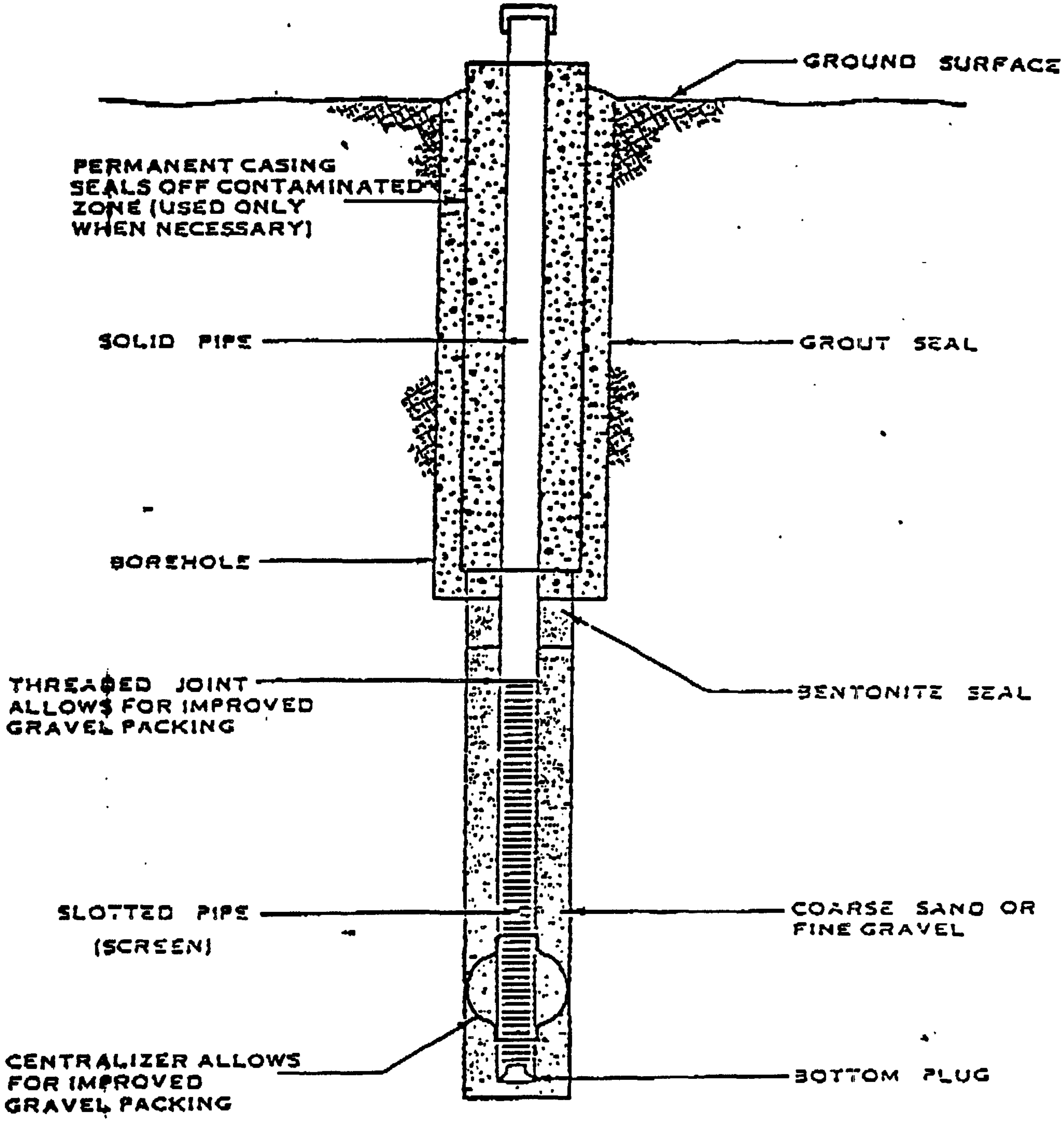
REPORT ANY PROBLEMS IN FIELD MEASUREMENTS OR SAMPLING

DON'T

ALLOW CLEAN SAMPLE CONTAINERS TO BECOME CONTAMINATED PRIOR TO USE

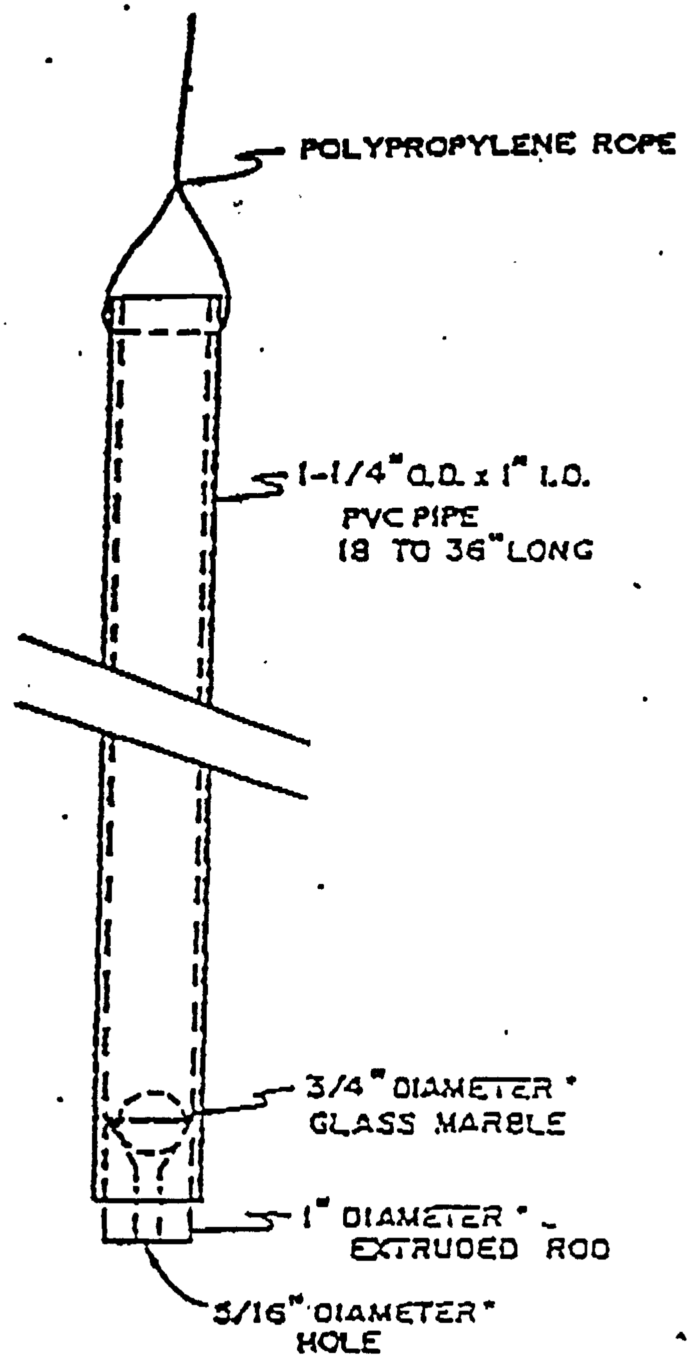
PRESERVE TURBID SAMPLES FOR METAL ANALYSES IN FIELD PRIOR TO FILTERING

ASSUME SAMPLES SHIPPED TO LABORATORY ARRIVE ON TIME - ALWAYS CONFIRM.



(NOT TO SCALE)

SOUTHERN WOOD PIEDMONT CO.	LAW ENGINEERING TESTING COMPANY MARIETTA, GEORGIA	TYPE III WATER QUALITY MONITORING WELL JOB NO. MH2345 FIGURE I



NOTE: A PVC FOOT VALVE IS ALSO ACCEPTABLE

SOUTHERN WOOD PIEDMONT CO. AUGUSTA, GEORGIA	LAW ENGINEERING TESTING COMPANY MARIETTA, GEORGIA	SCHEMATIC OF BAILER FOR WELL SAMPLING JOB NO. MH2345 FIGURE II

TABLE I
SUMMARY OF WELL AND PARAMETER SELECTION

Parameters indicating presence of K001

pentachlorophenol	tetrachlorophenol
phenol	phenanthrene + anthracene
2-chlorophenol	chrysene + benz(a)anthracene
p-chloro-m-cresol	naphthalene
2,4-dimethylphenol	fluoranthene
2,4-dinitrophenol	benzo(b,k)fluoranthene
2,4,6-trichlorophenol	indeno(1,2,3-cd)pyrene + benzo(a,h)anthracene
acenaphthene	

Parameters indicating presence of metals

copper

arsenic

chromium

Wells to be sampled

STB-13	STB-10
STB-18	STB-21
MW-1A	MW-1B
MW-5B	MW-5C
MW-6B	MW-6C
MW-9A	MW-9B
MW-12C	MW-20
MW-25A	MW-25B
MW-29B	MW-36A
MW-45A	MW-45B

TABLE 2

Sample Containers, Preservatives and Holding Times

WATER QUALITY PARAMETERS	CONTAINER	COLOR CODE	METHOD OF PRESERVATION	HOLDING TIME
Drinking Water Supply Parameters (B-1)				
Arsenic	Polyethylene	red	HNO_3 to pH less than 2	6 months
Barium	Polyethylene	red	HNO_3 to pH less than 2	6 months
Cadmium	Polyethylene	red	HNO_3 to pH less than 2	6 months
Chromium	Polyethylene	red	HNO_3 to pH less than 2	6 months
Fluoride	Polyethylene	purple	Cool at 4 C	28 days
Lead	Polyethylene	red	HNO_3 to pH less than 2	6 months
Mercury	Polyethylene	red	HNO_3 to pH less than 2	28 days
Nitrate (N)	Polyethylene	purple	H_2SO_4 to pH less than 2	6 months
Selenium	Polyethylene	red	HNO_3 to pH less than 2	6 months
Silver	Polyethylene	red	HNO_3 to pH less than 2	6 months
Endrin	Glass, teflon lined cap	purple	Cool at 4 C	7 days
Lindane	Glass, teflon lined cap	purple	Cool at 4 C	7 days
Methoxychlor	Glass, teflon lined cap	purple	Cool at 4 C	7 days

TABLE 2 (CONTINUED)

SAMPLE CONTAINERS, PRESERVATIVES, VOLUMES AND HOLDING TIMES

WATER QUALITY PARAMETERS	CONTAINER	COLOR CODE	METHOD OF PRESERVATION	HOLDING TIME
Drinking Water Supply Parameters (B-2)				
Chloride	Plastic	purple	Cool at 4 C	7 days
Iron	Plastic	red	HMO_3 to pH less than 2	6 months
Manganese	Plastic	red	HMO_3 to pH less than 2	6 months
phenols	Glass	green	H_2SO_4 to pH less than 2 Cool at 4 C	7 days
sodium	Plastic	red	HMO_3 to pH less than 2 Cool at 4 C	6 months
Sulfate	Plastic	purple	Cool at 4 C	28 days
K001 PARAMETERS				
Phenol	Glass	purple	Cool at 4 C	7 days
naphthalene	Glass	purple	Cool at 4 C	7 days
acenaphthene	Glass	purple	Cool at 4 C	7 days
phenanthrene + anthracene	Glass	purple	Cool at 4 C	7 days
fluoranthene	Glass	purple	Cool at 4 C	7 days
benzo (b) Fluoranthene + benzo (K) fluoranthene	Glass	purple	Cool at 4 C	7 days
benzo (a) pyrene	Glass	purple	Cool at 4 C	7 days
indeno (1,2,3-cd) pyrene + dibenzo (a,h) anthracene	Glass	purple	Cool at 4 C	7 days
pentachlorophenol	Glass	purple	Cool at 4 C	7 days
2-chlorophenol	Glass	purple	Cool at 4 C	7 days
p-chloro-m-cresol	Glass	purple	Cool at 4 C	7 days
2,4-dimethylphenol	Glass	purple	Cool at 4 C	7 days
2,4-dinitrophenol	Glass	purple	Cool at 4 C	7 days
2,4,6-trichlorophenol	Glass	purple	Cool at 4 C	7 days
tetrachlorophenol	Glass	purple	Cool at 4 C	7 days
chrysene + benz (a) anthracene	Glass	purple	Cool at 4 C	7 days

TABLE 2 (CONTINUED)

Sample Containers, Preservatives and Holding Times

WATER QUALITY PARAMETERS	CONTAINER	COLOR CODE	METHOD OF PRESERVATION	HOLDING TIME
Ground-Water Contamination Indicators (B-3)				
B-3				
pH	Polyethylene	purple	Cool to 4 C	24 hours
specific conductance	Polyethylene	purple	Cool to 4 C	28 hours
TOC	Glass	purple	Cool to 4 C add H_2SO_4 to pH less than 2	48 hours
TOH	Dark glass with teflon lined cap	purple	Cool to 4 C - if chlorinated add 1 ml 0.1 sodium[1] sulfite per liter	none established

Table 3

CHAIN OF CUSTODY FORM

Company/Location ____________________

Sample Location: ____________________

Collector's Name: ____________________

Sample Date: ____________________

Field Information: pH ________ Conductance ________ Temp. ________

Wastewater ________ Soil ________ Sludge ________ Groundwater ________

Analysis Requested: ____________________

____

SWP Identification No.	Time										LAB ID #

Chain of Possession

Relinquished by	Date/Time	////	Received By	Date/Time
Relinquished by	Date/Time	////	Received By	Date/Time

Method of Shipment: ________

Container sealed before shipment: ________

Container sealed upon receipt: ________

Internal Temp. of Container: ________ Before shipping ________ On receipt

TABLE 4

GROUND-WATER QUALITY PARAMETERS AND ANALYTICAL METHODS

GROUND-WATER PARAMETERS	ANALYTICAL METHOD
Arsenic	EPA 206.2
Chromium	EPA 218.2
Pentachlorophenol	EPA 8040
Phenol	EPA 8040
2-chlorophenol	EPA 8040
p-chloro-m-cresol	EPA 8040
2,4-dimethylphenol	EPA 8040
2,4-dinitrophenol	EPA 8040
2,4,6-trichlorophenol	EPA 8040
Acenaphthene	EPA 8100
Tetrachlorophenol	EPA 8040
Phenanthrene + antracene	EPA 8100
Chrysene + benz (a) anthracene	EPA 8100
Benzo (b,k) fluoranthene	EPA 8100
Indeno (1,2,3-cd) pyrene + benzo (a,h) anthracene	EPA 8100
Naphthalene	EPA 8100
Fluoranthene	EPA 8100

APPENDIX D

Compliance History

SOUTHERN WOOD PIEDMONT
Augusta, Georgia

Compliance History

The following is a summary, in chronological order, of the correspondence, reports, enforcement actions, etc. pertaining to the SWP Augusta facility. This should not be interpreted as a complete record.

10/81	RCRA monitoring wells MW1 through MW5 installed by Froehling and Robertson for SWP.
1/5/82	First quarter sampling results for wells MW2 to MW5; lead and arsenic exceed the NIPDWS for MW3.
1/8/82	EPD gives SWP waiver from analyzing gross alpha, gross beta and radium
5/18/82	Second quarter sampling results for wells MW2 to MW5; lead and arsenic exceed the NIPDWS for MW3.
5/21/82	EPD inspection performed at SWP.
8/12/82	Third quarter sampling results for wells MW2 to MW5.
10/4/82	Fourth quarter sampling results for wells MW2 to MW5.
6/6/83	Part B submitted for review to EPD.
10/31/83	EPD issues a NOD for Part B deficiencies; ground water monitoring system does not meet the 265 Subpart F requirements.
11/16/83	SWP notifies EPD of statistically significant differences; differences are verified by resampling of wells.
11/30/83	Ground water quality assessment plan (GWQAP) submitted to EPD for review.
2/8/84	EPD issues a NOV for a GWQAP that is not adequate to meet 265 regulations.
3/8/84	EPD consent agreement proposed to revise GWQAP.
3/28/84	SWP submits proposed consent agreement to EPD.
5/2/84	SWP/EPD meet to discuss proposed consent agreement.
5/14/84	Revised GWQAP prepared by Law for SWP.
5/22/84	Revised GWQAP submitted to EPD.
7/24/84	SWP/EPD meet to discuss GWM; consent agreement not signed by SWP.
8/9/84	EPD letter to SWP: define uppermost aquifer and define ground water flow direction, etc. Also tank certification is due 8/31/84.

8/22/84	SWP/EPD meet to discuss the ground water monitoring system at the site.
9/5/84	EPD makes recommendations on revised GWQAP.
9/7/84	SWP submits incomplete information on tank certification.
9/84-10/84	Well clusters MW6 to MW9 and B1 installed.
10/84	K001 detected in ground water samples.
11/2/84	First quarter sampling for wells 6C, 7C, 8B and 9B, and MW1 through MW5.
11/16/84	EPD issues a NOV - previously requested ground water monitoring information is due 12/3/84.
12/84	K001 detected in ground water samples.
12/1/84	Second quarter sampling for wells 6C, 7C, 8B and 9B.
12/11/84	EPD inspection performed at SWP; ground water monitoring violations noted.
12/11/84	EPD samples Richmond County water supply well - No K001 constituents are detected.
1/85	K001 detected in the ground water; arsenic exceeds the NIPDWS.
1/3/85	Law Engineering submits the report "Additional Monitoring Well Installation and Hydrogeological Assessment" for SWP.
1/9/85	EPD requests information on solid waste management units - this information is due 3/15/85.
1/11/85	EPD issues an NOV based on the 12/11/84 EPD inspection; information is due 2/8/85.
1/12/85	Third quarter sampling for wells 6C, 7C, 8B and 9B.
1/16/85	EPD drafts an Administrative Order for SWP to bring the facility into compliance with the regulations.
1/21/85	SWP submits an incomplete tank certification.
1/23/85	SWP/EPD meet to discuss the ground water monitoring system.
1/25/85	Additional tank information due 2/15/85.
2/5/85	Ground water elevations measured for wells MW6 to MW9.
2/15/85	SWP submits additional ground water monitoring information.
3/10/85	Fourth quarter sampling for wells 6C, 7C, 8B and 9B.

3/13/85	SWP requests approval to close wells MW1 through MW5.
3/15/85	SWP submits quarterly sampling results.
3/22/85	EPD issues a second NOV based on the 12/11/84 EPD inspection.
4/10/85	Quarterly sampling results for wells 6C, 7C, 8B and 9B.
4/25/85	Tank cannot be certified due to large cracks.
5/1/85	EPD samples neighborhood wells - K001 constituents detected.
5/2/85	Comments form EPA Site Screening and Identification Unit.
5/2/85	EPD samples the SWP 308-foot production well - K001 constituents detected.
5/3/85	EPD proposes a consent order for 265/270 deficiencies.
5/7/85	EPD issues a NOD for Part B deficiencies.
5/8/85	Well MW6C is sampled for Appendix VIII constituents.
5/8/85	EPD reports on samples taken from neighborhood wells.
5/16/85	SWP responds to the 5/3/85 consent order.
5/23/85	SWP notifies EPD that well MW6C has been sampled for Appendix VIII.
5/30/85	EPD samples more neighborhood wells - K001 constituents detected.
5/31/85	EPD samples the SWP 308-foot production well - K001 constituents detected.
6/4/85	SWP submits information to EPD regarding solid waste management units.
6/5/85	EPD issues Administrative Order EPD-HW-212 to bring the facility into compliance.
6/5/85	Law Engineering submits a GWQAP update to SWP.
6/10/85	EPA issues a consent order to bring the facility into compliance.
6/10/85	SWP begins installing more monitoring wells for assessment purposes.
6/13/85	GWQAP revision prepared by Law Engineering for SWP.
6/17/85	EPD trip report for the May 1985 inspection.
6/21/85	SWP submits more ground water monitoring information.
6/24/85	SWP submits information on solid waste management units.

6/27/85	SWP files a "Petition for Hearing" to challenge Administrative Order EPD-HW-212.
7/3/85	SWP/EPD meet to discuss Administrative Order EPD-HW-212.
7/15/85	Closure plan submitted for the surface impoundment.
7/25-26/85	Samples for ground water sampling of all well clusters taken by Law Environmental Services.
7/29/85	EPD files pleadings in connection with Administrative Order EPD-HW-212.
7/31/85	EPD sends letters to neighborhood residents regarding the results of sampling their private wells.
7/31/85	Law submits a "Compliance Monitoring Program Outline" for SWP.
8/2/85	SWP/EPD meet to discuss the Administrative Order.
8/9/85	Monitoring wells sampled by Law Environmental Services.
8/30/85	EPD requests information drilled by Virginia Supply and Well Company, about a well drilled 20 to 25 years ago screened in sand that yielded only creosote.
9/3/85	Ground water levels are measured in all monitoring wells.
9/15/85	Wells MW1 to MW5 abandoned.
9/17/85	SWP/EPD meet to discuss consent orders.
10/1/85	Part B revision is submitted.
10/85	A sampling and analysis plan for ground water monitoring during closure is submitted.
10/25/85	Ground water levels are measured in the monitoring wells.
11/6/85	"Report of On-Going Ground Water Quality assessment" prepared by Law Engineering for SWP.
12/10/85	EPD samples neighborhood wells - No K001 constituents detected; EPD also samples surface water and sediment in the vicinity of SWP.
12/17/85	Consent Order EPD-HW-258 signed.
1/2/86	"Human Health and Environmental Assessment" report to submitted EPD for review.
1/10/86	EPD Consent Order EPD-HW-257.
1/13/86	"Corrective Action - Segment I" prepared by Law Engineering for SWP.

3/4/86	SWP/EPD/EPA meet to discuss ground water monitoring.
3/17/86	"Corrective Action - Segment II" prepared by Law Engineering for SWP.
3/18/86	ACL's submitted; prepared by Law Engineering for SWP.
4/7/86	The closure plan for the surface impoundment is submitted.
4/9/86	A revised closure plan is submitted to EPD.
5/14/86	EPD performs an inspection at SWP.
5/19/86	Interim Status - Corrective Action Evaluation submitted for review.
5/20/86	EPA issues the Final Agreement and Final Order 85-29-R to SWP.
6/2/86	EPD in-house memo regarding the ground water assessment at SWP.
6/9/86	A proposal for closure is presented by Rollins (second revision).
7/3/86	EPD requests DHR to perform a Health Consultation for the area around SWP.
7/16/86	The revised compliance monitoring program is submitted.
7/16/86	The Ground Water Quality Assessment Summary for closure is submitted.
7/18/86	"Corrective Action - Segment II" prepared by Law Engineering for SWP.
7/22/86	EPD samples two SWP monitoring wells for Appendix VIII analyses.
7/22/86	SWP submits a revised Part B permit application.
7/29/86	Consent Order EPD-HW-257 is amended and executed.
8/8/86	SWP/EPD/EPA meet to discuss ground water monitoring issues.
8/20/86	EPD samples neighborhood wells - K001 constituents detected.
8/26/86	EPD inspection performed at SWP.
10/14/86	EPD receives results from the Rocky Mountain Analytical Laboratory for two wells at SWP. The wells showed detectable concentrations of chlorinated volatile compounds.
10/27/86	EPD approves the closure plan for the surface impoundment at SWP.

12/3/86 SWP begins installing additional monitoring wells for assessment purposes.

1/26/87 HWGWTF performs an evaluation of the SWP ground water monitoring system.